Powered by Innovation

Doosan Infracore
2019 Integrated Report
Doosan Infracore strives to embody corporate social responsibility (CSR) in its overall corporate management. To this end, the company publishes an integrated report to disclose its financial and non-financial performance results generated through the interaction of diverse CSR factors, based on which corporate values are created. This is Doosan Infracore’s eighth Integrated Report, and continued discussions and improvements are taking place for more effective and transparent disclosure of information.

Reporting Process
26 departments related to the company’s strategy, R&D, production, sales, investor relations, and communications have participated in the planning of this Integrated Report in order to enable comprehensive reporting on Doosan Infracore’s financial and non-financial performance as well as social and environmental values, with a particular focus on 2019 performance results and future plans of the company.

Reporting Period
This report presents quantitative data about the company’s performance during the 2019 calendar year. However, the company’s qualitative activities mentioned in the report, including the composition of the BOD, include developments recorded until the end of April 2020.

External Assurance
This report has been assured by Samjong KPMG, an independent assurance service provider, to ensure the propriety and integrity of the reporting processes as well as the accuracy and credibility of its contents. The Independent Assurance Report is attached in the Appendix section.

Disclaimer
This report contains details of some future activities, events and situations based on the company’s plans and estimations of future financial outcomes, which may turn out to be inaccurate in the event of changes in the global business landscape. The plans and estimations draw upon the best information available at the time of completion of this report, with due consideration given to future business environments as well as the company’s elaborate business strategies. Doosan Infracore, therefore, would like to remind its stakeholders that this report contains some predictions that may be affected significantly due to the risks, uncertainties and other factors involved in the company’s global operations.

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Printed Material
This report is published in Korean, English and Chinese to communicate better with our global stakeholders.

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Doosan Infracore 2019 Integrated Report
Doosan Group

The oldest and one of the fastest growing in Korea

Doosan Infracore

A world-leading company in infrastructure solutions based on world-class competitiveness

Doosan Group – Our Aspirations and Core Values

Doosan Credo – Our Aspirations and Core Values

The Doosan Credo is a combined word of "doo (a measuring stick)" and "sun (the shining)." Doosan has been doing business around the world for more than 120 years, and the way we work with all of our partners. The nine core values of the Doosan Credo in all places where they practice the nine core values of the Doosan Credo in all places where they

1. Inhwa Customers World-class Technology and Innovation

To create "Proud Global Doosan," Doosan employees around the world are making efforts to improve the foundation for life. Doosan can say we are building your tomorrow today. People unlock their full potential. That is the idea we have when we reality, Doosan aims to create a world of opportunity where all peoples unlock their full potential. It means being member of Doosan that instills pride in them; to customers, it means being a part of Doosan that delivers just things that are essential to daily life and progress.

2. Transparency

Doosan is making efforts to improve the foundation for life. Doosan can say we are building your tomorrow today. People unlock their full potential. That is the idea we have when we reality, Doosan aims to create a world of opportunity where all peoples unlock their full potential. It means being member of Doosan that instills pride in them; to customers, it means being a part of Doosan that delivers just things that are essential to daily life and progress.

3. Leadership

Doosan has No Fear of Change. In the fast-paced market that surrounds us, the company is a force in the world of business. Doosan group transformed into a global company competitive in infrastructure support business. Thereafter, through a series of mergers and acquisitions, Doosan has transformed into a global company competitive in infrastructure support business.

4. Global Network

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5. Sustainability

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6. Ethics

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7. Service

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8. Innovation

Doosan is making efforts to improve the foundation for life. Doosan can say we are building your tomorrow today. People unlock their full potential. That is the idea we have when we reality, Doosan aims to create a world of opportunity where all peoples unlock their full potential. It means being member of Doosan that instills pride in them; to customers, it means being a part of Doosan that delivers just things that are essential to daily life and progress.

9. Growth

Doosan is making efforts to improve the foundation for life. Doosan can say we are building your tomorrow today. People unlock their full potential. That is the idea we have when we reality, Doosan aims to create a world of opportunity where all peoples unlock their full potential. It means being member of Doosan that instills pride in them; to customers, it means being a part of Doosan that delivers just things that are essential to daily life and progress.

Doosan Infracore – A Leading Infrastructure Solutions Provider

Doosan Infracore was founded in 1937 as Chosun Machine Works, the first large-scale machine manufacturing factory in Korea. Through continuous growth for more than 80 years, it has become South Korea’s top machine manufacturing company. Its product line-up includes construction equipment, engines, a variety of automation systems, and unmanned systems, and is capable of operating in the world-class business

Company Profile

Doosan Infracore was founded in 1937 as Chosun Machine Works, the first large-scale machine manufacturing factory in Korea. Through continuous growth for more than 80 years, it has become South Korea’s top machine manufacturing company. Its product line-up includes construction equipment, engines, a variety of automation systems, and unmanned systems, and is capable of operating in the world-class business

Business Overview

Construction Equipment

The Construction Equipment Business Area has supplied high-quality irons and heavy long-term industrial equipment to its customers for the past 95 years, contributing to the development of the global infrastructure industry. The Construction Equipment Business Area has been proceeding to global business, such as Doosan Infracore, and finally, with the pump line-up, pump business can be considered as a large-scale construction equipment. It has production bases in Korea, North America, China, and Europe, and it provides world-class products in construction equipment, including pumps, compressors, lifting systems, and power products equipment.

Traditionally, the engine business has been a core business area of Doosan Infracore. The engine business has been a core business area of Doosan Infracore. It provides world-class products in construction equipment, including pumps, compressors, lifting systems, and power products equipment.

Engine

Established in 1988, the Engine Business Area has developed the first diesel engine in Korea and has continued to expand its business worldwide. It supplies diesel and gas engines for buses and trucks, power generation and ships, as well as various industrial engines across the world. Based on its product line-up that meets increasingly stringent world-wide environmental regulations, the Engine Business Area has achieved the world’s top sales performance, remaining among the top three major engine manufacturers in the world. It has been enhancing its global competitiveness by allowing new product development and efficient management of its new business operations.

Brand

Doosan Infracore’s brand embodies Doosan’s proud history and resilient growth, and mirrors world-class recognition.
As a member of the global community, Doosan Infracore is faithfully carrying out our roles and responsibilities. We are growing as a proud global company with the ardent support of customers, shareholders, suppliers, employees, local communities and other stakeholders. The driving force of this growth is clearly stated in the corporate motto, “Powered by Innovation.” The motto captures the importance of the innovation drive we have been pushing forward, signifies our resolution to sow the seeds of innovation across the field of operations, and emphasizes our determination to nurture business possibilities based on the driving force stemming from our tireless pursuit of innovation. We make continuous efforts to improve how we work and what we produce to provide customers with optimal solutions, we move forward towards our vision, “Global Leader in Infrastructure Solutions.”

Outlook and Plans for 2020

In 2019, despite a global economic downturn, Doosan Infracore posted sales of KRW 8,185.8 billion, a 5.9% increase year-on-year, and an operating income of KRW 840.4 billion, that shows a stable performance relative to the performance of 2018.

The year 2020 looks to be a year of extreme uncertainty as the confluence of the continuing global economic downturn and the COVID-19 pandemic more likely spawn unprecedented variables. The more uncertain looks the path ahead the greater focuses on fundamentals. Doosan Infracore will therefore implement three key strategies – strengthening fundamentals, diversifying product and regional portfolios, and developing future growth drivers – in order to continue our innovation drive and seize on new opportunities.

Strengthening fundamentals

We will improve upon fundamentals to stay competitive and profitable even in the event of drastic market fluctuations. We will sharpen our competitive edge in pricing, product quality and customer service by optimizing resource allocations, curtailing costs, and improving other components of our value chain, in the process delivering a higher level of customer value. Also, by harnessing massive amounts of data and information being generated as a by-product, we will create the basis for big data-based decision making and apply it to our business activities.

Diversifying product and regional portfolios

We will expand our construction equipment product line-up, restructure distribution channels, and strengthen sales in the global market. We will increase our overseas market share by equipping wheel loaders and new products with Stage V engines, In North American and emerging markets, we will channel resources into sales of large-sized equipment and development of large-scale dealers. In China, we will maintain our market position with introduction of special equipment, low-end wheel and crawler excavators, against local competition. In developing new markets, we will leverage our digital platform with the aim of providing total solutions to customers. As for engine business, we will pursue stable revenue growth by ramping up after-sale services and solution business while increasing external sales through expansion of the new product line-up and improvement of cost competitiveness.

Developing future growth drivers

Unmanned and automation technologies are the key concept of futuristic technologies Doosan Infracore is developing. In November 2019, we successfully demonstrate Concept-X, an all-purpose control solution packed with unmanned and automation technologies. In May 2020, we launched XiteCloud, a smart solution that significantly increases productivity at construction sites. XiteCloud is considered a prelude to commercialization of Concept-X. It processes and analyzes such various data as those from floor plans as well as generated by drones and other devices, thus enabling the establishment of optimal plans and the execution of efficient construction. Going forward, we will continue to maintain the growth momentum we have built over the years by improving and commercializing technological advances of ours, and securing electric excavator, hybrid powertrain and other eco-friendly technologies.

Making relentless efforts to improve social sustainability

In addition to improving product quality and cost competitiveness, Doosan Infracore faithfully practices ethical management and actively promotes transparent and continuous dialogues with our stakeholders under strong corporate governance and sound risk management. We are also building a win-win partnership with suppliers to grow together. We are supporting future generations and local communities, while taking an active part in responding to climate change and preserving the environment. Through these and other efforts, Doosan Infracore is taking the lead in increasing the sustainability of our society and ushering in a better future for all stakeholders.

I ask for your continued interest and support for Doosan Infracore, as we advance into a global company of which all stakeholders are proud in a world where we help realize the dreams of humankind.

Sohn, Dong Youn
Chief Executive Officer
Doosan Infracore Co., Ltd.
Our Business Model

Doosan Infracore strives to maximize its corporate value by effectively investing its financial and non-financial resources in its value chain. We actively address social and environmental issues related to our business operations, while pursuing our vision of becoming a "Global Leader in Infrastructure Solutions" as a means to ensure sustainable growth and contribute to social development.

**Capital Input**
- Funds that are generated through management, investments or financing, and that can be used by an organization to produce products or provide services
- Manufactured articles, such as facilities and buildings that can be used by an organization to produce products or provide services
- An organization’s knowledge-based intangible assets, such as patents, copyrights, software rights and licenses
- Members’ capabilities and experiences that drive innovation and allow the understanding, development, and execution of an organization’s strategies
- Stakeholder relations and trust, and other intangible assets related to brands and reputation developed by an organization
- All environmental resources, both renewable and non-renewable, that can be used to provide products or services

**Value Chain**

- **Procurement**
  - Build a healthy ecosystem for win-win growth by providing programs to strengthen supplier competencies, including the Leading Suppliers program and benefit sharing system

- **Manufacturing**
  - Maximize production efficiency and improve manufacturing competitiveness through the Global Manufacturing Execution System (GMES)

- **Product Development**
  - Develop products, that meet customer requirements and next-generation emissions regulations, and unmanned and automation technologies based such market trends as customer requirements, eco-friendly fuel and ICT

- **Sales & Service**
  - Build a systematic product line-up to increase customer satisfaction, optimize parts supply processes, and strengthen customer services, such as DoosanCARE
  - Develop DoosanCONNECT™-based service solution products and increase intact sales through a digital platform

**Key Performance in 2019**

- **Sales**
  - KRW 8,185.8 billion
  - Increased by 5.9% year-on-year as mainly attributable to the grow in advanced markets and some emerging markets, as well as sales increase in engines for Doosan Bobcat and generators

- **Operating income**
  - KRW 840.4 billion
  - Achieved a stable performance, relative to 2018, when we posted the highest figure ever, thanks to our efforts to increase sales and improve profitability

- **Debt ratio**
  - 165.7%
  - Increased by 25%p year-on-year as a result of increased profits which in turn led to capital expansion

- **Production facility investments**
  - KRW 702.7 billion

- **Investments**
  - To increase production capacity and improve the plant environment

- **Excavators and wheel loaders**
  - Production
  - 105,916

- **Engines**
  - Excavators and wheel loaders
  - 24,612

- **Percentage of R&D on unmanned and automation technologies among R&D projects of the company**
  - 28.3%

- **Employee turnover rate**
  - 1.05%

- **Training expenses per person**
  - KRW 750,000

- **Training hours per person**
  - 60.6 hours

- **Involved in UN Global Compact since 2013**
  - Leading Suppliers (cumulative)
  - 32

- **CCI investment**
  - KRW 8.64 billion

- **Greenhouse gas emissions**
  - 112,166 tCO2eq

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1) Based on consolidated financial statements
2) OIFR (Occupational Illness Frequency Rate): Number of workers who have occupational illness and other related illness/Total workers (Application of calculation formula of the Korea Occupational Safety and Health Agency, Unit: %)
3) LTIR (Lost Time Incidents Rate): Number of incidents involving more than one-day closure of workday per 100 workers, Total number of lost time cases/Total number of hours worked by employees * 200,000
4) LTRI* (Lost Time Rates Index): Number of incidents involving more than one-day closure of workday per 100 workers
5) CCI investment KRW 8.64 billion

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**Intellectual**

- Registrations (including 2,524 patents)
  - 4,394

- Applications (including 1,648 patents)
  - 2,871

**Human**

- Employee turnover rate
  - 1.05%

- Training expenses per person
  - KRW 750,000

- Training hours per person
  - 60.6 hours

**Social/Network**

- Involved in UN Global Compact since 2013
  - Leading Suppliers (cumulative)
  - 32

- CCI investment
  - KRW 8.64 billion

**Natural**

- Energy consumption
  - 2.142 TJ

- Improved by 3.5% compared to the energy intensity in 2007 by making continuous efforts to identify/track to reduce energy consumption and improve them

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Based on business sites in Korea
Performance Review & Outlook

2019 Performance Summary

Successful demonstration of Concept-X
Boryeong Proving Ground in 2019

87.3% Percentage of premium eco-friendly or eco-friendly products

1.7-ton mini excavator
Winner of the 2020 Red Dot Design Award in the product design category

Doosan Sustainable Value Framework
Established integrated mid-to-long-term financial and non-financial goals

9 consecutive years
Agreed on collective bargaining agreements without dispute

2019 National Sharing Grand Awards
Received the Prime Minister’s Commendation in the donation category

10 consecutive years
Listed in the machine and electric equipment categories of DSI Korea

A Rated Class A in the ESG Evaluation by the Korea Corporate Governance Service

2018 Integrated Report
Received Honors at the 2019 ARC Awards

Performance Overview

Since 2016, the global construction machinery market has been growing with global economic recovery and increasing demands for repurchases. The market growth in 2019 can be attributed to robust commercial real estate and public construction sectors in North America, increased housing and infrastructure investments in Europe, and a government-led expansion of infrastructure investment in China. The market expects solutions business to play a bigger role as a response to diverse, segmented customers’ trends. Accelerated digitalization across global construction sites encourages the opportunity to expand new digital-based business. Meanwhile, the global engine market also has grown since 2016 on the back of China’s booming construction equipment market and on a stable demand for gas engines from the oil & gas market fueled by a recovering oil price. Going forward, the market is expected to grow further on the account of such positive factors as market entry opportunities to increase as the exhaust emission standards of many nations are set to transition into a higher phase, strong growth momentum in the high-power large-size engine sector; and rising demands for engines in Southeast Asia and other emerging markets.

Amid such market developments, Doosan Infracore had its business base re-established in 2015 and 2016 in a bid to improve business growth potential and stability, and has made continuous efforts to solidify its business base by reorganizing its channel structure, improving product competitiveness, enhancing service capacity and quality. The company also sought to diversify business by acquiring business rights to sell heavy equipment in advanced markets, preparing new product lines, developing large-order customers, launching D20 Capital, and conducting other forward-looking projects, and by continuing efforts to make a new leap-forward.

In addition to financial performance, Doosan Infracore is enhancing value for both stakeholders and society. The company sets the direction for CSR activities to conduct based on its CSR strategy, and with the CSR Committee taking a central role, it shares the directives company-wide, and builds up its collective ability to execute them accordingly. It also aligns its activities as a company with the United Nations Sustainable Development Goals (SDGs) to ensure a sustainable future for society and the company. Moreover, in order to measure the social value of business activities it conducts, Doosan Infracore makes proactive efforts, such as analyzing the social value of Concept-X, a new solution to productivity improvement at construction sites based on the KPMG’s “True Value” methodology.

Financial Performance

1. Business Performance

Despite uncertainties shrouding the global economy, the sales performance of Doosan Infracore in 2019 increased 5.9% year-on-year to KRW 8,185.8 billion, surpassing the KRW 8 trillion mark for the first time, based on the current business portfolio (including construction equipment and engines, excluding machine tools included in 2011 when the company posted record high sales). The record performance is attributable to the robust growth of all advanced and some emerging markets and to increased sales of Doosan Bobcat and generator engine operations. Operating income decreased by KRW 7.7 billion to KRW 840.4 billion, while net income increased by KRW 1.5 billion to KRW 395.7 billion.

Sales

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales (KRW billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>8,185.8</td>
</tr>
<tr>
<td>2018</td>
<td>7,730.1</td>
</tr>
</tbody>
</table>

Net Income

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income (KRW billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>395.7</td>
</tr>
<tr>
<td>2018</td>
<td>394.2</td>
</tr>
</tbody>
</table>
2. Financial Status
As of the end of 2019, Doosan Infracore’s total assets amounted to KRW 11,338.593 billion, up KRW 309.4 billion increase from the previous year, total liabilities to KRW 7,071,041 billion, KRW 137.3 billion decrease, and total equity to KRW 4,267.562 billion, KRW 446.7 billion increase.

Financial Conditions

(Unit: KRW million; based on consolidated financial statements)

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets</td>
<td>3,763,434</td>
<td>4,479,821</td>
<td>4,304,912</td>
</tr>
<tr>
<td>Non-current assets</td>
<td>6,508,586</td>
<td>6,624,045</td>
<td>6,486,420</td>
</tr>
<tr>
<td>Total assets</td>
<td>10,276,010</td>
<td>11,103,866</td>
<td>10,791,332</td>
</tr>
<tr>
<td>Current liabilities</td>
<td>3,959,564</td>
<td>3,779,524</td>
<td>3,684,420</td>
</tr>
<tr>
<td>Non-current liabilities</td>
<td>3,407,283</td>
<td>3,479,778</td>
<td>3,586,621</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>7,366,847</td>
<td>7,289,302</td>
<td>7,271,041</td>
</tr>
<tr>
<td>Total equity</td>
<td>2,909,163</td>
<td>3,814,564</td>
<td>3,520,291</td>
</tr>
<tr>
<td>Total assets</td>
<td>10,276,010</td>
<td>11,029,167</td>
<td>10,791,332</td>
</tr>
</tbody>
</table>

3.1 Engine
The year 2019 was marked by escalating global trade conflicts and weakening investment sentiments, which in turn combined to suppress commodity prices, to heighten FX volatility, to increase labor costs, and to add weight to other burdens on corporations. Also, business competition further intensified as Chinese companies continued their growth and aggressive pricing strategies.

3.2 Management Analysis

3.2.1 Financial Status

3.2.2 Non-Financial Performance

Non-Financial Performance

1. Social Performance

1.1. Customers
Doosan Infracore makes continuous efforts to improve customer satisfaction. To this end, the company is developing specialty equipment, operating Customization Plants assembling machinery to custom orders; expanding the line-up of genuine and economy parts; optimizing global parts supply networks centered around Parts Distribution Centers (PDCs); and developing and mass-producing European Stage V and other engines to next-generation emission specifications. It is also bolstering market competitiveness by accelerating the pace of our technological innovation and improving fundamental quality. In addition, it has expanded the DoosanCONNECT™ service internationally, which enables global customers to better manage their construction projects by keeping them updated on the location and status of their equipment, including engines and parts.

To support customers’ convenient and efficient equipment operations, the company has developed and launched “Smart Maintenance,” a preemptive maintenance service made possible by the information of equipment operational status collected through DoosanCONNECT™. Doosan Infracore improves customer value by providing product information, educating customers on equipment maintenance and other types of customer support content through social media and other digital platforms as well as by operating customer communication channels.
Doosan Infracore implements human rights risk management systems to protect the human rights of employees and other stakeholders. Its wide-ranging activities include distributing manuals on prevention of human rights risks, operating a human rights protection center, educating employees on human rights issues, and instituting the Women’s Council. It also conducts online surveys and addresses human rights issues in and around its operations in order to increase human rights awareness among employees. In 2019, the company carried out activities designed to improve corporate culture and other issues identified through human rights awareness surveys, and provided a human rights education to all employees on gender equality, treatment of people with disabilities, and prevention of harassments.

Suppliers

Doosan Infracore helps its suppliers enhance their competitiveness by running a variety of programs centered on technology development, product quality management, and financial support. The programs, including Doosan Supplier Excellence Program (DSEP) and Leading Supplier program, are aimed at helping the suppliers strengthen their fundamental competitiveness. In addition, Doosan Infracore has implemented a multi-party benefit sharing system through which its first- and second-tier suppliers work together to create and share excellence. As human rights, environment, employee safety, and other CSR issues emerged as significant subjects, the company encourages suppliers’ CSR activities through systematic management. To this end, the company is sharing CSR guidelines with suppliers and establishing a process of defining and managing suppliers at high CSR risk. In 2019, it identified high CSR-risk suppliers and carried out programs to help them improve their CSR activities.

Environmental Performance

Doosan Infracore has been complying with the laws governing carbon emissions trading since its participation in trading system in 2015. Prior to the participation, its Incheon plant was designated as a workplace with greenhouse gas and energy target management system by the government in 2010. In its efforts to reduce energy consumption and greenhouse gas emissions, in 2018 the company launched the GHG/Energy Reduction Council that takes a central role in operating the Energy Management System (EMS) and managing its performance; establishing a mid-to-long-term road map in preparation for the coming enforcement of the carbon trading system; and setting emissions reduction targets and drawing up action plans for the goals, all as part of its detailed response to climate change. In 2019, the company’s greenhouse gas emissions stood at 112,186 tCO₂, a 3.6% increase over the previous year.

Doosan Infracore has been measuring and disclosing social values generated in the course of operations in its Integrated Report by using the KPMG’s “True Value” methodology since 2017. This year, the company analyzed the social values of Concept K, an unmanned automated control system of equipment at construction sites, which was successfully demonstrated in 2019. (P. 54-55) Going forward, Doosan Infracore seeks to fully internalize CSR by reviewing the progress of all CSR activities, offering support for proper operation, and conducting performance management, with the aim of achieving sustainable growth.

Keen on the close correlation between corporate and social values, Doosan Infracore has been measuring and disclosing social values generated in the course of operations in its Integrated Report by using the KPMG’s “True Value” methodology since 2017. This year, the company analyzed the social values of Concept K, an unmanned automated control system of equipment at construction sites, which was successfully demonstrated in 2019. (P. 54-55) Going forward, Doosan Infracore seeks to fully internalize CSR by reviewing the progress of all CSR activities, offering support for proper operation, and conducting performance management, with the aim of achieving sustainable growth.

Doosan Infracore conducts annual materiality and external ESG evaluations to identify stakeholder interests and needs, and based on their findings, the company devises annual CSR tasks and implements appropriate measures in an effective manner through collaboration among relevant departments. Doosan Infracore has launched eight new tasks as the strategic CSR tasks for 2020. The tasks include establishing management systems and strengthening monitoring to raise employee awareness of human rights, focusing on decarbonization and developing alternative fuel products, and helping leading suppliers bolster their competitiveness by building smart factories.

Keen on the close correlation between corporate and social values, Doosan Infracore has been measuring and disclosing social values generated in the course of operations in its Integrated Report by using the KPMG’s “True Value” methodology since 2017. This year, the company analyzed the social values of Concept K, an unmanned automated control system of equipment at construction sites, which was successfully demonstrated in 2019. (P. 54-55) Going forward, Doosan Infracore seeks to fully internalize CSR by reviewing the progress of all CSR activities, offering support for proper operation, and conducting performance management, with the aim of achieving sustainable growth.
OUR APPROACH

Doosan Infracore has assessed megatrends of the coming decade from poli-economic, technological, social, and environmental perspectives in order to identify critical sustainability issues.
Materiality Analysis

**Materiality Analysis Process**

**ISSUE POOL SELECTION**

- Regularly diagnose all departments related to CSR at domestic and overseas businesses.
- Conduct materiality assessment through a diagnosis model in a bid to assess its CSR competencies, identify areas to improve, and select internal CSR issues.
- Identify types of CSR issues and the degree of the stakeholders and international community’s interest by analyzing the media coverage as well as CSR-related international standards and guidelines.
- Compose a pool of issues by collecting internal stakeholders’ opinions on CSR issues, and benchmark industry peers to identify global responses.

**PRIORITIZATION**

- Prioritize the CSR issues selected from its CSR pool by relevance, business importance*, value chain influence* and stakeholder interest.

**REVIEW AND FEEDBACK**

- The CSR Committee, consisting of top executives, reviews the relationship between top priority issues and business activities, and approves the validity of selected core issues and CSR strategic tasks for each respective year.
- All material issues are discussed and managed by the Committee year around in view of the progress of respective CSR strategic tasks, with other issues managed by relevant business units in connection with those of industry peers and relevant social changes.

Results of Materiality Assessment

Out of 17 material issues selected in line of megatrends and their industry impact, seven material issues that are relatively high in stakeholder interest and business impact are detailed in the Material Issues section (P. 16-17). Also reported are key information on business strategies, products and technologies in the Our Strategy section as well as information on activities and achievements related to CSR strategic tasks in the Our Responsibility and CSR Facts & Figures sections.

**Material Issues**

1. Long-term growth and stability
2. Global market strategy and product portfolio enhancement
3. Digital transformation and technological innovation
4. Changes in work processes and operational competitiveness
5. Product stewardship and customer satisfaction
6. Corporate governance
7. Eco-friendly products
8. Climate change and energy
9. Stakeholder cooperation for sustainable development
10. Value chain management and risk management
11. Corporate health & safety
12. Contributions to local communities
13. Climate change and energy
14. Ethical management and compliance
15. Human rights and labor practices
16. Resource efficiency
17. Management of succession and waste

* Each circle represents an issue, and the size of each circle represents the issue’s level of influence in value chain.
**Material Issues**

In detailing the seven material issues found to be high in business impact and stakeholder interest, Doosan Infracore examines each issue’s potential risks and opportunities associated with afore-mentioned external factors such as megatrends and industry impacts, and discloses the strategic tasks it has implemented as a response and subsequent outcomes.

### Issues

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<th>Long-term growth and stability</th>
<th>Global market strategy and product portfolio enhancement</th>
<th>Digital transformation and technological innovation</th>
<th>Changes in work processes and operational competitiveness</th>
<th>Product stewardship and customer satisfaction</th>
<th>ESG evaluation and disclosure</th>
<th>Eco-friendly products</th>
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<tr>
<td>A company must ceaselessly rebalance the business portfolio to external changes and secure new growth drivers in order to maintain a business foundation stable enough even in times of high uncertainty.</td>
<td>For a global manufacturing company to increase its ability to influence markets, it is required to produce products that can satisfy each market’s regulatory standards and demand, to offer high quality services, and to have efficient channels.</td>
<td>Innovative technologies of the Industry 4.0 are changing the future of the construction equipment industry. AI enables automated cognitive and decision-making abilities, and 5G and IoT have increased connectivity and mobility. These technological innovations will markedly improve the construction industry’s productivity and safety.</td>
<td>As the growth of the economically active global population is forecast to turn downward in 2022, labor shortage is to be a common concern for all industries. In response, global companies are moving forward with AI and data-based operation innovation to improve productivity.</td>
<td>Strict quality management, proactive service and reflection of customer opinions are the basis for continued customer incuring a drop in sales due to business fluctuation while striving to minimize the chance of occurrence. Providing distinctive customer value is integral to establishing a sound market presence and reputation.</td>
<td>In the design of new products or processes, a company should enhance the corporate value in the direction of satisfying various stakeholder needs. In addition, it should engage in business activities that increase social and environmental value, and transparently disclose outcomes as well as future opportunities and risks.</td>
<td>Newly emerging consumer classes are highly sensitive to product environmental impacts due to the public’s increasing interest in climate change and a paradigm shift in values and behavior. Thus, a company should strive to reduce the environmental impact of its products right from the development phase of the product life cycle.</td>
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<td>Global industry is expected to suffer and the economy to heavily affect from COVID-19 and other factors. The construction market may grow at lower rates as investment and development slow down. Over-reliance on specific markets or product lines may lead to weaken financial performance.</td>
<td>The construction equipment industry’s adoption of innovative technologies has created the opportunity to go beyond a manufacturer and become a provider of integrated construction site solutions. Unmanned automated construction equipment increases efficiency of manufacturing process and creates social value related to safety and the environment.</td>
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<td>Prepare for the era of labor shortage and develop the operational agility to respond to change increasing operational efficiency through data-based decision-making and operational innovation</td>
<td>Use digital technology to create innovative opportunities for enhancing customer experiences. Overcoming geographical limits and thus increase customer satisfaction by preempting potential problems through remote monitoring of the status of products.</td>
<td>A company can communicate with investors and consumers on its non-financial corporate value and ESG status by disclosing information on its social/ environmental impacts of its business and other activities. A company’s ESG capability contributes to its resiliency to change in the business environment.</td>
<td>Emission regulations are increasingly stringent across the globe, making it all the more important to invest in new technologies and products that meet the regulations.</td>
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<td>Sales in North American, European and other advanced markets growth by 6.5% year-on-year in proportion to total sales</td>
<td>Implemented a value-selling strategy focusing on offering products together with consulting and services. Completed the construction of the Boryeong Proving Ground, Korea’s largest proving ground, for testing the durability of construction equipment. Launched Doosan CONNECT™, an integrated construction site control solution that includes unmanned automated equipment, by 2025. By leveraging its leading technological advantages, it will change its business model from manufacturing to providing comprehensive construction site solutions.</td>
<td>Announced the company’s new slogan, “Powered by Innovation” Successfully demonstrated the Concept-X, an integrated construction site control solution DossanCONNECT™ named “Innovative Solution of the Year” by BuiltWorlds, a professional North American infrastructure and construction community Established the Global Manufacturing Execution System (GMES) platform, strengthening operations and data collection.</td>
<td>Formed strategic partnership with Palantir, a big data company of the U.S., and moved forward with digital-based operation and decision-making optimization (opened Digi60). Established the Global Manufacturing Execution System (GMES) platform, strengthening operations and data collection.</td>
<td>Registered data in the statistical process control system for managing 122 inspection items of 86 suppliers to strengthen quality management. Began to provide Smart Maintenance service using DoosanCONNECT™, and strengthened remote monitoring of equipment status and preventive maintenance.</td>
<td>Lifeline by the Doosan Group, a 36-ton excavator which satisfies the Stage V, the latest in European emissions standards Launched a 62 engine which complies with the Stage V Unveiled “a Hybrid Powertrain” with an electric motor and battery attached, at POWERGEN International 2019 Unveiled a prototype electric excavator at CONEXPO 2020</td>
<td>Launch the D750LC, a 36-ton excavator which satisfies the Stage V, the latest in European emissions standards. Launched a 62 engine which complies with the Stage V Unveiled a “Hybrid Powertrain” with an electric motor and battery attached, at POWERGEN International 2019. Unveiled a prototype electric excavator at CONEXPO 2020.</td>
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<td>Diversified product portfolios to include special equipment and others, and secured largely scaled live-line up of engines</td>
<td>Doosan Infracore is strengthening the ability in managing and using data across all of its operations, to secure innovative technology-based operational excellence, on which it seeks to maximize productivity and efficiency, and to internalize innovativeness as part of its DNA</td>
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<td>Doosan Infracore plans to focus on diversifying its business portfolio in existing markets and breaking into new markets with great potential, while striving to minimize the chance of incurring a drop in sales due to business fluctuation. It continues to bolster its presence in regions with high growth potential in emerging markets and advanced markets, such as North America and Europe.</td>
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<td>Opened the company’s third Part Distribution Center (PDC) in Seattle, the U.S., strengthening the parts distribution network.</td>
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In conducting business, Doosan Infracore pursues sustainable growth that generates not only social and environmental values. In 2019, the company launched “Sustainable Value Framework,” describing its mid- to long-term ESG strategic objectives, as a way to manage financial and non-financial performance in an integrated manner. Based on Doosan Credo and UN Sustainable Development Goals (SDGs), it analyzed major external indices of corporate sustainability, including SASB Standards, MSCI ESG Ratings and SAM Corporate Sustainability Assessment (CSA), and results of materiality assessments of the past three years. Based on subsequent findings, the company derived a framework consisting of 3 areas and 14 indices, which has been approved by the CSR Committee which comprises top executives.

The Sustainable Value Framework will be managed as a key performance index in accordance with the mid- to long-term strategic tasks. Believing that the integrated management of mid- to long-term financial and non-financial performance will contribute to the basis of sustainable growth, Doosan Infracore will continue to disclose such performance results through 2025.

### ESG Ratings

1. SASB Standards: Industry-specific material issue and standard reporting index established by the US Sustainability Accounting Standards Board (SASB) to provide a comprehensive understanding of the sustainability of corporations

2. MSCI ESG Ratings: Index established by Morgan Stanley Capital International (MSCI) for evaluating corporate performance in the environmental, social, and governance (ESG) areas

3. SAM Corporate Sustainability Assessment: Corporate sustainability assessment methodology used by the Global Reporting Initiative to assess corporations' economic, environmental and social risks and opportunities, and related strategies

### Our Approach

**Product**

- **SOLUTION**
  - Product resilience
  - Product efficiency
  - Customer value

**Service**

- **SOLUTION**
  - Service enhancement
  - Customer value

**Supply chain**

- **SOLUTION**
  - Decarbonization
  - Alternative fuel products

- **PRODUCT**
  - Carbon footprint
  - Carbon emissions

**Governance**

- **SOLUTION**
  - Sustainability
  - Risk management

**Responsiveness to climate change**

- **SOLUTION**
  - Decarbonization
  - Alternative fuel products

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  - Decarbonization
  - Alternative fuel products

**Emission reduction technologies and leading the development of relevant products**

- **SOLUTION**
  - Decarbonization
  - Alternative fuel products

**Response to climate change**

- **SOLUTION**
  - Decarbonization
  - Alternative fuel products

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In 2019, Doosan Infracore expedited its innovation drive under the new slogan, “Powered by Innovation.” We focused on nurturing sustainable growth drivers by balancing growth and stability, diversifying markets through product differentiation, and implementing digital transformations and innovations. As a result, we were able to take a step closer to achieving our vision, “Global Leader in Infrastructure Solutions.”
Doosan Infracore is striving to build stable, long-term growth momentum by accurately assessing the confluence of external environments and making measured preparations for change to stay ahead of the curve.

GROWTH & SOUNDNESS

Expanding Customers and Markets

Strengthening Product Portfolio

Diversifying Business Portfolio

01

02

03
Growing Competitive in Advanced Markets

The construction equipment industry is unique in that it undergoes the cycle of ups and downs in a regular interval, and remains vulnerable to the global economy, government policy, infrastructure investment and other macro factors. Even amid such factors of volatility, North American and European construction equipment markets have grown on the back of rising energy demands and increasing infrastructure investments. However, with the spread of a COVID-19 which triggered slowdown in the economies, the markets are faced with growing uncertainties.

Doosan Infracore focuses on securing diverse sales sources to establish a stable revenue generation foundation, while steadily increasing its presence in advanced markets which are relatively more stable. As part of this effort, on January 1, 2018, it took over the construction equipment operations of Doosan Bobcat in advanced markets and has since been managing the business. The company has adopted a proactive business strategy in order to enhance market competitiveness, and is also strengthening the sales network by developing mid- to large-sized dealers and improving market coverage, thus enhancing channel capabilities. In North America, it is strengthening sales competitiveness by expanding its dealer base, implementing customer-tailored programs, and improving service responsiveness. In Europe, it is improving customer responsiveness by helping new dealers keep their business stable and allocating more authority to sales departments. In addition, in order to respond to customers’ needs, the company operates Customization Plants that assemble customized, semi-finished products sourced from Korea; and to improve customer satisfaction, it is optimizing parts distributions through the Parts Distribution Center (PDC). Thanks to increasing construction equipment demands in advanced markets and a subsequent rise in European market share, Doosan Infracore continued its robust sales performance in 2019, recording a year-on-year increase of 6.9% to KRW 812.4 billion in advanced markets.

In 2019, Doosan Infracore strived to strengthen sales channels, the most important factor in ensuring market competitiveness. To this end, it engaged in key account marketing and secured large outperformed dealers based on DoosanCONNECT™, a digital solution for advanced construction equipment management. In particular, the authority of European sales departments was expanded, and a system was put in place that enables an internal analysis of performance and profitability, and thus helps sales managers make decisions more promptly and efficiently. As a result of implementing such field-centered sales strategies, a record sales performance was achieved since the establishment of the European subsidiary as contracts were secured to supply 100 wheel loaders and 80 excavators to CEMEX and Beaulac, respectively. In addition, 14-ton excavators and wheel excavators, the company’s main products, are increasing their market presence in major European markets, including the UK, Belgium, the Netherlands, Luxembourg and Northern Europe, both competing for the top two spots in their respective market.
Expanding AM Business

Doosan Infracore has been expanding its after market (AM) business with an aim to build a revenue structure that can stay stable in the face of a slowing market. In 2019, it focused on such tasks as optimizing the global parts distribution network through the PDC, strengthening AM sales capabilities by fostering dealers in AM service, developing solutions based on the lifecycle of equipment, and expanding online communication channels to reflect more customer voices on customer service. As a result, 2019 sales improved by 2% year-on-year to KRW 246.3 billion (excluding special equipment and attachment performance).

In order to enhance its parts distribution capabilities, the company operates ten PDCs in eight countries – Korea, China, the U.S., the UK, Germany, Singapore, Brazil, and United Arab Emirates – keeping in stock a total of over 400,000 parts. The Seattle PDC, opened in April 2019 as an addition to the first two PDCs in Atlanta and Miami in the U.S., has some 12,000 parts available in its 5,300m² warehouse, covering the western part of the U.S. and Canada, while the Atlanta PDC serves the East coast and the Midwest regions, and the Miami PDC covers Latin America. As such, Doosan Infracore makes continuous efforts to improve its PDC operation efficiency and responsiveness to parts demands, and thus increases customer satisfaction. Going forward, it will continue to expand and operate its global PDC network in an efficient manner with the goal of getting customers the right parts anytime and anywhere across the globe.

For more systematic and effective parts distributions, Doosan Infracore integrated its Service Parts Planning (SPP), a system in which each region’s PDC individually anticipates parts demands and separately manages parts inventory, into a global planning system where headquarters centralizes planning and managing inventory. In addition to making continuous efforts to strengthen parts distribution capabilities, the company is implementing various measures to improve parts demand management. For example, the company operates Manufacturer Managed Inventory (MMI) through which headquarters anticipate parts demands based on dealers’ actual sales data. MMI then recommends relevant parts to respective dealers instead of using previous demand analysis based on parts order from dealers. In order to analyze a mounting data of parts consumption and to more accurately and quickly forecast parts demands, it is using a big data big data visualization program that enables an accurate analysis of the movements, locations, end-user consumption of parts on a real-time basis. The adoption of global planning and MMI, leveraging retail sales information, in 2019 had the effect of increasing the parts supply rate by 2.6% and reducing inventory costs by KRW 9 billion, both compared to the 2017 figures. Going forward, Doosan Infracore will expand the MMI operations by steadily building the environment for MMI at dealers across the globe, and through training aimed at strengthening skills for efficient operations.

Consistent collaboration with dealers is crucial to increasing AM sales and profits and to improving customer service. Based on Doosan Infracore’s unique training approach, the company provides Parts & Service Sales Representatives (PSSRs) with training on AM sales and service, including effective sales skills, the features of genuine parts and the benefits of using them, guidance on operation of DoosanCONNECT™, and equipment maintenance. The company also practices strategy by applying it to sales operation. PSSRs are Doosan Infracore’s AM experts and consultants who generate parts and service sales, and play an important role in cultivating sales opportunities by keeping customers well informed of all issues, including parts replacement cycles.
Doosan Infracore is focusing on service solutions and e-commerce in order to further generate market opportunities for parts and services. As part of this effort, the company launched the “Smart Maintenance,” a solution offering parts and maintenance services based on DoosanCONNECT™ in 2019. In addition, it plans to expand sales of out-of-warranty parts by offering more advanced services that center on analyzing equipment lifetime cycles and by proactively providing parts and services that are required in each cycle. The company also develops the foundation for e-commerce by adding a “cart” function. This newly added function allows customers to inquire about parts and maintenance services through “Mobile Parts Book” app. The app helps end-users access information on Doosan Parts – Doosan Infracore therefore expands its e-commerce operation by increasing the parts sales.

In addition to production and sales of finished vehicles, Doosan Infracore strives to diversify its business by offering top-quality parts and customer-tailored solutions based on its global network. This will enable the company to steadily increase sales and build a mid-to-long-term virtuous cycle in the face of uncertainties in the construction equipment market.

Increasing External Sales of Engines

Recently, the global engine market has been growing on increasing demands for power generator engines fueled by rising electricity consumptions mainly in emerging countries. Reflective of this market growth, total sales of Doosan Infracore’s engine business grew by 8.4% year-on-year to KRW 1,156.1 billion, powered mostly by robust sales of generator engines.

Doosan Infracore is seeking to diversify its customer base in order to better respond to change in the global engine market and to ensure stable sales even in a slowing market. The company increases external sales through business expansion into automobile, ship, and power generation sectors, and it engages in business diversification and development of technologies relevant to upstream and downstream engine, hybrid powetrain, electrification and other business responses to future changes. In particular, it is developing new products, such as a compact G2 Stage V-standard engine, that meet next-generation emissions standards in a bid to achieve the optimal business performance.

Doosan Infracore had signed a contract with Germany’s KION in June 2017 which stipulates supply of 63,000 compact G2 engines by 2028, and three more contracts with global companies, including China’s Baoli and Italy’s ARBOS, in 2018 involving supply of a total of 43,000 engines. Accordingly, Doosan Infracore will supply to Baoli, a leading forklift company in China, some 13,000 compact G2 Stage V engines by 2025, which will be used to power the buyer’s main export models. Doosan Infracore has signed a letter of intent (LOI) with ARBOS, a tractor manufacturer in Italy, and will develop and supply approximately 23,000 units of 1.8- to 3.4-liter G2 diesel engines for 2025, which will be used to power the buyer’s main export models.

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Having established LDEC in November 2017 with Lovol, a China's largest agricultural machinery company, Doosan Infracore broke ground in March 2018 for a production plant in China. The joint venture will complement Doosan Infracore’s market development and diversification strategies, allowing it to target both advanced and emerging markets with high-quality engines produced in Korea and affordable products manufactured in China. Also, sourcing and other synergistic opportunities, now made available thanks to Lovol’s local business networks, are expected to further enhance the competitive advantages of its engine business. Scheduled to be completed in June 2020, the LDEC engine plant will comprise research facilities, including a prototype shop and a lab for measuring the quality of parts, and production facilities, such as engine block processing and engine assembly lines, that reflect Doosan Infracore’s engine production know-how. Its annual production capacity will be expanded to 100,000 units. The engines to be produced include G2 engines (B18, D24, D34) optimized to the characteristics of the local market, and will be equipped to Lovol’s agricultural machinery and construction equipment. The D34-class engine, in particular, will reach China’s Stage IV emissions standards. Doosan Infracore will continue its proactive support for LDEC seeking to enter emerging markets as well as the Chinese market for industrial and generator engines and to achieve the optimal business performance.

In October 2019, Doosan Infracore successfully extended a contract to supply generator natural gas engines with Power Solutions International (PSI), the US-based manufacturer specializing in power generator engines that Doosan Infracore had been doing business with since 2008. In accordance with the contract, Doosan Infracore will supply an 8.1-liter to 22-liter generator natural gas engines through 2023. After tuning the Doosan Infracore’s engines to the emissions standards of the North American engine market, PSI offers them mostly to major power generator companies as well as oil and gas businesses. The extension of the supply contract with the US engine leader is a solid endorsement of the outstanding quality of Doosan Infracore’s engines as well as a boost to its commitment to growing together with partners through creation of win-win synergies.
In addition to new models, Doosan Infracore focuses on product improvements by reflecting voices of customers (VOC). In response to customer opinions that work radius should be expanded for the DX130LC-9C, which is used mainly for farming village construction/development or fish farm management, the company extended the boom length. It has also improved its key-product DX215-9C’s boom speed, in consideration of customers that mainly engage in 90-degree rotation loading work at construction sites, and thus shortened working time. The bucket size of the DX230LC-9C and DX260LC-9C models has increased in line with demand for higher productivity at small- to mid-sized engineering construction sites.

Increasing Customized Special Equipment

Doosan Infracore is developing new markets with a wide array of special equipment solutions customized to various challenging conditions as well as usage needs at worksites with the goal of improving work productivity and creating a safer work environment. Based on findings of its ongoing, thorough analysis of customer needs, the company has introduced a variety of special equipment product lines, including material handler, amphibious excavator, demolition and log loader, thus diversifying its product portfolio. As a result, special equipment sales rose by 10% year-on-year to KRW 82.1 billion in 2019.

China’s construction equipment market began to show signs of recovery in the second half of 2016, and continues its growth pace on the strength of increasing demands for excavators and mine developments fueled by increasing state-led infrastructure investments and rising commodity prices. In response to market demands for large-sized equipment, Doosan Infracore released three new models as a follow-up to the previous four models – DX380LC-9C, DX420LC-9C and DX500/520-9C. The DX360LC-9C, with improved fuel efficiency, is ideal for rental customers with large-scale engineering construction or for rocky mountain projects. The DX450LC-9C was developed to 50-ton breaker market demands; and the DX490LC-9C, a well-balanced performer in productivity, fuel efficiency and price, are designed to reduce entry barriers for 50-ton equipment renters. In response to growing mid- to large-sized equipment renters, Doosan Infracore released the DX200-9C in January 2020, of which high fuel efficiency makes it ideal for businesses specialized in rental construction equipment, thereby responding to increasingly segmented customer applications in the mid- to large-sized market.

Launching Region-specific Equipment

The compact equipment market thrives when construction increases in urban areas and other places with limited space. In particular, the Korean market for mini excavators of 5-ton or less grew at an annual average of 15% from 2014 to 2018. In 2019, some 3,000 units of such excavators were sold, accounting for 30% of the excavator market. In July, Doosan Infracore launched the DX17Z-5, an excavator developed specifically for the 1.7-ton market, which accounts for over 40% of the domestic mini excavator market and is expected to grow further. The DX17Z-5 excels in excavation power, rotation speed and operation angle, making itself optimal for projects in confined spaces or indoors. Its minimum width, with the track contracted, is a mere 950 mm (the smallest in its class), making it very useful in places with limited space. The track can be expanded up to 1,360 mm (the largest-in-class) which gives it a firm footing for jobs requiring stability. The DX17Z-5 is equipped with front LED lamps, cylinder protection covers surrounding the operating compartment, thereby enhancing its sense appeal. A footrest useful for working downward, a detachable two-pole-supported canopy, and other standard features increase work convenience.

In addition to the DX17Z-5, a 3.5-ton excavator unveiled in 2017 and the DX17Z-5, successfully launched in 2019, Doosan Infracore will steadily develop products to various needs of Korean customers and strengthen its position in the mini excavator market. Also, it will further improve the responsiveness of its customer service and expand its share of the mini excavator market, which was dominated by imports, by leveraging its service network, the largest in Korea, with 37 branches and more than 100 service personnel across the nation.
Modular Design Method for Special Equipment

In addition, Doosan Infracore uses a modular design method that involves configuring and assembling diverse fronts, cabins, attachments and other modules in accordance with the characteristics of the work environment, on the base part of excavators, in order to reflect customer needs faster and better. As the base machine serves as the basis for modular design, the method can maximize the usefulness of the basic equipment, enable an easy conversion or expansion of any parts of the equipment to diverse customer requests, and make equipment repair and maintenance easy. Moreover, the module assembly method enables customers to purchase special equipment at a relatively affordable price in a timely manner.

Doosan Infracore’s special equipment can be seen in diverse environments, including work sites where environmental improvements are needed. Its material handler is developed for transporting scrap metal, industrial waste and recyclables. The amphibious excavator differs from the conventional one in that its lower frame is made of air tank structure, which enables it to work afloat in such environments as lakes, streams, marshes and other areas whose ground surfaces would be too wet or weak to support the weight of ordinary excavators. For these and other reasons, the company has sold its amphibious excavators mostly to Southeast Asia and South American regions high in rainfall. As climate change is closely related to rising levels of rainfall so are market interests increasing in amphibious excavators. In 2019, the Department of Public Works & Highways (DPWH) of the Philippine government purchased some 10 amphibious excavators of Doosan Infracore as part of its effort to clean up the Manila Bay, which has been suffering from serious industrial pollution, and used the special equipment to preparatory work such as dredging the polluted beaches.

Based on its wide-ranging special equipment portfolio that reflects diverse customer needs, Doosan Infracore continues to grow, offering solutions to various challenges at construction sites and pursuing market diversification. It is also strengthening the region-specific product line-up, including improving material handlers, which have high scalability, and developing new products, such as pile drivers and rotary drill rigs, popular in the Chinese market.

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Securing Large Engine Line-up

Doosan Infracore is building a complete line-up of generator engines, ranging from mechanical to the latest electronic engines, in line with the steady growth of the diesel and gas generator engine market. Based on the extensive line-up, it meets market demands not only in the Middle East but also in North America, Europe, and other leading markets, while also discovering new customers. After unveiling a pilot product of the DX22, a 22-liter electronic generator engine, in 2018, Doosan Infracore showcased the mass-production model at international exhibitions, including the Middle East Electricity (MEE) in March 2019 and POWERGEN International in November 2019. The DX22 is more powerful than competitors’ models of the same class, and it is high-performance, eco-friendly engine that can produce 20% more power than the DV22, its mechanical-type predecessor of the same class. In addition, the DX22 adopts best-in-class energy efficiency, and the improved compatibility and extended parts replacement cycles of the DX22 have led to higher customer satisfaction. With the launch of the DX22 as a start, Doosan Infracore is making all-out preparations to enter the large electric generator engine market.

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Diversifying Business Portfolio

Strengthening Post-processing Solutions

Post-processing solutions are becoming more advanced with growing needs for exhaust gas treatment devices that can meet toughening emissions standards across the globe. Doosan Infracore has been working on new exhaust gas post-processing systems, thus successfully developing the “No-DPF Tier 4 Solution.” The No-DPF solution is based on “Ultra Low Particle Combustion (ULPC),” Doosan’s unique combustion technology for which an international patent has been obtained, and meets Tier 4 emissions standards without the need of a diesel particulate filter (DPF), and enables development of high-efficiency engines. The solution also lowers costs associated with the regenerative operation of incinerating and regular cleaning of the soot accumulating in and around the DPF, as well as concerns over DPF-related quality issues. In addition, it can be applied to equipment of diverse uses, as it delivers outstanding durability and reliability for it is designed to withstand extreme operating conditions. As DPF application has become a requirement in meeting Stage V emissions standards, which have significantly strengthened regulation on particulate matter (PM), in 2017 Doosan Infracore completed the development of SCR on DPF (SDPF), a technology based on the integration of SCR and DPF, in response to Euro 6 vehicle emissions standards. SDPF is an exhaust gas post-processing technology that has never been applied to the mass production of non-road engines. In developing SDPF, Doosan Infracore first derived the concept of an SDPF, that could be installed within the pre-existing engine configuration and still satisfy Stage V standards, by applying its own concept design process including catalyst simulation. And the company verified the feasibility of mass production through a swift evaluation and analysis of major post-processing performance Indices. It prepares to release highly efficient SDPF products by the time when global leading companies release their products.

Doosan Infracore identifies market trends in order to better respond to next-generation emissions standards. It has also established the development strategy for ultra-high efficiency post-processing technology in accordance with product development plans, based on which it is preparing for the release of post-processing solutions and engines that maximize the value of final products.

Identifying New Business

In the era of the Fourth Industrial Revolution, solution development is essential to generating new business opportunities in machinery manufacturing. Construction equipment business also is going beyond equipment sales and service, expanding in the direction of offering diverse solutions to productivity challenges and enhancing customer value.

Doosan Infracore is expanding into new business areas, going beyond equipment manufacturing and sales. With an eye on the future of construction sites, it is focusing especially on unmanned construction solutions (unmanned equipment and control systems) as well as on solutions based on electrification and telematics that increase productivity and reduce accidents at construction sites, and to relieve manpower shortages in an aging society. To this end, the company is developing new technologies and business in cooperation with internal and external experts in different areas, and is striving to secure competitiveness for future growth.

Moreover, the company is looking into ways of cooperating with various overseas start-ups, including those in Silicon Valley. A particular focus is placed on discovering start-ups with digital technologies that can complement Doosan Infracore’s projects, including autonomous driving and industrial internet of things. It is also exploring various modes of cooperation, such as partnership and equity investment. To expedite the development of new business, in April 2019 Doosan Infracore established “D20 Capital,” a venture investment company, in Silicon Valley.

“Clue Insights,” the first start-up established by Doosan Infracore, participated in CES 2020, the world’s largest home appliance exhibition held in Las Vegas in January 2020, and accomplished the winning of the Honoree distinction in the “Tech for a Better World” category. Clue Insights is a spin-off of a new business launched in the form of in-house venture. It is specialized in supporting efficient equipment operations by analyzing construction equipment’s telematics information using the application “CLUE.”

With the vision of becoming a “Global Leader in Infrastructure Solutions,” Doosan Infracore will continue to grow on its global competitive advantages. At the same time, it will actively make inroads into new markets leveraging its cutting-edge technologies in order to secure new revenue sources and growth drivers, and thus advance into a “Total Solution Provider.”

SDPF: A technology that considerably reduces the total volume of the catalyst by coating SCR catalyst in the DPF.
PRODUCT & MARKET

Doosan Infracore is not only solidifying its relationships with existing customers but also attracting new customers by making continuous efforts to improve its products and services, and to expand its communications channels for both customers and sales.
Advancing Product Development Capabilities

Doosan Infracore is improving the competitiveness of its products and building a foundation for sustainable growth by focusing on new technologies and advanced product development. It has established a mid- to long-term roadmap for product development which reflects market trends, including customer requirements, eco-friendly fuels and ICT, based on durability and convenience. The company has then connected this roadmap to its technology and product development and its business strategies. In addition, it put the DI Product Management System (PMS) in place to ensure the integration of customer opinions and trends in markets and technology into product development.

In addition to developing its own technology, Doosan Infracore innovates in many other ways, including collaboration with external organizations, investments in start-ups and industry-academia cooperation. It also increasing the competitiveness of its products by reflecting changes in customer, social, environmental and technological requirements. For example, the company developed electric excavators in line with the toughening regulations mainly in advanced markets.

In its engine business, Doosan Infracore is focusing on performance, fuel efficiency, durability and reliability, while developing products based on alternative fuels and engine electrification technology. The company is enhancing its technological capability in combustion and post-processing in order to better respond to the next-generation emissions standards, and is also expanding the scope of its alternative fuel technology to include CNG and LNG. Moreover, it builds the engines of the future by developing technologies in engine electrification, such as a hybrid powertrain. Doosan Infracore is becoming a “Total Powertrain Solution Provider” by developing advanced 48V full industrial hybrid powertrain*, and by researching the electrification of mechanical parts and the E-Powerpack.

Doosan Infracore responded to the scheduled enforcement of EU Stage V* emissions standards by developing the compact G2 Stage V pilot engine in January 2017 based on the latest combustion technologies. Mass production began at the end of 2019 after a series of thorough durability and quality tests. The compact G2 Stage V engine uses ultra-low fuel-consumption combustion (ULFC)* technology, an upgraded version of the technology used in the earlier model of G2 engines, resulting in improved power and the lowest fuel consumption in its class. In addition, Doosan Infracore has applied SCR on DPF (SDPF), a technology based on the integration of selective catalytic reduction (SCR) and diesel particulate filter (DPF), as Stage V emissions standards are significantly stricter on particulate matter (PM). SDPF was developed in-house by Doosan Infracore, and used the company’s unique concept design process, including catalyst simulation, to enable the installation of the engine in the space allowed by the equipment, while still meeting all Stage V regulations. It also extended the filter replacement cycle that lasts for 1,000 hours, as well as offering a range of other options for increased customer convenience.

Doosan Infracore’s History of Engine Development

* Hybrid powertrain: The main components for delivering different forms of power to equipment, including power generated by engines and power from batteries and motor drives

* Stage V: Exhaust gas regulations put into effect by the EU in 2019 to restrict PM emissions by diesel engines to a level at least 40% lower than previously

* ULFC: An innovative technology, patented by Doosan Infracore, that optimizes fuel combustion while increasing power

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Strengthening Product Competitiveness

01

1958
- Became the first engine manufacturer in Korea

1960s
- Developed engines that met Euro 2, 3, 4 emission standards
- Developed an engine based on in-house technology

1970s - 1980s
- Operated the most modernized engine plant in Asia
- Developed the first engine based entirely on in-house technology

1990s
- Developed engines that meet Euro 5, 6 emission standards
- Developed Tier 2 and 3 engines

2000s
- 2001: Tier 3
- 2012-2013: Tier 3, Tier 4, Euro 6 CNG
- 2016: Euro 6 Diesel
- 2019: Stage V Diesel/LPG

2010s
- 2021: Euro 5
- 2022: Tier 4 Final, Euro 6 CNG
- 2023: Stage V Diesel/LPG
In addition to making these performance improvements, Doosan Infracore undertook a range of targeted sales activities for the compact G2 Stage V engine, including setting up an exclusive customer team to provide distinctive services. As a result, it successfully signed supply contracts with global companies such as KION in Germany, Balfour in China, and ARBOS in Italy. The G2 Stage V engine matches the products of the most advanced companies in North America and Europe, enabling Doosan Infracore to make inroads into major markets based on the excellence of its products. Going forward, the company will participate in engine dealer conferences in North America and Europe as a way to share its sales strategies and plans to develop innovative, technologically advanced new products and services.

Doosan Infracore has also applied its highly efficient combustion technology to LPG and CNG gas engines. These eco-friendly alternative fuels emit 90% less PMs compared to diesel engines and almost with no CO₂, and therefore they can be used for many purposes in regions around the world. Applying eco-friendly fuel combustion technologies to diesel engines increases compatibility with those engines, while still benefiting from the unique strength, durability and reliability of diesel engines, so that they can be used for a long time without major breakdowns. In addition, Doosan Infracore is developing CNG stoichiometric air-fuel ratio technology, thereby increasing its competitiveness in eco-friendly alternative fuel solutions, in response to growing interest of global OEMs in this technology after the implementation of Euro 6 – Europe’s latest emissions regulations for vehicles. Even stricter NOx/CH₄ regulations and new CO₂ emissions regulations are expected in Euro 7, while customers are still demanding that CNG engines deliver as much power as diesel engines. This is why Doosan Infracore is developing new stoichiometric air-fuel ratio engine technologies, including the optimization of combustion, reducing heat loads, improved high temperature materials, and multi-fuel injection and EGR ratio optimization.

Developing Flexible Local Production Capabilities

Doosan Infracore operates Customization Plants, its customized assembly centers, in Europe and North America in order to better respond to customer requirements and to increase efficiency at its production facilities. Before establishing the Customization Plants, Doosan Infracore supplied 100% of its products as finished vehicles from Korea which placed limitations on changes to specifications. If existing product did not match the specifications ordered by a customer, the company had to produce a new product at its Korean plant and then ship it to the customer, resulting in long lead times and a restricted ability to reflect the needs of customers and dealers.

In order to overcome these limitations and generate greater customer value, Doosan Infracore established its first Customization Plant, the Europe Customization Plant (EuCup), in 2016 in Rotterdam, the Netherlands. Production at EuCup is based on the "semi knock-down (SKD)" partial assembly method, which involves importing the main body and the front parts, such as arms and beams, then assembling them to produce finished products which match the exact customer specifications. EuCup has significantly reduced lead times, from 16 weeks to five weeks, and has also improved sales forecasting and inventory management, leading to increased competitiveness in the European market.

Based on the success of EuCup, Doosan Infracore opened the North America Customization Plant (NaCup) in Savannah, Georgia in the U.S. in January 2020. Alongside the establishment of NaCup, the company undertook a detailed analysis of potential sales and an in-depth market survey, resulting in more accurate sales forecasting. It also calculated demand for options on each model to work out an appropriate level of inventory. As with EuCup, NaCup involves the main body being shipped as a half-finished product from Korea to NaCup, where attachments are assembled according to specific customer requirements. After the launch of NaCup, the lead time from order to shipment was reduced from 100 days to 4-6 weeks. NaCup can assemble 35 different models, and its annual production goal is more than 6,000 units. It plans to secure sufficient inventory for popular models to be delivered within ten days, which will enable stronger and more reliable sales throughout the North American market.

The Customization Plants have enabled Doosan Infracore to change its previous “make-to-order” system to “make-to-stock” based on demand forecasting for popular models, and resulted in reducing lead times substantially. The company will build an integrated global plant dashboard in 2020, through which it will assess production and inventory in all regions, and thus establish a supply system which responds quickly to customer needs, through better supply of finished vehicles and parts. Doosan Infracore will supply products faster than before and thus get closer to customers by forecasting demand by region and by month, and then preemptively acquiring the base machines, front kits, complete knock-down (CKD) materials and attachments.

Enhancing Product Quality

Strengthening PDCA*-Based Process Operations

In 2018, Doosan Infracore created the Quality Management Team, dedicated to diagnosing and verifying the Quality Management System (QMS) at the corporate level in its construction equipment and engine businesses. QMS covers strategies for quality and key performance indicators, organizational management and quality awareness, and was previously based on ISO 9001:2008. The company has added various factors to its existing QMS, including the findings of its reviews of internal and external changes; improvements it has made by evaluating potential issues in the QMS, and the need to expand to areas besides production, purchase and quality. This has substantially upgraded the QMS and operational management at the company. The new QMS reflects the latest ISO 9001:2015 standards, including taking into account the requirements of a wider group of stakeholders and more advanced risk management, and it consists of common diagnosis items of organizations and specific diagnosis items on work areas by organization.

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* PDCA: Plan-Do-Check-Act

5) SKD: Semi knock-down method
6) PN: Particle number
7) TCO: Total cost of ownership
8) HLA: Hydraulic valve clearance adjustment device

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Doosan Infracore built the foundations for upgrading its QMS in 2019. In 2020, it will enhance the execution of its quality management processes in order to meet customer expectations concerning quality, and will thus enhance its fundamental competitiveness. To this end, the company will expand its targets for QMS and focus on process-based business, including by improving the resolution of issues between front and back offices, and ensuring preemptive risk management even in an uncertain business environment.

Improving Preventive Quality and Basic Quality  Doosan Infracore continues to make rapid, innovative improvements in quality which increase customer value by “observing the basics of quality,” with a focus on its plants and suppliers. As we move into the Fourth Industrial Revolution, in 2020 Doosan Infracore will use big data to forecast potential quality issues caused by customers’ working environment and operating capacities (e.g. operating hours) of their equipment. It can then undertake preventative inspections and also use telematics system for remote diagnosis, thereby implementing activities to strengthen preventive quality so that no quality issues arise with customer equipment.

Doosan Infracore is focusing on quality improvement, and is building a working environment which adheres to the basic and standards in order to substantially improve its basic quality level. Every year, the company identifies the most urgent quality issues to be addressed, aimed at increasing customer value. In 2019, it formed a cross-functional team to improve the 5-ton hoses, and then improved assembly processes and undertook regular audits at each plant, constantly focusing on whether standards were being observed in order to make improvements in basic quality. As a result, issues in basic quality fell by 10%.

Verifying Equipment Performance and Durability  Doosan Infracore undertakes reliability tests and evaluations on all its products, including excavators and engines, to ensure their performance with full specifications and in any environment, throughout their lifespan. The Incheon Reliability Evaluation Center is equipped with the latest in testing facilities and equipment, including an environmental tolerance laboratory, a large anechoic chamber, a vibration test laboratory, a structure test laboratory, and a hydraulic test laboratory. The Center also tests and evaluates product durability and structural safety in a wide range of working environments.

Construction equipment is used in deserts, plateaus, wetlands and other harsh environments. Doosan Infracore conducts annual assessment to test durability in extreme cold temperature for its construction equipment, including excavators and wheel loaders, at the coldest time of year and in the coldest regions to check performance in extremely low temperatures in addition to testing them in its cold chamber. In 2014, Doosan Infracore became the first Korean construction equipment company that undertakes extreme cold testing, and it continues to conduct such testing every year. The company also runs vehicle performance tests in China at altitudes of at least 5,000m in order to ensure reliable performance even on high plateaus.

Moreover, in October 2019 Doosan Infracore completed the construction of the Boryeong Proving Ground at 300,000m², the largest of its kind in Korea with the goal of implementing more systematic verification of the durability and performance of its advanced construction equipment. The Boryeong Proving Ground consists of three proving grounds which are identical to actual working environments for construction equipment, as well as a mountain driving road, which enables the simultaneous testing of up to 20 units of construction equipment. In addition, “accelerated durability specialization testing” is available so that the durability testing period can be accelerated. This facility includes various other proving grounds, such as driving, salvage and traction power, and noise testing, as well as a dome. In addition to regulatory testing, construction equipment is evaluated in environments that are as similar to actual work sites as possible. The Boryeong Proving Ground improves the performance and durability of Doosan Infracore’s construction equipment, and is thus significantly enhancing product competitiveness. The Boryeong Proving Grounds will be Doosan Infracore’s “smart construction equipment research complex,” demonstrating its cutting-edge technologies to ensure environmental and customer safety.
Price competition in the construction equipment market continues to be intensified especially in emerging markets. Doosan Infracore avoids sales strategies based on low prices, but rather focuses on the distinctive value of its products. Its value-selling strategy offers such solutions as product consulting and other services, based on an in-depth understanding of customer requirements, and with a focus on delivering product value. This strategy has been successful in establishing strong relationships with customers, including attracting new customers and signing highly-profitable fleet deals. In order to implement its value-selling strategy, the company provides field training to its dealers’ sales personnel, as well as various tools to increase their understanding of the equipment. Doosan Infracore also provides them education on matters that are of great interest to customers, and trains them on a wide range of product solutions which can be offered to customers.

In 2019, Doosan Infracore developed marketing materials to explain the particular advantages of Doosan Infracore products from the perspective of total cost of ownership (TCO) and productivity, increased the number of customer visits, and expanded its training of sales personnel, all in its efforts to implement its value-selling strategy. In addition, the company developed the “Doosan Equipment Sales” app to integrate data which had previously been dispersed among different sales channels. This app enables dealers to undertake value-focused sales, and thus to deliver value to customers. It also helps to imprint the expertise and quality of Doosan Infracore in the minds of customers at its sales sites. This app has already been used to present the strengths of Doosan Infracore’s products to customers in emerging markets, and also to compare their productivity and TCO, which in turn has resulted in winning contracts. Doosan Infracore has further improved customer satisfaction through its “Smart Maintenance” service solution which uses DoosanCONNECT™ to provide remote monitoring to check the status of equipment and other preventative maintenance services. This led to the signing of a contract to supply nine large excavators to Dangote Cement, an affiliate of the Dangote Group, the largest conglomerate in West Africa.

In 2020, Doosan Infracore will focus on attracting key accounts by selecting potential key accounts in each region and implementing a wide range of marketing programs. The company will increase both sales and profitability by leveraging its unique value-selling strategy and expanding it to more sales sites, thereby striking the right balance between stable growth and strong profitability.
Digital Marketing

Doosan Infracore runs a range of digital platforms to facilitate customer communications and strengthen its untact sales ability. The company has been advancing into the huge Chinese market since 2016 by using WeChat, the largest mobile messenger service in China, as well as other online media to provide news about products, send information on used products and parts, share other information to help customers manage their equipment, and to identify customer demand for products and thus make actual sales. The company currently has around 140,000 followers on WeChat, and this number continues to grow. Doosan Infracore began parts sales through WeChat in 2019, recording sales of at least KRW 10 billion, with more than 1,200 units sold through online marketing, including WeChat. Beginning in February 2020, the company uses social media platform marketing through TikTok and Kweil to publicize its finished products and parts, and to provide customer support including technical education about equipment maintenance through live broadcasting. During an hour-long live broadcast in March, the company received many customer inquiries about its products, and a live broadcast about equipment management was seen by 7,300 viewers.

Digital marketing promotes continued interest in the company’s products and parts, and enables the company to deliver value without the restrictions of time and space. Doosan Infracore will therefore build up its digital infrastructure so that it can continue to offer its customers total solutions through data-based digital platforms.

Even in Korea, where traditional offline sales remain dominant, online and mobile purchases are increasing steadily. Doosan Infracore is therefore overhauling its customer services and establishing new marketing channels. The company is developing a smartphone-based customer support and product system to integrate across the entire value chain, including sales, after-sales services, parts dealers, equipment buyers and users, and other customers. The system will be linked to social media to improve its value and access to customers. In addition to customer-centered services such as location-based assistance, improved equipment maintenance, and the sharing of product information, the system will also offer new functionality, including dealer purchasing and technical support and repair connections. This will enable the company to establish the foundations for e-commerce.

In August 2019, Doosan Infracore released its “Mobile Parts Book” application to enable customers to have full access to product manuals and information on parts. The application includes plans, parts numbers and other data for a product. Until now, Doosan Infracore provided the book, which is an average of 600 pages long for each piece of equipment, in paper form, which was inconvenient for portability and storage, for sharing and communicating, and for updating information. Doosan Infracore therefore developed the Mobile Parts Book app with a focus on user convenience, rapid information updates and continued follow-up. The user interface was made as simple as possible, and access to parts information was improved even in places without an internet connection, thereby maximizing usability. Updates are possible in real time, enabling customers to check the latest information on parts and compatibility immediately. With just an equipment certification number, anyone can become a member and install the Mobile Parts Book app for free, provided in eight languages. Doosan Infracore recently adopted a system through which users can ask for parts estimates and make inventory inquiries through the Mobile Parts Book app, and is also building an online platform which allows the parts order placement. The company will continue to improve the Mobile Parts Book app from a customer perspective, and help dealers and customers to more effectively use its new online platform.

With customers responding increasingly favorably to digital content, Doosan Infracore will leverage its social media channels as a useful tool through which it can share new product releases and promotions, and deliver greater customer value.

Enhancing Service Competitiveness

Providing a TMS-based Lifetime Care Program

Telematics system (TMS) combines wireless communications with the global positioning system (GPS) that enables the real-time collection and analysis of information such as the location and operational status of equipment. This in turn allows users to remotely monitor equipment on their IT devices, including where the equipment is, how much work has been completed, how it is operating, and the status of consumables and parts, including if any of them need to be replaced, thereby enabling efficient work management and support. Doosan Infracore began its telematics services in China in 2005, which was followed by the release of DoosanCONNECT™ in 2015. DoosanCONNECT™ is a TMS developed in-house by Doosan Infracore, and the company will apply TMS to all models released from 2021. As of the end of 2019, TMS had been applied to around 71,600 units of equipment, such as excavators, wheel loaders and ADTs, enabling dealers to determine if there are
Doosan Infracore is providing TMS-based services to help customers check and manage the operational status of their equipment with ease. "Fleet Management Report" is an analysis of data collected through telematics, including the location and operational status of equipment, as well as the status of major parts, and then reflect this information in production. Moreover, it can use the collected information for big data analysis.

"Smart Maintenance" is a distinctive service program which provides preemptive maintenance services to customers based on the operational data collected through DoosanCONNECT™. Doosan Infracore released the Smart Maintenance program in five countries – the Philippines, Myanmar, Cambodia, Malaysia and Nigeria – in 2019, and will expand it to other countries. The program consists of three sub-products – Light, Standard and Premium. The main differences between the sub-products are the degree to which detailed program contents can be adjusted for the market environment, and the ability of the dealer to put the program into practice. Doosan Infracore will develop a set of Smart Maintenance service solutions which reflect the needs and strategic direction of each region. In addition, the company is developing lifetime care solutions for a wide range of customer equipment with the goal of maximizing capture of customers outside warrantee services and securing secure machine lifetime visibility. In 2020, the company will establish a roadmap for "Machine Lifetime Care" and implement it in connection with the Smart Maintenance.

Expanding the DoosanCARE Program

As part of its customer-tailored support services, and to build its relationships with customers, Doosan Infracore offers the DoosanCARE program whereby service experts visit customers, irrespective of whether they have on-going issues with products or warranties, to offer consulting and training on equipment management. In addition to DoosanCARE, offered by headquarters in Korea, in 2018 Doosan Infracore began DealerCARE in emerging markets such as Indonesia and Colombia, whereby dealers provide customers with quality service as high as that of DoosanCARE.

In 2019, the company headquarters, in partnership with dealers, ran the DoosanCARE program for some 900 units of equipment in both emerging and advanced markets. Doosan Infracore has improved customer value by preventing breakdowns through training programs for users about the characteristics and maintenance of their equipment. In 2020, the company will further facilitate the DoosanCARE program through cooperation with dealers worldwide, and upgrade its marketing activities.

The DoosanCARE program also enables the company to listen directly to customer opinions, and thus to increase efficiency in equipment operations by quickly identifying any inconveniences. Doosan Infracore aims to resolve customer complaints about its products, and is continually striving to find new ways to maximize customer satisfaction by improving the DoosanCARE program.

Improving Dealer Services

Doosan Infracore makes continuous efforts to strengthen service skills of its dealers in order to increase customer satisfaction and thus sharpen a competitive edge. In particular, it runs the Doosan Partners Academy (DPA), an online training program for dealers, aimed at helping dealer service personnel to improve their expertise. The company also provides quality training based on its standardized education and training systems, including "Hands-on Training" through which experts from headquarters use equipment that is used at actual worksites to train dealer service personnel on how to identify and deal with the most common causes of customer complaints.

In 2019, Doosan Infracore expanded its dealer service evaluation and training systems to ensure that customer service is at the same high level around the world. The company analyzed its best dealers across the globe, used them to define dealer service capabilities, and thus set out operational standards and evaluation criteria for dealers. In addition, the company has established systems for global dealer service training and directions for personnel development with the goal of expanding the base for stable services. As part of this effort, Doosan Infracore is fostering officially certified lecturers by the company through the Train the Trainer (TTT) program, and is also increasing the number of lecturers who have received intermediate level certificates by providing more opportunities for dealer service personnel to receive trainings.

Doosan Infracore strives to increase training opportunities and improve accessibility, as well as to carry out systematic and continuous service training. To this end, it established Service Training Centers in Colombia in 2018, and in Mexico, Singapore and Ghana in 2019. The level of previous training methodology, through which trainers visited individual dealers, differ according to the level of trainers. Also, compared to the resources invested, such as training personnel and budget, training quality and efficiency were unreliable. Doosan Infracore therefore established its Service Training Centers in major global bases, and on the back of significant support from headquarters, the Training Centers were set up with the equipment, training tools and materials needed to enable them to hold comprehensive “Hands-on Training.” After the opening of the Colombia Training Center, the company provided an engine service training program to dealer service personnel from South America in July 2019. The trainees learned about the fundamentals of the engines, and received practical training on skills such as removing, repairing and re-installing broken engine parts.

In July 2019, Doosan Infracore held the global final of the Doosan Service Contest, also known as “Doosan’s Got Talent.” First held in 2014 to motivate service personnel, Doosan’s Got Talent 2019 was the second such event. Service technicians from dealers across the globe took part in the contest, competing to display their service skills and sharing experiences. Preliminary contests were held locally in 2018, with participation by 120 service personnel affiliated with dealers from 30 emerging markets, including China. The final was held at headquarters in Korea, with participants tested on their professional knowledge and their ability to inspect equipment and undertake performance checks. They also had to demonstrate their skills in the “Troubleshooting Test” during which they were required to diagnose the cause of a problem that had been randomly created by the judges on an actual piece of equipment, and then to resolve it. Doosan’s Got Talent has given participants the opportunity to increase their service skills and to share know-how with professional technicians from around the world, and is helping the company by training service experts in each region to maximize customer satisfaction.
INNOVATION 
& DIGITALIZATION

Doosan Infracore is focused on diverse products and innovative solutions that will bring about fundamental changes to the global construction industry in the Fourth Industrial Revolution era. We are also moving forward with a digital transformation not only how to work but also how to think of.
Securing Future Technologies

Dossan Infracore makes continuous efforts to develop and commercialize future technologies, such as unmanned operation, automation and electrification. To publicize its vision of future technologies, the company participated in CES 2020, its first participation in the International Consumer Electronics Show held in Las Vegas, the U.S. in January 2020. It showcased new technologies and business models in an era where boundaries are fast disappearing between manufacturing and IT.

Concept-X, Solution to the Future of Construction Sites

The global construction industry accounts for at least 10% of global GDP, growing every year on the strength of the steady growth of housing and infrastructure construction. Despite such growth, the industry is low in productivity and high in accident rate relative to other industries mainly because of the nature of its business which requires a great number of equipment and skilled workers as well as inevitable wait time and idle time. For the construction industry to grow at a steady pace, it is essential to increase productivity, improve safety, and develop eco-friendly technology. In order to tackle these challenges at construction sites around the world and to add new value, Dossan Infracore has been carrying out “Concept-X,” a project that combines IT and AI technologies to create technologies for the construction site of the future, since 2017.

Dossan Infracore unveiled its tele operation technology and successfully demonstrated the industry’s first 5G-based system of remote-controlling machinery across borders at the Bauma China 2018 and Bauma Germany 2019. At the Bauma Germany in particular, the company succeeded in operating an excavator located 8,537 km away, using a remote-control station displaying video images of the job site, taken by cameras installed on the excavator, and live-streamed through an ultra-low latency (U-LT) network. This tele operation enabled the worker to remotely look at the real-time videos and control the excavator as if the worker was at the actual worksite. Also the company introduced 3D machine guidance which precisely measures movements of the excavator in three-dimensional data using attached sensors and sends the data to the station; leveling which requires advanced work skills; and machine control such as E-fence, a safety function that stops the equipment from moving outside the pre-defined work area.

Based on its long years of experiences in developing future technologies, Dossan Infracore successfully demonstrated the Concept-X, a solution to address challenges of an unmanned automated construction site, in November 2019 at the Boryeong Proving Ground. The Concept-X demonstration event was attended by around 200 people, including politicians as well as staff members of companies, organizations and academia related to the development of Concept-X, who were able to glimpse the future of construction sites. The X-center, a control center of the Concept-X, creates a 3D map of the worksite based on measurements sent by a drone flying over the worksite, and sends operation commands to excavators or wheel loaders installed with unmanned operation technologies. The X-center monitors and manages measurement data and work progress of the unmanned equipment. There had been cases where unmanned operations of equipment were featured. However, Dossan Infracore is the first to demonstrate the entire process, from worksite survey to equipment operations, using unmanned automation technologies.

By using the digital data of construction sites, the Concept-X 1) improves productivity based on digital data generated by the unmanned operations of equipment and the remote management of unmanned construction sites, 2) prevents accidents using a sensor-based perception system; 3) minimizes equipment breakdowns through preemptive response based on AI-generated prognostics. The X-center, a brain of Concept-X, is a comprehensive control system that enables the integrated monitoring and management of worksites, including creating digital data of the worksite, establishing a plan based on analysis results, and delivering operation commands to the equipment. After scanning the worksite and measuring the topography of the worksite by using a drone, the system creates a 3D topographical map, establishes a work plan based on BIM comparisons, analyzes the worksite data, and then sends operation commands to unmanned automation technology-equipped machinery. The development of the X-center has enabled Dossan Infracore to secure technological capabilities related not only to the operation of individual unmanned equipment but also to solutions of the comprehensive control of unmanned construction sites.

1) A network service that can transmit up to 10 times more data and 20 times faster than LTE, enabling hyper-connected, ultra-high-speed and ultra-low-latency services
2) U-LT: Ultra-low latency technology for an extremely short end-to-end delivery time in real-time communication

Innovation & Digitalization
In the Concept-X demonstration, Doosan Infracore showcased operations representative of types of work expected of excavators and wheel loaders equipped with unmanned automation technologies. The unmanned excavator in the demonstration carried out leveling, trenching and loading of excavated soil, while the unmanned wheel loader loaded the soil onto a nearby dump truck or transported the soil quite distant from the worksite. As the operations of excavators and wheel loaders depend on the worksite, the company will continue to research possible functionalities of unmanned equipment. Improved safety is another important consideration in the application of unmanned automation technologies. Doosan Infracore therefore is focusing on developing technology related to control algorithms that enable real-time monitoring of the operation areas of unmanned equipment, including those along the paths of travel, for detection of unexpected intrusions of other equipment or personnel into the areas, and an immediate cessation of the operation of the equipment whenever necessary.

Value of Concept-X at Future Construction Sites

Doosan Infracore conducted research on changes and value that it could bring to future construction sites after successfully completing the Concept-X demonstration in 2019. Using KPMG’s “True Value” methodology, the company calculated and analyzed the effects of improvements in economic, social and environmental value that will result from the adoption of solutions to the unmanned automation of construction sites, and would like to share its findings with stakeholders.

Total economic, social and environmental value before/after Concept-X

Concept-X includes the X-center technology that controls unmanned equipment, such as excavators and wheel loaders, at an unmanned worksite. To determine the social value of adopting Concept-X, Doosan Infracore has devised indices, including reduction of work hours, reduction in worksite environmental impact, equipment and personnel allocation, and safety and fuel efficiency improvements. The hypothetical construction environment where Concept-X was applied is found to be 36% higher in terms of economic, social, environmental benefit relative to conventional construction sites. Doosan Infracore will continually measure, manage and publicize the true total cost of ownership (TCO) of Concept-X solutions following technological improvements, and lead the social value creation of Doosan Infracore business.

In terms of economic value, the X-center solution, including drone-based 3D mapping and measurement technology, reduces construction time and costs by up to around 20% with an increased consistency in measurement. Moreover, unmanned automated construction sites require two-thirds fewer onsite personnel, such as work supervisors and construction equipment operators. Total construction time also decreases by 32.9%, contributing to reduce construction costs.

In social aspects, it has been found that the adoption of Concept-X creates meaningful value in improving safety issues. This impact is drawn by the forecast or detected breakdowns of equipment through PHM, unmanned equipment improves work efficiency in dangerous areas, and the fewer personnel at construction sites, the lower the accident rate will be.

Environmentally, the leading anticipated effect is reduced fuel consumption and greenhouse gas emissions as a result of improved fuel efficiency, as well as noise reductions from shorter construction periods. In addition, the total estimated construction hours saved will have a positive effect on reducing environmental pollution, such as air pollutants, fine dust and damage to forests in areas near construction sites.

More detailed information on the benefits of Concept-X adoptations can be found in a separately issued report titled, “Concept-X True Value Report.”
Unexpected equipment breakdowns at unmanned construction sites, where fleet operations will become the norm, can lead to economic losses and other risks. Prognostics and health management (PHM) is a solution to such potential problems—it enables unmanned automated equipment to self-diagnose its status and to identify potential sources of breakdowns, thereby ensuring seamless operation. The PHM technology uses big data analysis, deep learning and AI technology, based on the history of equipment usage data. Doosan Infracore’s future unmanned automated equipment can self-diagnose its operating status and detect signs of a potential breakdown in time for maintenance to take place, and thus minimizes downtime, offering a longer guarantee of equipment soundness, which in turn leads to the increased worksite efficiency and productivity.

Doosan Infracore plans to unveil solutions by phase prior to commercialization of Concept-X. As a first step for commercialization, it released XiteCloud in May 2020. XiteCloud is a smart solution to earthwork management at construction site, and it connects 3D drone measurements, earthwork amount calculations and construction layouts to an exclusive cloud platform through which it devises work plans for optimal efficiency at the worksite. Bringing together diverse and dispersed types of work, such as measurement, topography analysis, equipment operations and construction management, and managing them on a single platform can reduce costs and work time while also improving work accuracy, which leads to improved productivity at the construction site. XiteCloud enables a precision analysis of mounting amounts of data being generated in each stage of construction, and can reduce time needed for construction measurement and calculation of earthwork amounts from a traditional two-week period to a day or two. Going forward, Doosan Infracore will extend the usage of XiteCloud to large-scale construction equipment operations by leveraging 5G technology and telematics, and it will steadily advance into overseas markets.

Doosan Infracore pursued open innovation through internal and external collaboration, industry-academia cooperation and start-up investment, aimed to secure a distinctive competitive edge. The company as a total solution provider will continue to combine various internal and external ideas, and generate the marketability and profitability of advanced technologies accumulated through Concept-X, and thus will create innovative, distinctive customer value. In addition, it will present a new future for the construction industry by enhancing worksite productivity, safety and eco-friendliness.

**Electricity**

**Electric Excavators**

At the CONEXPO 2020, held in Las Vegas in the U.S. in March 2020, Doosan Infracore unveiled a pilot product of DX17Z-5, a 1.7-ton mini electric excavator. The DX17Z-5 electric excavator is powered exclusively by a battery pack stored within, and the battery supplies power to an electric motor that activates the hydraulic systems. DX17Z-5 is the first electric excavator developed in response to the opinions of customers who operate an excavator for hours in a confined space. DX17Z-5 is eco-friendly for it does not emit harmful gases, such as exhaust gas, and is suitable for working indoors (closed space) or in an urban area where eco-friendly operation is required. The company plans to commercialize DX17Z-5 in 2022.

**Hybrid Powertrain**

As a result of stricter GHG emissions standards across the global automotive market, “de-dieselization” is gaining momentum. The progress of electric engines in the automotive industry is also being accelerated, and the development of hybrid engines for industrial uses is at full speed. Doosan Infracore has been looking into developing various types of hybrid powertrains since 2017. A hybrid powertrain has an internal combustion engine and an electric motor powered by a battery pack installed on the machine or equipment. The electric motor is used when a little energy is needed (discharging), and an internal combustion engine is used when a lot of energy is required (charging).

Having found the potential of “48V mild hybrid powertrain,” Doosan Infracore commenced a full-scale technological development in July 2018. The mild hybrid powertrain is a combination of internal combustion and electrification systems in which a 48V electric motor is attached to an engine as an auxiliary power source. The electric motor is used in low-efficiency sections, thereby increasing energy efficiency and power while reducing CO₂ emissions. As a result of establishing such a unique powertrain concept and improving the specifications, the company has developed a “Doosan Intelligent Hybrid Powertrain,” the company’s first mild hybrid powertrain that has an electric motor directly connected to the engine, and successfully started up a prototype in August 2019.

Doosan Infracore’s Intelligent Hybrid Powertrain is a technology that combines an electric motor, hybrid control unit (HCU), inverter and 48V battery pack with the G2 engine for higher performance and efficiency. The company’s first hybrid powertrain is a combination of a 2-liter 75-horsepower D24 engine and a 25-horsepower electric motor, which is equivalent to a 3-liter 100-horsepower engine. Unlike 2-liter engines, 3-liter engines are required to use a urea solution to reduce air pollutant emissions. However, the D24 engine does not require such a solution. Going forward, Doosan Infracore will apply a hybrid powertrain technology for mid- to large-sized equipment that integrates the same eDrive module (eMotor, inverter, HCU, battery) to its D24 engine, in order to secure a 4-liter line-up. Combining a 25-horsepower electric motor with a 135-horsepower, D34 engine will evolve into a 160-horsepower powertrain. In addition, it enables engine downsizing for it does not need the selective catalytic reduction (SCR), a pollutant reducing device, while the use of an electric motor helps reduce fuel consumption and improve acceleration.

With the Doosan Intelligent Hybrid Powertrain as a start, Doosan Infracore will secure optimal engine and motor control technologies, and develop vehicles and equipment on which the mild hybrid powertrain can be installed, thereby improving the business value of the powertrain. In addition, through R&D of hybrid powertrains and electrification of mechanical parts, the company will grow into a total power solution provider offering not only first-rate engines but the latest in hybrid and electrification technology as well.

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1) XiteCloud: www.xitecloud.io
2) Cloud platform: A system that allows realtime processing and analysis of large amounts of data through an Internet-connected server
3) Rechargeable lithium-ion battery: A type of electric battery, which makes use of lithium as the raw material, and can be fully charged in 1 hour.
Digital technology is spreading rapidly through all industries, setting off innovation. Riding the wave of digital technology, companies are responding to external changes by moving forward with a digital transformation of their own centered on new value creation and operation efficiency enhancement through expansion of data collection, strengthening of data connection and analysis, and improving of data visibility. Having sought to improve operating efficiency through the adoption of diverse IT systems, Doosan Infracore is implementing a mid-to-long-term digital transformation by strengthening collection and connection as well as increasing visibility of all data being generated throughout the whole value chain, from R&D, production, quality control, sales, post-sales and AM parts business to customer service. In particular, it aims to become a more efficient company through operational innovation, and thus is focusing on carrying out operation management and data collection (Base Process & System), gaining data visibility and building a data-based collaboration platform (End-to-end Visibility), optimizing data analysis-based operations (Optimal & Flexible Operation), and changing the work process (Efficient & Easy Way of Working) across all of its business.

Doosan Infracore recently developed the Global Manufacturing Execution System (GMES), a project launched in 2018, and applied it to the Incheon construction equipment plant in August 2019, in order to enhance production efficiency through establishment of an up-to-date operation system and data collection. GMES enables use of information related to the logistics flow and quality of production materials on a single platform by integrating production and process plans and execution data. The system is an integrated solution applicable to all Doosan Infracore’s worksites around the world, for it can integrate not only key functions of manufacturing and production but specialized functions of all plants as well. The establishment of GMES is significant as it has enabled diverse production innovations, such as gaining production visibility categorized by business and region, optimizing production scheduling, digitalizing work orders and inspections, developing the Real-time Location System (RTLS), efficient responses non-operation/error messages, and thus is focusing on carrying out operation management and data collection (Base Process & System), gaining data visibility and building a data-based collaboration platform (End-to-end Visibility), optimizing data analysis-based operations (Optimal & Flexible Operation), and changing the work process (Efficient & Easy Way of Working) across all of its business.

In its efforts to expedite digital transformation, Doosan Infracore formed a strategic partnership in April 2019 with Palantir, a US-based unicorn start-up** offering a big data platform for use in diverse fields, including government, finance and manufacturing, and providing support for corporate productivity and quality enhancement as well as risk management.

Together with Palantir, Doosan Infracore built "Diyalo,” a data-based collaboration platform, in February 2020. The establishment of Diyalo has enabled Doosan Infracore to obtain data visibility throughout the value chain and to strengthen inter-department communications, which resulted in increased management efficiencies. As a big data-based collaboration platform that organically connects and analyses the data of numerous business systems, Diyalo is expected to significantly reduce inefficiencies in searching for and collecting data from each system by production, sales, quality and other categories. For example, when an equipment model is searched through the Diyalo search window, information on diverse subjects pops up, such as basic equipment, production volume, quality, major sales regions and dealers, and sales history by period. In addition, quick data-based decision-making can be done through creation and analysis of individual analysis reports on specific data. Doosan Infracore plans to add new fields, such as R&D and AM, into the Diyalo in addition to supply chain management (SCM) and field claim & quality management (FCQM), which are currently in operation, while also expanding the scope of its usage to include overseas subsidiaries and the engine business by 2024. On the strengths of the Diyalo platform, complex data integration and management have become easier, making employees have more time to focus on high value-adding work. It also gave rise to expectations that a data-based work culture will take root and generate greater additional value across the value chain.

Doosan Infracore is implementing diverse operational innovations in the areas of logistics, parts supply, field claim and SCM with the goal of achieving operational efficiency and optimization based on data analysis. To this end, the company has been focusing on corporate-wide logistics innovation since 2019, with the goal of securing overall visibility and optimizing logistics operations from suppliers to dealers. Corporate-wide logistics innovation and improvement tasks include: 1) obtaining logistics visibility, such as material procurement and product shipment, by developing sea and land cargo tracking systems; 2) devising ways of optimizing logistics infrastructure to enhance value chain strategies, production of new models, and mid-to-long-term changes in production lines; 3) building an integrated procurement and transport system to lessen internal congestion and achieve on-time delivery, and reducing logistics costs; 4) improving work productivity by adopting a digital technology-based picking method and enhancing logistics quality by preventing input error-base non-operation. In accordance with these tasks, Doosan Infracore has established a master plan and is implementing it by phase.

For operation automation and innovation in how work is done, in 2019 Doosan Infracore applied a trial basis robotics process automation (RPA), a technology for automating repetitive and standardized procedures, to 12 business processes, such as application for certificates of origin, supply list handling, and vendor account registration. The pilot operation of RPA is expected to reduce work hours involving the 12 processes by up to 10,600 hours a year, which will not only translate into a substantial increase in employee efficiency but business growth. In addition, it will facilitate a digital work environment that is converged with diverse digital technologies, such as RPA and AI Chatbot, in order to further increase work productivity and the flexibility of employment conditions. By this means, Doosan Infracore adopted "Office 365,” a public cloud-based platform, in 2018 to improve office productivity and support employee communication collaborations. The adoption has contributed to changing the way of internal and external collaboration, adopting the 32-hour workweek system, and facilitating remote working and telecommuting that are proven crucial to its ability to conduct business undisturbed through the COVID-19 pandemic in 2020.

Going forward, Doosan Infracore will transform into an innovative company that applies digital technology across the whole value chain, thereby creating new value for stakeholders and markets and seizing business opportunities, based on its mid-to-long-term business plan.

** Unicorn start-up: A start-up assessed to have the corporate value of at least USD 1 billion
Doosan Infracore fulfills our corporate social responsibility (CSR) so as to ensure the sustainable development of the company and local communities. CSR is an integral part of our management activities for sustainable growth. Therefore, we are moving towards achieving the goal of “Global CSR Leading Company” based on our CSR system, consistent strategy, and the commitment of all employees.
Doosan Infracore conducts its corporate social responsibility (CSR) activities, in cooperation with its business sites around the world, led by the CSR Part and CSR Committee at its headquarters in Korea. The CSR Part, as a coordinator responsible for promoting the company’s overall CSR initiatives, is in charge of establishing CSR strategies, identifying stakeholder issues and needs, diagnosing CSR levels at domestic and overseas business sites, identifying strategic CSR tasks, monitoring CSR activities, and responding to external evaluations.

The CSR Committee is the top decision-making body, not only leading the company’s sustainable growth and socially responsible activities, but also having responsibilities to find out risks and opportunities in line with ongoing changes in CSR issues, make decisions about CSR strategies and policies, identify CSR tasks and review progress. Doosan Infracore runs one CSR Committee at the company headquarters in Korea and another in China. The headquarters’ CSR Committee, under the direct control of the CEO, comprises five subcommittees – Human Rights and Labor Practices, Environment, Fair Operations, Customer Values and Local Communities subcommittees – and is held three times per year. Led by BG (Business Group) heads and division heads, the subcommittees are flexibly organized and operated according to strategic CSR tasks, thereby improving efficiency in decision-making and administrative processes. Once the CSR Committee makes decisions about major issues, including identification, operation and process of CSR strategic tasks, the CSR Working Group, draws up and implements specific action plans. Established in 2009, the CSR Committee in China is led by the regional director, who serves as its chairperson, with the sector leaders serving as heads of its five subcommittees. The committee is held three times per year to discuss CSR tasks, process review and approval, and performance management, among other matters.

In 2019, the company upgrades its existing CSR strategic tasks while also identifying a series of new tasks, including the establishment of a sustainable value framework and indicators; the demonstration of Concept: X and the development of a new business model, and the development of prerequisite technologies for hybrid powertrain. With the CSR Committee taking the lead, all relevant departments of the company worked in unison to execute the tasks. At the first CSR Committee held in 2020, eight tasks were selected as the strategic CSR tasks for 2020: focusing on decipheration and developing alternative fuel products, improving preventive quality and strengthening global governance, helping leading suppliers bolster their competitiveness by building smart factories, and setting CSR directions and increasing employee awareness.

Doosan Infracore has developed a sustainable value framework composed of 14 indicators based on its sustainability issues, social value, corporate competitiveness and strategic tasks, to link the company’s mid- to long-term strategies with its CSR directions, and then set targets and management plans for each index by 2025. The company will continue to establish the direction and manage its performance based on the sustainable value framework with the goal of achieving sustainable growth. The details of Doosan Infracore sustainable value framework are provided on pages 18-19.

2018 2019 2020

- Provide support to disclose CSR information of overseas worksites
- Establish a Sustainable Value Framework and identify indicators
- Establish management system and strengthen monitoring system to promote human rights: Conduct advanced human rights education for relevant departments and provide human rights consultation for each organization
- Provide support for global CSR information disclosure
- Strengthen CSR management system of supply chain: Define core suppliers and identify suppliers with high CSR risks, and establish a management process
- Strengthen CSR management system and support improvement activities
- Establish a management system and strengthen monitoring system to enhance the human rights mindset: Develop a due diligence tool for the monitoring of human rights risks
- Strengthen CSR management system of supply chain: Identify suppliers with high CSR risks, and support improvement activities
- Establish a management system and strengthen monitoring system to promote human rights: Conduct advanced human rights education for relevant departments and provide human rights consultation for each organization
- Develop a due diligence tool for the monitoring of human rights risks
- Set CSR directions and increase employee awareness
- Help leading suppliers bolster their competitiveness by building smart factories
- Develop a due diligence tool for the monitoring of human rights risks
- Focus on decipheration and develop alternative fuel products
- Develop an unmanned automation technology
- Develop the 48V hybrid powertrain
- Improve product quality and strengthen global governance

- Reduce GHG emissions
- Strengthen management system of supply chain: Identify suppliers with high CSR risks, and support improvement activities
- Support improvement activities
- Strengthen CSR management system: Provide relevant training
- Strengthen management system of supply chain: Provide relevant training
- Manage the pre-qualification of new products: Enhance quality management ahead of the mass-production of new products that meet EU Stage V and China’s Stage IV emission standards
- Strengthen CSR management system: Provide relevant training
- Strengthen management system of supply chain: Provide relevant training
- Manage the pre-qualification of new products: Enhance quality management ahead of the mass-production of new products that meet EU Stage V and China’s Stage IV emission standards
Doosan Infracore discloses our major management issues, performance results and future directions through our integrated reports, disclosure materials, websites, annual general meeting (AGM) and BOD meetings, while continuing to collect and listen to stakeholder opinions through a wide range of communication channels. For more systematic stakeholder engagement and communication, Doosan Infracore defines our major stakeholders, identifies and addresses their interests and issues, and discloses our activities and outcomes through various communication channels.

Communication Channels and Responses for Stakeholders

<table>
<thead>
<tr>
<th>Stakeholders/ Investors</th>
<th>Communication Channels</th>
<th>Major Issues</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Annual general meeting (AGM)</td>
<td>• Profitability and a dividend policy</td>
<td>• Share the company’s mid- to long-term business directions</td>
<td></td>
</tr>
<tr>
<td>• Disclosure materials</td>
<td>• Strengthen disclosures</td>
<td>• Make earnings announcements and provide IR materials</td>
<td></td>
</tr>
<tr>
<td>• Investor relations (IR) information on the company website</td>
<td>• Sound corporate governance</td>
<td>• Hold analyst meetings</td>
<td></td>
</tr>
<tr>
<td>• Conferences</td>
<td>• Business opportunity and risk management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• IR meetings</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customers</th>
<th>Communication Channels</th>
<th>Major Issues</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Field surveys</td>
<td>• Prompt customer complaint handling and feedback</td>
<td>• Product presentation through exhibitions and dealer meetings</td>
<td></td>
</tr>
<tr>
<td>• Voice of Customers (VOCs)</td>
<td>• Make improvement to product quality, performance, safety, and convenience</td>
<td>• Tasks relating for eco-friendly products</td>
<td></td>
</tr>
<tr>
<td>• Call centers</td>
<td>• Strict customer data privacy policy</td>
<td>• Incorporate VOCs into products through the New Product Development (NPD) process</td>
<td></td>
</tr>
<tr>
<td>• Joint workshops</td>
<td>• R&amp;D investment and the improvement of technological capabilities</td>
<td>• Enhance customer accessibility by providing dealers with online information and strengthening dealer management system</td>
<td></td>
</tr>
<tr>
<td>• Integrated customer management systems</td>
<td>• Differentiated customer service</td>
<td>• Increase customer satisfaction through the Happy Call and dealer service training</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employees</th>
<th>Communication Channels</th>
<th>Major Issues</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Labor-Management Council</td>
<td>• Fair evaluation and compensation</td>
<td>• Implement the Doosan Credo</td>
<td></td>
</tr>
<tr>
<td>• Grievance-handling system</td>
<td>• Education and competence development</td>
<td>• Human resources development based on the Functional Competency (FC) system</td>
<td></td>
</tr>
<tr>
<td>• Intranet</td>
<td>• Work-life balance</td>
<td>• Operate the Women’s Council</td>
<td></td>
</tr>
<tr>
<td>• Doosan-Credo surveys</td>
<td>• Positive labor relations</td>
<td>• Publish a human rights risk-prevention manual and provide education on human rights</td>
<td></td>
</tr>
<tr>
<td>• Dialogue with the executives</td>
<td>• Active communication within the company</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Communication Channels</th>
<th>Major Issues</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Supplier Council</td>
<td>• Share more information with suppliers</td>
<td>• Foster Leading Suppliers</td>
<td></td>
</tr>
<tr>
<td>• Supplier education</td>
<td>• Expand support to improve suppliers’ capabilities through financial, technology, education, environment, and ethical management support</td>
<td>• Financial support for suppliers</td>
<td></td>
</tr>
<tr>
<td>• Consulting, technical support for suppliers</td>
<td>• Strengthen fair trade</td>
<td>• Operate the Shared Growth Hotline</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local Communities (the environment, NGOs, etc.)</th>
<th>Communication Channels</th>
<th>Major Issues</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Meetings with residents</td>
<td>• Eco-friendly products and production processes</td>
<td>• Operate Dream School</td>
<td></td>
</tr>
<tr>
<td>• Workshops for working level staff in charge of corporate community involvement (CCI)</td>
<td>• Improve worksite and surrounding environments, and prevent pollution</td>
<td>• The Doosan Day of Community Service</td>
<td></td>
</tr>
<tr>
<td>• Sisterhood relationship with island regions</td>
<td>• Establish environmental management system</td>
<td>• Conduct CCI activities for local communities</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Central/Local Governments</th>
<th>Communication Channels</th>
<th>Major Issues</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Participate in national projects</td>
<td>• Comply with laws and regulations</td>
<td>• Regulatory monitoring and internal compliance</td>
<td></td>
</tr>
<tr>
<td>• Operate joint programs</td>
<td>• Public-private partnership</td>
<td>• Suggest improvement measures through participation in related organizations’ activities</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Media</th>
<th>Communication Channels</th>
<th>Major Issues</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Press releases</td>
<td>• Prompt and accurate information sharing</td>
<td>• Issue press releases in a timely manner</td>
<td></td>
</tr>
<tr>
<td>• Press conferences</td>
<td></td>
<td>• Press reporters’ news coverage</td>
<td></td>
</tr>
<tr>
<td>• Regular meetings</td>
<td></td>
<td>• Find feature items and provide them to the media</td>
<td></td>
</tr>
</tbody>
</table>

**Stakeholder Engagement**

**Definition of Stakeholders**

Doosan Infracore discloses our major management issues, performance results and future directions through our integrated reports, disclosure materials, websites, annual general meeting (AGM) and BOD meetings, while continuing to collect and listen to stakeholder opinions through a wide range of communication channels. For more systematic stakeholder engagement and communication, Doosan Infracore defines our major stakeholders, identifies and addresses their interests and issues, and discloses our activities and outcomes through various communication channels.

**Communication Channels Major Issues Responses**

- **Shareholders/Investors**
  - Annual general meeting (AGM)
  - Disclosure materials
  - Investor relations (IR) information on the company website
  - Conferences
  - IR meetings
  - Profitability and a dividend policy
  - Strengthen disclosures
  - Sound corporate governance
  - Business opportunity and risk management
  - Share the company’s mid- to long-term business directions
  - Make earnings announcements and provide IR materials
  - Hold analyst meetings

- **Customers**
  - Field surveys
  - Voice of Customers (VOCs)
  - Call centers
  - Joint workshops
  - Integrated customer management systems
  - Prompt customer complaint handling and feedback
  - Make improvement to product quality, performance, safety, and convenience
  - Strict customer data privacy policy
  - R&D investment and the improvement of technological capabilities
  - Differentiated customer service
  - Develop eco-friendly, high efficiency products

- **Employees**
  - Labor-Management Council
  - Grievance-handling system
  - Intranet
  - Doosan-Credo surveys
  - Dialogue with the executives
  - Fair evaluation and compensation
  - Education and competence development
  - Work-life balance
  - Positive labor relations
  - Active communication within the company

- **Suppliers**
  - Supplier Council
  - Supplier education
  - Consulting, technical support for suppliers
  - Share more information with suppliers
  - Expand support to improve suppliers’ capabilities through financial, technology, education, environment, and ethical management support
  - Strengthen fair trade

- **Local Communities (the environment, NGOs, etc.)**
  - Meetings with residents
  - Workshops for working level staff in charge of corporate community involvement (CCI)
  - Sisterhood relationship with island regions
  - Eco-friendly products and production processes
  - Improve worksite and surrounding environments, and prevent pollution
  - Establish environmental management system
  - Communicate with local communities
  - Facilitate economic development of local communities

- **Central/Local Governments**
  - Participate in national projects
  - Operate joint programs
  - Comply with laws and regulations
  - Public-private partnership

- **Media**
  - Press releases
  - Press conferences
  - Regular meetings
  - Business site visits (field trips)
  - Prompt and accurate information sharing

**Governance**

Doosan Infracore strives to enhance transparency in its decision-making process and protect the rights of shareholders and various other stakeholders. To this end, the company has developed an independent governance structure under the principle of checks and balance.

**SUSTAINABLE VALUE FRAMEWORK**

**OUR APPROACH**

Doosan Infracore has built a healthy and transparent governance structure by ensuring the independence and expertise of its Board of Directors (BOD), centered on independent outside directors, and by establishing an internal decision-making system led by the committees within the BOD. We transparently disclose a variety of information related to corporate governance, including the composition of the BOD and the Board’s major resolutions, through our website and a series of corporate reports.

**Progress | Governance transparency**

Doosan Infracore maintains our BOD composition above legal standards and is active in the Board operations, to build a foundation for a healthy and transparent governance structure and to increase our corporate value as well as shareholder value. To this end, the company is managing the number of outside directors in composing its BOD and their attendance at the Board meeting.

**Percentage of outside directors**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of outside directors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>57.1 (Unit: %)</td>
</tr>
<tr>
<td>2019</td>
<td>57.1 (Unit: %)</td>
</tr>
<tr>
<td>Goal for 2025</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**BOD meeting attendance rate of outside directors**

<table>
<thead>
<tr>
<th>Year</th>
<th>BOD meeting attendance rate of outside directors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>85.7 (Unit: %)</td>
</tr>
<tr>
<td>2019</td>
<td>92.9 (Unit: %)</td>
</tr>
<tr>
<td>Goal for 2025</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**CSR Structure · Governance**

2019 Doosan Infracore Integrated Report 64
Corporate Governance

Composition of Shareholders and Equity
Doosan Infracore is one of major affiliates of Doosan Group, with 35 consolidated subsidiaries (based on business reports) being operated across the globe. As of the end of 2019, the number of shares issued stood at 208,161,279, of which the largest shareholder, Doosan Heavy Industries & Construction, owned a 36.27% stake.

Ownership Structure
(As of December 31, 2019; based on number of shares issued)

- Shareholders with 5% or More Shares
  - Industrials & Construction, owned a 36.27% stake.
  - BlackRock Fund Advisors 5.00%

- Shareholders with 1% or More Shares
  - Returns to shareholders
  - Investors

Shareholder and Investor Communication

Communication Channels
Doosan Infracore actively seeks out the expectations and demands of its shareholders, investors, customers, and other stakeholders when making key decisions. The company publishes quarterly reports and integrates reports, and also invites institutional investors to its investment conferences, and also invites institutional investors to its

Protection of Minority Shareholders
Doosan Infracore has adopted and operates a paper ballot, an electronic voting system, and an electronic proxy solicitation system to protect the voting rights of its minority shareholders. When sending out notices of its annual general meeting (AGM), the company embeds paper ballots so that shareholders can exercise their voting rights if absent. Their votes are valid until the condition that they arrive at the company one day prior to the date of an AGM.

Disclosure of Corporate Information
Doosan Infracore complies with all applicable legal disclosure requirements. The company also strives to disclose information in a balanced manner, concerning its financial and non-financial activities, through the voluntary disclosure of the company’s compliance program (CP) status and CSR activities.

Status of Disclosure Activities

- Financial Disclosure of provisional statistics on sales performance; Quarterly and biannual reports and statements of affairs; Disclosures relevant to AGM and special shareholder meetings; Disclosure of changes in the shareholdership structure; and Disclosure on the Online Provision of Enterprises Information (OPIE) system operated by the Korea Fair Trade Commission, etc.
- Non-financial Status of CP operations; Disclosure of CSR activities including integrated reports, and Disclosure of information through company presentations, etc.

Operation of an Independent BOD

Composition and Operations of the BOD
The Board of Directors, as the company’s highest decision-making body, has been delegated the right to make decisions related to corporate management from shareholders in accordance with the relevant laws and the company’s Articles of incorporation. It is also in charge of checks and balances for the company’s transparent management through its independent decision-making practices regarding the company’s long-term growth and major management issues. The BOD of Doosan Infracore is composed of three internal and five outside directors who were transparently appointed through an AGM held in March 24, 2020. (three internal and four outside directors before March 24, 2020)

The Outside Director Candidates Recommendation Committee recommends outside director candidates who are suitable for establishing a transparent governance structure and enhancing the BOD’s expertise. Outside directors are appointed in consideration of their ownership of the company’s shares, potential conflicts of interest, career with the company’s competitors, diversity and stakeholder representativeness. As of the end of December 2019, the average tenure of the Board members is 3.46 years.

Intra-organizational Decision-making System

Incorporated shareholders can exercise their voting rights if absent. Their votes are valid until the condition that they arrive at the company one day prior to the date of an AGM.

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Status of Disclosure Activities

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There are three committees under the BOD which are entirely composed of outside directors – the Audit Committee, which is responsible for guaranteeing the transparency and independence of audit procedures; the Internal Transaction Committee, which is designed to improve the transparency of corporate management through the establishment of CP; and the Outside Director Candidates Recommendation Committee, which has the authority to recommend outside directors.

Composition of BOD
(As of March 4, 2020)

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Expertise</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Director</td>
<td>Park, Yong Muan</td>
<td>Management, Finance</td>
<td>Chairman of the BOD</td>
</tr>
<tr>
<td>Internal Directors (CID)</td>
<td>Sohn, Dong Yoon</td>
<td>Technology, Industry</td>
<td>Overseeing the general management of the company</td>
</tr>
<tr>
<td>Internal Directors (CID)</td>
<td>Go, Daehyeon</td>
<td>Finance</td>
<td>Overseeing the financial affairs of the company</td>
</tr>
<tr>
<td>Outside Directors</td>
<td>Ham, Sung Soo</td>
<td>Policy</td>
<td>Chair of the Outside Director Candidates Recommendation Committee</td>
</tr>
<tr>
<td>Outside Directors</td>
<td>Jeong Min Hwan</td>
<td>Finance, Accounting</td>
<td>Member of the Internal Transaction Committee</td>
</tr>
<tr>
<td>Outside Directors</td>
<td>Yoon, Sung Soo</td>
<td>Finance</td>
<td>Member of the Audit Committee</td>
</tr>
<tr>
<td>Outside Directors</td>
<td>Lim, Sung Ram</td>
<td>Economy, Tax</td>
<td>Member of the Audit Committee</td>
</tr>
<tr>
<td>Outside Directors</td>
<td>Deuk Hong</td>
<td>Law, Policy</td>
<td>Member of the Internal Transaction Committee</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Committee</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit Committee</td>
<td>Accounting audit, management performance audits and inspection of internal accounting system operations</td>
</tr>
<tr>
<td>Internal Transaction Committee</td>
<td>Review and approval of large-scale internal transactions (more than KRW 5 billion per case or per quarter) and audits of internal transactions</td>
</tr>
<tr>
<td>Outside Director Candidates Recommendation Committee</td>
<td>Recommendation of outside director candidates</td>
</tr>
</tbody>
</table>

* The tenure of a director is by the end of AGM for the third fiscal year after his/her appointment.
* Outside Director Jung Byung Moon was resigned on March 24, 2020 upon the expiration of a term; and Lim Sung Kyoon and Lee Deuk Hong were newly appointed as outside directors on March 24, 2020.
* As of March 4, 2020, the BOD of Doosan Infracore is composed of three internal and five outside directors.
Board Meetings Held in 2019

<table>
<thead>
<tr>
<th>Order</th>
<th>Date</th>
<th>Agenda Items</th>
<th>Approval</th>
<th>Number of attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Feb. 12</td>
<td>Report on the operation status of the internal accounting system in 2018</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Mar. 08</td>
<td>Report on the CP operation performance in 2018 and operation plan for 2019</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Mar. 22</td>
<td>Report on the 2018 business performance</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Apr. 15</td>
<td>Approval of 2018 financial statements and business report</td>
<td>Passed</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Apr. 24</td>
<td>Approval of 2019 management plan</td>
<td>Passed</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Jul. 22</td>
<td>Report on the inspection of internal accounting system operations in 2018</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Aug. 21</td>
<td>Report on the 2018 audit</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Sep. 10</td>
<td>Approval of convening of the 13th AGM and purpose of the meeting</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Oct. 09</td>
<td>Matters on adopting the electronic voting system</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Nov. 12</td>
<td>Matters on the appointment of the chairman of the BOD and the convening authority holder</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Nov. 26</td>
<td>Matters on the appointment of compliance officer and a self-compliance manager for fair trade</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>Dec. 10</td>
<td>Matters on the partial amendment of the operating regulations of the Audit Committee</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Dec. 10</td>
<td>Matters on the partial amendment of internal accounting management regulations</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Dec. 10</td>
<td>Approval of the signing of a contract for the transfer of shares of DVC Co., Ltd. and the provision of DVC shares as collateral</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>Dec. 10</td>
<td>Report on the business performance for the first quarter of 2019</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>Dec. 10</td>
<td>Approval of transaction with the affiliate</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>Dec. 10</td>
<td>Report on the business performance for the first half of 2019</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>Dec. 10</td>
<td>Approval of the establishment of a new overseas subsidiary</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>Dec. 10</td>
<td>Approval of delegating the debenture issue to the CEO</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>Dec. 10</td>
<td>Report on the business performance for the third quarter of 2019</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>21</td>
<td>Dec. 10</td>
<td>Matters on the issuance of foreign guarantee bonds</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>Dec. 10</td>
<td>Matters on the GDR-debenture</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>23</td>
<td>Dec. 10</td>
<td>Matters on delegating the debenture issue to the CEO</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>24</td>
<td>Dec. 10</td>
<td>Approval of self-dealing transaction with Doosan Heavy Industries &amp; Construction</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>25</td>
<td>Dec. 10</td>
<td>Approval of self-dealing transaction with Doosan Engineering &amp; Construction</td>
<td>Passed</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td>Dec. 10</td>
<td>Approval of donations for 2020</td>
<td>Passed</td>
<td>4</td>
</tr>
</tbody>
</table>

The total amount of approved pay for directors and auditors in 2019 was KRW 67.5 billion, of which KRW 64.75 million was actually paid, with the average compensation per person standing at KRW 882 million. The actual payment amount was calculated based on the pay for three registered directors and four members of the Audit Committee who were paid from January to December 2019.

The remuneration of internal and outside directors is determined within the limits approved by the AGM. The internal directors are paid according to a performance-based compensation system that links their compensation to their management performance. Directors receive performance bonus based on the management performance of their respective organization and their basic annual salaries are determined by their job position. The outside directors’ performance evaluation is based on their attendance at the BOD and committee meetings, industry expertise, level of contribution and performance at the Board meetings. To ensure their independence from the management and controlling shareholders, members of the Audit Committee receive remuneration only as directors and are prohibited from receiving any other types of compensation.

Ethical Management

Ethical Management Policies

All employees at Doosan Infracore are required to adhere to the Code of Conduct, and third parties such as suppliers are strongly recommended to comply with the guide of principles. Doosan Infracore’s employees are responsible for ensuring that they have a full understanding of all related laws and internal regulations, including the Code of Conduct. It has also connected the company-wide operation system with the ERP, e-procurement, evaluation of internal control, and fair trade compliance systems to improve the transparency and efficiency of its business activities. The Audit Team is in charge of auditing ethical management of the company, while the Internal Control Team develops the internal control system and evaluates its operations.

Completion rate of ethical management training in 2019

Korea 95%  China 100%

Communicating and Promoting Ethical Management

We disclose the Code of Conduct on our website and operate a cyber reporting center that can be accessed easily by our internal and external stakeholders. To prevent recurrence of Code of Conduct violations, the company clearly identifies the process and cause of issues that arise during the work process, and shares a white paper. Moreover, to maintain a transparent ethical management system, Doosan Infracore urges new employees to sign a written oath pledging their compliance with the Code of Conduct. We also require new suppliers to submit a written oath pledging not to engage in unethical business practices. The company requires each of team leaders, part leaders, and higher level managers, as well as its executives to write and submit a statement of interests form on an annual basis, with an aim to remind them of the strict compliance standards. In 2019, all respondents required to submit the statement complied with the obligation. In addition, to encourage our suppliers to practice ethical management, the CEO sends a letter, while the company conducts ethical education for them at general supplier meetings.

Training on the Code of Conduct is designed to raise employees’ awareness of ethical business practices and control the ethical risks involved in their business transactions in advance. Doosan Infracore provides the training to all employees, and notifies them of major ethical management issues by posting the details on the bulletin board of each business site. The company expanded the scope of its online training to include managers of its Chinese subsidiary in 2017 in addition to managers at its domestic business sites, and has been continuing to do so.
Establishment of Fair Trade Practices

Doosan Infracore adopted the Compliance Program (CP) in 2002 to ensure transparent business operations and fair competition. To build a culture of fair trade and horizontal transactions meeting global standards, the company discloses the CEO’s declaration on compliance and four major pledges1 the website.

The company has upgraded “Sanctions Process for Employee Violations of Fair Trade Laws and Regulations” by revising the regulations concerning the fair trade compliance program. We have also developed STDM (Subcontracting partners Technical Data request Management System), an integrated data management system protecting suppliers’ technical data, meeting legal requirements about subcontract (requests for technical data, data management system, etc.) and improving user convenience. STDM is an integrated system which enables one-stop processing, from the preparation of technical data requests by suppliers to internal approvals and the handling of technical data. With STDM, Doosan Infracore has been able to prevent the occurrence of any problems related to subcontracting caused by unpublished or incomplete issuance. In addition, the company continuously monitors the compliance with subcontracting laws in areas such as the imposition of price cuts and cancellations, and also ensures the compliance with work processes related to technical data. Moreover, it regularly undertakes employee training on subcontracting law to prevent violations of laws and regulations related to fair trade, and deal with any violations promptly. In 2019, the company operated seven training courses and 132 sessions of subcontracting (in the first half), obligations concerning the cancellation of subcontracting orders and the inspection (5 times), and basic R&D subcontracting (in the second half). It also offered company-wide training on purchasing, quality, and materials.

Compliance with the Anti-graft Law

In Korea, the “Improper Solicitation and Graft Act,” also known as the anti-graft law, came into effect on September 28, 2010. Intended to prevent public officials’ corruption, the Act applies to employees and their spouses of all public institutions, including constitutional agencies, central administrative agencies, and local governments, schools, and media outlets. The Act forbids improper solicitations to public officials and other relevant persons, and prohibits them from accepting financial or other advantages. Doosan Infracore has been carrying out various activities to raise awareness among employees, such as the Doosan Code and the Code of Conduct. These channels include the website, the Cyber Reporting Center2, postal mail, telephone, fax, and in-person visits. The Cyber Reporting Center is available in Korean, English, and Chinese languages, and the company employees or any external stakeholder can file a report under their real name, or anonymously. The company guarantees the confidentiality of the identity of the person making the report and its contents, and it also prohibits any measures being taken against the person making a report in good faith. Matters being reported are processed rapidly, and the whistleblower is notified of the results and the measures to be taken, with these measures also shared within the company to improve awareness of the importance of ethics.

Internal Controls

Audit and Monitoring

In line with the increased scope of the company’s management and responsibility with the expansion of its overseas business and the adoption of the International Financial Reporting Standards (IFRS), Doosan Infracore has been operating an independent audit team in China for audit and monitoring since 2012. The Audit Team at its headquarters in Korea is working to increase overseas subsidiaries’ management and decision-making based on respect for subsidiaries’ responsible business management.

Internal Controls Evaluation System

Doosan Infracore established the Doosan Internal Control Assessment System (DICAS), an internal controls evaluation system, in 2006 and since then it has been carrying out regular evaluations for the entire business areas, ranging from finance to sales, purchasing, and production. The results of the evaluations are reported to the Audit Committee and the BOD, as well as at the annual general meeting (AGM), following the reports to CFO and CEO under the “Act on the External Auditing of Corporations.” In 2014, the company began applying the same internal controls evaluation system to the subsidiaries in China.

Corruption Risk Assessment

Korean companies are required to design and operate internal controls based on an internal accounting management system, under the Act on External Audit of Stock Companies. Corruption risk assessment is an internal control system through which a company identifies potential corruption risks and manages the changes required in response to actual risks. Doosan Infracore conducts corruption risk assessments on 31 items, including unfair financial reporting, asset misappropriation, and corruption. We reflect the results of these assessments in our internal accounting management system, and in the implementation of annual internal audit plan, thereby managing related risks.

Internal and External Reporting Systems

Doosan Infracore has a number of internal and external reporting channels which enable the reporting of any unethical acts or behavior, including the receipt of money or bribes, involvement in unfair business practices, corruption, and any violations of related laws and internal regulations on the prohibition of solicitation to all employees in Korea and expatriate employees in China. The company also has a relevant organization in place to conduct regular monitoring and offer necessary legal advice. Doosan Infracore prevents fair trade laws and relevant regulations by setting fair trading orders based on building prior business consultations and post business diagnosis systems, providing consistent education programs, etc. As a full participant of a free and fair market, also, we keep fostering a corporate culture of compliance.

Risk Management

Risk Management Organization

Doosan Infracore identifies potential risks based on measured risks against such risks and discusses risk prevention at the monthly management meetings and at CSR Committee meetings with participation from senior management. In the monthly management meeting, the CEO and key executives discussed various risk issues such as financial, non-financial, and emerging risks, and established appropriate countermeasures.

Integrated Risk Management

Risk Management Process

Communication with stakeholders

Relevant internal and external stakeholders are informed of the risks that have occurred and the results of the company’s response to the risks according to its risk management procedures. Doosan Infracore continuously communicates with our stakeholders through quarterly earnings results and annual integrated reports.

PHASE 1

Establish a Foundation for Risk Management

Establish strategies, organizations and risk management systems, or consideration of overall business environment and industry characteristics to manage risks efficiently.

PHASE 2

Recognize Risks

Build a risk pool by defining all uncertain risk elements that might affect future management environments.

PHASE 3

Identify Risks

Identify potential risk factors and categorize them into appropriate areas.

PHASE 4

Evaluate Risks

Rate the identified risks according to the degree of danger, involvement in consideration of their intensity and frequency before analyzing the required control level and determining necessary management priority.

PHASE 5

Respond to Risks

Categorize required responses into company- or by functional measures depending on the risk and mitigate the degree of danger by distributing risk specific manuals and providing education on risk prevention.

Monitor

Control risks by continuously monitoring for any changes in the level of risk and report on a regular basis.

1) Responsible contracts for win-win cooperation between large companies and SMEs, fair selection and management of supplier, establishment of the Self-Review Council, and disclose payment and its retention in subcontracting transactions

2) Doosan Cyber Reporting Center - https://cyberreporting.com
To prevent liquidity risk arising from a lack of liquidity or difficulties in financing due to abnormal operations, the company establishes a three-month and annual funding plans to predict the funding required related to sales, investments, and financial activities, and to secure and maintain the required liquidity in advance.

Capital risk management involves the maintenance of an optimum capital structure to ensure the company’s capabilities to provide its shareholders and other stakeholders with corporate profits while reducing capital expenditure. Doosan Infracore maintains its capital in alignment with its debt ratio. It also manages capital risks by adjusting its dividend paid to shareholders, repaying share capital, and issuing new shares and selling assets to reduce debts.

Non-financial risk
Non-financial risks are categorized into product, ethics and compliance, the environment, safety, and disaster risks, and the company has established a preemptive risk response system for each.

Doosan Infracore improves customer safety and satisfaction through a range of activities aimed at improving product quality in cooperation with its suppliers. The company makes ethical management the basis of decision-making by establishing the Code of Conduct and conducting activities to promote CP. In addition, we undertake preemptive risk management based on transparent management, thereby ensuring the safety of our management environment.

Credit risk arises from transactions or investment activities when customers or business partners do not follow the conditions of the relevant business agreements. It may also arise from cash, cashable assets, derivatives, and deposits in financial institutions. Doosan Infracore manages credit risks with the goal of minimizing losses under its credit policies. For credits in which default is anticipated at the end of the fiscal year, the company properly assesses the risks and addresses the results in its consolidated statements of financial position.

As required by the Group-level business continuity management (BCM), Doosan Infracore has established response manuals and emergency notification systems for 20 essential items of infrastructure in each area. This enables the company to respond promptly to threats to employee safety.

Emerging Risk
With society changing faster than ever before, new and diverse economic, environmental, and social risks continue to emerge. Doosan Infracore, therefore, analyzes the trends shaping the global economy and consumer sentiment, as well as changes in culture and institutions. Based on the results of its analysis, the company identifies emerging risks, that are relevant to the company, and implements countermeasures in its business operations.

Risk Type | Details | Response measures
--- | --- | ---
Global economic slowdown | • Demand in the construction equipment and engine industries is affected by energy, front-end industries like automobiles, economic trends, and national SOC investment policies • COVID-19, which emerged in 2020, is likely to hit global industries and cause a global economic downturn | • Promote entry into new markets so as to diversify the company’s global portfolio (Strength in performance in advanced markets for construction equipment business, and enter the Indonesian market for engine business) • Review and respond to market, credit, liquidity, and capital structure risks through monthly management meetings

Stricter product environmental regulations | • Enforcement of emissions regulations for commercial goods and vehicles by country and continent • The accelerating introduction cycle of new emissions regulations not only in advanced markets but also in China and emerging markets, with the level of standard increasing | • Establish company-wide goals for developing and applying eco-friendly technologies and expanding related research • Monitor the trends of strengthening emissions regulations by country and continent, and develop new engine products, such as engines that meet EU Stage V and China’s Stage IV emissions standards • Develop hybrid powertrains

Personal information protection and information security | • Increasing security threats related to personal and corporate information following the development of information and communication technologies and hacking and simulating techniques • Increasing risks of human rights violations if the personal information, that a company collects, handles and stores, is leaked | • Conduct a risk assessment of the information protection management system, led by the Information Security Part, to identify vulnerabilities and take prompt actions; provide information security training for employees; and obtain the Information Security Management System (ISMS) certification

Worsening climate change | • Increasing frequency and intensity of extreme weather events, such as heavy rain/snowfall, typhoons, and heat and cold waves, due to climate change • Increasing limit on business operations and logistics due to extreme weather events More strict regulations related to energy and greenhouse gases, such as the energy target management system and the emissions trading system in line with climate change emerging as a major global agenda item | • Establish a climate change response system, including the GHG/Energy Reduction Council, EHS operation and performance management, and the establishment of a mid- to long-term roadmap for the emissions trading system • Set a mid- to long-term greenhouse gas reduction target and monitor the relevant performance

Risk Type | Response measures
--- | ---
Product quality | Establish a quality management system; manage quality indicators, and strengthen supplier quality management
Ethics and compliance | Establish ethical standards; operate reporting channels for violations of the Code of Conduct or CP; conduct audits; and provide employee ethics training
Discharge of pollutants, complaints, and environmental accidents | Establish an environmental management system, obtain ISO 14001, an international standard for environmental management system, and manage environmental pollutants and disclose relevant information
Workplace fire and safety accident | Engage in risk factor self-management activities; enhance the safety management (operation of the Disaster Prevention Center); provide safety training; and run programs to boost safety management of suppliers
Natural disasters and non-made hazards | Build the BCM and non-BCM drills

Risk Type | Response measures
--- | ---
Market risks | Manage exchange-rate fluctuations, interest rates, and price risks
Credit risks | Manage credit risks and reserve issues through safeguard measures in bonds
Liquidity risks | Establish quarterly and annual financial balance plans
Capital risks | Reduce capital costs and manage liabilities

Doosan Infracore has classified our financial risks into four types – market risk, credit risk, liquidity risk, and capital risk – and monitors and manages them by risk type.
Integrated EHS Management

EHS Management Strategies

In 1995, Doosan Infracore established the EHS Management Policy in order to share key elements of its environmental management strategies both internally and externally. The company amended the Policy for six times to set the current one which consists of five specific principles, including the operation of the EHS management system, through which the company promotes company-wide participation in EHS management. In addition, we declared our EHS management vision of becoming a “Global Leading Green Company,” and established and implemented five strategic tasks in our efforts to achieve sustainable growth.

EHS Management System

Doosan Infracore has been enhancing the level of its EHS management by systematizing relevant organizations under the EHS Policy and strategies, operating an EHS management system at its global business sites, obtaining international certifications, reviewing the status of implementation and managing performance, and operating an EHS IT system.

The company makes continuous efforts to better respond to changes in the internal and external environment, such as stricter EHS regulations in Korea, increased demand for corporate social responsibility, the upward trend in the rate of safety accidents, and more focus on on-site inspections by external organizations. To this end, Doosan Infracore set its EHS directions for 2019 as the enhancement of on-site EHS capability, efficient improvement of the EHS system, and preemptive investment. Based on the directions, the company focused on developing an EHS IT system, strengthening the education system, enhancing the crisis management capabilities, and responding to the GHG emissions trading system. In 2020, we will strengthen our sustainable fundamentals that can endure internal and external changes in the business environment, and build an EHS culture that enables employees to protect their own safety by focusing on compliance, preemptive regulatory response, risk management, enhanced leadership and EHS capabilities of executives, and the establishment of the emergency response system.

5 Strategic Tasks for EHS Management

Global Leading Green Company

- Conduct evaluation on Leading EHS Management Indicators
- Obtain certification of EHS management systems at overseas business sites
- Strengthen GHG emissions reduction
- Strengthen EHS competencies

EHS Policy

Operation of the EHS System

We establish, operate, and continue to develop a system designed to improve EHS impacts of our products, activities, and services.

Compliance with EHS Regulations

We adhere to national and international EHS regulations and agreements, establish strict internal management standards, and faithfully implement them.

Development of Eco-friendly Technologies to Boost Customer Safety

We develop eco-friendly technologies that place top priority on our customers’ health and safety, and then preserve resources and energy to actively contribute to sustainable environmental conservation and fight against global warming.

Realization of Zero Occupational Accident

We create a pleasant and safe people-centered work environment, improve the health and quality of the lives of all our employees and suppliers, and thus achieve a zero-accident workplace. In addition, we focus on minimizing our environmental impact and carrying out pollution prevention activities to contribute to environmental conservation.

Communication with Stakeholders

We expand communication with our stakeholders and disclose EHS performance transparency to continue to grow as a trusted and respected company that fulfills its social responsibilities.
EHS Organization

In response to the expansion of our overseas business sites and the increasing concerns over global environmental issues, the EHS units at overseas business sites of Doosan Infracore work in unison for systematic and effective EHS management, with central roles performed by the EHS Team at the Incheon Plant, which is the company’s head office. Also, the company established a global EHS governance in 2017, and has been strengthening the EHS support and management by building a company-wide EHS risk management system, sharing its EHS policies, and establishing a joint response system for global issues related to REACH and climate change. In 2019, the company expanded the regular EHS Committee to include OICC, its Chinese affiliate, to form the EHS Committee for Overseas Manufacturing Subsidiaries, and shared EHS issues and implementation tasks through such channels as video workshops. In 2020, the company plans to build an EHS governance system for the global production corporations including ones in DIN, thereby sharing EHS data and conducting Doosan EHS rating system (DSRS) evaluations.

Doosan Infracore also holds monthly EHS steering meetings to discuss EHS issues and share the progress of EHS goals. The CSR Committee, composed of the CEO and the BD heads, makes decisions on EHS-related policies, plans, and activities. In November 2019, the first “EHS Session” was held with the CEO and executives in charge of production in attendance to check the progress of the company’s EHS targets and to further raise leaders’ interest. Agenda items discussed at the session include the anticipated legislative amendments related to safety and environment in 2020 and the key implementation plans, along with the current EHS status by Business Group. Starting from 2020, there will be two EHS Sessions per year – at the company level in the 1st half and at the Doosan Group level in the 2nd half – where EHS issues, strategic directions, and implementation plans will be shared and discussed.

Managing the EHS Management System

Doosan Infracore has put an EHS management system in place based on international standards, and continues the operation of its EHS management system and the level of compliance with relevant laws and regulations by conducting internal and external inspections every year. The global business sites of Doosan Infracore continue to put efforts in minimizing environmental pollution and damage that can arise from corporate activities by earning such international standards as ISO 14001 Environmental Management Certification and the Occupational Health and Safety Management System (OHSAS 18001) certifications, and through safety inspections on hazardous machines and equipment and the process safety management (PSM) system. They also remove industrial accident risk factors. In 2019, the company’s business sites in Korea received surveillance audits for their ISO 14001, OHSAS 18001, and KOSHA 18001 certifications to ensure that they are continuing to comply with those standards.

Self-evaluation of Global EHS

To further advance our EHS management and strengthen EHS fundamentals, Doosan Infracore conducts Doosan EHS Rating System (DSRS)* evaluations as well as self-assessment reviews of relevant laws and regulations. Developed on the basis of global standards and in consideration of business characteristics, the DSRS is a basis to build an advanced EHS system and create an EHS culture shared by staff.

Each year, we conduct EHS compliance evaluations for all our business sites to prepare them for external assessments and inspections, while ensuring that they always comply with relevant laws and regulations. The evaluation is carried out through field guidance to review the proper use and management of dangerous machines, equipment, and chemicals, as well as the status of safety training progress. Evaluation results are linked to the management by objectives (MBO) of relevant executives and the integrated reward system by duty type, which in turn is increasing employee awareness and identifying areas where improvement is needed, thereby leading to actual improvements. Doosan Infracore has been conducting two EHS compliance evaluations per year at the business sites in Korea and China, and of the in-house suppliers since 2018. In particular, one of the two evaluations is carried out through the self-assessment to improve worksite execution capability in complying with laws and regulations. In 2020, the company plans to conduct an autonomous safety diagnosis and evaluation under the supervision of the team leaders and site managers by following a compliance culture to take root at its worksites. We will also conduct compliance assessments including our suppliers.

Environmental Management Certified Worksites

ISO 14001

Korea (Incheon, Gunsan, Ansan), China (Fuzhou)

Safety and Health Management System Certified Worksites

OHSAS 18001

Korea (Incheon, Gunsan, Ansan), China (Fuzhou)

KOSHA 18001

Korea (Incheon, Gunsan)

EHS Performance Management

Doosan Infracore has developed company-wide EHS management evaluation indicators and applied them to our business sites in Korea and China. We also manage them through an annual performance analysis in a bid to continuously improve and develop our EHS performance. In addition, we strive to improve the execution capability of our EHS management system and raise the standards including by reflecting the EHS management evaluation to the performance indicators of the executives of related departments. We will further strengthen our execution capabilities by strengthening required competencies based on clear EHS standards and systems linked to our value chains, such as purchasing and production, and by applying EHS management to all business operations.

EHS IT System

Doosan Infracore has established an EHS IT system for more systematic EHS management. Leveraging the system, the company manages EHS information in real time and analyses them comprehensively to respond to areas which need to be strengthened or improved.

In 2019, we complemented our existing EHS IT system by adding such functions as laws/standards, chemicals, laboratory safety, firefighting facility management, and employee health checkup history management, and thus developed the “Doosan Green” system, with the goal of supporting on-site EHS activities. In 2020, we will further upgrade the system by stabilizing the Doosan Green system through standard maintenance, offering user training, conducting VOC survey, and making improvements.

In order to secure business continuity by responding to the increasingly strict environmental regulations and preventing environmental accidents, the company will establish an integrated IoT-based monitoring system to reduce environmental risks while increasing the operational efficiency. In April 2020, it launched an IoT-based integrated monitoring system that focuses on the establishment of real-time environmental facility management software and an integrated management platform; the integration of existing environmental monitoring systems; and real-time IoT-based monitoring aimed at managing the operational status of air and water pollution prevention facilities and preventing environmental accidents.

Energy Management and Responses to Climate Change

Global warming and climate change caused by an increase in GHG emissions is influencing the ecosystem as well as all areas related to humankind, including industrial activities. To preemptively respond to climate change risks and opportunities, Doosan Infracore forecasts GHG emissions based on our annual production plan, and makes investment in improving energy efficiency and carries out activities to achieve the target. The company is also expanding the development and sales of highly energy-efficient, low-carbon products, including electric excavators. The quantitative data on the company’s energy consumption and GHG emissions over the past three years is found in the “CSR Facts & Figures” section (pages 113-114) of this report.

Improving Energy Efficiency

Doosan Infracore has identified and implemented energy conserva- tion tasks, established an energy intensity management system, and upgraded the energy monitoring systems to reduce energy consumption and improve energy efficiency at our business sites. In addition, we upgraded the Energy Management System (EMS) to lay the groundwork for energy-related information reporting that would enable us to monitor the energy consumption and costs, monthly energy consumption managers so as to source, and energy intensity performance in relation to production. We also built an energy measurement equipment monitoring system, thereby enhancing our EMS data credibility. The company’s energy conservation efforts in 2019 include the distribution of boilers to minimize heat dissipation and energy loss; investments in air compressor load control facilities, replacement of old boiler burners at the Gunsan Plant, installation of high-efficiency lighting lamps; and use of high-efficiency low-temperature oxidation catalysts in its paint shops. Moreover, in line with the digital transformation strategy, the company has installed environmental sensors in its medium-sized engine plant to build an air-conditioning and illumination control systems, in addition to the construction of a wireless monitoring system for gas sensors used in boilers and pipe plants. As a result of such investments and improvements, the energy intensity of Doosan Infracore has improved by 7.5% as of 2019 year-end compared to the 2017 figure.

Energy Consumption in 2019 (Korea)

Electricity

Fuel

2,142
Reponsible Response to Climate Change

GHG Emissions Management
In managing GHG emissions at business sites in Korea, their energy consumption (electricity, LNG, etc.) is gauged by plant production line, and the data is analyzed through the integrated EHS IT system to identify monthly emissions amount. Given the characteristics of the company’s assembly processes, indirect emissions from purchased electricity account for about 73% of its total GHG emissions. In 2019, the company’s total GHG emissions rose by around 3.6% to 112,186 tCO2eq.

Response to Emissions Trading
Doosan Infracore was designated as subject to the Korean government’s GHG & Energy Target Management System in 2010, and fulfilled all the legal obligations by 2014. During the first phase of the emissions trading scheme from 2015 to 2017, the company kept its total GHG emissions at around 66% of the quota allocated by the government, recording 313,381 tCO2eq. Only the Incheon Plant is subject to the second phase from 2018 to 2020, and the plant is now managing its emission allowances.

In 2019, GHG emissions of the Incheon Plant amounted to 93,197 tCO2eq or 49.8% of the quota allocated by the government. In 2020, the company will establish a mid- to long-term roadmap for GHG emissions to identify opportunities based on the strategy aimed at securing GHG emission allowances. Thereby, it will forecast future demand for GHG emission allowances for each internal and external scenario; form the portfolio of carbon assets (purchase, internal/ external reduction, etc.); and set directions for the response to climate change in accordance with the plan. The company will also prepare for the third phase of the emissions trading scheme from 2020 to 2025, responding to the quota allocated by the government, and trade its emission allowances by swapping remaining allowances.

Doosan Infracore is striving to lay a foundation for the operation of the emissions trading system and set the direction for responding to the system from the mid- to long-term perspectives, such as preemptive trading. To this end, the company has been taking actions to reduce its GHG emissions and to respond to the emissions trading system in a phased manner, as part of its strategic CSR tasks, every year since 2015. In 2019, the company set “reduction of GHG emissions” as one of its CSR strategic tasks, based on which it established and implemented the investment plan for GHG reduction to secure the emission allowances during the second phase of the GHG emissions trading scheme and to better respond to the scheme; established and operated the GHG/Energy Reduction Council, and enhanced its negotiating power with the government and submitted opinions to the government by forming a business council.

Improving Resource Efficiency and Reducing Environmental Impact

Doosan Infracore explores better ways of using limited resources more efficiently while striving to minimize the impact of its business activities on the environment and local communities. To this end, the company has adopted various ways of promoting the eco-friendly use of resources and conducts activities to reduce the discharge of pollutants. In 2020, the company will conduct an environmental impact assessment based on the material balance for each process to improve efficiency in using resources in the production process, in addition to registering important environmental impacts and setting goals for each department in terms of resources.

Doosan Infracore manages the emissions of pollutants more strictly than required by laws in all relevant areas. The quantitative data on the company’s resource use and discharge over the past three years is found in the “CSR Facts & Figures” section (pages 131-135) of this report.

Improving Efficiency in Resource Use

Water Consumption
As extreme weather, such as drought and heavy rainfall, becomes more frequent, the importance of managing water resources has been increasing. The Incheon plant, as part of its efforts to help solve this water shortage problem, has installed a wastewater reclamation and reuse system that enabled it to reuse 5,197 m3 of wastewater. More than 44% of the wastewater at the Incheon Plant goes through a wastewater reclamation and reuse system that enabled it to reuse 5,197 m3 of wastewater. In 2015, there was a significant increase in the amount of wastewater used to manufacture processes, and has continued to expand the use of recycled effluent. It reused 44% of its wastewater for manufacturing processes and others in 2019, thereby saving the company more than 7,000 m3 of fresh water. The company has also built a wastewater recycling system designed to recycle the effluent discharged from its wastewater treatment facility and reuse it for the manufacturing processes, and has continued to expand the use of recycled effluent. It reused 44% of its wastewater for manufacturing processes and others in 2019, thereby saving the company more than 7,000 m3 of fresh water. The company will continue to expand the use of recycled effluent and achieve the target of a 70% reuse rate by 2022.

Wastewater Reuse (Incheon Plant)

<table>
<thead>
<tr>
<th>Production/Process</th>
<th>Wastewater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhouse Treatment</td>
<td>55%</td>
</tr>
<tr>
<td>Recycling</td>
<td>27%</td>
</tr>
<tr>
<td>Other Uses</td>
<td>18%</td>
</tr>
</tbody>
</table>

The Incheon Plant conducted an external diagnosis on its processes that generate odors to contribute to improving air quality in the metropolitan area and enhancing residents’ quality of life nearby the Plant. Based on the outcome, it established an improvement plan together with the respective local government, and continues to expand facility investments. In addition, it has been carrying out more systematic monitoring along the waste network and nearby areas since 2017.

Management of Soil Contamination
In 2010, Doosan Infracore conducted a voluntary soil contamination survey of the areas where facilities that cause soil contamination were operating in the Incheon Plant, and completed soil remediation in those areas over the following three years. In 2013, the company extended the survey scope to all areas surrounding all its worksites. There has been additional voluntary soil remediation work since 2014 and completed it in August 2018, receiving confirmation from the municipal government.

Strengthening Environmental Disaster Response System

Doosan Infracore has established an emergency response system against environmental spills, including a pollutant leakage block system at the Incheon Plant and spill monitoring system. The company increased the number of floodgates to six to minimize the risks of pollutant leakage by rainwater. We also further strengthened our infrastructure to respond to the risks by installing pollutant detection sensors and building an environmental monitoring system with the replacement of old wastewater pipes. In 2019, we actively prevented and responded to environmental accidents by preparing for the enactment and amendment of relevant laws and regulations. In particular, we expanded the existence of emergency response facilities and incident response capabilities. There will be efforts to ensure the stable operation of the wastewater treatment plants by optimizing wastewater treatment plant operation conditions, and installing facilities to block migrant wastewater.

Reducing Environmental Impact on Local Communities

Doosan Infracore has intensified its efforts to minimize environmental impacts on local communities, and thus making continued improvements for a cleaner living environment. In 2015, the company set up a digital signboard to display information on air pollutants in the Incheon area with three other companies in the area. The company fulfilled the obligations as a corporate citizen by engaging in precautionary management of factors that may cause resident complaints, such as foul odors, as well as making conscious investments in local communities, including the Heuseo Environment Improvement project near the Incheon Plant.

GHG Emissions in 2019 (Korea)

<table>
<thead>
<tr>
<th>Incheon Plant</th>
<th>93,197</th>
<th>16,349</th>
<th>1,725</th>
<th>591</th>
<th>147</th>
<th>186</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t)</td>
<td>(tCO2eq)</td>
<td>(tCO2eq)</td>
<td>(tCO2eq)</td>
<td>(tCO2eq)</td>
<td>(tCO2eq)</td>
<td>(tCO2eq)</td>
</tr>
</tbody>
</table>
Enhancing Worksite Safety Risk Management

With the amendment of the Occupational Safety and Health Act, effective as of January 16, 2020, the responsibilities of employers have been increased so that they are subject to a shutdown and/or suspension of business in the event of an industrial accident in any of their workplaces including those of their suppliers. Operating losses may be incurred as the scope of the contractor’s liability has been extended to all business sites, and the operations of an entire site may be suspended in the event of a serious disaster. To achieve zero accident in the workplace, Doosan Infracore has established such mid- to long-term goals as the establishment of a disaster prevention system, internalization of self-management activities for risk factors, and facilitation of compliance monitoring and evaluation. Accordingly, the company has been making concentrated efforts to further improve its safety devices so as to prevent serious disasters; promote a safety culture based on close cooperation between labor and management; and strengthen relevant organizations and workforces.

Prevention-focused Worksite Safety Management

Safety Training  Doosan Infracore provides safety education aimed at enhancing worker’s awareness and capacity building of its employees. To this end, it runs training programs designed to promote EHS leadership, increase awareness, cultivate knowledge, and encourage self-development by job title. In 2019, the company expanded its supervisor training from 16 hours of online training to 8 hours of online training and 16 hours of offline training to promote voluntary participation and capacity building through strengthened EHS leadership and increased awareness. In 2020, the company plans to offer various EHS training courses, such as training programs for EHS leadership and increased awareness. In 2020, the company plans to offer various EHS training courses, such as training programs for EHS leadership and increased awareness.

Worksite Hazard Management  Doosan Infracore implements a discussion-based risk factor identification process with its workers to encourage them to manage risk factors by themselves in the first place by observing and improving potentially hazardous behaviors. It implemented self-management activities for risk factors in the first half of 2019, and conducted a risk factor self-management evaluation in the second half. It also ran monthly EHS meetings held by each business unit, and asked each technical staff to identify more than two items or activities, that need safety improvements, and took corrective actions. As a result, a total of 5,362 risk factors (5,824 in Korea and 2,488 in China) were identified, and necessary corrective actions have been taken in 2019.

Acquisition of Safety Zone Certification  Doosan Infracore’s business sites in Korea are all certified by the government in terms of disaster safety with the Incheon and Gunsan Plants’ acquisition of the Safety Zone Certification in December 2014 and November 2015, respectively. Awarded by Safety Zone-CERTI® and supervised by the National Fire Agency, the Safety Zone Certification is the only voluntary corporate safety evaluation system in Korea and entails a comprehensive evaluation of building design, construction, and maintenance. In 2019, Doosan Infracore received a detailed evaluation on six safety areas, including the safety management system, firefighting, building/fireproof, dangerous goods, machine/electricity/gas, and evacuation. To ensure that experts in the field of disaster and safety, the company actively made improvements for matters that were pointed out, and obtained the Safety Zone Certification for the second consecutive time in December 2019 following 2014. The Certification is valid for three years. Investments in safety and firefighting are not expenses but a must to protect its employees. The company therefore will further spread awareness of the importance of fire and disaster prevention and systematically and efficiently manage safety facilities based on the Safety Zone Certification.

Response to Process Safety Report Evaluation  Worksites with large hazardous, dangerous facilities have risks of fatal industrial accidents, so that they are required to operate the Process Safety Management (PSM) system. Accordingly, they create a report on comprehensive, scientific prevention activities, such as process risk assessment and establishment of a safe operation and emergency plan, and submit to the government, after which the government examines and reviews the report and has the respective workplaces implement preventive activities to prevent fatal industrial accidents. Doosan Infracore carried out an internal audit on the PSM of its Incheon Plant and Gunsan Plant, and based on the results of the internal audit, the company identified improvement measures, such as increasing supplier safety training, expanding the scope of job safety analysis (JSA), and revising safe work permissions, and continues to inspect the implementation status.

Expansion of Safety Management Culture  Doosan Infracore believes that the safety awareness of its employees is the most important factor in preventing safety accidents, along with efforts to improve facilities. The company, therefore, actively implements programs and operates systems in which both its employees and those of the suppliers participate so as to strengthen the safety culture.

Building a Culture of Safety  Doosan Infracore continues to promote compliance with the “EHS 3-3-3 Basic Rules” and engage in safety culture activities, including improvements in the field of safety, to achieve zero accidents. Each month, the heads of Business Groups provide safety reports to employees. The company has designated April as Health and Safety Month during which it strives to improve safety and raise safety awareness through education sessions, promotional campaigns, and inspections. Visitors to its worksites are required to watch a video on safety precautions first to raise their safety awareness.

Support for Suppliers’ Safety Management Capabilities  Doosan Infracore has been implementing “Symbiotic Cooperation Programs” to help its suppliers boost their safety management capabilities under one of its EHS Principles—“We aim to create a pleasant and safe people-oriented working environment, improve the health and quality of life of all employees, including those of our suppliers, prevent losses, and thus ultimately realize a zero-accident workplace.” Launched by the Ministry of Employment and Labor in 2011, the Symbiotic Cooperation Program is designed to urge large companies to help improving the health and safety capabilities of their suppliers to prevent industrial accidents through continuous cooperation. In March 2019, the company held a ceremony to launch a team devoted to the implementation of the “2019 Health and Safety Symbiotic Cooperation Program”, and then supported its suppliers in the areas of risk factor assessment and improvement, health and safety training, distribution of guidelines, and supply of the related goods. In particular, it focused on promoting the Safety Observation System (risk factors self-identification), a scheme for removing potential risks based on concentrated daily monitoring by not only field supervisors but also working-level employees, so that suppliers themselves can identify risk factors and work on them.

In 2020, Doosan Infracore aims to improve the safety management system of its suppliers to the standard of its own. To this end, it will provide specialized risk assessment training and self-management support through the Symbiotic Cooperation Programs; form a council attended by all its internal suppliers, and help its suppliers make improvements to any unsafe practices or behaviors.

Safety Management for Outsourced Projects  Doosan Infracore is further strengthening safety management to prevent supplier safety accidents during outsourced projects at its worksites. The company operates a daily on-site patrol to check on-site safety status and report the results to the management. It also runs the “Safety Walk” program every month in which executives, production managers, and EHS officers carry out a safety patrol and come up with improvements, thereby managing potential safety risks.

In 2019, a serious accident occurred at the Incheon Plant when a worker of an external contractor fell. Although the company’s suspension was cleared, irrespective of its legal liability, it has enhanced its safety management for the safety of all its suppliers and visitors. In 2019, the company also strengthened its safety management process for outsourced projects by establishing work plans for high-risk work, such as high-place operation, and running a committee; monitoring risks based on JSA, and providing trainings aimed at helping a construction manager increase his her capacity. In 2020, it will make continuous efforts to strengthen its safety management process while also focusing on managing outsourced construction projects throughout the natural disaster crisis.

Emergency Prevention System

Fire Prevention System  As the number of fires related to electricity, overheating, and dust increases, Doosan Infracore has been upgrading its firefighting facilities and improving its firefighting capabilities. In December 2019, the Incheon Plant, having been chosen as the representative workplace within the jurisdiction of the Incheon Central Fire Department, was awarded a “Self-Defense Forces Firefighting Training Assessment” involving a total of 500 employees. The assessment is a fire drill led by Incheon Metropolitan City to strengthen the initial response and firefighting capability in the event of a fire. The Incheon Plant conducted evacuation, fire suppression, and emergency drills following a hypothetical firefighting scenario in which its R&D center is hit by an earthquake. Following the fire drill, it had trainings on the risks of smoke inhalation, an air mat experience, how to operate a fire extinguisher, and cardiopulmonary resuscitation.

In 2020, to minimize losses in the event of a fire, the company will install oil mist detectors and fire extinguishers in the painting process, thereby establishing an initial fire suppression system. It also plans to upgrade its fire prevention system by identifying and removing fire hazards in advance through the installation of motion-detection CCTVs in blind spots such as underground machinery rooms, as well as installing proper firefighting facilities when building new buildings and expanding facilities.
Upgrading Emergency Response Training. Doosan Infracore aims to minimize human and material damages by responding promptly in the event of an emergency such as a fire. In 2020, it will upgrade its drills to better handle fire suppression, the truck entry, and lifesaving, with a particular focus on such processes with a high probability of a fire as painting and commissioning. It will also strengthen its prevention system so that it can respond quickly and efficiently by developing an emergency response scenario for each department.

Industrial Accident Rate Management. The traditional method used to calculate the industrial accident rate does not faithfully reflect the incidence of minor accidents. Doosan Infracore, therefore, began to use the TRIR, TIRIR, and LWIR indicators in 2018, which allowed the company to identify minor accidents that resulted in lost time as well as those who received treatment at the company or its suppliers. By doing so, the company aims to prevent minor accidents from repeating and becoming a major accident, and to further strengthen supplier’s safety management. Accident rate indicators are managed as a major key performance indicator (KPI) of respective executives, based on which Doosan Infracore plans to further promote a safety management culture.

The company analyzed accidents that had occurred at its worksites in the past four years, and found that conventional accidents, such as jamming, fall, and bump, have been occurring continually, with unstable practices and behaviors being the root cause of 70% of such accidents. In 2020, it will, therefore, focus on preventing accidents due to unsafe practices and behaviors by enforcing compliance with the on-site safety rules and behavioral requirements, expanding site inspections and facility improvements, and strengthening the safety culture based on employee participation.

Enhancing Employee Health Management

Improving Employee Health Management

Occupational Disease Prevention. Doosan Infracore strives to prevent occupational diseases such as noise-induced deafness and musculoskeletal disorders, and to strengthen implementation capabilities at its worksites. To this end, the company holds a monthly meeting of the Musculoskeletal Disorder Improvement Working Council, which is composed of labor union officials, worksite managers, and employees in charge of EHS and production, to discuss physical load risks and identify ways of making improvements. It also arranges for medical professionals to visit its worksites regularly as part of its efforts to improve employees’ health and boost their morale. As the number of workers suffering from hearing problems, such as noise-induced deafness, has been increasing, Doosan Infracore has set a strategic direction to fundamentally minimize noise-generating processes while also offering high-quality earplugs and other protective gears, and providing education on the proper use of them. In addition, with the increasing amount of surface particulate matter around the country, the company has developed response guideline that calls for the provision of protective gears and proper work breaks starting at the stage of caution.

In 2020, the company will carry out various preventive activities for each type of occupational disease including by monitoring its working environment through health risk assessments; measuring noise at all of its worksites and developing a noise map; preventing respiratory diseases by inspecting and improving control speed efficiency of local exhaust systems; expanding the activities of the Musculoskeletal Disorder Improvement Working Council to prevent musculoskeletal disorders; conducting regular inspections on harmful factors (every 3 years); and assessing the risks of brain and cardiovascular diseases.

Health Management Programs. In helping its employees manage their health, Doosan Infracore operates various health promotion programs, including the installation of automated external defibrillators (AEDs) and the preparation of a low sodium diet menu. Whenever a healthcare issue such as the spread of an infectious disease arises, the company operates the Emergency Situation Room and promptly offers the relevant information on preventive measures to its employees. The company pays for mandatory vaccinations for six diseases – yellow fever, cholera, malaria, typhoid, hepatitis A, and tetanus – designated internally for employees who go on business trips to countries with limited healthcare.

In response to the COVID-19 pandemic that has swept the world in 2020, the company has provided masks to its employees and those of its internal suppliers, disinfected business sites, and made hand sanitizers and thermometers available for any employee.

It has also followed the guidelines issued by the Korea Centers for Disease Control and Prevention, and established its response guidelines to prevent the spread of COVID-19, including countermeasures (working hours, domestic/overseas business trips, preventive activities, etc.) by stages, as well as reporting system and employee behavior standards in the event of an emergency. The company strives to keep its working environment safe by strictly obeying all the relevant rules and guidelines.

IT System for Health Checkup History Management. In 2019, Doosan Infracore developed and launched “Doohug,” an integrated EHS IT system that includes an employee health checkup history management function. The system enables management of company-wide health checkups and the related training schedules to prevent employees from inadvertently skipping their regular medical checkups and education, while preventing legal risks related to a lack of special checkup data. In addition, the system helps Doosan Infracore employees improve their health by managing their personal health checkup-related items, including health checkup history management, management of chemicals used for each task, and management of working environment measurement results.

Programs to Manage Job Stress. Doosan Infracore conducts stress surveys to manage the mental health of its employees, and runs a professional stress management program, with a particular focus on high-risk employees, based on statistical analysis. The company ensures that its employees can access counseling services whenever necessary through the psychological counseling office within an affiliated clinic and an external counseling center linked to the company. Launched in April 2014 for the first time among affiliates of Doosan Group, “DOOHUG” is a professional counseling service offered in partnership with an external professional institution. It provides employees with professional counseling services about not only their work-related concerns but also personal worries, including their families and childcare. The company keeps all DOOHUG counseling details and personal information strictly confidential, and pays all of counseling expenses.

Moreover, Doosan Infracore runs a “healing program” for teams. In 2019, the company conducted a “Psychological Health Test” for all of its employees to diagnose their stress level, including job stress, and provided support for employees with a high level of stress. The supportive measures include a total of 1,134 cases of counseling services through its in-house counseling center and an outside counseling center, a healing program, visiting counseling services to Doosan Tower, and relevant education programs. In 2020, the company will continue conducting employee surveys (job stress index, etc.) and analyses while providing training and conducting assessments aimed at protecting the psychological health of emotional workers. It will also offer professional training as part of its Employee Assistance Program (EAP), and expand the operation of “DOOHUG,” a job stress prevention program.

Certified as Excellent Worksite in Employee Health Promotion. In October 2019, the Incheon Plant was re-certified by the Korean Ministry of Employment and Labor and the Korea Occupational Safety and Health Agency for its excellence in promoting employees’ health, following its initial certification in 2013 and the re-certification in 2016 (evaluation period: 3 years). The Gursan Plant was first designated as an Excellent Worksite in Employee Health Promotion in November 2015, and re-certified in February 2019 in recognition of its exemplary in-house health promotion activities customized for the characteristics of workers, including a health management program, a musculoskeletal disorder prevention program, and a job stress prevention program. The Excellent Worksite in Employee Health Promotion certification is the most important health industry-recognized certification, which involves a comprehensive evaluation of 40 items in six areas, such as organizational culture, health promotion activities and programs, and environmental management. Designated worksites are awarded the benefit of being exempted from supervision by the Ministry of Employment and Labor for the next three years. The company will continue employee health promotions as part of its efforts to create a better workplace.
Suppliers

Strengthening Suppliers’ Competitiveness

Doosan Infracore focuses on enhancing its overall competitiveness in purchase and production by helping its suppliers boost their competitiveness. To this end, the company provides a range of support programs, including financial support, competency enhancement training, and on-site guidance. In addition, it is implementing the Leading Supplier (LS) project to help its core suppliers grow into giants based on the Doosan Supplier Excellence Program (DSEP), a system for fostering suppliers.

Fostering Leading Suppliers

Doosan Infracore conducts an annual survey of core suppliers according to the criteria for core suppliers defined by the analysis of transaction dependency and supplier relationship segmentation. And the company helps them have the capability to supply quality products at competitive prices on time by making innovative improvements in the areas of plant operations, quality assurance, and manufacturing technologies. It also makes continuous efforts to foster them to become Leading Suppliers, setting a benchmark for other suppliers. The LS project aims not only to solve problems that suppliers are facing but also to raise their fundamental competitiveness by enabling them to secure supply capacity and quality competitiveness in terms of a comprehensive ranking evaluation (supplier evaluation) through one- to three-year support programs. To foster 52 Leading Suppliers by 2025, Doosan Infracore has selected and supported a total of 32 suppliers from 2014 through 2019.

In 2019, the company focused on improving product quality and delivery compliance for five suppliers that were newly selected as Leading Suppliers. It categorized its support period into four—fostering period, follow-up management period, self-sufficiency period, and internalization period—to help them to continue improving their performance even after the LS support programs. In 2020, Doosan Infracore will focus more on helping its suppliers to establish a smart factory system. In connection with the government’s “Smart Factory Supply and Diffusion Project,” it will support the establishment of a manufacturing execution system (MES) at its suppliers, through which they will be able to strengthen their quality capabilities and competitiveness.

Expanding Participation in the Benefit Sharing System

The benefit sharing system is an agreement made between large companies and small and medium-sized enterprises (SMEs) to improve suppliers’ capabilities to deliver high-quality goods on time and share the benefits. It is an iconic model for the creation of a healthy corporate ecology. Doosan Infracore collects suppliers’ suggestions regarding new product development, parts localization, quality improvements, and design changes through the benefit sharing system. It reflects good suggestions into its products and shares the outcome, thereby creating win-win partnerships with its suppliers. In October 2019, the company ran the “Benefit Sharing Academy,” with some 40 Doosan Infracore purchasing staff and suppliers’ employees in attendance, in order to increase stakeholders’ understanding of the system and to encourage their participation. Going forward, Doosan Infracore will extend the scope of our benefit sharing system to include not only first-tier suppliers but also second-tier suppliers, to enhance our fundamental competitiveness as well as that of our suppliers, create synergy, and establish a fair subcontracting culture.

LS Development Stages

Stage 1 Diagnosis

Identify capabilities that need to be improved by diagnosing factory operations, quality assurance, and manufacturing technologies

Stage 2 Planning

Draw up plans by Doosan Infracore’s experts and supplier staff to address the identified capabilities

Stage 3 Development

Carry out improvement activities according to the DSEP for one year and offer supplier staff training

Stage 4 Sharing

Share improvements at the supplier conference held every October

supplier ESG inspection is conducted every other year. Thus, the Year 2024 goal is reflected as the Year 2025 goal.
Diverse Supplier Support Programs

Competitiveness Enhancement Programs

Supporting the Enhancement of Suppliers’ Competitiveness An exclusive team, composed of dedicated staff from the Supplier Development Team and Shared Growth Team, visits suppliers if necessary, to help them conduct innovative activities. In 2019, Doosan Infracore employees—twice as many as planned at the beginning of the year—helped suppliers with their innovation efforts for more than five consecutive days. Specifically, Doosan Infracore staff helped suppliers improve their manufacturing capability by providing key technical support for welding, materials manufacturing, and non-destructive inspection; and support for innovation in the fields of 3 Ps 6Ss, lean, DTC, single PFM, quality guidance and problem solving, localization, and product development.

Management Doctor System Doosan Infracore is an active participant in the Management Doctor System which is currently being promoted by the SME Support Center of the Federation of Korean Industries (FKI). Suppliers recommended by large companies are selected through a review process, whereupon experts from three parties—large companies, suppliers, and the FKI’s management consulting team—help them improve management environments and solve problems.

Industrial Innovation Campaign 4.0 Industrial Innovation Campaign 4.0 is one of Doosan Infracore’s leading programs for shared growth. Through this program, consultants are dispatched to the company’s suppliers to provide them with practical assistance with their production innovation and smart factory operations, based on the company’s financial contributions. The Campaign entered its second phase in 2019 following the successful completion of the first phase in 2018. The company will help some 50 suppliers for the next five years to increase their productivity, thereby making practical improvements in their performance.

Competency Building Training for Suppliers’ Staff Doosan Infracore reflects its suppliers’ feedback into the Supplier Academy, a customized training program to help suppliers secure competitiveness, and offers the program every year. In 2019, 97 employees from 38 suppliers benefited from the Supplier Academy in seven areas, including quality, manufacturing, and production costs. To further increase training effectiveness, the company plans to add training courses in such areas as production quality, Industry 4.0, import and customs clearance, and intellectual property rights based on the results of demand survey. In terms of training efficiency, it will offer both internal and external training programs.

Support for the Creation of Sound Corporate Ecosystem Beginning in 2012, Doosan Infracore has been running a supplier support program that helps reduce the wage gap and increase welfare benefits for the employees of its second- and third-tier suppliers*, in house subcontractors**, and service providers. For the employees of those companies, it provides them with KRW 1.2 million per year (KRW 100,000,000 per person for each individual) to reduce their wage gap in the form of Win-Win Encouragement Funds while also offering high school tuition fees to their children and allowing them to use the company’s day care center free of charge to enhance their welfare benefits.

Footnotes:
* Criteria of the Korea Fair Trade Commission: 1 day = person(s) 1 day = 4 hours, based on the time and attendance criteria
** 3 Ps: Proper Items, Proper Quantity, Proper Place; 6Ss: Safety, Sort, Straighten, Shine, Standardize, Sustain
** Lean: Automation designs to minimize inventories and innovate work processes, thus reducing costs and enhancing productivity
*** DTC: Designs cost innovation
** Single PFM (parts per million): A quality innovation campaign designed to achieve the quality management goal of reducing the rate of faulty products to under 1 in 2,000,000 parts.
Motivating Shared Growth  Doosan Infracore reflects the shared growth performance of the relevant executives in the evaluation of their management by objectives (MBO), and it also reflects the findings of the benefit sharing system in the MBO of executives in charge of purchasing to promote the system. Furthermore, to encourage suppliers to participate in shared growth activities, it reflects their involvement in shared growth and relevant performance in the comprehensive supplier evaluation.

Strengthening Communication with Suppliers

To enhance communication with its suppliers, Doosan Infracore operates a “Shared Growth Hotline” while also holding agreement ceremonies and meetings. The CEO visits the company’s second-tier suppliers twice a year to listen to their concerns and find solutions to their problems. In China, senior executives attend a meeting with suppliers twice a year, share the purpose of shared growth, and encourage commitment to realizing shared growth.

Integrated Cooperation Council For active and effective communication with suppliers, Doosan Infracore launched the Integrated Cooperation Council in 2015. The Council meets twice a year to share the company’s business plans, quality policies, and the latest global trends including environmental restrictions, and to align the strategies of the company with the suppliers and strengthen mutual exchanges.

Grievance Handling Channel for Suppliers Doosan Infracore has established the Shared Growth Hotline on its company website in the Shared Growth section, through which people may express their overall opinions and grievances about the company’s trade practices and shared growth activities or request related programs. In addition, the company has put diverse communication channels in place, such as telephone, fax, and postal service, and notifies to its suppliers. All communication made through the Shared Growth Hotline is kept strictly confidential, and for those wishing to maintain their anonymity, the Hotline can be used anonymously. Doosan Infracore makes sure that no one faces retaliation for submitting a grievance, and critical issues are reported to the CEO and relevant executives.

Strengthening Product Development

Doosan Infracore is committed to securing customer safety and minimizing environmental impact throughout the entire process ranging from product development to production and sales. To this end, the company strives to ensure customer safety and convenience from the product planning and development stage, and also focuses on expanding the development of eco-friendly products in order to minimize the environmental impact of product manufacturing and use. In addition, the company aims to contribute to the improvement of human rights and the environment in areas that produce conflict minerals by continuously monitoring the use of conflict minerals in its products.

Management of Hazardous Chemicals Doosan Infracore makes various efforts to respond to hazardous chemicals regulations, including the EU’s REACH/RoHS 3, and the “Act on the Registration and Evaluation etc. of Chemical Substances” and the “Chemicals Control Act” of Korea. The company conducted a total inspection on hazardous chemicals used throughout its work processes in 2015; conducted a study on the possibility of replacing some of hazardous chemicals, and replaced or removed 11 types of chemicals subject to the “Rules on Construction Machinery Safety Standards” of Korea, the “Machinery Directive” of Europe, and the “Guoshao (GB) Standard” of China. The company also ensures that its products are manufactured to meet the regulations of the markets to which they will be exported. Moreover, we have the Global Product Compliance Council (GPCC), through which we share information on the latest trends in global safety regulations and standards and discuss preemptive responses to any changes.

Compliance with International Safety Standards Doosan Infracore sets up new product development and verification plans at the planning stage by reviewing various countries’ technical regulations and international standards on safety and environment, including fire, explosion, noise, rollover, electromagnetic compatibility, and toxic chemicals. The company also reflects the guidelines set forth in major technical regulations when setting up its product development objectives, such as the “Rules on Construction Machinery Safety Standards” of Korea, the “Machinery Directive” of Europe, and the “Guoshao (GB) Standard” of China. The company also ensures that its products are manufactured to meet the regulations of the markets to which they will be exported. Moreover, we have the Global Product Compliance Council (GPCC), through which we share information on the latest trends in global safety regulations and standards and discuss preemptive responses to any changes.

Doosan Infracore provides world-class products, parts, and services with the goal of maximizing customer value.

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<tr>
<th>Product, Solution, Service</th>
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<td>Sales of remanufactured parts (Unit: KRW million)</td>
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Doosan Infracore offers customers better value through products that take into account not just performance but also customer safety and environmental impacts. In addition, the company focuses on improving product quality, enhancing customer services, and having more dialogues with customers to become a company trusted by customers.
new REACH/RoHS 3 substances and requested renewal. In 2019, the company reduced the use of hazardous chemical substances included in the Candidate List of Substances of Very High Concern (SVHC), Annex 12 under RoHS, 20 imposed. Also, the company has extended the applicable laws and regulations to include California Proposition 65 and other international agreements in addition to REACH/RoHS 3 so as to proactively respond to high risks posed by hazardous chemicals and to avoid regulatory obstacles in import/export of products.

The scope of application of the relevant regulations has been extended from finished products to include parts. In response, Doosan Infracore included supplier’s obligation to REACH/RoHS 3 in the basic purchase contract form to raise suppliers’ awareness of the importance of hazardous substance management. It has also continued to assist suppliers with training and on-site guidance to improve the management competency of their staff, and helped them establish the management process. In 2019, the company offered online trainings aimed at urging its suppliers to respond to the regulations and helping them improve relevant competencies.

Conflict Mineral Management Conflict mineral refers to four minerals – tin, tantalum, tungsten, and gold – that are mined in 32 war-torn countries, including Democratic Republic of the Congo, Sudan, Rwanda, Burundi, Uganda, Congo, Zambia, Angola, Tanzania, and Central Africa Republic. Armed forces in these countries are believed to be caught up in conflict as they are raising funds through the mining and distribution of the minerals, which in turn causes human rights issues, such as loss of human life, human rights abuses, child labor, and sexual violence, in addition to serious social problems including environmental pollution. The international community, therefore, has been requiring companies to disclose the origin of the minerals they use in their production processes, and to eradicate the use of conflict minerals. As a responsible corporate citizen, Doosan Infracore strives to ensure that no conflict minerals associated with armed forces in the conflict areas are included in its supply chain. Furthermore, all suppliers that do business with Doosan Infracore are required to make sure that they do not use conflict minerals in their manufacturing processes and to submit certificates of origin.

Classification of Eco-Friendly Products

The company has also put the conflict minerals management process in place based on close cooperation among different departments including purchasing, CSR, and chemical materials. In addition, it strives to increase the value of conflict minerals including by establishing a conflict mineral response system, conducting surveys on the usage of minerals, helping its suppliers manage their risks, and providing guidance to them.

Increasing Eco-Friendly Products

Doosan Infracore is conducting its business based on its corporate philosophy which defines minimizing environmental footprint as a corporate responsibility through which it can create more value. Following this corporate philosophy, the company established definition and management standards for eco-friendly products in 2015, and reflected the eco-friendly product management process in its new product development process and completed an upgrade of the environmental friendliness index in 2016. At Doosan Infracore, products that preemptively meet mandatory environmental regulations of each market in free areas – fuel efficiency, durability, noise control, safety, and emissions control – are defined as eco-friendly products. The portion of eco-friendly products in 2019 recorded 83.7%, similar to the figure of the previous year.

Responsible Customer Service

Preemptive Response for Customers

Doosan Infracore has been solidifying its relationship with customers based on trust by acting ahead of customers’ requests. The company provides information on products for customer safety and increased convenience, and carries out voluntary preemptive correction measures.

Providing Information for Customer Safety

Doosan Infracore complies with regulations of each country related to increased customer safety, including Safety Standards and the Product Liability Act, and takes all the necessary actions to prevent related accidents. To ensure safe operation and maintenance of its products, the company provides customers with safety labels of three levels – danger, warning, and caution – according to the severity of the safety risks involved. It also alerts customers that are critical to customer safety in a product manual. Doosan Infracore complies with ISO 9244 for the safety labels attached to its construction equipment and provides operator manuals for its machinery under ISO 6357.2

Preemptive Correction Measures

Preemptive correction measures are improvement measures carried out by manufacturers after making notices to customers without any external pressure. To better manage its preemptive correction measures, Doosan Infracore not only utilizes local staff at its overseas business sites but also dispatches its experts from the head office to any location in the world. Construction equipment must be able to withstand rough work environments. The company therefore repeatedly checks the whole range of equipment features, from the performance of the specialty parts to simple malfunctions, when performing preemptive correction measures, and makes corrections so that the product can be delivered to customers in the best possible state. In addition, the company frequently manages the major correction measure status using a system for quicker preemptive correction measures.

In March 2019, construction equipment and excavators were designated by law as a subject to a recall in Korea. The voluntary recall involves the company making a direct report if it discovers an issue and officially implements preemptive correction measures. In December 2017, Doosan Infracore voluntarily chose one of its products as a subject of a recall for it found possible defects in the lower heater of the fuel filter which may cause an inflow of moisture into an inner pin, damage it, overheat the fuel filter and thus make the filter stop functioning. The company sent out a recall notice to customers and offered free repairs at designated maintenance centers or locations preferred by consumers.

Process to Reflect Customer Feedback

Collecting and Responding to Customer Feedback

Doosan Infracore collects and promptly handles customer feedback and requests through its dealers and directly with major customers. It regularly holds meetings to share the voice of customers (VOC) in which major suppliers participate, and thus uses them as opportunities to analyze and apply market trends.

In Korea, the Customer Support Center receives customer requests, and assigns persons who in a position to quickly visit customers through the global positioning system (GPS). This is followed by the “Hapgeo Call” with customers one day after checking final processes. To smoothly provide services to customers, the company has built a one-stop-after-market (SMA) service system from sales to end-of-life disposal, and continues to enhance its dealer service training. It also carries out trainings for office and field staff of the Customer Support Center quarterly in line with a new product release. As an outcome of such efforts, the company has achieved 97.4% of claim settlement ratio within the timeline required by customers.

In China, dealers receive customer feedback and requests through the Service Call Center and aim to handle them within 24 hours and complete their services within seven days. VDCs are reflected in product design and quality improvement. Doosan Infracore provides various online and offline trainings to enhance the technical capabilities of its dealers’ service personnel. Approximately 20 emergency service engineers make two-month training visits to around 30 dealers throughout China to provide training on mechanical repairs and maintenance while also helping to solve technical issues of the company’s C (Chinese) models. As a result of these efforts, in 2019 the company achieved 95.7% in claims processing rates for all its models. It also achieved 92% in making improvements by successfully working on 34 cases out of 37 design-related VDCs.

Standardizing Product Post-sale Management Services

Doosan Infracore offers our customers the One-Stop Service – One Time Contact, One Day Repair, One Touch Repair, One Plus Service – to deal with product malfunctions and provide technical assistance. The company strives to provide One Touch Repair on the day when requests are made. Therefore the company continues to make improvements in its technical capabilities and service procedures while building a comprehensive customer support system that leaves no blind spot unaddressed and supplies parts in a timely manner.

Customer Satisfaction Management

Doosan Infracore has been standardizing our customer services to improve the overall customer service quality, and providing all the service personnel with customer satisfaction (CS) trainings to foster them into CS experts. In addition, we conduct CS surveys on Happy Call services in Korea and China, and strive to keep the satisfaction level above 4.5 points on a scale of 5 points. In 2019, the level of satisfaction in Korea stood at 4.83 points.
In 2019, we began to build the Project Management Information System (PMIS), an integrated system to better manage our new product and technology development tasks. PMIS is a platform-type integrated task management system that targets entire NPD and NTD (New Technology Development) processes of the company. The system digitalizes the information accumulated during the development process, which enables the company to manage its NPD and NTD gate as well as project schedules and issues. PMIS also supports efficient resource allocation of the company and quick decision making of its leaders. Doosan Infracore aims to complete the establishment of PMIS through two stages over the next two years. During the first stage, the company will carry out stage gate management, resource management, and project management, while the functions for strategic planning and portfolio management will be developed in the second stage.

Building Customer Trust in Marketing and Sales Stages

Responsible Marketing Policies Doosan Infracore sets and complies with proactive and responsible customer service policies to build customer trust and enhance our product values. For responsible marketing, it provides the latest product information via its website and social media channels, along with unique brand guidelines to serve as the yardstick for marketing and communication activities, including advertising and sales promotions. The company complies with legislation related to sales, marketing, and information security, and was not subject to any sanctions for falsehood including exaggerated advertising practices in 2019.

Quality Management System

Quality Stabilization and Standardization

Foundation of Quality Management

Quality Management System

Doosan Infracore has established and been operating a quality management system in order to achieve its vision of developing into a “Global Leader in Infrastructure Solutions.” In 2019, in its efforts to continue to place top priority on quality, the company strove to secure a quality competitiveness of new products; enhance its global quality management by establishing differentiated quality strategies for different regions; enhance mass production quality and strengthen proactive quality management by reinforcing suppliers’ quality competitiveness and expanding the scope of their quality management; establish an infrastructure system by laying foundations for a quality management system and improving its quality system; and make continuous efforts to improve fundamental quality.

To strengthen its quality management throughout the entire value chain, the company has established and been operating a diagnosis and management system for its quality management system (QMS) that enables the company to assess the level of its quality management in the production, purchasing/quality, R&D, sales, and service sectors and to derive improvement measures. The company has also built a risk management system and set up strategies to better respond to key risks that are managed at the company level.

In 2020, it will further strengthen the preventive quality of its new models, plants, and suppliers, and will expand its global governance through a set of global quality indicators and the standardization of quality management practices at its overseas production subsidiaries. In addition, the company will upgrade its quality management system based on digital data and cultivate internal quality experts in a bid to continuously improve its quality capabilities. It will secure fundamental competitiveness and achieve zero-defect quality management to global standards by establishing a real-time statistical process control (SPC) system, improving its preemptive quality management capabilities through mechanical failure predictions based on digital data analysis, and fostering internal quality experts in connection with the functional competency (FC) diagnosis.

Company-wide Integrated Quality Conference Doosan Infracore has been holding the Company-wide Integrated Quality Conference, participated by the CEO, every month since 2010 with the goal of attaining the highest quality from a customer’s perspective. The conference agenda reflects the result of the product quality analysis and shares improvement points and responses.

Quality Improvement Index Management

Doosan Infracore focuses on making innovations in parts quality and improving product perfection to produce products that meet customer needs. The company has selected initial quality and warranty quality as indicators for customer recognition, and set an ambitious goal to increase customer satisfaction through quality management.

Project Tracking System

The Project Tracking System (PTS) is Doosan Infracore’s system for managing quality projects. Using PTS, the company checks the progress status of the projects related to market quality, process quality, and advance quality; responds to VOCS; and improvement effects to help the company make improvements to quality and accelerate the pace of improvement. In 2019, the company focused on upgrading PTS by improving the quality conference screen, developing a dashboard for its process audit, improving batch mailings, and building a database for claims, and thus increased work efficiency and established a real-time monitoring system. In 2020, it will continue to manage quality issues.

Strengthening Preventive Quality

In 2019, Doosan Infracore concentrated its efforts on making rapid and considerable quality improvements in a drive to secure fundamental competitiveness and increase customer value. To raise the level of the product quality by 3% compared to the current level, the company is implementing tasks aimed at quality improvement, and encouraging its manufacturing plants and suppliers to abide by the basics of product quality. In 2020, Doosan Infracore will analyze quality problems that have occurred previously by using big data in line with the Fourth Industrial Revolution to predict quality problems associated with customers’ working environments and/or equipment operation time. In addition, it will focus more on strengthening preventive quality through the preventive inspections and TMS-based remote diagnosis service so as to prevent quality issues.

Strengthening Quality at the Parts Production Stage

In order to minimize the number of defects at the production stage, Doosan Infracore is continuing to improve parts quality in partnership with its suppliers. As a result, the company’s warranty quality, which serves as a quality index of construction equipment parts, has improved by 20% and 21% in Korea and China, respectively, over the past three years. To prevent fluctuations in quality due to personnel change and process improvement, the company assigns different reporting obligations according to the business type of each supplier, while enhancing quality management through pre-inspections. It also holds the worst quality supplier meetings to raise suppliers’ awareness on the importance of quality and urge them to implement quality-first policies.

Doosan Infracore conducts quality audits customized to each supplier’s level of quality and business type to help them improve quality, and inspects their quality systems, processes, and products on a regular basis to prevent quality defects and ensure the consistency in quality management. In 2019, it conducted on-site assessment (OSA) and quality inspection audit for 74 suppliers, and in 2020 it will select 33 suppliers that need quality improvements and make concentrated efforts to help them improve their quality level. Going forward, Doosan Infracore will continuously prevent quality issues by diagnosing and checking quality risks in advance, including cases of transfer of suppliers’ contractual status, and modifications in design or processes.

Enhancing Supplier’s Quality Management

Doosan Infracore has put the statistical process control (SPC) system in place and analyze data to prevent quality defects and ensure stable manufacturing processes. In 2019, as part of its digital transformation tasks, the company began to develop a real-time SPC management system that automatically receives SPC data from its suppliers and monitors their process management capability. As of 2019, it completed its goal for the first stage by establishing the system for 10 suppliers. In 2020, it will proceed to the second stage and expand its scope to a total of 50 suppliers. Through the operation of the SPC system, the company expects to make continuous improvements in fundamental quality and reduce warranty costs; build a foundation for quality data analysis based on big data; secure data reliability by automating data input; and improve work efficiency through the automated transfer of suppliers’ quality information.

In addition, Doosan Infracore has been making continuous efforts to manage SPC data of its suppliers. In 2019, the company registered and managed data on 332 inspection items of 86 suppliers, resulting in continuous improvements. In 2020, it plans to expand the scope to 349 items of 100 suppliers.
Employees

Doosan Infracore continually fosters talented people who support fundamental values of the company, are competitive, and act in the right way.

Based on a corporate culture where employees are considerate of others and diversity is respected, Doosan Infracore helps its employees achieve personal growth at their own pace according to the Functional Competency (FC) system while applying reasonable standards and principles and providing fair opportunities. Through this, the company has been building a mutually beneficial cycle in which people grow, and the growth of people in turn leads to the growth of the business. In addition, the company has been enhancing its organizational culture and win-win labor-management relations with the aim of standing proud based on the Doosan Credo.

Human Rights and Diversity

Respect for Human Rights

As a participant of the UN Global Compact (UNGC), Doosan Infracore supports the UNGC’s 10 Principles on Human Rights, Labor Standards, Environment, and Anti-Corruption, and complies with the International Bill of Human Rights and the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work. Moreover, we respect the human rights of comprehensive stakeholders, including our employees and suppliers. We do not tolerate any type of verbal abuse, violence, sexual harassment, or other improper acts that violate the spirit of “Inhwa,” meaning harmony between people, in interactions within the company and with suppliers. Doosan Infracore runs reporting channels, such as the Human Rights Protection Center (Help Line) and the Internal Reporting Center to report verbal and physical abuse. In the event of a violation, the Personnel Committee will take immediate action according to the relevant regulations and provide education to ensure that the same violation is never repeated and to build up human rights awareness.

Enhancing the Management of Human Rights Risks

As a global company, Doosan Infracore is committed to fulfilling its responsibilities regarding human rights. The establishment and implementation of a human rights risk management system is, therefore, one of the company’s strategic CSR tasks, supported by the concerted efforts of the CSR Committee. To identify the status of human rights within the organization, Doosan Infracore reviewed the reports received through its reporting channels and the outcomes of its focus group interviews, and established a process for responding to violations of human rights based on the results of its studies. It also distributed human rights risk prevention manuals throughout the company. To raise awareness concerning the importance of the human rights of its employees, it expanded the existing Gender Equality Center into the Human Rights Protection Center. In addition, the company has continued to run the offline and online human rights campaigns and education programs which began in 2018, and is now customized to the different requirements of its office and technical staff. In 2019, Doosan Infracore added a course on the prevention of workplace harassment to its curriculum for human rights education for all its employees. The company also launched an in-depth course called “Building Healthy Partnerships Together,” customized for employees in direct contact with our suppliers, including those in the purchasing, production management, parts quality, and R&D departments.

In 2018, Doosan Infracore surveyed its leaders and office workers to identify potential human rights risks, and to preempt such risks by analyzing awareness of the importance of human rights among its employees. Based on the results of this survey, in 2019 the company launched an organizational development program, called Winning Team Dynamic (WTD), for new leaders and for members of specific departments. The program is structured to increase cooperation and build a positive organizational culture through mutual understanding and respect between employees, as well as to encourage better communications. The program earned highly positive responses from participating employees, so that the company will expand the WTD program to be run company-wide and solve related issues.

In 2020, Doosan Infracore will reduce human rights risks by running educational courses and undertaking due diligence on human rights throughout the company, while also strengthening its human rights management system.

Grievance Reporting Channels and Handling Processes

Doosan Infracore strives to prevent and properly handle sexual harassment and any other verbal and physical abuse. To this end, the company is operating the Help Line at the Human Rights Protection Center (previously called the Gender Equality Center), while also providing all employees with education on gender equality, including prevention of sexual harassment. It identifies employees’ grievances through diverse channels, such as the Human Rights Protection Center, the Internal Reporting Center, and the Cyber Reporting Center on the company website, and promptly responds to them. The company protects the privacy of the informant by maintaining anonymity, and handles the grievances under the relevant company regulations and procedures. As a result, Doosan Infracore has handled all major grievance reports filed in Korea in 2019.

Respect for Diversity

Protection of Employee Diversity

As of December 31, 2019, there were 4,630 employees across the globe at Doosan Infracore, including 2,860 in Korea. Given the characteristics of the machine manufacturing industry, it is not easy to recruit female employees. The company however strives to eliminate bias by having its female engineers take part in the interviews for recruiting. To foster the personal growth of female staff, the company does not discriminate against its female staff in their job assignments, nor does it place any restrictions on their assignments. The number of female employees is on the rise, and it is expected that the percentage of female managers will also steadily increase.

<table>
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<tr>
<th>Types and Details of Human Rights Violations</th>
<th>Details</th>
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<td>Gender</td>
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<td>Marital and childbirth</td>
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* The types of human rights violations are based on the company’s rule of conduct and guidelines as the creation of a sound organizational culture.
Providing Fair Opportunities As specified in the Doosan Credo and the company’s Ethics Charter, people at Doosan are respects for their individual characteristics. Their employment, evaluation, and compensation are not discriminated against the grounds of gender, religion, disability, age, social status, country of origin, nationality, ethnic backgrounds, race, skin color, physical conditions, marital status, pregnancy, childbirth, family type or status, ideology, political opinions, sexual orientation, educational backgrounds, or military service. Doosan people are also not treated unfairly depending on their personal relationships with the company’s officials based on their academic or geographical backgrounds.

Women’s Council Doosan Infracore expanded the scope of its Women’s Council, launched for the Technology Division in 2014, to company-wide in 2017, thereby listening to the voice of female employees and sharing information on gender equality from an unbiased perspective. In 2018, to enhance internal communication channels, each member of the Women’s Council was assigned to a particular department to identify any violations of human rights and collect ideas on improving gender equality in the organization. The Council also held a meeting with HR executives twice every half year to share the collected feedbacks and took necessary improvement measures. In 2020, we launch programs designed to realize gender equality and collect opinions of a wide range of minority groups, including millennials, thereby establishing a horizontal organizational culture where diversity is respected.

Human Resources Development

Doosan Infracore has established a human resources development system, with a particular focus on the right balance between leadership and expertise, aimed at fostering “global leaders who can lead the way in organizational changes and innovation.” Individual employees develop their training plans according to their strength and competency levels, and participate in various education programs suited to their growth path.

Global HR Information System

Doosan Infracore has been standardizing and streamlining its HR systems, processes, standards, and data from the Doosan Credo perspective. Accordingly, the company launched a new HR system called “MY HR” in March 2017 to integrate some 50 HR systems that had been previously used by different subsidiaries in various countries around the world. MY HR is a globally integrated one-stop HR system designed to handle various HR tasks, such as Doosan Competency Model (DCM), management by objectives (MBO), and development plan (DP), as well as training applications. It is available to all Doosan Infracore business sites in Korea, China, the U.S., and Europe. All employees have the right to create or view personal information about themselves and their team members (if they are managers) through MY HR. They are thus required to sign the Pledge of Personal Information Protection to promise to handle and process the personnel information of themselves and their team members according to certain principles.

Enhancing Functional Competency

Doosan Infracore has put a sophisticated Functional Competency (FC) development system in place, with the head office taking a central role, in consideration of individual employee’s unique skill sets and capabilities. The company also encourages its employees to devise their education plans according to the result of their FC assessment.

Building the FC Development System FC enables employees to define the competencies they need to perform their duties successfully and to set their roadmap for personal growth in line with their level of competencies. Doosan Infracore operates an FC-based HR education and development system to help its employees become experts in their respective fields. In 2015, the company published a development directory which contains a list of training courses and details required for each job competency level. In 2016, it completed the establishment of the FC development system for R&D, production, and sales, and restructured functional courses. In 2017, it launched an FC level-up program that enables its employees to establish and implement their development plans on their own based on the result of the FC assessment. Starting from 2019, Doosan Infracore is diagnosing its employees’ job competency level based on the latest FC system, while also implementing an FC level-up program for all employees every two years.

To nurture its technical staff to a high level of expertise and competitiveness in their respective fields, in 2014 Doosan Infracore set up a draft FC system for technical staff based on National Competency Standards (NCS). This was followed in 2017 by competency assessment across 11 technical categories, and the implementation of an FC-based HR development plan, including the building of an FC diagnostic system and the launch of job training linked to the FC system in 2018. In 2019, the FC diagnostic system was completed for all 11 job categories, and new job training courses were launched based on the results of the diagnostics. NCS-based training programs and self-diagnostic tools have enabled the company to more systematically manage technical job development, and to set up more targeted training. Doosan Infracore became the first major Korean company to apply the NCS to its employee skill diagnostics system, and its NCS-based FC development system for technical staff was recognized as a pioneering case by the Human Resources Development Service of Korea in January 2020 and will be shared throughout the industry. In 2020, Doosan Infracore will improve its production and quality by running a new curriculum which reflects the results of its FC diagnostics. It will also share the results more widely as part of its efforts not only to increase the understanding of its own employees, but also to help the entire Korean manufacturing industry to improve.

Competency Development Trainings Doosan Infracore has set up a self-directed learning system so that employees may study voluntarily under their own volition. Employees can search, apply for, and access various courses offered by the company’s self-directed learning system on their computers or mobile devices anytime, anywhere through MY HR, an integrated HR system. In December 2017, the company launched CELL (Community of Employee-Led Learning), a new employee learning support system, to promote and support employees’ self-directed, small-group, job-related learning activities. A CELL consists of 3 to 10 employees who choose their education contents and methods, and undertake autonomous learning on this basis for 5 months. Launched in 2018, the CELL had run a 4 classes by the end of 2019, participated by 1,188 employees in 177 CELLS. Outstanding CELLS were selected following performance evaluations, and were rewarded with cash prizes and gift certificates. In 2020, the company will continue to support self-directed CELL-based learning by its employees.

As set out in the company’s digital transformation direction, Doosan Infracore offers courses to help foster experts with business acumen and theoretical skills in data analysis, management, and utilization. The “DRAW (Digital Edge Reinforcement at Work)” course was launched in 2018, followed by the “HDAS (Field Data Scientist)” course in 2019 to nurture in-house data experts. In 2020, Doosan Infracore will accelerate the training of data experts by setting up the “AI Community,” a self-directed AI learning group, in addition to running its regular training courses.

In 2019, Doosan Infracore launched its “MEX (Marketing Excellence)” course to improve the marketing skills and strategic thinking of its sales and marketing leaders. The MEX course consists of lectures on market sensing, marketing strategy (STP/4P), pricing & channel, and brand power. There are also workshops on the hot topic of digital marketing, and an action learning module during which participants can apply the theories and practices they learn during the course to the company’s actual sales strategies. Eight MEX courses were run in 2019, enabling the company to enhance the sales and marketing strategies needed to increase the value of its brand and generate long-term sustainable growth.

To improve the expertise of its technical staff and foster in-house professionals, Doosan Infracore runs technical job training based on the FC system, and also supports technical study clubs and the acquiring of certification by individual employees. The technical job training system was established through cooperation between its production executives and on-site VDCs. 271 courses in total are now being developed, in stages according to priority. In 2019, there were 36 programs for the employees’ study clubs, aimed at sharing technologies or passing technical license exams, and 236 individuals (including double counting) completed the courses. In 2020, the company will continue to support the employees’ study clubs, establish a management system for the outcomes of the study clubs using TEAMIS, and develop them into knowledge assets of the company, to promote a voluntary, field-oriented learning culture. As a result of these efforts to foster technical experts, 146 Doosan Infracore employees had been nationally certified as master technicians (52% of all its regular technical workers) as of December 2019, and 15 of them have obtained their master technician title in more than two areas, meaning that the company has obtained 145 master technician licenses. Those employees who acquire expertise through the company’s support system in turn disseminate it throughout the company, creating a virtuous cycle within the organization.

Outcomes of Development of Technical Staff

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<td>Master Craftsmen</td>
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1) Master Craftsman of Korea, 2) a Technological Metropolitan City Mitchell Master Craftsmen

* Master Craftsman of Korea: This refers to those who are designated by Article 1 of the Act on Encouragement of a Skilled Craftsman among those who have the highest level of skilled crafts, and greatly contributed to the development of skilled crafts and the improvement of the status of skilled craftsman by facing working in industrial fields for a long period of time.

* Incheon Metropolitan City Mitchell Master Craftsmen: This refers to those who are designated by Paragraph 2 of Article 3 of the Ordinance on the Selection and Support of Incheon Metropolitan City Mitchell Master Craftsmen among those who are equipped with an outstanding spirit of master craftsmen and the highest level of skilled crafts, and greatly contributed to the development of technologies by having worked in industrial fields for a long period of time.
Developing Global Talent

Leadership Training
The future of a business depends to a great extent on its leaders. Doosan Infracore, therefore, offers a wide range of leadership education programs, including the Leadership Coaching Program, the Partnership Coaching Program, and the Competency Improvement Course for Part Leaders. These courses enable leaders to understand their duties and acquire the leadership skills required for different leadership positions. The Leadership Coaching Program was run between June 2019 and January 2020, to offer team leaders and part leaders the opportunity to demonstrate effective leadership. They were taught various coaching skills, and learned how to apply these to their leadership environments. The Partnership Coaching Program was offered two times to deputy managers and managers from June to September 2019, enabling them to tap into their personal strengths and contribute to the development of their department within the organization as a whole. In 2020, the company will continue to offer customized coaching courses which enable employees to improve their leadership skills, prepare leaders to step forward, and, through the Winning Team Dynamics course, bring positive changes at the team level.

Doosan Infracore runs group coaching programs tailored for field leaders in technical positions. This helps to resolve any on-site issues with the support of professional coaches, and is bringing about practical changes and more advanced leadership through daily learning and coaching. In 2018, based on the role model for technical field leaders established in 2017, the company made improvements in the technical education system, and operated a leadership field leader coaching program while expanding the technical field leadership education system, and operated a leadership field leaders established in 2017, the company made improvements in practical changes and more advanced leadership through daily coaching. In 2020, the company will continue to offer customized coaching courses which enable employees to improve their leadership skills, prepare leaders to step forward, and, through the Winning Team Dynamics course, bring positive changes at the team level.

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Doosan Infracore established its Career Development Paths of Technical Staff by creating a technical managing director system and strengthening the existing technical expert system, thereby offering the technical staff a choice of becoming a “field leader” or a “technical specialist.” A technical managing director is a person with leadership and practical skills and plays his/her role as a team leader in the company’s production units, presenting technical staff with a vision to be a top leader. A technical specialist is a field expert with professional skills and strong competitiveness, presenting technical staff with a vision to be a top leader. This system, technical staff can choose from the two development paths – the “technical specialist track” which enables them to grow into Meisters and the “field leader track” in which they develop into executives in charge of production sites.

Following the first appointment of a technical managing director on the company’s 80th anniversary in January 2017, four Meisters were chosen in April 2019. The title of Meister is the highest honor granted to professional technicians who have long been engaged in particular job categories for the purpose of cultivating technical staff and inspiring pride in them. Doosan Infracore selects a Meister through a strict comprehensive evaluation conducted by the Professional Technical Committee that includes evaluation and verification of their personal competencies, fact-checking through 360-degree interviews with their colleagues, and in-depth interviews, during a span of six months. The four Meisters have worked for over 30 years in calibration/testing, welding, engine assembly, and facility maintenance using their top of the line technical competencies, with their colleagues taking them as their role models. Doosan Infracore will continue to foster its technical staff in a systematic way so that they can improve their work engagement with pride, thereby building a virtuous cycle of growth at the corporate level.

Career Development Paths of Technical Staff

Doosan Infracore’s Career Development Paths of Technical Staff

1. Young Bok (YB): Technical staff level 1 to 2

2. Technical Staff

3. Field Leaders

4. Technical Specialists

1. Young Bok (YB): Technical staff level 1 to 2

2. Technical Staff

3. Field Leaders

4. Technical Specialists

Invigorating Organizational Culture

Internalization of the Doosan Credo

All members of Doosan internalize the Doosan Credo, a set of principles that represents Doosan’s philosophy and unique way of doing business, thereby contributing to the development of the company as a sustainable organization. To create sustained positive outcomes through a virtuous cycle structure, all employees of Doosan Infracore strive to internalize the Doosan Credo with its leaders undertaking an exemplary role and CAs playing a central role in bringing change. The company promotes and shares the Doosan Credo on a continuous basis by annually discovering and honoring exemplary cases of employees who have made an exceptional contribution to promoting core values of Doosan and improving office productivity.

Improving the Way of Working

Changes Starting from Leaders

Doosan Infracore emphasizes the need for its leaders to initiate changes and set a strong example for others to follow. The company holds leadership sessions on an annual basis to bring together the CEO and senior executives to share the latest changes in business management environments, figure out the implications of such changes, discuss the directions that the company’s organizational culture must pursue, and find ways to make improvements.

Operating the CA Channel

Doosan Infracore makes constant improvements in its way of working through the Change Agent (CA) channel run by each executive organization. Serving as a bridge between executives and staff, a CA has a CORE Time on a monthly basis to identify inefficiencies at work, discuss improvement measurements with leaders, and implement necessary tasks.
Improving Office Work Productivity

Since 2018, Doosan Infracore has implemented the company-wide campaign and action plans to boost office work productivity. In 2019, the company made a positive impact on productivity by adopting more efficient ways of working, helping its employees create the right work-life balance, and strengthening its execution capabilities. Meetings and reports have been made more efficient and smarter, with a particular emphasis on eliminating gray zones which can arise from job assignments falling into gaps between departments, new types of work emerging, and ambiguities in roles and responsibilities (R&R) occurring. If issues and problems related to gray zones are solved, the office work productivity can be significantly improved. Doosan Infracore, therefore, strives to identify gray zones and solve any related problem at the company level, thereby further enhancing its office work productivity. The company has also made progress in improving work-life balance, including through more flexible working hours and automated PC shutdown after business hours. In addition, it strengthened its execution capabilities by continuing to discuss the improvement measures regarding office productivity in its leadership sessions.

Communication and Consideration

Doosan Infracore operates diverse communication channels, including online and offline grievance mechanisms, the Human Rights Protection Center, the company website, and the in-house portal with the goal of boosting employees’ satisfaction at work through genuine communication between the company and its employees. In addition, the company has been sharing media coverage about the company and its employees through the “Briefing” from 2016 onward. Moreover, it shares with its employees the corporate vision, including key business strategies, new businesses, and new growth drivers, through “CEO Talks” to ensure transparent communication of corporate activities.

Work-Life Balance

Doosan Infracore complies with the labor regulations of the countries in which it operates. To further improve its employees’ quality of life, the company offers a wide range of welfare benefits that match each country’s unique situation. In particular, it proactively supports a sound work-life balance through family-friendly management practices, including the operation of childcare centers and the granting of parental leave, reduced working hours, and family care leave. It also carries out customized activities to improve corporate culture by promoting the use of flextime.

Operation of Flextime

In Korea, Doosan Infracore operates a flextime system to support its employees’ work-life balance. When working hours need to be altered as a means of improving work productivity and efficiency, employees can freely adjust their work hours by receiving pre-approval from their leaders as long as their regular working time per day is eight hours.

Support for Building a Stable Life

In Korea, Doosan Infracore offers industrial accident insurance, supports medical costs, and carries out regular medical checkups to protect its employees in the events of health emergencies or accidents. It also helps its employees financially through loans for their children’s tuition fees and housing support measures.

Employee Assistance Program

Doosan Infracore runs the Employee Assistance Program (EAP) which offers counseling and education on health, finance, and other matters. In Korea, the company has been operating DODOHUJ, an in-house psychological counseling center, since 2004. (Please refer to page 85 of this report for further details about DODOHUJ.) In China, the company offers sand-therapy as a special program for employees and their family members, and operates psychological counseling programs for expatriate employees and their family members.

Moreover, the company runs a life-cycle design program in cooperation with an external professional organization to help retiring employees with any career shift they may be considering. The life-cycle design program offers on-one-one consulting and open lectures in such areas as career exploration, support for starting a business, life counseling, finance, and liberal arts licenses for up to ten days for around six months depending on the individual lifetime design goals.

Recharging Opportunities

In Korea, Doosan Infracore encourages its employees to take a two-week vacation before or after the first week of August when domestic plants halt their operations. The company has also implemented the Overseas Advanced Culture Exploration Support System for its regular staff office or technical staff who joins the company before January of the previous year to help them experience foreign culture on the occasion of their annual vacation periods. The company offers them round-trip air tickets and Eurow passes so that they can take the opportunity to recharge themselves. This is a differentiated benefit program from other companies offered to Doosan employees, thus boosting their pride in the company.

Family-friendly Management

Doosan Infracore allows its employees to choose childcare leave and family care leave or reduced working hours depending on their situations. The company also runs flextime and leave of absence systems according to the circumstances of the relevant countries. In Korea, Doosan Infracore runs the Mom’s Caring Program, a company-wide policy to support pregnant employees. To this end, the company publishes a “Guidebook on Pregnancy, Childbearing, and Childcare” to offer information about support programs available in and outside the company regarding pregnancy, childbearing, and childcare. Also, it creates a “Mom and Pop Guidebook” based on the opinions collected through the Women’s Council, shares it with all employees, and makes constant updates.

Support Systems for Family-friendly Business Management (Korea)

<table>
<thead>
<tr>
<th>System</th>
<th>Details</th>
<th>Eligibility and period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnancy employee care program</td>
<td>Parking permit for pregnant employees</td>
<td>Pregnant female employees</td>
</tr>
<tr>
<td></td>
<td>Guidebook on pregnancy, childbearing, and childcare</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of affiliated hospitals, in-house clinics, internal and external psychological counseling centers, if needed</td>
<td></td>
</tr>
<tr>
<td>Basic support during pregnancy</td>
<td>Compliance with 4-hour workday and prohibition of holiday work</td>
<td>Pregnant female employees (the entire pregnancy period)</td>
</tr>
<tr>
<td></td>
<td>Support for medical bills during pregnancy and childbearing</td>
<td>Pregnant female employees (from pregnancy to childbearing)</td>
</tr>
<tr>
<td>Leave for prenatal checkup</td>
<td>Reducing working hours for the health of pregnant employees and their babies</td>
<td>Pregnant female employees (reduce working time up to 2 hours per day until the 12th week and after the 36th week of pregnancy)</td>
</tr>
<tr>
<td></td>
<td>Parental checkup leaves</td>
<td>Pregnant female employees (since per month until the 36th week of pregnancy; once every two weeks from the 28th to the 36th week, and twice per week after the 36th week)</td>
</tr>
<tr>
<td>Childbearing</td>
<td>Leave before or after childbirth</td>
<td>Female employees who gave birth to a child (30 days / 60 days for twins)</td>
</tr>
<tr>
<td></td>
<td>Childbirth leave</td>
<td>Female employees who have a miscarriage or abortion (Leave duration varies depending on pregnancy period, with a ceiling of 30 days for pregnancy of more than 28 weeks)</td>
</tr>
<tr>
<td></td>
<td>Mecare/abortion leave</td>
<td>Female employees who have a miscarriage or abortion (Leave duration varies depending on pregnancy period, with a ceiling of 30 days for pregnancy of more than 28 weeks)</td>
</tr>
<tr>
<td>Childcare</td>
<td>Birth gift</td>
<td>Cash gift in celebration of childbirth</td>
</tr>
<tr>
<td></td>
<td>Leave for childcare</td>
<td>Childcare leave</td>
</tr>
<tr>
<td></td>
<td>Childcare leave</td>
<td>Employees with children aged less than 8 years or second graders in elementary school (up to 5 years for a total of childcare leave (1 year) and shortened working hours)</td>
</tr>
<tr>
<td>Reduced working hours for childcare</td>
<td>Reduction of working hours for child care (15-30 hours per week)</td>
<td>Employees with children aged 5-3 years (selected through transparent procedures at a fixed time)</td>
</tr>
<tr>
<td>In-house daycare center</td>
<td>Daycare centers in Incheon, Gunsan, and Seoul</td>
<td>Employees (30 days per year)</td>
</tr>
<tr>
<td>Family</td>
<td>Special leave of absence</td>
<td>Leave of absence to take care of family members suffering from illness or recovering from accidents</td>
</tr>
<tr>
<td></td>
<td>Leave of absence intended for family members in need of special care, personal development, and treatment of infertility</td>
<td>Employees (6 months + additional 6 months)</td>
</tr>
</tbody>
</table>
Win-Win Labor-Management Relations

Compliance with Labor Policies
Doosan Infracore complies with the labor standards of the International Labour Organization (ILO). Each year, the company conducts investigations to detect any child labor or forced labor practices within the company through the annual CSR assessment of all domestic and major overseas business sites. In 2019, none of the company’s business sites in Korea and overseas have reported child labor or forced labor of any kind. It has also signed the Guidelines on the Protection of the Working Conditions of In-house Subcontractors’ Workers with the Korean Ministry of Employment and Labor. Accordingly, the company ensures compliance with relevant regulations through a regular monitoring, and it also complies with the government’s guidelines on fair transactions and thus properly operates in-house subcontracting activities.

Labor-Management Relations
Since the launch of the Win-Win Labor Union in 2011, Doosan Infracore has maintained and developed labor-management relations based on mutual trust and respect, including the strike-free conclusion of collective bargaining agreement for nine consecutive years. Labor and management continue to communicate through diverse channels, including the Labor-Management Council and the Welfare Subcommittee, and share major issues through the quarterly Business Information Session.

In 2019, the company held diverse labor-management events, including “Family Day” for its technical staff, participation in the Incheon International Half Marathon, and support for local welfare facilities. In addition, each of its business sites in Incheon, Gunsan, and Ansan holds a “Great Workplace Committee” meeting every two months, and thus improves the work environment based on employees’ opinions.

Its Chinese subsidiary has established a special council in accordance with the Trade Union Law of the People’s Republic of China which is equivalent to the Labor Standard Act in Korea. The special council’s members are elected by vote. The company holds a monthly meeting with the special council to discuss major developments and share opinions on various workplace issues, and discusses wage on an annual basis.

Joint Customer Support of Labor-Management
The labor union and management of Doosan Infracore have been working in unison to overcome the market downturn since 2016 through the joint customer support program by visiting customers, listening to their voice, and providing customer services. The joint customer support activities enable the company to identify customer requirements and forward them directly to the company’s production sites, thereby further improving product quality and also enhancing the brand value of Doosan Infracore.

Based on our purpose of sincere corporate community involvement (CCI), Doosan Infracore has established a global CCI system and guidelines that reflect its corporate capabilities and social demands while carrying out CCI activities worldwide guided by a common set of core values. The CCI Committee ensures that donations are spent in a transparent way. Together with its employees around the globe, Doosan Infracore is implementing CCI programs that are instrumental to the development of local communities.

CCI Strategies and Directions

CCI System
Doosan Infracore generates not only business opportunities but also social values by leveraging its expertise and competencies to grow into a trusted and reputable company that contributes to the sustainable growth of its own and local communities as well. To this end, the company plans and executes corporate community involvement (CCI) activities that take into account the characteristics of local communities based on its CCI guidelines and continuous communication with local communities. The CSR Part at the head office is taking a central role and works in partnership with staff in charge of its overseas business sites.


diagram

CSR Part at the head office is taking a central role and works in partnership with staff in charge of its overseas business sites.

Top 100 Global CSR Leading Company

- To boost local communities/ future competitiveness and the company’s corporate values through strategic CCI activities
- To promote the shared growth of the company and society through CCI activities

CCI Strategies

- Mission
- Value
- 3 Strategies

Support for the next generation | Support for local communities | Support based on the company’s core competencies

- Based on the announcement of the World Economic Forum (Davos Forum)

Support for the next generation

1) Based on the announcement of the World Economic Forum (Davos Forum)
In 2019, the company aligned its business directions with strategic CCI directions, and subsequently expanded its employees’ voluntary CCI activities, stabilized the operations of the reorganized Dream School program, strengthened community-centered activities, and developed new programs. In 2020, it plans to access the Dream School program performance and develop new community-centered CCI programs.

Operation of the CCI Committee and the CCI Council

Doosan Infracore spends donations after carrying out a comprehensive review of the public interest and appropriateness of programs and institutions, and the relevance of programs to the company’s CCI direction. For the more transparent and proper collection of donations and execution thereof, the company has launched the CCI Committee, an organization that deliberates on and determines all matters related to donation, in 2017 and established relevant regulations. Led by the CEO, who also serves as the chairman of the CSR Committee, the CCI Committee is comprised of the CFO and executives in charge of legal affairs and CSR. The Committee deliberates where to spend donations following reviews of how much to spend on each proposed program considering each program’s relevance to the company’s business and its public nature together with the company’s financial situation. Doosan Group’s CCI Committee, which is composed of executives from major affiliates of the Group including Doosan Infracore, discusses and makes decisions on policies on donations along with the donation beneficiaries and amounts for each affiliate. In addition, donations that exceed 200 million won in those deemed necessary to be reviewed by the BOD are deliberated and approved by the BOD.

Support for the Next Generation

Dream School

Doosan Infracore has been running “Dream School” since 2012 together with World Vision, an international NGO devoted to humanitarian aid across the world. As one of the company’s flagship CCI programs, the Dream School helps youth living nearby its business sites in Seoul, Incheon, and Gunsan to nurture their dream for five years from second grade of middle school by offering mentoring programs, education for self-discovery, Dream Project activities, and other experiential programs to help them shape their career path. Middle school mentees take part in a mentoring program provided by Doosan Infracore employees for two years – it also includes education for self-discovery, specialist mentoring sessions, and career experiences. High school mentees engage in self-directed activities, including developing skills through Dream Club activities, in an effort to shape their career paths.

The first year of Dream School mainly consists of “Dream Leaders” activities where a mentor and mentee meet once a month to discover the mentee’s area of interest and dream. There are also other activities that form a series of closeness between mentor and mentee including the “Summer Camp” where mentees meet friends from other regions, “Professional Mentoring” where mentees meet professionals, and “Home Coming Day” where mentees meet their families. In the second year, the “Dream Project” is executed to improve youth’s problem-solving capabilities with the advent of the Fourth Industrial Revolution that is changing the world faster than ever. Mentees think about, identify with, and discover solutions for daily life problems that require their improvement, and challenge themselves to find solutions, thereby enhancing their independent problem-solving skills. The high school program focuses on emotional support and capacity building through coaching programs while also increasing the practical understanding of their dreams and aspired careers through opportunities to meet professionals.

In 2019, Doosan Infracore selected 42 mentors and mentees for the 6th class of Dream School. The 6th class, in particular, was run under the new program direction of “career exploration to prepare future generations,” based on which the company has been making continuous efforts to help the mentees to grow into good members of society by encouraging them to participate in various community activities, such as experiential activities, professional coaching, and peer activities, in addition to mentoring supports offered by its other activities that form a series of closeness between mentor and mentee including the “Summer Camp” where mentees meet friends from other regions, “Professional Mentoring” where mentees meet professionals, and “Home Coming Day” where mentees meet their families. In the second year, the “Dream Project” is executed to improve youth’s problem-solving capabilities with the advent of the Fourth Industrial Revolution that is changing the world faster than ever. Mentees think about, identify with, and discover solutions for daily life problems that require their improvement, and challenge themselves to find solutions, thereby enhancing their independent problem-solving skills. The high school program focuses on emotional support and capacity building through coaching programs while also increasing the practical understanding of their dreams and aspired careers through opportunities to meet professionals.

Support for Local Communities

Doosan Infracore carries out corporate community involvement (CCI) activities in consideration of the characteristics and needs of local communities with an aim to grow together with them. The company holds workshops with staff in charge of CCI at its business sites, and shares the CCI direction and major annual schedule, while collecting their opinions. By doing so, the company promotes various CCI activities that address the needs of communities based on cooperation with reputable non-profit organizations in local communities.

Doosan Infracore carries out a variety of CCI activities with the participation of not only its employees but also their family members in a way that the activities can bring practical assistance to local communities. In Seoul, the company conducts activities to improve the residential environment of the neighborhoods in which its business site is located, while in Incheon and Gunsan, the company supports local community welfare facilities as part of its efforts to improve the welfare of local residents. The company also continues to supply kimchi and briquettes to the underprivileged in local communities. It undertakes its CCI activities with funds raised through voluntary financial contributions from its employees in the form of “Collecting Small Change from Employee Salary” and the “Employee Donation Accounts,” as well as the company’s donation in the form of a matching grant.

In recognition of its efforts to understand the needs of local communities and continue with its CCI activities, Doosan Infracore received the Prime Minister’s Commendation in the donation category at the 2019 National Sharing Grand Awards. The company will continue its CCI activities based on the enduring interest it has developed as a member of communities where its business has prospered.

Support Based on the Company’s Core Competencies

Doosan Infracore leverages its business resources to promote its CCI activities, including expertise in construction mechanical engineering and product development.

Support for Natural Disaster Relief

In the event of a massive disaster such as an earthquake or a typhoon, Doosan Infracore promptly provides construction equipment, such as excavators, wheel loaders, and compact construction machinery, and funds for relief efforts, thus providing support based on its core competencies – one of the company’s core CCI strategies. It deploys specialized equipment and donations for rapid relief and recovery from devastating natural disasters around the world, such as Hurricane Katrina in the U.S. in 2005, the 2008 Sichuan earthquake in China, the earthquake in Haiti in 2010, the Tohoku earthquake in Japan in 2011, Typhoon Haiyan in the Philippines in 2013, the devastating earthquake in Nepal in 2015, and the earthquake that hit Indonesia in 2018.

Our Responsibility

Support for Education

In the event of a massive disaster such as an earthquake or a typhoon, Doosan Infracore promptly provides construction equipment, such as excavators, wheel loaders, and compact construction machinery, and funds for relief efforts, thus providing support based on its core competencies – one of the company’s core CCI strategies. It deploys specialized equipment and donations for rapid relief and recovery from devastating natural disasters around the world, such as Hurricane Katrina in the U.S. in 2005, the 2008 Sichuan earthquake in China, the earthquake in Haiti in 2010, the Tohoku earthquake in Japan in 2011, Typhoon Haiyan in the Philippines in 2013, the devastating earthquake in Nepal in 2015, and the earthquake that hit Indonesia in 2018.
Employee Engagement

Doosan Day of Community Service
The Doosan Day of Community Service refers to the CCI activities undertaken by Doosan Group employees. They assess the needs of the local communities in which Doosan Group operates around the world, and then lend a helping hand. Doosan Infracore takes part in making meaningful changes through the Doosan Day of Community Service every year, making the event a festival of sharing. In 2019, 352 Doosan Infracore employees participated in the Doosan Day of Community Service and conducted volunteer activities, including putting up wallpaper and providing quarantine products in a shantytown of Dongdaemun in Seoul, improving the local community welfare facilities in Incheon, and upgrading a community center cafeteria for the elderly in Gunsan. As an active member of its local communities across the globe, Doosan Infracore will continue to participate in the Doosan Day of Community Service as part of its unique culture of voluntary engagement.

Employee Donations
Approximately 73% of Doosan Infracore’s employees in Korea participate in the company’s employee donation programs as of the end of 2019. These consist of the “Collecting Small Change from Employee Salary” scheme and the “Employee Donation Accounts,” alongside the company’s matching grant. The funds raised are donated to the Community Chest to which the company has been making donations since 2011 as part of its efforts to spread a culture of sharing and donation. As a result, the company was recognized by the charity as one of “2019 The Best Good Company” in January 2020. This honor is given to the most outstanding of all those organizations whose employees donate part of their monthly salaries to the Community Chest, thereby setting a good example. For the 2019 award, 46 organizations were selected, out of more than 1,500 which were qualified nation-wide. Doosan Infracore will become a valued corporate citizen that contributes to local communities by continuing its wide-ranging sharing activities.

Building a System for Employee Engagement
Doosan Infracore is operating various systems to establish a corporate culture where employees’ participation in CCI is encouraged. The company built a CCI Information System on the company Intranet to increase employees’ awareness of the company’s voluntary services while keeping track of their participation and managing the employee donation. In addition to company-led CCI programs, Doosan Infracore operates a support system for voluntary service clubs run by employees. In addition, the company operates diverse support programs, such as the CCI diligence and indolence system and reward system, to encourage the voluntary participation of employees in CCI activities.
## Consolidated Statements of Financial Position

Doosan Infracore Co., Ltd. and Subsidiaries | Years Ended December 31, 2019 and 2018

<table>
<thead>
<tr>
<th>Assets</th>
<th>2019 (in Korean won)</th>
<th>2018 (in Korean won)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>715,231,372,146</td>
<td>707,011,029,410</td>
</tr>
<tr>
<td>Short-term financial instruments</td>
<td>1,041,678,466,937</td>
<td>961,419,186,722</td>
</tr>
<tr>
<td>Derivative financial assets</td>
<td>9,359,316,872,382</td>
<td>5,571,418,896,965</td>
</tr>
<tr>
<td>Derivative assets</td>
<td>15,496,828,816,093</td>
<td>5,958,720,942,613</td>
</tr>
<tr>
<td>Inventories</td>
<td>1,216,895,807,852</td>
<td>1,214,903,986,135</td>
</tr>
<tr>
<td>Other current assets</td>
<td>4,296,599,328,929</td>
<td>4,821,814,882,572</td>
</tr>
<tr>
<td>Total current assets</td>
<td>11,338,592,981,121</td>
<td>11,029,592,998,044</td>
</tr>
<tr>
<td>Non-current assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-term financial instruments</td>
<td>388,906,631,011</td>
<td>481,931,192,112</td>
</tr>
<tr>
<td>Long-term investment securities</td>
<td>56,660,746,041</td>
<td>59,009,790,223</td>
</tr>
<tr>
<td>Long-term trade and other receivables</td>
<td>722,931,011,014</td>
<td>913,965,617,825</td>
</tr>
<tr>
<td>Non-current derivative financial assets</td>
<td>198,205,094,684</td>
<td>279,951,751,287</td>
</tr>
<tr>
<td>Property, plant and equipment</td>
<td>1,812,494,154,884</td>
<td>1,506,609,765,463</td>
</tr>
<tr>
<td>Intangible assets</td>
<td>4,562,982,046,654</td>
<td>4,346,640,181,729</td>
</tr>
<tr>
<td>Intangible assets</td>
<td>4,346,640,181,729</td>
<td>4,346,640,181,729</td>
</tr>
<tr>
<td>Derivative financial liabilities</td>
<td>376,735,749,287</td>
<td>375,481,194,495</td>
</tr>
<tr>
<td>Right-of-use assets</td>
<td>99,586,539,694</td>
<td>72,442,089,666</td>
</tr>
<tr>
<td>Other non-current assets</td>
<td>2,910,034,105,627</td>
<td>2,869,045,327,078</td>
</tr>
<tr>
<td>Total assets</td>
<td>11,338,592,981,121</td>
<td>11,029,592,998,044</td>
</tr>
</tbody>
</table>

## Liabilities

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>2019 (in Korean won)</th>
<th>2018 (in Korean won)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current liabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade and other payables</td>
<td>559,952,467,241</td>
<td>561,127,440,972</td>
</tr>
<tr>
<td>Short-term borrowings</td>
<td>2,427,559,330,420</td>
<td>2,230,591,941,140</td>
</tr>
<tr>
<td>Current portion of long-term borrowings</td>
<td>621,579,126,028</td>
<td>637,058,873,845</td>
</tr>
<tr>
<td>Current tax liabilities</td>
<td>238,401,905,808</td>
<td>238,078,564,882</td>
</tr>
<tr>
<td>Other current liabilities</td>
<td>90,625,636,762</td>
<td>72,442,089,666</td>
</tr>
<tr>
<td>Total current liabilities</td>
<td>11,338,592,981,121</td>
<td>11,029,592,998,044</td>
</tr>
<tr>
<td>Non-current liabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bond issuance costs</td>
<td>1,895,632,460,155</td>
<td>1,828,158,656,705</td>
</tr>
<tr>
<td>Derivative liabilities</td>
<td>376,735,749,287</td>
<td>375,481,194,495</td>
</tr>
<tr>
<td>Right-of-use liabilities</td>
<td>99,586,539,694</td>
<td>72,442,089,666</td>
</tr>
<tr>
<td>Other non-current liabilities</td>
<td>2,910,034,105,627</td>
<td>2,869,045,327,078</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>11,338,592,981,121</td>
<td>11,029,592,998,044</td>
</tr>
</tbody>
</table>

## Statement of Profit or Loss

Doosan Infracore Co., Ltd. and Subsidiaries | Years Ended December 31, 2019 and 2018

<table>
<thead>
<tr>
<th>Items that may be subsequently reclassified to profit or loss</th>
<th>2019 (in Korean won)</th>
<th>2018 (in Korean won)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange differences</td>
<td>112,849,095,578</td>
<td>112,849,095,578</td>
</tr>
<tr>
<td>Cash flow hedges</td>
<td>1,419,509,051</td>
<td>2,110,364,978</td>
</tr>
<tr>
<td>Other comprehensive income for the year, net of tax</td>
<td>196,999,852,976</td>
<td>211,789,656,524</td>
</tr>
<tr>
<td>Total comprehensive income for the year</td>
<td>501,898,028,975</td>
<td>514,209,720,491</td>
</tr>
</tbody>
</table>

## Consolidated Statements of Comprehensive Income

Doosan Infracore Co., Ltd. and Subsidiaries | Years Ended December 31, 2019 and 2018

<table>
<thead>
<tr>
<th>Items that will not be reclassified to profit or loss</th>
<th>2019 (in Korean won)</th>
<th>2018 (in Korean won)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items that may be subsequently reclassified to profit or loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other comprehensive income</td>
<td>501,898,028,975</td>
<td>514,209,720,491</td>
</tr>
<tr>
<td>Revaluation of equity instruments at fair value through other comprehensive income</td>
<td>511,216,373</td>
<td>314,216,373</td>
</tr>
<tr>
<td>Profit before income tax</td>
<td>395,698,170,996</td>
<td>514,209,720,491</td>
</tr>
<tr>
<td>Income tax expense</td>
<td>500,698,028,070</td>
<td>514,209,720,491</td>
</tr>
<tr>
<td>Profit for the year attributable to owners of the Parent Company</td>
<td>305,666,065,211</td>
<td>342,631,656,647</td>
</tr>
<tr>
<td>Total comprehensive income for the year</td>
<td>305,666,065,211</td>
<td>342,631,656,647</td>
</tr>
</tbody>
</table>

## Total comprehensive income for the year attributable to: Owners of the Parent Company | 305,666,065,211 | 342,631,656,647 |
| Non-controlling interests | 158,731,962,500 | 274,447,787,531 |
| Diluted earnings per share (in Korean won) | 510,207,989,749 | 1,114 |
| Basic earnings per share (in Korean won) | 510,207,989,749 | 1,114 |
### Consolidated Statements of Changes in Equity

**Doosan Infracore Co., Ltd. and Subsidiaries**

<table>
<thead>
<tr>
<th>Components of equity</th>
<th>Years Ended December 31, 2018 and 2019</th>
<th>(in Korean won)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share Capital</td>
<td>213,014,383,085</td>
<td>2,044,988,860,808</td>
</tr>
<tr>
<td>Surplus</td>
<td>(70,649,474,593)</td>
<td>(70,649,474,593)</td>
</tr>
<tr>
<td>Capital</td>
<td>213,014,383,085</td>
<td>2,044,988,860,808</td>
</tr>
<tr>
<td>Patent</td>
<td>15,369,022</td>
<td>154,356,219,760</td>
</tr>
<tr>
<td>Share of retained earnings of associates</td>
<td>(2,369,093,630)</td>
<td>(2,369,093,630)</td>
</tr>
<tr>
<td>Gain on valuation of financial property, plant and equipment</td>
<td>1,854,463,736</td>
<td>33,791,953,262</td>
</tr>
<tr>
<td>Revaluation reserves of components of equity</td>
<td>(3,09,506,066)</td>
<td>(3,09,506,066)</td>
</tr>
<tr>
<td>Remeasurement of net defined benefit liabilities</td>
<td>3,000,935,957</td>
<td>3,000,935,957</td>
</tr>
<tr>
<td>Net cash inflow from operating activities</td>
<td>2,044,988,860,808</td>
<td>2,044,988,860,808</td>
</tr>
</tbody>
</table>

---

### Consolidated Statements of Cash Flows

**Doosan Infracore Co., Ltd. and Subsidiaries**

<table>
<thead>
<tr>
<th>Cash flows from operating activities</th>
<th>Years Ended December 31, 2019 and 2018</th>
<th>(in Korean won)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit for the year</td>
<td>2,044,988,860,808</td>
<td>2,044,988,860,808</td>
</tr>
<tr>
<td>Dividends paid</td>
<td>(53,980,207,600)</td>
<td>(53,980,207,600)</td>
</tr>
<tr>
<td>Changes in cash and cash equivalents</td>
<td>2,044,988,860,808</td>
<td>2,044,988,860,808</td>
</tr>
<tr>
<td>Dividends received</td>
<td>12,982,337,562</td>
<td>12,982,337,562</td>
</tr>
<tr>
<td>Interest received</td>
<td>4,267,552,038,259</td>
<td>4,267,552,038,259</td>
</tr>
<tr>
<td>Interest paid</td>
<td>(166,701,900,364)</td>
<td>(166,701,900,364)</td>
</tr>
<tr>
<td>Cash flows from operating activities</td>
<td>1,037,907,544,286</td>
<td>1,037,907,544,286</td>
</tr>
<tr>
<td>Net cash from financing activities</td>
<td>2,044,988,860,808</td>
<td>2,044,988,860,808</td>
</tr>
<tr>
<td>Dividends paid</td>
<td>(53,980,207,600)</td>
<td>(53,980,207,600)</td>
</tr>
<tr>
<td>Proceeds from issuance of bonds</td>
<td>3,172,456,546,527</td>
<td>3,172,456,546,527</td>
</tr>
<tr>
<td>Proceeds from issuance of shares</td>
<td>154,356,219,760</td>
<td>154,356,219,760</td>
</tr>
<tr>
<td>Net cash inflow from operating activities</td>
<td>1,037,907,544,286</td>
<td>1,037,907,544,286</td>
</tr>
<tr>
<td>Net cash from investing activities</td>
<td>2,044,988,860,808</td>
<td>2,044,988,860,808</td>
</tr>
<tr>
<td>Disposal of short-term investment securities</td>
<td>1,037,907,544,286</td>
<td>1,037,907,544,286</td>
</tr>
<tr>
<td>Net cash from investing activities</td>
<td>2,044,988,860,808</td>
<td>2,044,988,860,808</td>
</tr>
<tr>
<td>Total cash flows for the year</td>
<td>4,082,896,401,694</td>
<td>4,082,896,401,694</td>
</tr>
<tr>
<td>Cash and cash equivalents at the end of the year</td>
<td>4,082,896,401,694</td>
<td>4,082,896,401,694</td>
</tr>
</tbody>
</table>
### Economic

#### Economic Growth: Sales Records

<table>
<thead>
<tr>
<th>Classification</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales million</td>
<td>6,567,572</td>
<td>7,335,108</td>
<td>8,183,469</td>
</tr>
<tr>
<td>Operating income million</td>
<td>664,769</td>
<td>813,177</td>
<td>843,377</td>
</tr>
<tr>
<td>Net income million</td>
<td>113,617</td>
<td>139,204</td>
<td>158,182</td>
</tr>
</tbody>
</table>

#### Financial Soundness: Financial Status

<table>
<thead>
<tr>
<th>Classification</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assets KRW million</td>
<td>10,276,090</td>
<td>11,029,167</td>
</tr>
<tr>
<td>Total equity KRW million</td>
<td>7,071,041</td>
<td>7,730,108</td>
</tr>
</tbody>
</table>

#### R&D investment

<table>
<thead>
<tr>
<th>Year</th>
<th>Korea %</th>
<th>R&amp;D investment KRW billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>9.9</td>
<td>5,053,901</td>
</tr>
</tbody>
</table>

#### R&D investment (Korea)

<table>
<thead>
<tr>
<th>Year</th>
<th>Korea KRW billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>5,053,901</td>
</tr>
</tbody>
</table>

### Corporate Governance

#### Corporate Governance Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
<th>Unit 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance rate of directors in BOD meetings</td>
<td>Korea %</td>
<td>86.9</td>
<td>85.7</td>
</tr>
</tbody>
</table>

#### CEO to Worker Remuneration Ratio

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
<th>Unit 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO remuneration million</td>
<td>1,105</td>
<td>1,514</td>
<td>1,463</td>
</tr>
<tr>
<td>Average remuneration per employee million</td>
<td>79</td>
<td>87</td>
<td>89</td>
</tr>
<tr>
<td>Ratio*</td>
<td>13</td>
<td>12</td>
<td>16.2</td>
</tr>
</tbody>
</table>

#### Ethical Management

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
<th>Unit 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion rate of ethical management training</td>
<td>Korea %</td>
<td>94.4</td>
<td>93.3</td>
</tr>
</tbody>
</table>

#### Customer Information

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
<th>Unit 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of employees who submitted a signed copy of statement of interests form</td>
<td>Korea no</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No. of employees who attended the ethical management training</td>
<td>Korea no</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Policy-related Expenditures

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
<th>Unit 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total political donation</td>
<td>Korea million</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total contributions to associations</td>
<td>million</td>
<td>1,514</td>
<td>1,271</td>
</tr>
</tbody>
</table>

### Latest Expenditures to Associations in 2019

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea Foundation for Cooperation of Large &amp; Small Business, Rural Areas</td>
<td>KRW 108 million</td>
<td></td>
</tr>
<tr>
<td>Incheon Chambers of Commerce &amp; Industry</td>
<td>KRW 270 million</td>
<td></td>
</tr>
<tr>
<td>Incheon Chambers of Commerce &amp; Industry</td>
<td>KRW 51 million</td>
<td></td>
</tr>
</tbody>
</table>

### Environmental

#### Environmental Expenditure and Investment

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
<th>Unit 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental investments and operating costs</td>
<td>KRW million</td>
<td>16.7</td>
<td>19.6</td>
</tr>
</tbody>
</table>

#### Environmental Management System

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
<th>Unit 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops with ISO 14001 (EMS) certification</td>
<td>Korea sides</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### Resources Usage

#### Water consumption

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of water consumed</td>
<td>million</td>
<td>557,644</td>
</tr>
</tbody>
</table>

#### Energy Consumption

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit 2017</th>
<th>Unit 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total TJ</td>
<td>2,343</td>
<td>2,478</td>
</tr>
</tbody>
</table>

### CSR Facts & Figures

- **Total oil consumption** includes natural gas, gaseous fuel, and liquefied gas.
- **Total electric power consumption** includes electricity, and electric power generated by own power generation.
- **Total natural gas consumption** includes sludge gas and liquefied gas.
- **Total water consumption** includes natural water, reclaimed water, and recycled water.
Source of Scope 1 emissions includes LNG, diesel fuel, LPG, gasoline, and carbon dioxide emissions. There is a difference between the total emissions volume by GHG type and the total of all figures. All figures are rounded off to the nearest tenth, and therefore there may be a singular number of differences in the sum of figures.

<table>
<thead>
<tr>
<th>Classification Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incheon</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>282,492</td>
<td>351,698</td>
<td>364,342</td>
</tr>
<tr>
<td>Scope 1</td>
<td>3,464</td>
<td>4,970</td>
<td>3,824</td>
</tr>
<tr>
<td>Scope 2</td>
<td>278,982</td>
<td>346,728</td>
<td>360,518</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,473</td>
<td>2,437</td>
<td>3,320</td>
</tr>
<tr>
<td>Scope 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Scope 2</td>
<td>3,473</td>
<td>2,437</td>
<td>3,320</td>
</tr>
</tbody>
</table>

* Legal standard (mg/m): company’s internal standard (mg/m); Legal standard (ppm): company’s internal standard (ppm); Continuous type/Non-continuous type:
  * Continuous type: legal limit (ppm): company’s internal limit (ppm);
  * Electric arc furnace: legal limit (ppm): company’s internal limit (ppm)

** Emissions of air pollutants

<table>
<thead>
<tr>
<th>Classification Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incheon</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,461</td>
<td>3,191</td>
<td>2,918</td>
</tr>
<tr>
<td>Scope 1</td>
<td>2,432</td>
<td>2,371</td>
<td>2,099</td>
</tr>
<tr>
<td>Scope 2</td>
<td>1,029</td>
<td>820</td>
<td>819</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,473</td>
<td>2,437</td>
<td>3,320</td>
</tr>
<tr>
<td>Scope 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Scope 2</td>
<td>3,473</td>
<td>2,437</td>
<td>3,320</td>
</tr>
</tbody>
</table>

* Legal standard (mg/m): company’s internal standard (mg/m); Legal standard (ppm): company’s internal standard (ppm); Continuous type/Non-continuous type:
  * Continuous type: legal limit (ppm): company’s internal limit (ppm);
  * Electric arc furnace: legal limit (ppm): company’s internal limit (ppm)

** Emissions of water pollutants

<table>
<thead>
<tr>
<th>Classification Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incheon</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>27,119</td>
<td>31,945</td>
<td>28,118</td>
</tr>
<tr>
<td>Scope 1</td>
<td>27,119</td>
<td>31,945</td>
<td>28,118</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>51,288</td>
<td>74,244</td>
<td>80,539</td>
</tr>
<tr>
<td>Scope 1</td>
<td>51,288</td>
<td>74,244</td>
<td>80,539</td>
</tr>
</tbody>
</table>

* Legal standard (mg/L): company’s internal standard (mg/L); Legal standard (ppm): company’s internal standard (ppm); Continuous type/Non-continuous type:
  * Continuous type: legal limit (ppm): company’s internal limit (ppm); Legal standard (ppm): company’s internal limit (ppm)

** Effluents and Waste

<table>
<thead>
<tr>
<th>Classification Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Korea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total waste</td>
<td>37,655</td>
<td>58,865</td>
<td>87,137</td>
</tr>
<tr>
<td>General waste</td>
<td>27,532</td>
<td>45,297</td>
<td>62,549</td>
</tr>
<tr>
<td>Specified waste</td>
<td>10,123</td>
<td>13,568</td>
<td>24,588</td>
</tr>
<tr>
<td>Recycling rate %</td>
<td>94</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td><strong>China</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total waste</td>
<td>40,962</td>
<td>51,398</td>
<td>65,983</td>
</tr>
<tr>
<td>General waste</td>
<td>30,484</td>
<td>37,940</td>
<td>54,394</td>
</tr>
<tr>
<td>Specified waste</td>
<td>9,478</td>
<td>13,458</td>
<td>16,783</td>
</tr>
<tr>
<td>Recycling rate %</td>
<td>91</td>
<td>96</td>
<td>100</td>
</tr>
</tbody>
</table>

* OIFR data has been managed since 2018
  ** Chinese (2019: 43,880) * Based on accidents requiring medical care covered by Industrial Accident Insurance

** Waste discharge and reuse

<table>
<thead>
<tr>
<th>Classification Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Korea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total waste</td>
<td>36,697</td>
<td>57,577</td>
<td>87,547</td>
</tr>
<tr>
<td>General waste</td>
<td>26,416</td>
<td>43,172</td>
<td>60,979</td>
</tr>
<tr>
<td>Specified waste</td>
<td>10,281</td>
<td>14,405</td>
<td>26,568</td>
</tr>
<tr>
<td>Recycling rate %</td>
<td>93</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td><strong>China</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total waste</td>
<td>43,391</td>
<td>53,996</td>
<td>68,976</td>
</tr>
<tr>
<td>General waste</td>
<td>32,055</td>
<td>41,359</td>
<td>59,877</td>
</tr>
<tr>
<td>Specified waste</td>
<td>11,336</td>
<td>12,637</td>
<td>19,099</td>
</tr>
<tr>
<td>Recycling rate %</td>
<td>90</td>
<td>99</td>
<td>100</td>
</tr>
</tbody>
</table>

* Includes both hazardous and non-hazardous waste
  ** Waste steel, waste wood

** Occupational Safety and Health

<table>
<thead>
<tr>
<th>Classification Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Korea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of work injuries</td>
<td>37,655</td>
<td>58,865</td>
<td>87,137</td>
</tr>
<tr>
<td>Total number of work injuries by employee *</td>
<td>400,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>China</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of work injuries</td>
<td>40,962</td>
<td>51,398</td>
<td>65,983</td>
</tr>
<tr>
<td>Total number of work injuries by employee *</td>
<td>400,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* OIFR data has been managed since 2018

** Occupational Illness Frequency Rate
**Shared Growth**

### Support for Suppliers

#### Financial support

- **Number of suppliers:**
  - Korea: 47
  - China: 40

- **Financial support:**
  - Korea: 39
  - China: 25
  - Global: 64

- **Amount of financial support:**
  - Korea: KRW 2,866 million
  - China: KRW 2,270 million
  - Global: KRW 1,582 million

- **Number of payment settlement cases:**
  - Korea: 0.1
  - China: 0.3
  - Global: 0.2

- **Number of payments:**
  - Korea: Once a month
  - China: Once a month
  - Global: Once a month

* Including indirect support

### Technical development support

- **Support for developing technology:**
  - Korea: Cases 45
  - China: Cases 28

- **Support for protecting technology:**
  - Korea: Cases 7
  - China: Cases 6

### Education support

- **Training courses:**
  - Korea: 14
  - China: 14

- **Suppliers who completed training:**
  - Korea: Persons 116
  - China: Persons 112

### Complementary enhancement support

- **Support for enhancing competitiveness:**
  - Korea: man-day 286
  - China: man-day 286

* Fair Trade Commission standard: 5 days=1 person (7 day=8 hours, Based on the application period of participation)

### Past development capacity enhancement support

- **Portion of existing suppliers who sent employees to overseas worksites:**
  - Korea: 36%
  - China: 28%

- **Portion of existing suppliers who sent employees to overseas worksites:**
  - Korea: 25%
  - China: 33%

#### China support

- **Companies:**
  - Korea: 77
  - China: 77

### EHS support

- **Korea Companies:**
  - 44
  - 46

* In 2020, calculated on criteria for “Preventive EHS Support”. 18% were revised, and accordingly, the number of suppliers which had received EHS support for the past three years was revised.

### Employees

#### Employment

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees</td>
<td>Korea</td>
<td>Persons</td>
<td>2,600</td>
<td>2,740</td>
</tr>
<tr>
<td></td>
<td>China</td>
<td>Persons</td>
<td>2,050</td>
<td>2,050</td>
</tr>
<tr>
<td></td>
<td>Global</td>
<td>Persons</td>
<td>4,650</td>
<td>4,790</td>
</tr>
</tbody>
</table>

#### By job

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>Temporary</td>
<td>Persons</td>
<td>1,455</td>
<td>1,555</td>
</tr>
<tr>
<td>Technical</td>
<td></td>
<td></td>
<td>1,455</td>
<td>1,455</td>
</tr>
</tbody>
</table>

#### By employment type

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary</td>
<td>Dismissed</td>
<td>Persons</td>
<td>26</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Rate of temporary</td>
<td>%</td>
<td>6.9</td>
<td>7.4</td>
</tr>
</tbody>
</table>

#### By job type

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>Temporary</td>
<td>Persons</td>
<td>1,455</td>
<td>1,555</td>
</tr>
<tr>
<td></td>
<td>Technical</td>
<td></td>
<td>1,455</td>
<td>1,455</td>
</tr>
</tbody>
</table>

#### By job

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary</td>
<td>Dismissed</td>
<td>Persons</td>
<td>26</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Rate of temporary</td>
<td>%</td>
<td>6.9</td>
<td>7.4</td>
</tr>
</tbody>
</table>

#### By employment type

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>Temporary</td>
<td>Persons</td>
<td>1,455</td>
<td>1,555</td>
</tr>
<tr>
<td></td>
<td>Technical</td>
<td></td>
<td>1,455</td>
<td>1,455</td>
</tr>
</tbody>
</table>

#### By job type

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary</td>
<td>Dismissed</td>
<td>Persons</td>
<td>26</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Rate of temporary</td>
<td>%</td>
<td>6.9</td>
<td>7.4</td>
</tr>
</tbody>
</table>

### Community Involvement

#### Community Involvement Activities

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees who participated in CC activities</td>
<td>Korea</td>
<td>Persons</td>
<td>116</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>China</td>
<td>Persons</td>
<td>77</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>Global</td>
<td>Persons</td>
<td>193</td>
<td>196</td>
</tr>
</tbody>
</table>

#### Total hours of CC activities

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>Hours</td>
<td>5,747</td>
<td>4,447</td>
<td>5,993</td>
</tr>
</tbody>
</table>

#### Community involvement

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees in the salary/fundraising donation campaign</td>
<td>Korea</td>
<td>Persons</td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>

#### Annual fund raised by the salary/fundraising donation campaign

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>KRW million</td>
<td>1,021</td>
<td>1,021</td>
<td>1,021</td>
</tr>
</tbody>
</table>

* Excluding individuals who earned while working

#### Education

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
</table>
| Turnover rate by age
<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>%</td>
<td>1.32</td>
<td>1.29</td>
<td>1.25</td>
</tr>
</tbody>
</table>

#### Average annual training hours per person

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>KRW 6,100</td>
<td>123</td>
<td>123</td>
<td>123</td>
</tr>
</tbody>
</table>

#### Average annual training expenses per person

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRW</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td></td>
</tr>
</tbody>
</table>

* There was a change in the per-capita annual average training expense management standards in 2019. Accordingly, training expenses per person for the past three years has been recalculated.

* Korea's calculation is based on the average exchange rate of the year

#### Participation rate in education and human rights protection

<table>
<thead>
<tr>
<th>Classification</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>%</td>
<td>35.7</td>
<td>35.6</td>
<td>35.6</td>
</tr>
</tbody>
</table>

* In 2020, calculated on criteria for “Supportive EHS Support”. 18% were revised, and accordingly, the number of suppliers which had received EHS support for the past three years was revised.
Independent Assurance Report

We were engaged by Doosan Infracore to provide limited assurance on the ‘2019 Doosan Infracore Integrated Report’ for the year ended December 31, 2019 (further “the Report”).

Context and Scope
Our engagement was designed to provide limited assurance on whether the Report is presented fairly, in all material respects, in accordance with the Sustainability Reporting Standards of the Global Reporting Initiative (GRI). We do not provide any assurance on the achievability of the objectives, targets and expectations of Doosan Infracore.

The scope of our engagement conforms to the KPMG Sustainability Assurance Manual™ (KSAM™), including the aspect of “materiality”. With regards to financial data, our procedures were limited to verifying that they were correctly derived from audited financial statements. To obtain a thorough understanding of Doosan Infracore’s financial results and position, the audited financial statements produced on 30 March 2020 should be referred to.

Responsibilities
As stated in the ‘Reporting Principles and Standard,’ Doosan Infracore is responsible for all content within the Report in respect of the GRI Sustainability Reporting Standards. It is the responsibility of Doosan Infracore’s management to establish and maintain appropriate performance management and internal control systems from which the reported sustainability information is derived.

Our responsibility is to perform a limited assurance engagement and to express a conclusion based on the work performed.

Independence
In conducting our engagement, we have complied with the requirements of the International Federation of Accountants (IFAC) Code of Ethics for Professional Accountants, issued by the International Ethics Standards Board for Accountants. We do not engage in any and all activities that may influence our independence from Doosan Infracore. KPMG has systems and processes in place to monitor compliance with the Code, and to prevent conflicts regarding independence.

Assurance Standards
We conducted our engagement based on the International Standard on Assurance Engagements (ISAE) 3000: Assurance Engagements other than Audits or Reviews of Historical Financial Information, issued by the International Auditing and Assurance Standards Board, and also ISAE1000AS. The standards require that we comply with applicable ethical requirements, including independence requirements, and that we plan and perform the engagement to obtain limited assurance about whether the Report is free from material misstatement.

Limitations
A limited assurance engagement is substantially less in scope than a reasonable assurance engagement, and consequently does not enable us to obtain assurance on all significant matters that we may become aware of in a reasonable assurance engagement. Accordingly, we do not express a reasonable assurance conclusion.

This report has been prepared solely for Doosan Infracore in accordance with the terms of our engagement. We do not accept or assume responsibility to anyone other than Doosan Infracore for our work, or for the conclusions we have reached in the assurance report.

Main Assurance Procedures
Our engagement was designed to provide limited assurance on whether the Report is presented fairly, in all material respects, in accordance with the reporting criteria. Procedures performed to obtain a limited level of assurance on a sustainability report consists of making inquiries, primarily of persons responsible for the preparation of information presented in the integrated report, and applying analytical and other evidence gathering procedures, as appropriate. These procedures included the following:

- Confirmation on whether the financial information presented in the Report was correctly derived from Doosan Infracore’s audited financial statements.
- Inquiries to gain an understanding of Doosan Infracore’s processes for determining the material issues for key stakeholder groups.
- Interviews with relevant staff at corporate and business unit levels responsible for providing the information in the Report.
- Visit to Doosan Infracore’s offices in Doosan Tower.
- Comparing the information presented in the Report to determine whether it is in line with our overall knowledge of, and experience with, Doosan Infracore’s performance on non-financial value creation.

Opinion

* Stakeholder Inclusiveness
  - Doosan Infracore operates communication channels with key stakeholders such as shareholders/investors, customers/dealers, employees, suppliers, local communities (environment/NGOs), local/central government and media.
  - We are not aware of any key stakeholder group that has been excluded from dialogue in the Report.

* Sustainability Context
  - Doosan Infracore has established a process to incorporate CSR in management’s decision making and the business management plans of relevant teams, thereby securing continuity.
  - We confirmed that Doosan Infracore recognizes general business management and social responsibility management comprehensively and applies such understanding within the Report.

* Materiality
  - Doosan Infracore conducts a materiality test in determining material issues.
  - We are not aware of any material aspects concerning its sustainability performance which have been excluded from the Report.

* Completeness
  - Doosan Infracore applies reporting scope, boundary and temporal criteria.
  - In terms of criteria mentioned above, we confirm that the Report is suitable for stakeholders to assess social responsibility performance.

Based on the procedures performed, as described above, nothing has come to our attention to indicate that the Report is not presented fairly, in all material respects, in accordance with the reporting criteria.

July 2020
KPMG Samjong Accounting Corp.
CEO Kim, Kyo Tai

Kyo Tai Kim
Global Network

Headquarters
Doosan Infracore Co., Ltd.
489, Injung-ro, Dong-gu, Incheon, Korea

Doosan Infracore(China) Investment Co., Ltd.
19th Fl., Tower B, Gateway, No. 118, Xiaguang, North Road, East Third Ring, Chaoyang District, Beijing 100023, China

Doosan(China) Financial Leasing Corp.
20th Fl., Tower B, Gateway, No. 118, Xiaguang, North Road, East Third Ring, Chaoyang District, Beijing 100023, China

Production Subsidiaries
Doosan Infracore Co., Ltd.
489, Injung-ro, Dong-gu, Incheon, Korea

Doosan Infracore Co., Ltd.
185, Dongjiangsan-ro, Gunsan-si, Jeollabuk-do, Korea

Doosan Infracore China Co., Ltd.
No. 28, Wuzhishan road, ECO & Tech. Development Zone Yantai, Shandong, China

Doosan Infracore Norway AS.
Varholvegen 149 N-6440 Elnesvågen, Norway

Sales Subsidiaries
Seoul, Korea | Yantai, China | Beijing, China | Chennai, India | Americana, Brazil | Santiago, Chile | Elnesvågen, Norway | Groot-Ammers, Netherlands | Suwanee, U.S. | Prague, Czech Republic

Parts Distribution Center (PDC)
Ansan, Korea | Yantai, China | Halle, Germany | Dubai, UAE | Singapore | Americana, Brazil | Miami, U.S. | Atlanta, U.S. | Seattle, U.S. | Cardiff, U.K.

UN Global Compact – 10 Principles

Human Rights
Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and
Principle 2: make sure that they are not complicit in human rights abuses.

Labour
Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
Principle 4: the elimination of all forms of forced and compulsory labour;
Principle 5: the effective abolition of child labour; and

Environment
Principle 7: Businesses should support a precautionary approach to environmental challenges;
Principle 8: undertake initiatives to promote greater environmental responsibility; and
Principle 9: encourage the development and diffusion of environmentally friendly technologies.

Anti-Corruption
Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

Doosan Infracore supports the Ten Principles of the UN Global Compact.