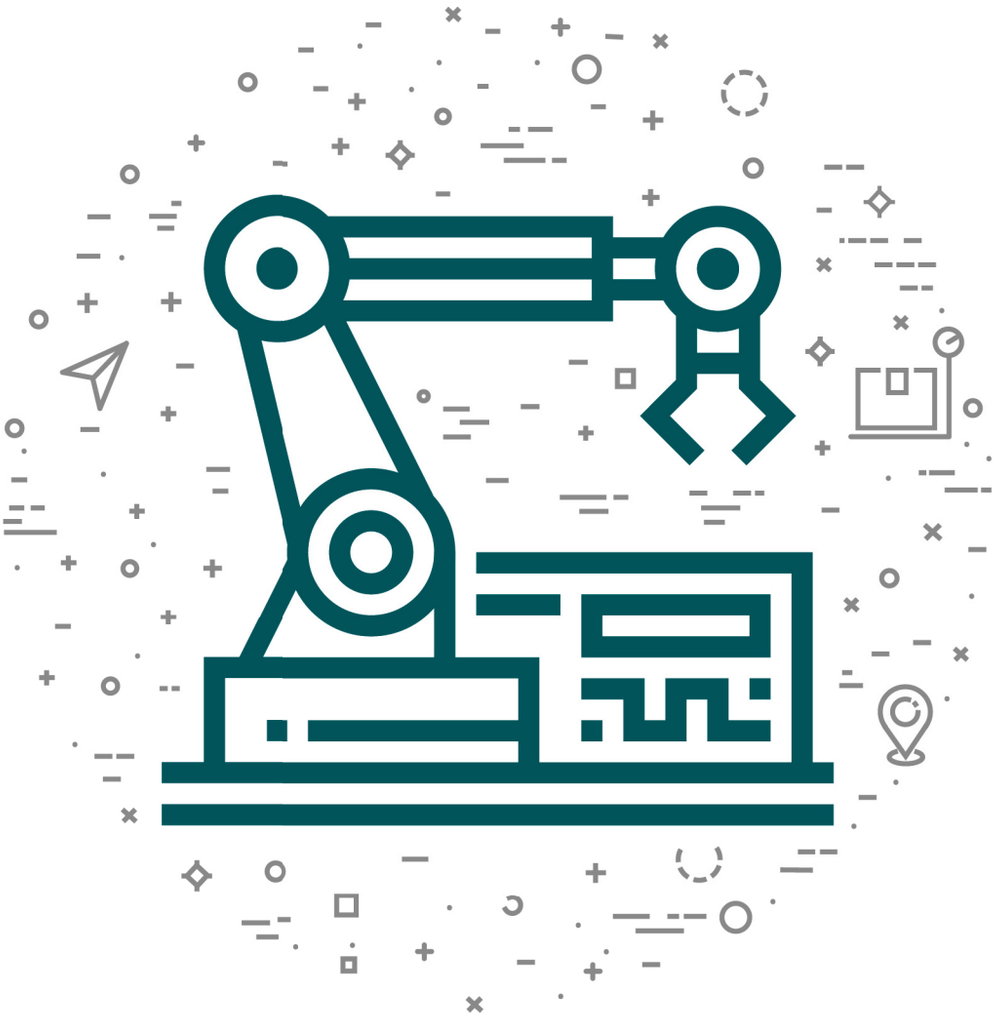
INVEST KOREA

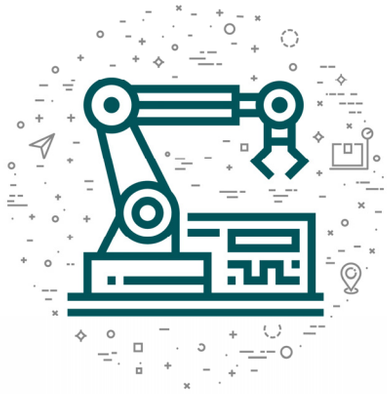
INVESTMENT
OPPORTUNITIES
IN KOREA

Machinery



Contents

* Figures on the report show the likely adjustment of average yearly currency rates from Korean Won (KRW) to the US dollar (USD). A rate adjustment is adopted particularly reflecting the recent average market variations to eliminate the valuation effects arising from movements in exchange rates in case when the data expressed shows an annual growth rate on the paper.
* Rate adjusted figures are rounded off, but the sum is correct down or up to the decimal when the rounded values are not equal to the adjustment.

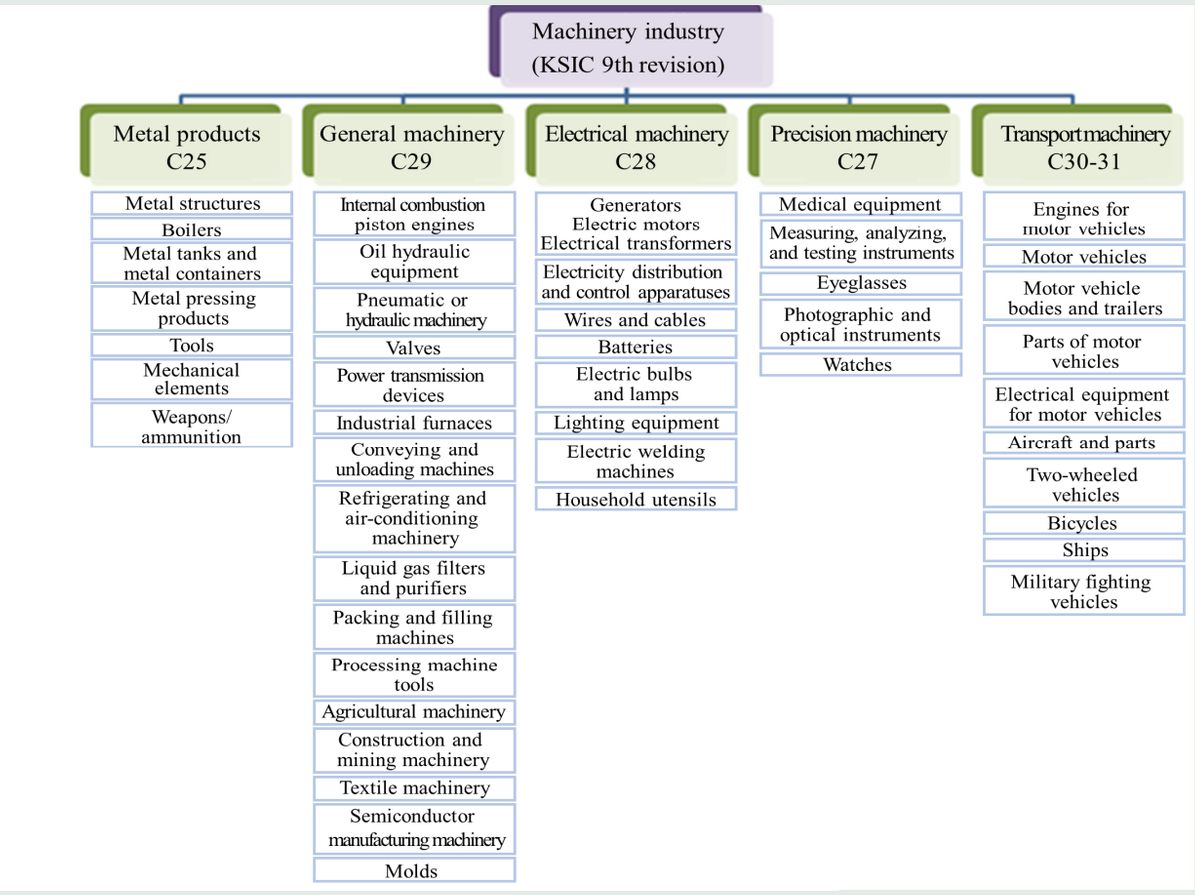


1 Industry Trends

Definition and Classification

- The Korean Standard Industrial Classification (KSIC) classifies the machinery industry into five industries: general machinery, electrical machinery, precision machinery, transport machinery, and metal products (fabricated metal products).
  - In general, the machinery industry only refers to general machinery among the five machinery industries, which provides production facilities and components to other industries.
  - The main items classified as general machinery according to the KSIC include internal combustion piston engines, turbines, pumps, compressors, taps and valves; components such as bearings, gears and power transmission devices, etc.; machine tools, construction and mining machinery, refrigerating and air conditioning machinery, textile machinery, molds, etc.

■ Five Major Machinery Industries Based on the Korean Standard Industrial Classification ■



Source: Statistics Korea

1.1 Market Trends in Korea

Status of the general machinery industry

- The general machinery industry is the core of the capital goods industry, and ranks fifth in the Korean manufacturing sector in the production value, first in the number of businesses, third in the number of workers, and fourth in added value.
  - Since 2013, production has been steadily increasing, recording a steady increase of 5.0% annually from 2013 to 2017, and thereby reaching USD 186.5 billion in 2017.
  - Production has been rising since the second half of 2016 because of recovery in the manufacturing sector in major export destination countries such as China, the United States and Europe, and the expansion of facility investment caused by booming demand in the semiconductor and display industries.
  - The number of businesses increased from 9,181 in 2013, to 9,790 in 2017, marking an average annual increase of 1.6%. Meanwhile, the number of employees increased by 1.7% per year from 313,603 in 2013, to 335,089 in 2017.
  - In terms of the size of workers in the machinery industry, the number of businesses with 10 to 49 employees is 86.0%, and the shares of their employees as well as their added value account for 50.9% and 39.0%, respectively, in the general machinery industry.

Status of the Machinery Industry in Korea's Manufacturing Sector

Medium classification by KSIC		Production			Number of businesses			Number of workers			Added value		
Code	Item name	USD 100 million	Ratio	Rank	Businesses	Ratio	Rank	Thousand people	Ratio	Rank	USD 100 million	Ratio	Rank
Code	Item name	13,423	100.0	-	69,458	100.0	-	2,955	100.0	-	4,801	100.0	-
29	Manufacturing (10-33)	1,070	8.0	5	9,790	14.1	1	335	11.3	3	397	8.3	4

Source: Statistics Korea, Report on Mining and Manufacturing Survey, based on businesses with 10 or more employees

Number of Workers in the Machinery Industry

	General machinery (C29)					
	Number of companies		Number of employees		Added value	
	Companies	Ratio (%)	Thousand people	Ratio (%)	USD million	Ratio (%)
Total	9,790	100.0	335	100.0	399	100.0
10-49	8,417	86.0	171	50.9	156	39.0
50-299	1,302	13.3	124	36.9	153	38.3
300 or more	71	0.7	41	12.1	90	22.7

Source: Statistics Korea, Report on Mining and Manufacturing Survey, based on businesses with 10 or more employees

Number of Companies, Employees, and Production in the Machinery Industry

(Unit: Companies, people, USD million, %)

	2013	2014	2015	2016	2017	Annual average growth rate (2013-2017)
Number of companies	9,181	9,521	9,526	9,416	9,790	1.6
Number of employees	313,603	319,008	315,282	316,519	335,089	1.7
Production amount	88,034	90,533	88,773	89,358	106,814	5.0
Shipment amount	87,508	90,119	88,562	89,049	105,652	4.8

Source: Statistics Korea, Report on Mining and Manufacturing Survey, based on businesses with 10 or more employees
Note: Since 2016, based on the KSIC 10th Revision

- General machinery exports have declined since 2016 because of the prolonged economic slump in China, weak competitive prices because of the yen's extended weakness, and a decrease in facility investment in oil-producing countries in the Middle East. However, after the second half of 2016, the economic growth of developed countries such as the United States as well as those in the European Union, and the recovery of emerging economies such as India, led to an increase in SOC and facility investment.
  - General machinery exports grew at an annual average rate of 4.3% from 2013 to 2018, reaching USD 53.284 billion in 2018.
  - As for the average annual growth rate of exports from 2013 to 2018 in general machinery, semiconductor and display manufacturing machinery have the highest rate with 20.7%, followed by bearings and gears and power transmission devices with 9.1%, agriculture and forestry machinery with 3.7%, and pumps and compressors with 3.1%.
- Imports in general machinery grew at an annual rate of 2.4% from 2013 to 2018, reaching USD 39 billion in 2018.
  - As for the average annual growth rate of imports from 2013 to 2018 in general machinery, semiconductor and display manufacturing machinery have the highest rate with 22.4%, followed by textile machinery with 11.3%; refrigerating, air-conditioning, filtering, and distilling equipment and gas generators with 9.1%; forming machinery and machine tools with 4.4%; and pumps and compressors with 3.1%.

Trends of Imports and Exports in the Machinery Industry

(Unit: USD million, %)

	2013	2014	2015	2016	2017	2018	Annual average growth rate (2013-2018)
Export	43,256	45,008	44,490	41,991	48,154	53,284	4.3
Import	35,052	35,916	33,665	32,509	42,607	39,439	2.4
Trade balance	8,204	9,092	10,825	9,482	5,547	13,845	11.0

Source: Korea Customs Service, Statistical Yearbook of Trade

Export Trends of Major Items in the Machinery Industry

(Unit: USD million, %)

	2013	2014	2015	2016	2017	2018	Annual average growth rate (2013-2018)
Internal combustion piston engines	2,407	2,730	2,882	2,297	2,466	2,471	0.5
Pumps and compressors	5,424	5,588	5,758	5,986	5,925	6,306	3.1
Bearings and gears and power transmission devices	1,595	1,887	1,916	2,106	2,250	2,461	9.1
Refrigerating, air-conditioning, filtering, and distilling equipment and gas generators	4,754	5,009	5,135	4,960	4,409	4,955	0.8
Agriculture and forestry machinery	621	698	715	616	694	746	3.7
Forming machinery and machine tools	2,824	2,982	3,110	2,673	3,160	3,428	4.0
Mining and construction machinery	6,290	6,279	4,693	4,208	5,403	6,287	-0.01
Textile machinery	2,172	1,873	1,668	1,582	1,805	1,542	-6.6
Semiconductor and display manufacturing machinery	3,265	3,721	4,388	4,154	6598	8,371	20.7
Molds and casts	1,850	2,223	1,943	1,829	1,879	1,759	-1.0

Source: Korea Customs Service, Statistical Yearbook of Trade

Import Trends of Major Items in the Machinery Industry

(Unit: USD million, %))

	2013	2014	2015	2016	2017	2018	Annual average growth rate (2013-2018)
Internal combustion piston engines	3,438	2,485	2,163	1,765	1,881	2,094	-9.4
Pumps and compressors	6,584	7,013	6,316	5,702	5,985	5,979	-1.9
Bearings and gears and power transmission devices	2,346	2,333	2,140	2,024	2,105	2,200	-1.3
Refrigerating, air-conditioning, filtering, and distilling equipment and gas generators	2,545	2,596	2,435	2,336	2,839	3,229	4.9

	2013	2014	2015	2016	2017	2018	Annual average growth rate (2013-2018)
Agriculture and forestry machinery	408	459	382	473	465	505	4.4
Forming machinery and machine tools	2,079	2,081	1,890	1,648	1,864	1,830	-2.5
Mining and construction machinery	1,369	1,301	1,112	962	1,061	1,050	-5.2
Textile machinery	433	422	372	457	564	740	11.3
Semiconductor and display manufacturing machinery	4,666	5,742	5,892	8,354	16,712	12,816	22.4
Molds and casts	116	107	129	108	135	139	3.7

Source: Korea Customs Service, Statistical Yearbook of Trade

1.2 Industrial Competitiveness

Strengths of Korea's machinery industry

- The strengths of the Korean machinery industry is maintaining competitive prices compared to Japan, the largest producer of machinery; having Internet-based technology with its advanced IT industry; and owning a developed ecosystem of industries where front-end and back-end industries interact closely, which include materials and components, automobiles, aviation, and shipbuilding.
  - Quality and performance are superior to developing countries, and the external competitiveness of the mid-tech area has been secured.
  - Industrial ecosystems are well established with closely related front-end and back-end industries, such as materials and components, automobiles, aviation, and shipbuilding.
  - Collaborative infrastructures, such as parts design and processing, are in place, and the production and assembly technology are excellent.
  - Businesses are actively working on technology development, and government is strengthening its support.

Growth opportunities for Korea's machinery industry

- ① Increasing demand for investment in facilities because of industrialization in emerging countries ② Increasing demand for high-tech machinery equipment in line with the development of China's manufacturing structure ③ New markets created by the spread of convergence technologies and products based on the Fourth Industrial Revolution

Export Ranking of Major Items in the Global Machinery Industry

	Germany	Japan	USA	China	Korea
Internal combustion piston engines	1	4	2	6	14
Liquid pumps	1	5	2	3	11
Air or vacuum pumps and compressors	1	5	3	2	8
Bearings	2	3	4	1	9
Power transmission devices	1	4	3	2	7
Conveying and unloading machines	2	5	3	1	10
Refrigerating and air-conditioning machines	3	8	2	1	7
Parts of other general machinery	1	4	3	2	11

Source: Korea Association of Machinery Industry (2017)

Development potential of Korea's machinery industry

- The domestic machinery industry is expected to increase its market dominance in the Korean and emerging markets thanks to the spread of smart factories with abundant demand in industries, such as the automobile industry and the semiconductor and display industry in Korea.
  - The self-sufficiency of the material and parts of machinery and equipment are expected to be improved, and the capacity to supply manufacturing systems, combined with SW service, will be strengthened.
  - Korea's market dominance will improve with the digitization of Mexico, Turkey, and other emerging southern countries.
- In the case of semiconductor and display equipment, the production and exports of equipment in Korea will increase because of the increase in the production of large Korean companies that manufacture semiconductors, the expansion of Chinese panel production, and the construction of overseas module factories. However, exports to global conglomerates are expected to be low.
- In the case of processing equipment, the product supply structure will not change at a large scale, but the proportion of convergence equipment and hybrid equipment within the main items is expected to expand relatively.
- Construction equipment is expected to have diversified demand patterns by region according to its purpose, and its production in Korea is expected to grow based on export markets.
- The production of manufacturing robots is determined by the demand from the back-end industry, which is expected to increase in the electric and electronic industry and the machinery industry.

- As the robots used in manufacturing aim to increase productivity on manufacturing sites, the important factors in determining purchasing are low prices and improved performance by robots.

Global status and goals

- Achieving the No. 1 market share in display equipment in China and the No. 1 in production value worldwide (2030)
- Maintaining the world's sixth position in the processing equipment field and expanding the supply of multipurpose production facilities (2030)
- The proportion of eco-friendly and smart heavy equipment is expected to increase to 15%, achieving exports of USD 12 billion (2030).
- Taking a quantum leap to become the fourth global powerhouse of the intelligent robot industry
  - The robotics market is expected to grow from USD 5.1 billion in 2018 to USD 13.6 billion in 2023.
  - The number of robot-specialized companies with a revenue of more than USD 88.42 million is expected to increase from 6 companies in 2018 to 20 in 2023.
  - The number of manufacturing robots supplied (cumulative basis) is expected to increase from 320,000 units in 2018 to 700,000 units in 2023.

1.3 Promising Fields in Korea

Recent trends in Korea's robot industry

- (Market for Manufacturing Robots) The Korean robot market has an annual average growth rate of 10% over the past five years, ranking fifth in the world with about USD 2.7 billion of scale in 2017.
  - More than 80% of the demand for robots comes from the automotive market and the electrical and electronic markets with small-batch and mass production systems.
  - The utilization rate of robots is low in the roots, textiles, and food and beverage industries, requiring improvement in the work environment and an increased supply of the labor force.
- (Companies Producing Manufacturing Robots) Out of the total of 718 robot companies, only 2 companies make more than USD 170 million in sales, and the remaining 686 companies (95% of the total) make less than USD 8 million in sales.

- The Korean market leaders in this field are Hyundai Robotics (motor vehicles), Robostar Co., Ltd. (household appliances), and Kohyoung Technology (semiconductors), which have secured large-scale demand from manufacturers of automobiles, home appliances, and semiconductors.
- Recently, latecomers such as Hanwha Precision Machinery (March 2017), Neuromeca (March 2017), and Doosan Robotics (February 2017), competitively launched cooperative robots and entered the manufacturing robot market.

Distribution Status of Korean Manufacturing Robots

(Unit: ea, %)

Classification	Motor vehicles	Electric and electronic	Root industry	Plastic and chemistry	Food and beverage	Machinery	Other Manufacturing	Others	Total
Number	87,417	141,691	4,112	10,072	1,041	3,624	2,504	22,919	273,380
Ratio	32.0	51.8	1.5	3.7	0.4	1.3	0.9	8.4	100.0

Source: IFR 2018, WR Industrial Robots

Number of Korean Robot Manufacturing Companies by Revenue Size

(Unit: Companies, %)

Classification	USD 170 million or more	USD 86 million or more	USD 43 million or more	USD 8.6 million or more	USD 4.3 million or more	Less than USD 4.3 million
Companies	2	5	7	22	51	631
Distribution	0.3	0.7	1.0	3.1	7.1	87.9

Source: Joint work of ministries, Third Basic Plan for Development of Intelligent Robots (August 2019)

Status of Korean Companies Producing Service Robots by Revenue Size

(Unit: Companies, %)

Classification	USD 43 million or more	USD 8.6 million or more	USD 4.3 million or more	USD 0.86 million or more	USD 0.86 million
Companies	2	3	12	133	322
Distribution	0.4	0.6	2.5	28.2	68.2

Source: Joint work of ministries, Third Basic Plan for Development of Intelligent Robots (August 2019)

- (Service Robot Market) It has grown at an annual average rate of 9% over the past five years, amounting to USD 530 million in 2017. Except for cleaning robots, logistics robots and medical robots are in the early stages of market formation.
  - The market share consists of household robots (38.2%), medical (13.7%), education and research (11.4%), agriculture, forestry and fishery (6.5%), etc.
  - Exports amounted to approximately USD 88 million, including cleaning robots worth USD 55 million (about 60%), while imports reached about USD 35 million, including medical robots worth USD 26 million (about 77%).

- (Service Robot Companies) Among the total of 472 companies, there are 2 large companies (Samsung Electronics and LG Electronics), 17 medium-sized companies, and 467 small and medium-sized enterprises (SMEs), accounting for 99% of the total.
  - Service robot products that are under development and testing include Smart Home Robot (LG Electronics), Autonomous Mobile Robot (Naver), and Wearable Robots (Samsung Electronics and Hyundai Motor Company).
  - meerecompany succeeded in commercializing the first laparoscopic surgical robot in Korea (March 2018).
  - CJ Korea Express and Shinsegae are preparing to introduce logistics robots, while Woowa Brothers Corp.* is developing outdoor delivery robots for food delivery.
    * A food tech company that runs "Baedal Minjok," the nation's No. 1 delivery app
  - Curaco Inc. launched the Smart Nursing Bidet (excretory care robot) for severely impaired patients and became the world's first company to be covered by Japan's Long-Term Care Insurance (October 2018).
- (Robot Parts and Software Market) It achieved about USD 1.2 billion in 2017, growing at an average annual rate of 29.3% over the past five years.
  - The proportion of driving and structural parts is higher than that of control parts and software because many robot products with simple sensing and control devices are used in electric and electronic products.
  - Curaco focuses on securing core parts and software technology of next-generation robots rather than trying to localize the parts that are mainly made in advanced countries.
- (Robot Parts and Software Companies) Companies in the robot parts and software industries are mostly small, with only 1 large company and 12 mid-sized companies out of 1,000 companies in total.
  - The proportions of companies by type of parts are driving (27%), sensing (15%), structure (14%), control (11%), and software (8%).

Status of Korean Robot Parts and Software Companies by Sales

(Unit: Companies, %)

Classification	USD 43 million or more	USD 8.6 million or more	USD 4.3 million or more	USD 0.86 million or more	USD 0.86 million
Companies	1	19	43	317	621
Distribution	0.1	1.9	4.3	31.7	62.0

Source: Joint work of ministries, Third Basic Plan for Development of Intelligent Robots (August 2019)

Promising fields in Korea's robot industry

- Manufacturing robots are needed for three major business processes: roots, textiles, and food and beverages, which have a poor working environment lacking in workforce.
- Out of the 14 service robots, 4 are considered promising: caring, wearable, medical and logistics; based on global market size, business potential, and expected values.

Reasons for Selecting Four Service Robots

Classification		Subfield	Reasons for selection
Public led (Government 50%, Local government 50%)	Care	- Entry-level meal care robot - Dual-arm transfer robot - Silver care robot	- Most closely related to our living - Global sales quantity - High capacity in the Korean industry
	Wearable	- Labor support robot - Robots to assist the elderly and the disabled	- Most promising in the long run - Most unexplored field at present
Private led (Government 50%, Private 50%)	Medical care	- AI-based smart surgical robots - Surgical robot arm	- High technical barriers - High risk and high return
	Logistics	- Smart logistics robot - Robot for indoor and outdoor delivery	- Highest growth field - Promising use in logistics centers, hospitals, etc. - High competence in the Korean industry

Source: Joint work of ministries, Third Basic Plan for Development of Intelligent Robots (August 2019)

- Three items selected as the next-generation core parts are the intelligent controller, autonomous driving sensor, and smart gripper.
  - Intelligent controller: Easy-to-use controller for non-experts
  - Autonomous driving sensor: Sensor used for autonomous driving of robots whether indoors or outdoors
  - Smart gripper: Grippers that can recognize various items at high speed and steadily hold them

2 Foreign Direct Investment Trends

2.1 Foreign Direct Investment Status

Machinery industry

- Investment in the machinery industry is made mainly in the areas of general machinery and machine tools, and the investment scale is gradually decreasing.

Foreign Investment in Machinery

(Unit: USD 1,000, %)

		2014	2015	2016	2017	2018	Running total
Machinery	Number	84	92	66	74	18	2,710
	Report amount	868,753	507,740	529,826	454,569	91,814	10,344,025
General machinery	Number	50	41	28	32	11	1,541
	Report amount	542,222	196,767	67,232	143,507	11,058	6,694,890
Machine tools	Number	28	45	35	39	7	1,133
	Report amount	181,828	206,999	359,494	302,672	80,756	3,264,012
Special purpose machinery	Number	6	6	3	3	0	36
	Report amount	144,703	103,974	103,100	8,390	0	385,123

Source: Foreign Investment Statistics

2.2 Success Cases of Major Foreign-Invested Companies

Samick THK Co., Ltd.

- (Company history) Samick THK, formerly Samick Industrial, was founded in 1960. Since then, it has become a medium-sized listed company leading the new era through constant innovation and change.
  - Samick THK's 2018 revenue was USD 250 million (USD 240 million in Korea and USD 10 million in exports), with 589 employees.
- (Business area) Starting with the production and sales of "files," a finishing tool essential for industrial sites, the company produces linear motion (LM) guides, which are the core parts of automation, ball screws, and industrial robots, which are mainly used to manufacture semiconductors, LCDs, and rechargeable batteries.
  - The company continues to change and innovate with the vision of "a company with solutions for global industrial automation."
- (Case of investment) In 1991, Samick THK signed a joint venture and technology introduction contract with THK, the world's leading manufacturer of LM systems in the field, and localized the LM guides. In 2005, it started to produce and supply ball screws.
  - Samick THK contributes to the automation of industrial facilities through continuous R&D, leading to the expansion of LM guide products and the development of related equipment.
  - In the field of mechatro and robot systems, Samik THK supplies the Cartesian Robots with high-speed and high-precision position control functions, LCD Transfer Robots (LTRs), and Wafer Transfer Robots (WTRs) to transfer LCD Panels and semiconductor wafers.

- (Investment considerations) Japan THK considered the following when deciding to invest in Korea: market growth and technology trends in front-end industries, prospects of maintaining or expanding market share, the expectation to maintain competitiveness among overseas companies after investment, plans to secure the flexibility of employment adjustments through automation, etc.
  - In the case of overseas investment, consideration should be given to the target country's employment, taxation, operational regulations, the possibility of use as a base for expanding overseas business, whether there are local partners to support your expansion overseas, and whether raw materials and parts are procured locally.
- (Benefits of Investment) Advantages of investing in Korea: 1) Securing an affordable factory site in a good location within an industrial complex, under the Foreign Investment Promotion Act; 2) financial support and tax reduction benefits; 3) securing stable demand in Korea; 4) establishing foundation technologies for all industries, making it easy to utilize related technologies and secure raw materials; and 5) securing a high-quality labor force.

Volvo Group Korea's construction equipment unit

- (Company overview) The Volvo Construction Equipment unit of Volvo Group Korea acquired Samsung Heavy Industries' construction equipment business for USD 500 million to enter Korea in 1998. As a global production base for the Volvo Group excavator business, it is in charge of all aspects of production, sales, marketing, research, and development.
  - Volvo exports more than 80% of its total production to Europe, North America, and Asia. After winning the USD 2 billion Export Tower in 2012 based on its export performance, the company continues to grow its exports.
- (Business area) Volvo Construction Equipment's main exports include excavators, wheel loaders, off-road articulated haulers, motor graders, compact equipments, road machinery, etc.
- (Background of acquisition) Samsung Heavy Industries' construction equipment business was acquired because of Korea's attractive investment environment and the superiority of Samsung Heavy Industries' heavy equipment unit.
  - Korea was facing an economic crisis because of the lack of foreign exchange holdings. However, among Asian countries, it was determined to have the most attractive investment environment, such as high economic growth potential, excellent manufacturing technology, highly competitive prices because of efficient production and low value of the KRW, advanced parts industry, and excellent industrial infrastructure.

- By acquiring Samsung Heavy Industries, Volvo Group Korea can take advantage of Samsung's market position in Korea, create a synergy effect in key components such as hydraulic and power transmission components, and secure Samsung's outstanding human resources and advanced production facilities.

- (Vision) To build a competitive excavator line using Korea's cost competitiveness and high-quality products
  - To build a global hub of the excavator business by installing an excavator R&D center and a comprehensive production base (an excavator plant in Eslöv, Sweden was closed in July 1999)
  - To strengthen Volvo's position in the Asian market with high growth potential by establishing a production base for strategic next-generation products, such as off-road articulated haulers and motor graders, and establish a forward base in the Asian market
  - To enter the Korean market by selling Volvo Group Korea's products in Korea
- (Investment results) Positive win-win results through investment
  - (Samsung Heavy Industries' Construction Equipment Unit) The sale of a marginal company resulted in savings of USD 85 million a year in budget deficits and financial costs, the first example of the restructuring of a Korean conglomerate, and improved external credibility.
  - (Korean government) The first large-scale investment after the International Monetary Fund (IMF) contributed to the government's investment promotion policy and enhanced foreign exchange reserves, it improved the reliability and confidence of the Korean economy among foreign companies, and supported the government's investment attraction policies at overseas road shows. This investment also resulted in supporting and fostering the business of more than 400 partners.
  - (Volvo Group) Volvo gained a competitive edge in the vulnerable excavator industry and a stronghold in the Asian market and strengthened its position in the Korean market. It is considered the most successful M&A within the group, serving as a good role model.
- (Business performance) The M&A case increased exports and achieved successful business results.
  - In 2000, Volvo Group Korea was awarded the first USD 200 million Export Tower, for the first time, for a single heavy equipment unit. Two years later, it won a USD 300 million Export Tower and a Gold Tower Order of Industrial Service Merit.

- Then, it was awarded a USD 500 million Export Tower in 2004, a USD 700 million Export Tower in 2005, a USD 1 billion Export Tower in 2006, and a USD 2 billion Export Tower in 2012, for its record-breaking performance.
- Through this continuous growth, the company surpassed the cumulative production of 150,000 units with a single item of an excavator at the Changwon Plant at the end of 2010 and won the Presidential Citation at the National Productivity Awards in September 2011.
- The company received an environmental label certification for 10 excavator models from the Korea Institute of Environmental Technology and won the Presidential Award at the National Productivity Awards in September 2011.
- In particular, by increasing export prices by 1.5 times compared to Korean prices and localizing parts accounting for more than 85% of the cost, it has contributed to the trade balance, the development of Korean parts companies, and employment creation.

3 Policy Position

3.1 Key Policies and Incentives

Major policies and incentives for intelligent robots, a promising field in the machinery industry

- The Korean government has prepared the “Third Basic Plan for Development of Intelligent Robots (2019–2023)” to develop the robot industry as a core industry in the era of the Fourth Industrial Revolution and support the innovation of the manufacturing and service industries.
  - Under the “Intelligent Robots Development and Distribution Promotion Act,” the First and Second Basic Plan was prepared to establish the Korea Institute for Robot Industry Advancement (2010), and the full support for the robot industry began in 2011 after exploring pilot robot projects.
  - The Third Basic Plan for Development of Intelligent Robots has been established and implemented when the Second Basic Plan ended in 2018.
  - Over the last decade, more than USD 500 million has been invested in the R&D of robot technology to improve the technology level of the robot industry.
- Expansion of technical, legal, and institutional foundations for dissemination and proliferation of robots

- Seven national bases were established for testing, certification, demonstration, and corporate support of developed robots.
- Certification criteria for cooperative robots were prepared (June 2018), and regulatory sandbox systems were introduced through the revision of the Industrial Education Enhancement and Industry-Academia-Research Cooperation Promotion Act (January 2019).
- The extension (June 2018) of the Sunset of the Intelligent Robots Act provides additional support for the next 10 years.
- The establishment of the Korea Robot User Association was supported to activate the networking of robot-using companies (2019).

Major Performance in Robot Development

Classification		Research and development	Key performance
Manufacturing robots		Vertical articulated robot, dual-arm robot, cooperative robot ("cobot")	A dual-arm robot was developed (Korea Institute of Machinery & Materials, 2016), and cooperative robots are under development (since 2019, company D).
Service robots	For professional services	Medical, logistics, and safety robots, etc.	An autonomous mobile robot (2018, Y company) and a laparoscopic surgery robot (2018, company M) were launched.
	For personal services	Social robots, HRI Technology	A social robot for household use was developed (2016, company I).
Robot parts		Motor, reducer, sensor, etc.	A robot drive module was localized (2018, company P)

Source: Joint work of ministries, Third Basic Plan for Development of Intelligent Robots (August 2019)

Differences Between the First and Second Basic Plans for the Development of Intelligent Robots

Classification	First and Second Basic Plans for the Development of Intelligent Robots	Third Basic Plan for the Development of Intelligent Robots
Support system	■ A focus on initial market creation through establishment and promotion by government-led policies ■ Promotion of the dissemination projects centered on Korean public institutions ■ An investment of more than USD 500 million in research and the development of robot technology for 10 years to expand the base of the robot industry and improve technology level	■ An increase in effectiveness by sharing roles between government and private sectors ■ (Government) Development of standard models ⇒ Taking the initiative in distribution ⇒ User training ■ (Private sector) Autonomous spread by supporting rental/lease services
Areas of support	■ An attempt to support various fields through Seed R&D ■ Extensive support in existing market-forming fields (robots for manufacturing, education,	■ Support for promising fields through selection and concentration ■ Expansion of manufacturing robots centered on three manufacturing industries

Classification	First and Second Basic Plans for the Development of Intelligent Robots	Third Basic Plan for the Development of Intelligent Robots
	cleaning, etc.) and areas where growth is expected (robots for agriculture, exploration, construction, demolition, etc.) ■ Support for dissemination centered on suppliers and public institutions	■ A focus on the four service robots ■ Independence in three core parts and four SW technologies
Growth base	■ A focus on establishing institutions and supporting institutions ■ Addition and extension of the provisions in the Intelligent Robots Development and Distribution Promotion Act ■ Establishment of the Korea Institute for Robot Industry Advancement ■ Market expansion for quality certification	■ A focus on identification and improvement of regulations ■ Support for identification and improvement of the system by establishing the Regulatory Innovation Center ■ Research on robot proliferation by establishing a robot economics and management research institute ■ Support for distribution by issuing safety certifications for cooperative robot workplaces

Source: Joint work of ministries, Third Basic Plan for Development of Intelligent Robots (August 2019)

3.2 Major Locations

Locations of the machinery industry

- A total of 52.0% of all operators in the machinery industry is located in the Seoul metropolitan area and Gyeongsangnam-do.
  - In particular, the general machinery industry in Gyeongsangnam-do has the second-highest share of the general machinery industry in Korea.
- The general machinery industry in Gyeongsangnam-do focuses on multiprocessing equipment based on the technology of large and medium-sized enterprises that rank in the world's top 20.
  - Along with Doosan Machine Tools and Hyundai WIA, which are part of the top 10 machine tool companies in the world based on revenue, other midsize companies such as EM Korea are located here.
  - Main products are complex processing equipment, such as Computerized Numerical Control (CNC) turning centers, CNC lathes, Numerical Control (NC) boring machines, and machining centers.
- Gyeongsangnam-do creates an excellent machinery industry ecosystem that leads to materials, parts, and finished products.
  - Since the establishment of the Changwon National Industrial Complex, which is centered on machinery, a superior industrial ecosystem has been created based on metal.

- The machinery industry is the root of the manufacturing sector in Gyeongsangnam-do and the foundation of the machinery, aviation, shipbuilding, and automobile industries.
- Major machinery and material parts manufacturers are located in Changwon, Gyeongsangnam-do, including SeAH Changwon Integrated Special Steel Co., Korea Iron & Steel Co., Ltd., and NSK. They supply material parts to major companies in the fields of machinery, automobile, aviation, and shipbuilding, which are located in and around Changwon.
- Continuous growth is led by large companies, such as Doosan Machine Tools, Hyundai WIA, and Korea Precision Machinery

Locations of Machinery Companies

(Unit: Companies, %)

Area	2013		2014		2016		2017	
	NNo. of companies	Ratio	No. of companies	Ratio	No. of companies	Ratio	No. of companies	Ratio
Countrywide	9,181	100.0	9,521	100.0	9,416	100.0	9,790	100.0
Seoul	284	3.1	309	3.2	268	2.8	277	2.8
Busan	661	7.2	697	7.3	681	7.2	682	7.0
Daegu	484	5.3	504	5.3	487	5.2	518	5.3
Incheon	848	9.2	872	9.2	864	9.2	879	9.0
Gwangju	196	2.1	216	2.3	248	2.6	242	2.5
Daejeon	157	1.7	146	1.5	136	1.4	132	1.3
Ulsan	192	2.1	220	2.3	196	2.1	189	1.9
Sejong	10	0.1	10	0.1	14	0.1	17	0.2
Gyonggi-do	3,404	37.1	3,540	37.2	3,466	36.8	3,671	37.5
Gangwon-do	45	0.5	47	0.5	61	0.6	62	0.6
Chungcheong buk-do	196	2.1	205	2.2	219	2.3	234	2.3
Chungcheong nam-do	459	5.0	473	5.0	556	5.9	596	6.1
Jeollabuk-do	151	1.6	143	1.5	133	1.4	141	1.4
Jeollanam-do	80	0.9	85	0.9	93	1.0	97	1.0
Gyeongsang buk-do	565	6.2	583	6.1	626	6.6	628	6.4
Gyeongsang nam-do	1,445	15.7	1,467	15.4	1,365	14.5	1,422	14.5
Jeju-do	4	0.04	4	0.04	3	0.03	32.8	0.03

Source: Statistics Korea, Survey report of Mining and Manufacturing Industry, based on companies with 10 or more employees

4 Potential Partners

4.1 List of Related Companies

Company name	Main items	Website	Location
Doosan Infracore	Excavators, wheel loaders, diesel engines, etc.	www.doosaninfracore.com	Incheon and Gunsan
Hyundai Construction Equipment	Excavators, forklifts, wheel loaders, etc.	www.hyundai-ce.com	Ulsan and Seongnam
Soosan Heavy Industries	Hydraulic breakers, hydraulic drills, cargo trains, drilling machines, etc.	www.soosanheavy.com	Hwaseong
Tong Yang Moolsan Co., Ltd	Tractors, combines, rice planting machines, etc.	www.tym.co.kr	Jincheon and Iksan
Daedong Industrial	Tractors, combines, rice planting machines, etc.	www.daedong.co.kr	Daegu
Kukje Machinery Co., Ltd.	Tractors, combines, rice planting machines, etc.	www.kukjemachinery.co.kr	Okcheon
LS Mtron Ltd.	Tractors, etc.	www.lsmtron.co.kr	Jeonju
LG Electronics	Industrial air-conditioning and heating machines	www.lge.co.kr	Changwon
Samsung Electronics	Industrial air-conditioning and heating machines	www.samsung.com	Gwangju
Kiturami	Boilers, freezers, ventilation systems, etc.	www.krb.co.kr	Seoul
SAMJUNG TECH CO., LTD.	Refrigerating and air-conditioning systems, etc.	www.samjungtech.co.kr	Gimpo
Hyundai Elevator Co., Ltd.	Elevators, etc.	www.hyundaielevator.co.kr	Icheon
EM KOREA Co., Ltd.	Machine tools, power generation and hydraulic equipment, defense parts, etc.	www.yesemk.com	Changwon
Doosan Machine Tools	CNC lathe, milling, turning, and machining centers, etc.	www.doosanmachinetools.com	Changwon
HYUNDAI WIA Co., Ltd.	Machine tools, defense industry equipment, industrial machines, automobile parts, etc.	www.hyundai-wia.com	Changwon
Hwacheon Machine Tool Co., Ltd.	CNC lathe, milling, turning, machining centers, etc.	www.hwacheon.com	Gwangju
Hyundai Robotics	Industrial robots, factory automation, etc.	www.hyundai-robotics.com	Daegu

Source: In reference to each company's respective website

4.2 Related Associations

Related Associations	Website	Major roles
Korea Association of Machinery Industry	www.koami.or.kr	The organization contributes to the promotion of the machinery industry and the development of the national economy by promoting mutual benefits for the people involved in the machinery industry.
Korea Machinery Auction and Exchange	www.komax.or.kr	The organization contributes to the development of Korean corporations by providing various services to advance machinery distribution and promote transactions.
Korea Federation of Machinery Industry Cooperatives	www.komico.or.kr	The organization provides information about various kinds of support for members, makes recommendations to the government, and conducts projects to promote and develop the members' common interests, such as securing sales channels and developing common technologies.
Korea Association of Machinery Industry	www.eaa.or.kr	In response to the government's energy development initiatives, this association works to create a foundation for the development of the energy equipment industry and to standardize technology.
Korea Construction Equipment Manufacturers Association	www.kocema.org	In addition to carrying out various projects in the construction machinery industry, this association promotes friendship and mutual benefits among members.
Korea Construction Equipment Association	www.kcea.or.kr	The association protects the rights of construction equipment rental operators and contributes to the national economy through mechanized construction.
Korea Tools Industry Cooperative	www.tool.or.kr	The cooperative carries out projects by promoting the healthy development of the Korean tools industry and the well-being of its members.
Korea Industrial & Tool Dealers Association Inc.	www.kimta.kr	The association promotes the balanced development of the national economy by strengthening the competitiveness of the distribution industry of industrial materials.
Korea Machine Tool Manufacturers' Association	www.komma.org	To promote the development of the machine tool industry, this association makes efforts to expand domestic demand and exports, develop technology, foster human resources, seek standardization, and promote the joint interests of its members.
Korea Die & Mold Industry Cooperative	www.koreamold.com	The association promotes the importance of the mold industry as a national infrastructure industry, protects members' rights, and strengthens their status.
Korea Refrigeration and Air-conditioning Industry Association	www.ref.or.kr	The association collects industry opinions for the prosperity of the heating, ventilation, and air-conditioning (HVAC) industry, presents opinions to the government, and makes various efforts, such as establishing and inspecting specifications for products, supporting technology development and export, and promoting through exhibitions, thus seeking to promote and develop the common interests of HVAC manufacturers.

Related Associations	Website	Major roles
Korea Agricultural Machinery Industry Cooperative	www.kamico.or.kr	The association aims to promote the stable development of agricultural machinery and hand tools, as well as enhance the welfare of its members, the agricultural mechanization, and the balance of the national economy.
Korea Bearing Industry Association	www.koreabearing.or.kr	The association promotes the rational development of the bearing industry and the profits of member companies, and contributes to the development of the bearing industry and the national economy.
Korea Packaging Machinery Association	www.kpmasite.or.kr	The association fosters friendship among member companies and promotes the advancement and globalization of the field in relation to packaging machines.
Korea Association of Robot Industry	www.korearobot.or.kr	The association acts as a partner of robot makers who lead the development of the robot industry.
Korea Institute for Robot Industry Advancement	www.kiria.org	The association systematically and efficiently conducts projects for the prosperity of the robot industry and promotes the development of policies related to the intelligent robot industry.

Source: In reference to each association's respective website

kotra
Korea Trade-Investment Promotion Agency

INVEST KOREA

KOTRA 20-154

Investment Opportunities in Korea

Machinery

Publisher	KOTRA	**Writer**	Investment Public Relations Team, KOTRA
Date of Publication	Feb. 2020	**Reference**	Korea Institute for Industrial Economics and Trade
Contact information (Call)	(82-2) 1600-7119		www.kiet.re.kr (Man Tae Jeong)
Official website	www.kotra.or.kr www.investkorea.org	**ISBN**	979-11-6490-313-9 (95320)