Off-Highway Research

The Construction Equipment Industry in SOUTH KOREA

A Multi-Client Study

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Multi-Client Study

South Korea

October 2017

CONTENTS

INTRODUCTION

This report examines the construction equipment and agricultural tractor industries in Korea and is an update of the last study on the country published Off-Highway Research in 2008.

The aim of this report is to present a concise overview of the development of the various construction equipment sectors in Korea since 2012, assessing the major changes which have taken place, and those which are likely to occur by the year 2021.

Following an initial period of desk research and discussions with the world's leading construction equipment manufacturers, Off-Highway Research undertook an in-depth field research programme in Korea in July 2017. This covered all manufacturers of any significance, importers of construction equipment and trade associations.

Off-Highway Research would like to record its deep appreciation to all those who assisted in the compilation of this report.

The report follows the usual format of a typical Multi-Client Study from Off-Highway Research, which has been developed with an emphasis on clarity. The coverage is organised as follows:

The first section includes important topics of a general background nature, such as the political and economic history, current economic activity including construction and prospects for both that industry and the general economy. The conclusions apply to all the product areas and are therefore not repeated in each analysis.

The second section covers fifteen construction equipment sectors and agricultural tractors. For each category the following information is given:

- Market Size and Trends, 2012-2016
- Domestic Production, 2012-2016
- Component Sourcing
- Foreign Trade
- Market Shares
- Population of Machines and End-Users, 2017
- Sales Forecast, 2017-2021
- Machines Available in Korea, 2017

The section of Company Profiles gives comprehensive profiles of the leading manufacturers of construction equipment and agricultural tractors, with details given under the following headings:

- Address
- History and Structure
- Turnover
- Personnel
- Product Range
- Licences
- Joint Ventures
- Manufacturing Facilities
- Key Personnel
- Production 2012-2016
- Component Sourcing
- Distribution and Service
- Domestic Sales
- Exports
- Future Developments

The second section gives comprehensive profiles of the leading importers of construction equipment, with details given under the following headings:

- Address
- Key Personnel
- History and Structure
- Outlets
- Franchises
- Sales 2012-2016
- Future Developments

SUMMARY OF MARKET ANALYSIS

SALES

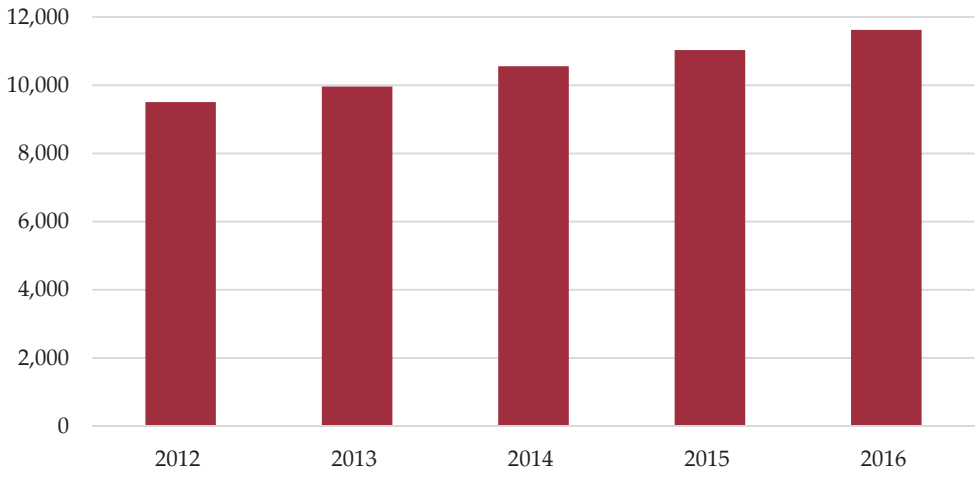
This section summarises the statistics and trends of the 16 product lines to be found in the individual Equipment Analyses that follow.

Table 1. South Korea: Sales of Construction Equipment and Agricultural Tractors, 2012-2016 (Units)

	2012	2013	2014	2015	2016	% Change 2012-2016
Articulated Dump Trucks	6	5	7	6	10	67
Asphalt Finishers	30	28	32	38	45	50
Backhoe Loaders	-	2	1	1	-	-
Compaction Equipment	160	210	175	192	123	-23
Crawler Dozers	15	20	21	19	17	13
Crawler Excavators	1,250	1,200	1,475	1,570	1,175	6
Crawler Loaders	2	1	1	-	-	-100
Mini Excavators	4,000	4,250	4,500	4,904	5,828	46
Mobile Compressors	362	346	378	445	410	13
Mobile Cranes	54	73	205	100	86	59
Motor Graders	2	-	1	3	1	-50
Rigid Dump Trucks	4	2	3	4	3	-25
RTLTs – Masted	-	-	-	-	-	-
RTLTs – Telescopic	12	10	15	13	19	58
Skid-Steer Loaders	880	918	895	965	924	5
Wheeled Excavators	2,350	2,500	2,475	2,390	2,620	11
Wheeled Loaders						
– Under 80 HP	-	-	-	-	-	-
– Over 80 HP	380	400	376	387	368	-3
Total Construction Equipment	**9,507**	**9,965**	**10,560**	**11,037**	**11,629**	**22**
Agricultural Tractors	13,250	11,800	12,500	12,750	12,350	-7

Source: Off-Highway Research

Chart 1. South Korea: Sales of Construction Equipment, 2012-2016 (Units)



Source: Off-Highway Research

ASPHALT FINISHERS

The government has provided little in the way of new road construction in recent years. Over the five years shown above, the market has only reached an average of 35 units per year.

BACKHOE LOADERS

The effort to convince the mainstream of the virtues of the multipurpose backhoe loader has been without success. The small excavator at 5.5 tonnes is the current replacement.

COMPACTION EQUIPMENT

Used compaction equipment from Japan has traditionally dominated all sectors in terms of sales, although the introduction of Tier IV emissions regulations has restricted the flow of imports significantly in recent times. This has led to a modest recovery in demand for new machines.

CRAWLER DOZERS

The product is not much favoured and until the introduction of the latest emissions legislation most sales were of used machines. The decline in golf course construction in recent years has significantly reduced demand for smaller dozers, which constituted a major proportion of the overall market. Civil engineering and coal handling applications sustain a modest volume of new machine sales.

CRAWLER LOADERS

The crawler loader has fallen completely out of favour. The only area where they are irreplaceable is in steel works for slag handling.

DUMP TRUCKS

It is impossible for the true off-highway articulated trucks to compete on price and they are not allowed to run on the roads. Volvo Korea finally started retail sales in 2001 and the Caterpillar dealer has imported machines for a rental fleet. Rigid trucks are not a large market but the limestone and cement industries need trucks and have bought regularly over the years. The quarrying operations in limestone for the cement industry and the steel foundries are of varying sizes and have been the main buyers of rigid trucks recently, mainly of 60 tonnes' capacity.

HYDRAULIC EXCAVATORS

Hydraulic excavators have a history in Korea of being the chosen implement of the construction industry. Ten years after the financial crash, the market returned to a more realistic level of 4,000 units and, despite fluctuations in economic growth, demand has remained extremely stable during the period under review, largely as a result of buoyant growth in the construction sector.

MINI EXCAVATORS

The market has undergone significant expansion during the last five years, primarily as a result of the continuing rise in popularity of machines under 3.5 tonnes, and in 2016 reached an historical high of 5,800 units. Aggressive promotion of the concept by several Japanese suppliers has overcome contractors' initial reluctance to accept that the smaller capacity machines could offer a viable alternative to the still ubiquitous 5.5 tonne product.

MOBILE COMPRESSORS

After 1997 the demand for the services of large mobile compressors and associated tools decreased dramatically. After 2004 the market picked up at last, reaching between 175 and 220 units in any one year. More recently, demand has stabilised at 350-400 units, although much of this volume is attributable to the increased activities of Korean contractors overseas, not to any change of heart at home about using small compressors and hammers.

MOBILE CRANES

The new crane market has changed dramatically since the government put restrictions on the emissions of the engines of imported cranes, and most older cranes were barred as imports. The other big change is the huge surge in ordering

by the shipyards that are almost entirely responsible for the change in the crawler crane business.

MOTOR GRADERS

In the last five years only seven new motor graders have been sold in the country, a reflection on the lack of new road building. The machines are long lived and owners invariably prefer to refurbish their existing machines rather than buy new.

ROUGH TERRAIN LIFT TRUCKS

The rough terrain lift truck is not a product that has reached any degree of popularity yet. The use of fork lift trucks in industry is for all practical purposes so far confined to traditional industrial types. Construction uses cheap tower cranes for on-site handling and crude electric lifts for the bringing of materials to the desired height. Unloading cranes on trucks sell between 1,000 and 1,500 units per year, effectively blocking all possibility of success for telescopic handlers.

SKID-STEER LOADERS

The skid-steer loader survived the 1997 catastrophe quite well. By 2007 sales had passed 800 units and in recent years have stabilised at a level of 900-1,000 units per year.

WHEELED LOADERS

The market is essentially a mature one and demand has stabilised at an annual level of 350-400 units. Tighter emissions legislation has effectively ended the importing of used wheeled loaders, which in past years amounted to some 150 units annually. As a result, the market for new machines has become firmer and is sustained by the regular fleet replacement programmes of the material production industries.

Table 2. South Korea: Suppliers of Construction Equipment and Their Market Shares, 2016
(Units)

	Articulated Dump Trucks	Asphalt Finishers	Backhoe Loaders	Compaction Equipment	Crawler Dozers	Crawler Excavators	Mini Excavators	Mobile Compressors	Mobile Cranes	Motor Graders	Rigid Dump Trucks	RTLTs	Skid-Steer Loaders	Wheeled Excavators	Wheeled Loaders	Total
Airman								20								20
Atlas Copco								200								200
Bobcat							40						450			490
Bomag				39												39
Case													90			90
Caterpillar	6	1		26	17	53				1	3		173	73	48	401
Doosan	2					392	1,069	155						1,298	159	3,075
Dynapac		2		12												14
Gehl													60			60
Grove									32							32
Hitachi							260									260
Hyundai						294	1,063						91	550	73	2,071
JCB							1									1
Kobelco							482		10							492
Komatsu															3	3
Kubota							735									735
Liebherr									13							13
Manitou												10				10
Sakai				46												46
Tadano									18							18
Vögele		24														24
Volvo	2	18				396	1,198							699	73	2,386
Yanmar							980									980
Others						40		35	13			9	60		12	169
Total	**10**	**45**	**-**	**123**	**17**	**1,175**	**5,828**	**410**	**86**	**1**	**3**	**19**	**924**	**2,620**	**368**	**11,629**

Source: Off-Highway Research

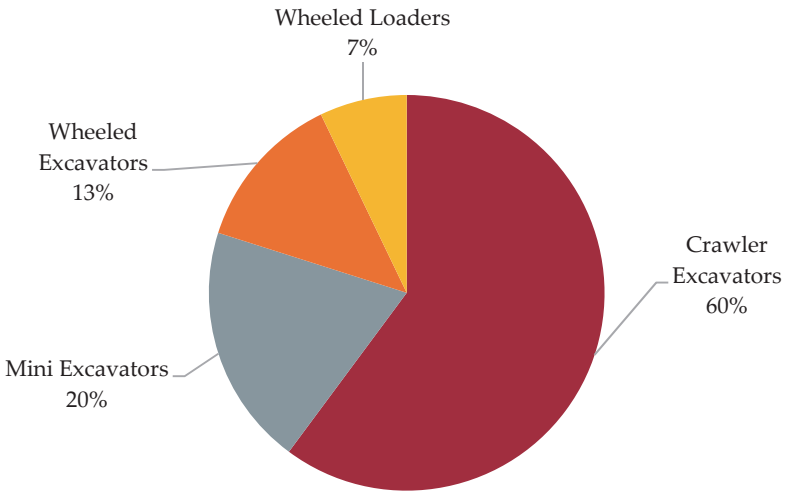
PRODUCTION

Table 3. South Korea: Production of Construction Equipment by Type 2016 (Units)

	Units
Crawler Excavators	18,800
Mini Excavators	6,175
Wheeled Excavators	4,050
Wheeled Loaders	2,230
Total Construction Equipment	31,255
Agricultural Tractors	38,300

Source: Off-Highway Research

Chart 2. South Korea: Production of Construction Equipment by Type, 2016 (Units)



Source: Off-Highway Research

AGRICULTURAL TRACTORS

The combined production volume of the four active manufacturers has increased in line with the mechanisation of agriculture in the domestic market, but also as a result of significantly increased export volumes, especially to the USA. It now approaches 40,000 units per year compared to 32,000 units ten years ago.

MINI EXCAVATORS

Production of mini excavators by the three domestic manufacturers consists primarily of the industry standard 5.5 tonne type on wheels and tracks, almost all of which are destined for the Korean market.

Volvo produces both crawler and wheeled varieties of its 5 tonne class mini excavators in Changwon. Mini excavators below this size are imported from its

factory in France. No other size is made in Changwon but the company is now the largest producer of mini excavators in Korea. **Doosan**'s factory in Incheon produces mini excavators in the 2.7, 3 and 3.5 tonne classes. It also outsources production of other mini excavator models to an independent manufacturer in Korea. **Hyundai** production volumes at its Ulsan plant broke through the 1,000 unit barrier in 2004 and have since grown to nearly 2,000 units. The agreement with Nagano Industry in Japan, which made a number of smaller mini excavators for Hyundai, is no longer operational.

HYDRAULIC EXCAVATORS

The production volume in hydraulic excavators has varied quite widely over the years, although the rapid expansion in the three manufacturers' export trade in recent years has seen standard size excavator production volumes stabilise at over 20,000 units.

Volvo is the largest producer and its factory in Changwon is the company's core production plant for crawler excavators (it also has excavator assembly plants in USA, Germany, France, Russia, China, India and South America), and produces machines from 5 to 95 tonnes, including the latest E Series, launched in 2014 and equipped with Tier IV Final engines. It also produces 5 tonne wheeled excavators and three models of standard wheeled excavators between 14 and 20 tonnes. **Doosan** and **Hyundai** each produce a similar volume of machines. In 2010 Doosan opened a second production plant in Gunsan, which assembles excavators above 30 tonnes. Machines below this weight are built in its main Incheon factory.

WHEELED LOADERS

Hyundai assembles its wheeled loader range at the same Ulsan plant as the hydraulic excavators. **Doosan**'s plant in Incheon manufactures medium size machines, while production of larger capacity units takes place at its plant in Gunsan.

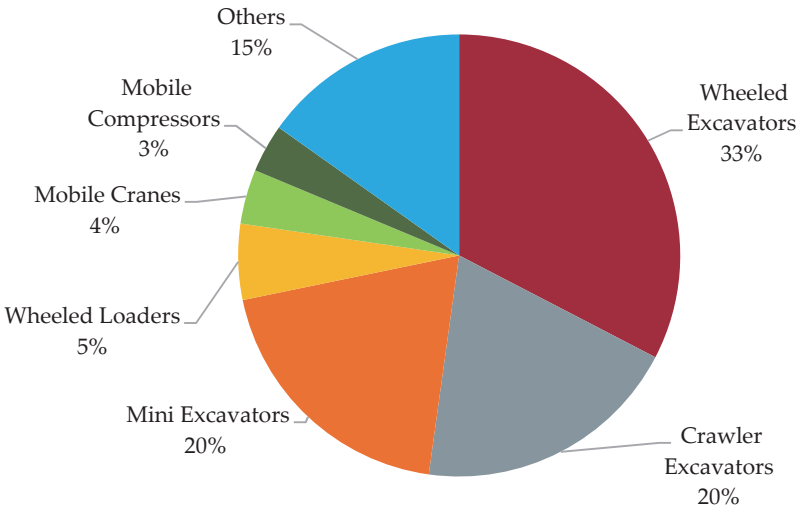
POPULATION

Table 4. South Korea: Population of Construction Equipment and Agricultural Tractors, 2016 (Units)

	Units
Articulated Dump Trucks	125
Asphalt Finishers	750
Backhoe Loaders	50
Compaction Equipment	6,100
Crawler Dozers	4,800
Crawler Excavators	30,000
Crawler Loaders	70
Mini Excavators	30,000
Mobile Compressors	5,400
Mobile Cranes	8,500
Motor Graders	900
Rigid Dump Trucks	250
RTLTs – Masted	-
RTLTs – Telescopic	75
Skid-Steer Loaders	3,750
Wheeled Excavators	50,000
Wheeled Loaders	
– Under 80 HP	-
– Over 80 HP	12,500
Total Construction Equipment	153,270
Agricultural Tractors	235,000

Source: Off-Highway Research

Chart 3. South Korea: Population of Construction Equipment by Type, 2016



Source: Off-Highway Research

The data on this subject is unusually detailed because the government exacts a tax on construction equipment and publishes the number of licensed machines, even down to drill rigs and tar sprayers. Where an independent estimate has been

necessary, the usual method of useful machine life has been adopted, with the lives being significantly longer than they are in Europe and North America.

The growth in the population of machines has been hindered in recent years by the import ban on non-emissions compliant used equipment from Japan, the volume of which has not been matched by sales of new machines. As a result, the total construction equipment figure of nearly 153,000 machines existing in 2017 is only some 7,000 units above the level ten years ago.

ASPHALT FINISHERS

A fall in the population at the start of the new millennium partly resulted from exports of machines formerly belonging to bankrupted construction companies. It has recovered since then but most of the increase is a reflection of imports of used machines, mostly from Germany.

BACKHOE LOADERS

A population of less than 75 units reflects the lack of interest shown in the product by Korean contractors, whose preference remains the 5.5 tonne mini excavator on wheels or tracks.

COMPACTION EQUIPMENT

The population has declined in the last five years since the decline in imports of used machines from Japan. The rental companies specialising in earthmovers for the main contractors are the largest owner grouping but civil engineers and construction companies still own about 35 per cent of the compaction equipment registered.

CRAWLER DOZERS

The population has fallen by 20 per cent in the last 10 years, the dozer losing out to small tracked excavators. The decline in golf course construction has been the main contributory factor.

DUMP TRUCKS

80 per cent of rigid dump trucks are in use in limestone quarries, the remainder in coal transport and a few in civil engineering. There are very few articulated dump trucks in the country.

HYDRAULIC EXCAVATORS

The main form of ownership is the small sub-contractor, sometimes known as renters but always with a driver, as with the mini excavator. The second leading

user group is the large industrial companies that have their own construction companies within the group.

MINI EXCAVATORS

The machines are rented, both with and without a driver. A minority is directly owned contractor machines and in the country, some are involved in landscaping, including paddy field reshaping.

MOBILE COMPRESSORS

The population has recovered to some extent during the last ten years following the sharp decline witnessed in the early part of the millennium. Rental companies own about 60 per cent of the remaining machines, industry a further 25 per cent. The rest is in quarries or with contractors.

MOBILE CRANES

Telescopic cranes belong 95 per cent to rental companies, with very few ever being bought by construction companies. Crawler cranes, on the other hand, are often placed with civil engineering contractors, which convert them temporarily from cranes into pile driver carriers, draglines or even auger boring rigs. The shipyards constitute another important end-user group.

MOTOR GRADERS

The rental companies specialising in earthmovers for the main contractors are the largest owner grouping but civil engineers and construction companies still own about 40 per cent of the motor graders.

RTLTS

The rough terrain lift truck is not a product that has reached any degree of popularity yet. The use of fork-lift trucks in industry is for all practical purposes so far confined to traditional industrial types. The increasing use of small telescopic handlers in agriculture offers some hope to suppliers, although no rapid growth in sales is expected in the short to medium term.

SKID-STEER LOADERS

The population has more than doubled in the last 10 years. The leading customer group is rental, offering machines to construction and industry. The largest applications are in industry and small road maintenance contractors.

WHEELED LOADERS

In the case of loaders below 250 horsepower the main form of ownership is the small sub-contractor, sometimes known as renters but always with a driver, as with the mini excavator. Larger machines are bought by the aggregates sector and cement production industry, both of which operate regular fleet replacement programmes, a significant contributory factor to the stability of the wheeled loader market.

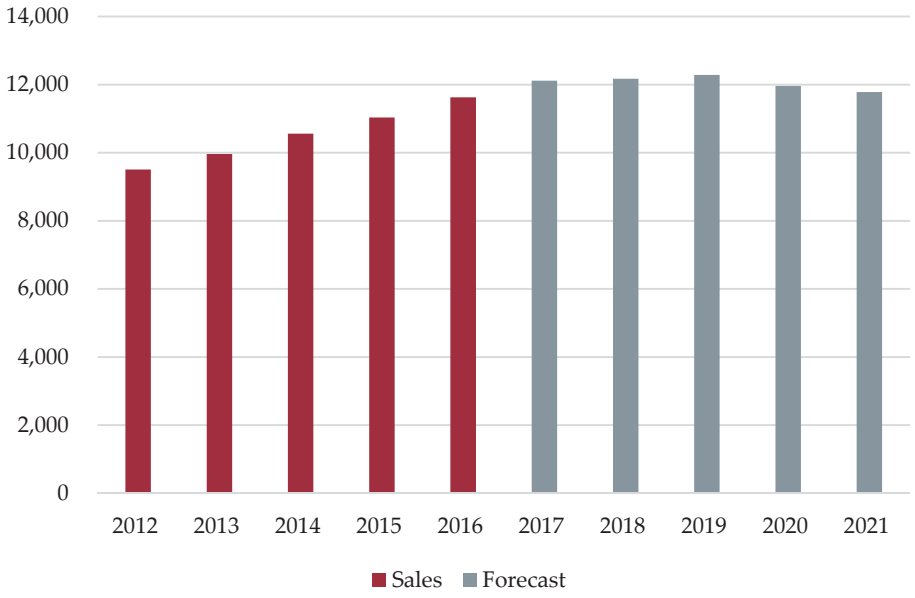
FORECAST TO 2021

Table 5. South Korea: Forecast Sales of Construction Equipment and Agricultural Tractors, 2017-2021 (Units)

	2017	2018	2019	2020	2021
Articulated Dump Trucks	10	8	8	10	10
Asphalt Finishers	45	50	55	50	50
Backhoe Loaders	1	-	-	1	1
Compaction Equipment	127	138	143	155	112
Crawler Dozers	20	22	25	25	20
Crawler Excavators	1,600	1,500	1,450	1,400	1,400
Crawler Loaders	1	1	-	-	2
Mini Excavators	5,800	5,900	6,000	5,750	5,600
Mobile Compressors	400	420	450	450	425
Mobile Cranes	52	64	59	75	75
Motor Graders	1	2	1	-	1
Rigid Dump Trucks	4	4	5	5	5
RTLTs – Masted	-	-	-	-	-
RTLTs – Telescopic	30	35	40	40	50
Skid-Steer Loaders	1,000	1,100	1,150	1,200	1,250
Wheeled Excavators	2,650	2,550	2,500	2,400	2,400
Wheeled Loaders					
– Under 80 HP	-	-	-	-	-
– Over 80 HP	375	380	400	400	380
Total Construction Equipment	**12,116**	**12,174**	**12,286**	**11,961**	**11,781**
Agricultural Tractors	12,000	11,800	11,900	12,000	12,250

Source: Off-Highway Research

Chart 4. South Korea: Sales and Forecast Sales of Construction Equipment, 2012-2016 (Units)



Source: Off-Highway Research

ASPHALT FINISHERS

The outlook for sales of asphalt finishers should be promising in light of the government's proposed infrastructure construction plans. If these plans are realised, annual demand should be maintained at an average level of 50 units per year throughout the forecast period under review.

BACKHOE LOADERS

A poor outlook for future demand is predicted, as it does not seem likely that users will change their minds, especially in view of the expanding range of mini excavators now becoming available.

COMPACTION EQUIPMENT

Given that the country has 100,000 kilometres of main highways, there are some prospects of network development but nothing dramatic. To maintain the network and make some modest additions, the compaction equipment market might rise towards 150 units per year.

CRAWLER DOZERS

The domestic market for crawler dozers seems to have all but disappeared. In the longer term, the forecast shown above may be too pessimistic. Forthcoming infrastructure projects could employ new machines and so demand should at least be sustained at current levels.

CRAWLER LOADERS

On past evidence one can only predict a small drip feed of sales for the coming five years.

DUMP TRUCKS

Suppliers should be able to create a small amount of interest in articulated dump trucks. The forecast for rigid dump trucks implies small regular investment by the cement industry but no wholesale adoption of rigid dump trucks by the civil engineers.

HYDRAULIC EXCAVATORS

The market has remained buoyant during the first half of 2017 and suppliers expect this year will represent the peak of the current demand cycle. The current volume of inner city redevelopment projects will continue to sustain demand for wheeled excavators in particular, whilst the predicted flow of public works projects should ensure the market maintains its customary level of stability for the short to medium term at least.

MINI EXCAVATORS

The preponderance of inner city redevelopment projects already underway, and planned for the future, suggest a positive outlook for mini excavators in the short to medium term. The forecast also assumes that the country will keep its distinctive high usage of the 5 tonne types, since the market for eight tonne excavators has shown virtually no sign of expansion.

MOBILE COMPRESSORS

The level of civil engineering work planned for the years to come and replacement business for contractors working on plant installation for the oil refining and petrochemical industries should be sufficient to maintain a stable volume of new sales in the short to medium term. Concentrating on high outputs and high pressures, the suppliers could stay at a yearly rhythm of 400-450 units per year.

MOBILE CRANES

The introduction of Tier IV Final emissions legislation means that the import of used cranes from Japan will be superseded by sales of new cranes. In addition, the plethora of old cranes in Korea, many of which are over 20 years old, dictates that the replacement market should remain buoyant in medium to long term. The planned government expenditure on construction over the next five years will also help to sustain the market for new cranes.

MOTOR GRADERS

Sales of new machines will be purely for the high productivity contractors who feel that they can justify paying two to three times the price of a normal used machine.

RTLTS

A few sales may be possible each year, particularly if the rising trend towards the use of small telehandlers in agriculture can be maintained.

SKID-STEER LOADERS

The outlook for skid-steer loaders appears positive according to suppliers interviewed for the purposes of this report. The product is ideally suited to the plethora of renovation projects in inner city areas and is likely to benefit from the rising trend towards the use of compact equipment generally.

WHEELED LOADERS

The wheeled loader market is a traditionally very stable sector and little change can be expected to demand in the short to medium term. The product is not widely used in the civil engineering sector and so any future growth here will not directly impact

on demand. It will, however, contribute to the willingness of the aggregates and materials production sectors to implement regular replacement programmes, and thereby sustain buoyant demand for medium to large wheeled loaders during the forecast period.

POLITICS AND THE ECONOMY

POLITICAL HISTORY

The earliest documented period of Korean history is the Three Kingdoms period, from the third century AD to the seventh century. The peninsula was divided between the Koguryo, Silla and Paekje kingdoms, all of them highly civilised, embracing Buddhism and encouraging fine arts. In AD 668 the Silla kingdom prevailed and unified Korea in a way that lasted until 1945. The Silla kings ruled until the ninth century. The Koryo dynasty then replaced it, instituting Confucianism, codifying the laws and giving the country its modern name, Korea. A system of moveable type for printing was introduced 52 years before Gutenberg did the same in Germany. The Jeosun dynasty replaced it in 1392, when it also founded the city of Seoul. This dynasty, also called the Yi dynasty, is notable for establishing a regular system of administration of eight provinces ruled from the capital city.

Most of the narrative up to this point has a background of uneasy relations with the powerful Chinese empires to the north but in 1592, the Japanese entered the picture when they invaded and overran the peninsula in one month. A large Korean victory at sea and guerrilla warfare enabled the Koreans to expel the invaders twice but the price paid was that the Koreans turned inward, just as the scientific revolution was taking shape in the West. After the occupation of Beijing by the British and French in 1860, the extreme attitude prevailed and all foreigners were banned.

In 1885, Japan forced its way into the Korean ports. A period of fighting for supremacy inside Korea between Russia and Japan then followed. China was eliminated as a protector. In the war of 1904 in the Far East, the Japanese beat the Russians; with the consequence that Korea was occupied and annexed in 1910 by Japan.

The Japanese policy was one of direct colonisation, together with an attempted eradication of all Korean culture. The economy was redirected to fit Japanese needs and farming was employed to provide food for Japan. The banks, law courts, education system and religion were all replaced with Japanese models. The Korean language was banned as a medium of teaching in schools during the 1930s and thousands of Koreans were taken to Japan and China to assist the army. This was regarded by Koreans as a period of attempted cultural genocide and they have not forgiven the Japanese to this day.

AFTER 1945

Unfortunately for the Koreans, the post-war settlement between the victorious Allies included a division of the Korean peninsula in which the USSR occupied the land north of the 38th parallel and the USA the land to the South. This was supposed to be temporary but the negotiations for a new government broke down and the two parts declared their independence. The occupiers withdrew in 1948 but the USSR continued to pile arms into the north while the USA supplied only enough for a modest self-defence in the south. North Korea invaded the south in June 1950 and the USA defended the country, together with 16 others and a UN resolution. The extinction of South Korea was almost achieved in the first months of the war but a daring American landing at Incheon pushed the North Koreans back at the end of 1950. Mao Zedong, the Chinese communist revolutionary otherwise known as Mao Tse-tung, then came into the war on the side of the North and it dragged on for a further two years until a truce was signed in 1953.

After the war the North became a closed society, dominated by a personality cult directed at the Great Leader, Kim Il-Sung, with such vehemence as to put that around Mao as a distant second. The trends of history were not kind to Kim Il-Sung and the passing of power to his reclusive son, Kim Jong-Il, and subsequently to the latter's son Kim Jong-Un, was not convincing. The Kim dynasty has figured as a sort of ever-present threat in the years since 1953 and the inclusion of the régime in President Bush's 'axis of terror' list of countries aroused mixed emotions. For economic help and military assistance North Korea was to a large extent sidelined by China's headlong economic growth since the mid-1980s. The Chinese had better things to do, specifically from 2001 onwards coping with the effects and opportunities of entry into the WTO. South Korea was steering its deeds with the north in accordance with the 'sunshine policy', the idea that by being benign to North Korea, the South could make it less furiously aggressive. The policy began in 1998 but was ended in 2008.

The Korean War ended in 1953 without a peace agreement, leaving South Korea technically at war for more than fifty years. The following four decades were marked by authoritarian rule, during which government-sponsored schemes encouraged the growth of family-owned industrial conglomerates, including the Hyundai and Samsung groups. They helped transform South Korea into one of the world's major economies and a leading exporter of cars and electronic goods. South Korea has thus developed into one of Asia's most affluent countries since partition in 1948. The Communist North has slipped into totalitarianism and poverty.

RECENT POLITICAL DEVELOPMENTS

Politics of the Republic of Korea takes place in the framework of a presidential representative democratic republic, whereby the President is the head of state, and of a multi-party system. Executive power is exercised by the government.

Legislative power is vested in both the government and the National Assembly. The Judiciary is independent of the executive and the legislature and comprises a Supreme Court, appellate courts and a Constitutional Court. Since 1948, the constitution has undergone five major revisions, each signifying a new republic. The current Sixth Republic began with the last major constitutional revision in 1987.

The main political parties in South Korea are the liberal Democratic Party of Korea, the conservative Liberty Korea Party (LKP), the centrist People's Party (PP), and the left-wing Justice Party (JP). The liberal Democratic Party of Korea and the conservative Liberty Korea Party are the traditional dominant forces of South Korean politics.

Table 6. South Korea: Parties in the 20th National Assembly, 2017

	Seats
Democratic	120
Liberty Korea	107
People's	40
Bareun	20
Justice	6
Independents	6
Total	299

Source: Official Statistics

The last two years have marked one of the most dramatic periods of political chaos and turmoil in contemporary Korean politics. In May 2017, in an historic ruling, South Korea's Constitutional Court formally removed impeached former President Park Geun-hye from office over a corruption scandal that plunged the country into political turmoil, worsened an already-serious national divide and led to calls for sweeping reforms. The ruling made her South Korea's first democratically elected leader to be removed early from office since democracy in the country in the late 1980s.

Following the presidential elections in May 2017, Democratic Party candidate and former human rights lawyer, Moon Jae-in, won South Korea's 19th presidential election by a considerable margin with 41.1 per cent of the vote. The second place candidate, conservative Hong Joon-pyo, took 24 per cent of the vote. In fact, the 17.1 percentage point difference constitutes the largest margin of victory in the history of South Korean elections.

Despite concerns amongst opposition parties about his position on national security and North Korea, Moon has emphasized a strong message on national defence. While he signaled his intent to pursue a more autonomous role for South Korea on peninsular affairs, the denuclearisation of North Korea and national security of South Korea have been listed as top priorities. Moon has also pledged to resume commercial ties with North Korea (namely, re-opening the Kaesong Industrial

Complex), but has repeatedly stated he would work closely with the United States on addressing the security threat posed by North Korea's nuclear program, rather than go at it alone.

ECONOMIC BACKGROUND

The economy of South Korea is the fourth largest economy in Asia and the 11th largest in the world. It is a mixed economy dominated by family-owned conglomerates called chaebols. South Korea is famous for its spectacular rise from one of the poorest countries in the world to a developed, high-income country in just one generation. This economic miracle, commonly known as the Miracle on the Han River brought South Korea to the ranks of elite countries in the OECD and the G-20. South Korea still remains one of the fastest growing developed countries in the world following the Great Recession. It is included in the group of Next Eleven countries that will dominate the global economy in the middle of the 21st century.

South Korea's rigorous education system and the establishment of a highly motivated and educated populace is largely responsible for spurring the country's high technology boom and rapid economic development. Having almost no natural resources and always suffering from overpopulation in its small territory, which deterred continued population growth and the formation of a large internal consumer market, South Korea adapted an export-oriented economic strategy to fuel its economy, and in 2014, was the seventh largest exporter and seventh largest importer in the world.

In the1997 Asian financial crisis, the South Korean economy suffered a liquidity crisis and relied on the bailout by the IMF that restructured and modernised the South Korean economy with successive DJnomics policy by President Kim Dae Jung. Historically, subsidies were used as means of speeding up adoption of new technology in Korea and has ultimately helped the adoption and development of faster mobile standards for the economy of South Korea. The growth of the Information and Communication Technology (ICT) industry has been concentrated on the hardware sector, which focuses on expanding wired and wireless telecommunication network penetration rather than the software sector, which creates innovative applications and value-added services.

The economy of South Korea is the global leader in consumer electronics, mobile broadband and smartphones. South Korea's LCD TV global market share has also jumped to around 40 per cent, and it will soon replace Japan as the world's number-one LCD TV supplier. The economy also ranked No.1 in the world in the ICT Development Index 2015 and 2015 Bloomberg Innovation Index.

Despite the South Korean economy's high growth potential and apparent structural stability, the country suffers perpetual damage to its credit rating in the stock market due to the belligerence of North Korea in times of deep military crises, which has an adverse effect on its financial markets. However, renowned financial organisations, such as the International Monetary Fund also compliment the resilience of the South Korean economy against various economic crises, citing low state debt, and high

fiscal reserves that can quickly be mobilised to address any expected financial emergencies. Other financial organisations such as the World Bank describe South Korea as one of the fastest-growing major economies of the next generation along with BRIC and Indonesia.

Like most industrialised economies, Korea suffered significant setbacks during the global recession that began in 2007. Growth fell by 3.4 per cent in the fourth quarter of 2008 from the previous quarter, the first negative quarterly growth in 10 years, with year on year quarterly growth continuing to be negative into 2009. Most sectors of the economy reported declines, with manufacturing dropping 25.6 per cent as of January 2009, and consumer goods sales dropping 3.1 per cent. Exports in autos and semiconductors, two critical pillars of the economy, shrank 55.9 per cent and 46.9 per cent respectively, while exports overall fell by a record 33.8 per cent in January, and 18.3 per cent in February 2009 year on year. As in the 1997 crisis, Korea's currency also experienced massive fluctuations, declining by 34 per cent against the dollar. Annual growth in the economy slowed to 2.3 per cent in 2008, and came to a near standstill at 0.2 per cent in 2009.

Despite the global financial crisis, the South Korean economy, helped by timely stimulus measures and strong domestic consumption of products that compensated for a drop in exports, was able to avoid a recession unlike most industrialised economies, posting positive economic growth for two consecutive years of the crisis. In 2010, the economy rebounded strongly with a growth rate of 6.1 per cent, signaling a return to pre-crisis levels. The South Korean economy of the 21st century, as a Next Eleven economy, is expected to grow from 2.6 per cent in 2017 to 4.2 per cent annually between 2020 and 2030, similar to growth rates of developing countries such as Brazil or Russia.

Table 7. South Korea: Real Growth of GDP, 2014-2017
(Per Cent)

2014	2015	2016	2017*
3.3	2.8	2.8	2.6

* forecast
Source: Bank of Korea

GDP growth declined in the latter part of 2016 in the context of political uncertainty, corporate restructuring and a drop in exports. Assuming that domestic and international political uncertainty dissipates, growth is projected to edge up to 2.8 per cent in 2018, supported by a pick-up in exports and rising business and consumer confidence. Inflation reached the 2 per cent target in early 2017, while the current account surplus is expected to remain large at 6 per cent of GDP.

Downside risks to the outlook include heightened geo-political tensions and trade protectionism, notably a possible revision of the US-Korea free trade agreement.

However, Korea's strong external position provides a buffer against such events. On the domestic side, the main risks relate to a hard landing in the housing market or a failure to rein in household debt. On the upside, a faster-than-projected increase in world trade growth and effective structural reforms could reignite domestic demand and reverse the decline in Korea's export performance.

Korea has joined 16 free trade agreements since 2003, promoting its integration in global value chains. However, excess world capacity in some capital-intensive industries, such as shipbuilding, is forcing restructuring and driving up unemployment in some areas in Korea.

GEOGRAPHY

TOPOGRAPHY

The Korean peninsula is approximately 1,000 kilometres long from North to South and at its narrowest point is only 216 kilometres across. In area, it is therefore similar to the United Kingdom but it is divided just north of the 38th parallel into two countries, North and South Korea. In this report, all references to "Korea" are to the South, the country also known as the Republic of Korea, occasionally the ROK. The North is officially known as the Democratic People's Republic of Korea, the DPRK.

The bulk of the country, about 70 per cent, is mountainous, the highest peaks being Mt. Halla on Jeju Island (2,000 metres) and Mt. Paektu in North Korea. In the southern part of the peninsula, agriculture is confined to narrow, often terraced valleys where the main crops are rice, other cereals, ginseng and tobacco. There are few such valleys on the East Coast. On Jeju Island, south of the south-west tip of the country, the weather is suitable for growing semi-tropical crops, like bananas, pineapple and citrus.

The peninsula faces China in the West across the Yellow Sea and Japan to the East and South across the South Sea and East Sea, also known collectively as the Sea of Japan. The area of South Korea is 99,200 km^2; North Korea, very typically, does not publish a consistent figure for its landmass, but it is around 122,800 km^2.

CLIMATE

The climate is continental, with extremes of heat and cold. It is influenced by winds from Siberia and the Gobi Desert, and the East Asian monsoons. The summers are hot, rising to maximums of over 30° C in August, at which time the monsoon comes and lasts until the end of September. The winters are very cold, down to -15°C, thanks to the winds from Siberia. The exception is the southerly island of Jeju, where the temperature rarely falls below 7°C in winter. The average rainfall in Seoul, for example, is around 1,250 mm per year, with about 640 mm falling in July and August.

POPULATION

The population of South Korea was 50.4 million in 2016; that of the North is guessed to be 25.3 million. The Koreans are a highly homogeneous people, having descended from Altaic peoples who migrated into the peninsula from Mongolia and intermingled with the natives of the peninsula about 3,000 years ago.

In the 20th century, the population in the South grew rapidly until the 1960s, when it tailed off and the rate of growth is now 0.2-0.3 per cent per annum. The population is young, with about 26 per cent being under 25, but the age profile is changing and

there are no longer vast masses of young people entering the labour market and keeping wages low because of the excess supply.

In administration, the country is divided into nine provinces (*do*); one special city, Seoul; and six metropolitan cities – Busan, Ulsan, Incheon, Daegu, Gwangju and Daejeon. The nine provinces contain 68 cities and 136 counties.

Table 8. South Korea: Population in the Main Cities, 2015 (Millions)

Seoul	9.9
Busan	3.4
Incheon	2.9
Daegu	2.5
Gwangju	1.4
Daejeon	1.4

Source: Official Statistics

Korea's programme of industrialisation and modernisation brought increasing urbanisation and reduced the farmers from 18 per cent in 1990 to 4.9 per cent of the working population now. Korea is therefore to be regarded as a country that lives in cities, of which the capital, Seoul, is the largest. The relevant figures are that 70 per cent of Koreans live in towns and 25 per cent of them in Seoul.

The population density of 519 per km^2 is the third highest in the world (excluding city-states) after Taiwan and Bangladesh. The workforce is no longer growing faster than the population as a whole but it is not falling and the standard of education is very high, aiding the changeover of industry to a technology-orientated export drive. Life expectancy is high, having increased to 79 years for men and 85 for women but only 13.5 per cent of the population is over 65, an official UN barrier that has just made it an 'ageing' society but not yet an 'aged' one.

Housing has not kept up with the growth in the number of households since the 1960s, when the country was directed towards industrial expansion based on exports. Mobility increased and households became smaller, having in them only 3.8 people on average now, compared with 5.4 in 1970. The consequence was that there was a chronic shortage of housing in the 1970s and the 1980s. The ratio of houses to households fell from 78 per cent in 1970 to 71 per cent in 1989 but at the end of the 1980s there was a massive effort to correct this deficit.

CONSTRUCTION ACTIVITY

The outlook for the South Korean construction industry during the next five years is better than the period under review (2012–2016), with average annual growth in real terms set to accelerate from 0.93 per cent during the review period to 2.41 per cent over the forecast period. This increase will be a result of increased government investment in public infrastructure, recovery in regional and global economic conditions, and improving consumer and investor confidence. Rises in construction permits for residential, industrial and institutional buildings will also support growth over the forecast period.

More recently, the industry has been supported by works related to the hosting of the 2018 Winter Olympic Games in Pyeongchang, Gangwon province. The government is expected to invest KRW13.0 trillion (US$10.8 billion) to construct new stadiums and other related infrastructure.

According to the Korean Statistical Information Service (KOSIS), total construction permits, including industrial, commercial and residential, issued in the country grew by 12.1 per cent from 236,804 units in 2014 to 265,445 in 2015. Moreover, the total area of construction grew by 34.3 per cent from 141.3 million m^2 in 2014 to 189.8 million m^2 in 2015.

According to the KOSIS, foreign investment in the country's real estate increased from KRW243.5 billion (US$229.4 million) in 2014 to KRW3.0 trillion (US$2.8 billion) in 2015. Affordable housing projects, growing interest from foreign investors and liberal real estate laws will help the market to grow over the forecast period.

The government's focus on the tourism industry is expected to drive growth in the commercial construction market, in particular leisure and hospitality buildings, over the forecast period. The government has promoted its cultural heritage across the world through the 'Visit Korea Years 2016–2018' program and the 'Friendly Korea' campaign. The government is also developing infrastructure to accommodate tourists, and plans to invest KRW2.1 trillion (US$2.0 billion) to develop tourism, education, healthcare, city planning, energy and traffic by 2019.

- In June 2015, the government announced the Innovation in Manufacturing 3.0 initiative to address fundamental and structural issues in the manufacturing sector. The government plans to invest KRW200.0 billion (US$172.0 million) to construct 1,500 smart factories annually, and computerize all manufacturing plants by 2020.

The South Korean government aims to connect all major cities of the country with a high-speed rail system, enabling travel to any city within 90 minutes. Accordingly, the government announced plans to expand the High-Speed Railway (HSR) network from 368km in 2011 to 2,362km by 2020 under PPP model, with an investment of KRW88.0 trillion (US$81.9 billion).

In 2014, the government reduced its total target of producing energy from nuclear power from 41.0 per cent of the total energy demand by 2030 to 29.0 per cent by 2035, as a result of safety concerns. After the 2011 Fukushima Nuclear disaster in Japan, a scandal in South Korea over nuclear safety certificates, and public protests to reduce the use of nuclear energy, the government scaled back its nuclear power expansion plans. However, to achieve the target to produce 29.0 per cent of total energy demand by nuclear, the government needs to double nuclear power-generation capacity by 2035.

Growth in the construction sector is expected to remain elevated through 2019 as work continues on numerous residential, industrial and infrastructure projects; the domestic property boom has resulted in a glut of new residential projects launched between 2014 and 2016, many of which are currently under construction. The construction market will return to a long-term trend of slow growth after 2020, however, as property-cooling measures diminish demand for residential buildings and the country's already-high level of infrastructure development negates the demand for new, high-value projects. Following 10.5 per cent real growth in 2016 - which was buoyed by an energetic real estate sector, the construction industry is now forecast to expand by 7.1 per cent in 2017. Annual growth in the construction industry will average 1.3 per cent between 2020 and 2026, with the infrastructure sector underperforming - with some segments even contracting - over that period.

Measures aimed at cooling the real estate market, introduced in October 2016, will reduce the number of new residential projects launched as developers expect demand to diminish in the upcoming years, although in the short term activity will remain robust, supported by low interest rates.

MINING AND QUARRYING

The south of Korea has virtually no mineral resources at all. It has found small reserves of antimony, copper, gold, iron ore, lead, molybdenum, silver, tin, tungsten, and zinc. The country’s reserves of coal and offshore natural gas are also small. Reserves of such industrial minerals as kaolin, limestone, pyrophyllite, silica stone (quartzite), and talc, however, are somewhat larger.

Declining amounts of lead, zinc and copper are still produced at a very low level. The only fossil fuel resource is anthracite of low grade and most production is in small deep mines in the hands of private operators. In 1990 production was as high as 17.2 million tonnes but it is much lower now.

The principal quarrying is of limestone for the production of cement. Production increased every year since 1985 until 1998, when the construction recession took its

toll. It recovered up to 2003 but fell again after that. The latest available figure is the output of 2015, 83 million tonnes.

The production of cement itself peaked, as one would expect, in 1997, at 56.9 million tonnes. It was very nearly back at that level by 2002 but recently has oscillated around 50 million tonnes annually. The cement industry comprises 11 companies that operate 51 kilns at 13 kiln plants and 27 grinding plants.

AGRICULTURAL ACTIVITY

Small and very small owner-occupied smallholdings dominate the agricultural industry. The staple crop of rice is highly subsidised, so that farmers receive far above the world price. There are 1.21 million farming households, a 54 per cent decline since 1960. 3.2 million people live on farms, a reduction of 10.8 million since 1960. The size of an average farm family has declined from 6.2 people in 1960 to fewer than three today. With fewer people available, the farmers have had to mechanise. A programme of support for mechanisation has raised the number of farm machines from 300,000 in 1980 to 2.5 million today.

Most farms are still very small. Half of all farms existing today sell less than $5,000 of produce each year. The very small units of under half a hectare (equivalent to a square plot with sides of only 71 metres) account for 35 per cent of all farms, and have held up remarkably well over the years.

The smallest units are not economic and since 2003 there have been no more direct subsidies to them. The problem is that rice farms of this size have accounted for 43 per cent of all rice farms and have received a subsidy of $376 per hectare. The government also provide subsidies to small farmers willing to sell their paddies to their neighbours. The main form of subsidy is a direct area payment, permitted by WTO rules because it does not influence market prices. From 2002 the government has zoned the country and will pay only $300 per hectare in areas where it wants to discourage rice farming, as against $600 elsewhere.

The largest crop area by far is rice, covering 61 per cent of the farmland area and generating 28 per cent of farm receipts. The government aims to reduce the rice production area to 950,000 hectares, encouraging farmers to grow alternative crops, especially vegetables. The theory was that increasing urban affluence should permit a greater consumption of fresh vegetables but the vegetable growing area has not grown, simply because their prices were less profitable after 1995. The rice farmers faced the opening of the rice market in 2004, with a programme of increased quotas of permitted imports. Other products face a promised end to the massive tariff levels of more than 45 to 700 per cent through a phased 10 year reduction programme. Rice accounts for half of the money that farmers earn directly from agriculture.

Only 42 per cent of the typical farm household's income now comes from farming. In the last six years, the farmhouse income has stagnated at around Won23 million per home. The agricultural income now grows at no more than three per cent each year, a consequence of the compromises reached during the WTO opening of trade. Farming is no longer an attractive proposition to young people and its workforce is ageing rapidly. Secondly, on a purely practical level, the ending of subsidies may take a plot of land out of use but it then tends to lie unused. Half a hectare of disused paddy does not make the space for a new electronics factory and many citizens ask what the point is of simply destroying livelihoods without thinking of the consequences.

FORESTRY

The forest area has been sustained over the last 20 years at nearly 6.5 million ha. Over 70 per cent of it is privately owned. The Korean War destroyed most timber stands and a massive reforestation programme since 1960 has resulted in 2.5 million hectares of plantation, mainly of poplar, larch and varieties of pine. The timber supply is of low quality, because much of the forest is slow growing and immature.

97 per cent of production is of small diameter logs of under 30 centimetres. It is made into lumber, plywood and chips for pulping. The government limits the harvest but in any case, the potential for high quality timber is low and much that comes out of the forest is diseased wood or inferior. Most timber used in construction, plywood apart, comes from Indonesia and Malaysia and for the present the forest owners make more money out of mushrooms and chestnuts than they do out of timber.

EQUIPMENT ANALYSES

AGRICULTURAL TRACTORS

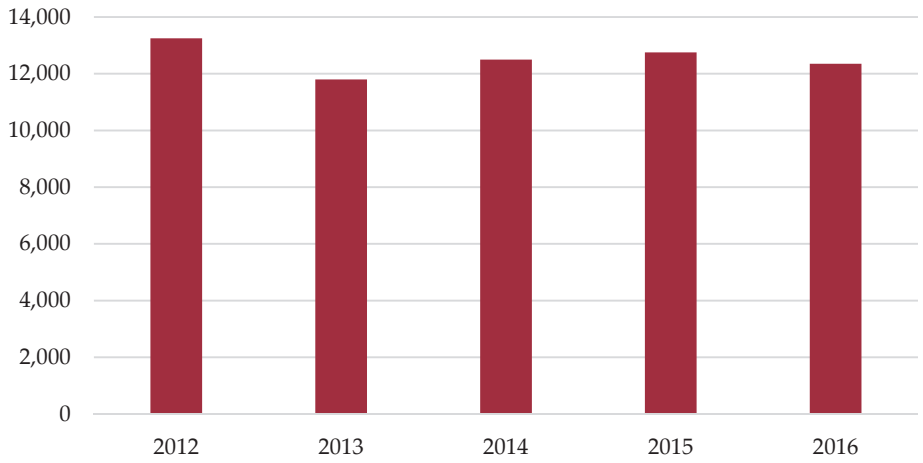
MARKET SIZE AND TRENDS

Table 9. South Korea: Sales of Agricultural Tractors, 2012-2016
(Units)

2012	2013	2014	2015	2016
13,250	11,800	12,500	12,750	12,350

Source: Off-Highway Research

Chart 5. South Korea: Sales of Agricultural Tractors, 2012-2016
(Units)



Source: Off-Highway Research

In the years when high import tariffs combined very generous support prices for rice, the agricultural tractor market varied between 20,000 and 30,000 units each year. The change came in 2000, when the market lost more than a third of its size in one year, only to be followed by a further fall of more than a quarter in 2002. Many farms are very small and need financial assistance to mechanise. Their smallness also makes them vulnerable to changes of fortune as harvests vary and prices fluctuate. The political climate had changed against the small rice farmers and, knowing that their days were numbered, they cut their purchases of farm machinery. More recently, the market appears to have settled at an average level of 12,000 tractors per year.

As regards sizes of tractor bought, the bulk of demand now lies within the band of 50 to 100 horsepower, and machines of 50-60 horsepower in particular have grown in popularity at the expense of the once popular sizes of 35 and 45 horsepower. Farmers who want to buy neighbours' land, or rent it, and carry on in farming can afford these products. Until ten years ago there were few models of Korean design in this area but initiatives by the leading manufacturers to offer larger products than

their traditional under 50 horsepower products have led to some good, up-to-date tractors being available in this size. Likewise in the category above 60 horsepower, which has more than doubled in size during recent years.

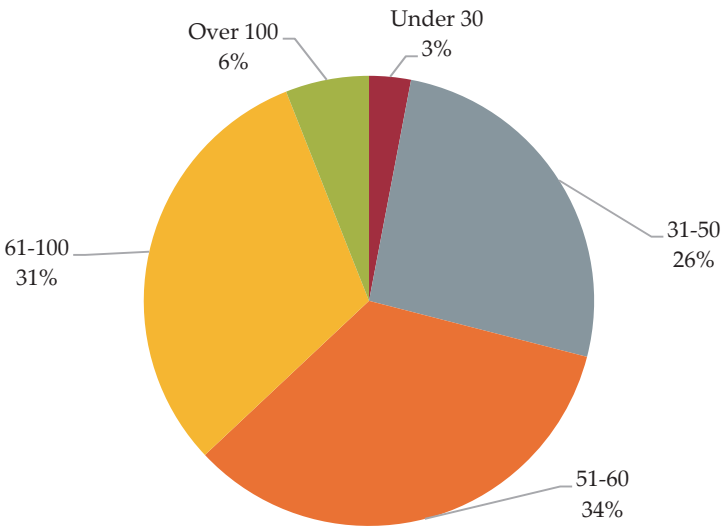
These machines often sell to the agricultural contractors, who can win enough work to justify more expensive machines. Their favourite tool is the power-hungry rotary harrow but they also work at ploughing. Thus, although Korea is a land of small farms, some large tractors (often imports or licensed designs from Europe) sell quite well. Tractors above 100 horsepower constitute a relatively small proportion of demand, although are used widely within the livestock farming sector.

Table 10. South Korea: Sales of Agricultural Tractors by Horsepower Category, 2016

Horsepower	Units	%
Under 30	370	3
31-50	3,210	26
51-60	4,200	34
61-100	3,830	31
Over 100	740	6
Total	**12,350**	**100**

Source: Off-Highway Research

Chart 6. South Korea: Sales of Agricultural Tractors by Horsepower Category, 2016



Source: Off-Highway Research

PRODUCTION

Four tractor producers exist in Korea, all of which began with licences from Japanese tractor producers.

- Daedong – Kubota
- LS – Mitsubishi
- Kukje – Yanmar
- Tong Yang – Iseki

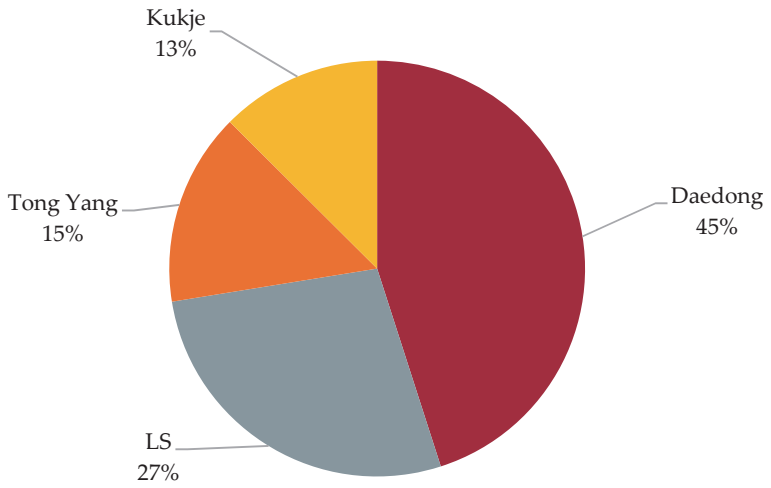
Their production has increased in line with the mechanisation of agriculture in the home country, but also as a result of significantly increased export volume, especially to the USA.

Table 11. Korea: Production of Agricultural Tractors by Manufacturer, 2012-2016 (Units)

	2012	2013	2014	2015	2016
Daedong	14,290	13,800	15,275	17,500	17,250
LS	8,890	8,100	8,450	9,450	10,500
Tong Yang	5,000	6,000	6,250	6,400	5,750
Kukje	4,250	4,500	5,000	4,900	4,800
Total	**32,430**	**32,400**	**34,975**	**38,250**	**38,300**

Note: Volumes include small amounts of imported tractors.
Source: Off-Highway Research

Chart 7. South Korea: Sales of Agricultural Tractors by Horsepower Category, **2016**



Source: Off-Highway Research

DAEDONG

Daedong is the largest manufacturer. Established in 1947, it made its first agricultural tractors in 1968, with a licensed design from Kubota of Japan. It took a licence from Ford New Holland to produce certain of its tractor models but the licence has now expired. It continued importing built-up tractors from the UK until

2005 but now imports John Deere tractors. In Europe and North America its products are marketed under the Kioti brand name via its overseas affiliates Daedong Kioti Europe and Daedong USA respectively.

The single plant in Daegu comprises a machining shop and assembly plant for engines, a sheet metal plant and two final assembly shops, one for agricultural tractors, combine harvesters and rice transplanters, the other for power tillers.

LS MTRON

LS Mtron is part of a conglomerate that produces telecom cables and related components, power and control cables, electronic components, copper wire rod and industrial machinery. Agricultural tractor production dates from 1977. Its own first tractor design came in 1984. The tractor manufacturing moved to Jeonju, the capital of north Jeolla, in 2005. The plant has a separate component shop for front and rear axles, hydraulic and assembly of the transmission, as well as a paint shop. There are two production lines, with an annual capacity of 15,000 units.

TONG YANG

Tong Yang established a factory in Anyang to make farm machinery in 1973 but moved it to Changwon in 1978. Farm machinery production in China has expanded, with a combine harvester factory being built in Suzhou in China in 1999; an assembly factory for rice transplanters in Yancheng, Jiangsu province, in 2000; and a plant for small tractors in Liaoning in 2005.

The agricultural tractor range comprises small models powered by Mitsubishi engines and medium-sized products with Caterpillar engines. The separate export range of compacts uses Mitsubishi engines, larger products having Caterpillar engines.

In September 2016 Tong Yang completed the acquisition of all the assets of fellow domestic tractor manufacturer, Kukje Machinery.

KUKJE

Kukje has been a farm machinery manufacturer since 1978. In 1980, it took a licence for farm machinery from Yanmar of Japan and in 1987, it became the John Deere dealer for Korea.

The company's plant in Okcheon makes engines and transmissions, as well as assembling farm machinery. It has a foundry for engine blocks, cylinder heads, transmission cases and clutch housings, machine shops, heat treatment and a sheet metal plant. The block and head making capacity is 20,000 units per year, on an exclusive automated line.

Although they employ a variety of engines to complete their ranges (with Korean engines usually supplanted by Japanese units for export markets), all the manufacturers have facilities to make their own gearboxes and axles. Some go as far as having foundries on-site or within the group that can supply the necessary castings. Korean manufacturers supply pumps but again it is the tractor plants themselves that build the draft and position control systems.

COMPONENT SOURCING

Table 12. Korea: Component Sourcing for Agricultural Tractors, 2017

Component	Daedong	Kukje
Engines	In-house, Doosan, Perkins	Yanmar, Deere
Transmissions	In-house	In-house, Deere
4WD Axles	In-house	In-house, Deere
Pumps	Korea	In-house
Hydraulic Systems	In-house	In-house, Deere
Cabs	In-house	In-house
Tyres	Various	Various
	LS	**Tong Yang**
Engines	Mitsubishi, In-house, Perkins	Kubota, Daedong, Deere
Transmissions	In-house, New Holland	In-house
4WD Axles	In-house, New Holland	In-house
Pumps	Choyang Precision, Shimatsu	Korea
Hydraulic Systems	In-house	In-house
Cabs	In-house	Subcontract
Tyres	Various	Various

Note: Data does not cover imported tractors
Source: Company Information

FOREIGN TRADE

Korea came late to exporting agricultural tractors but its products have found a place in the compact tractor market in North America. The volume exported has increased significantly since the last report, thanks to major efforts by Daedong and LS, the most successful exporters.

Table 13. Korea: Exports of Agricultural Tractors by Manufacturer, 2016

Manufacturer	Export Brand Name	Units
Daedong	Kioti (USA and Europe)	13,800
LS	LS	6,800
Kukje	Branson	2,900
Tong Yang	TYM	2,875
Total		**26,375**

Source: Off-Highway Research

Daedong began selling agricultural tractors in 1985 and currently has 250 dealers in North America. They account for 80 per cent of all export sales. **LS** has supplied

tractors to Montana Tractors of the USA since 2004 and also supplies its compact products to McCormick and Landini networks in North America.

Kukje has been exporting to North and South America for around 20 years. The sales campaign in the USA began in earnest in 2001, selling the Branson brand of tractors through two importers. One then changed to marketing the tractors with the Century brand name (and finally gave up in 2005), while Kukje bought out the other and made it into Branson Tractors Inc.

Tong Yang has not been a consistent performer in exports in recent years, although dealers are established in several European countries, New Zealand and Australia.

Imports have begun to play an increasing role in the market. The most prominent importer is **Kubota**, marketing compact tractors of 40-50 horsepower for paddy work, a medium range of models up to 90 horsepower and a single example of the big M series. Its volumes have grown significantly during the last five years and its market share now equates to some 10 per cent. Other imported brands include Yanmar; John Deere, which sells through Daedong and Kukje; and New Holland.

MARKET SHARES

All four of the leading manufacturers sell a variety of small equipment for the mechanisation of rice and other agriculture.

DAEDONG

In the field of tractors **Daedong**, which has been in the market since 1968, is well ahead of its rivals. It has an 80 per cent share of the power tiller market and over 30 per cent of the rice transplanters. The volumes shown above include its sales of John Deere imported tractors.

LS

In second place comes **LS**. Its volumes include a variety of New Holland agricultural tractors from Italy and the UK, at 60 to 110 horsepower. LS is the second most successful supplier of these larger tractors today.

TONG YANG

Tong Yang acquired the **Kukje** tractor business in 2016 and the two companies' combined market share is now 30 per cent. The best sellers for TYM are the 50-60 horsepower home produced models. Kukje has held its share of the market steady but now no longer builds the John Deere 6000 series in Korea, a line of which it used to sell 700 examples every year.

KUBOTA

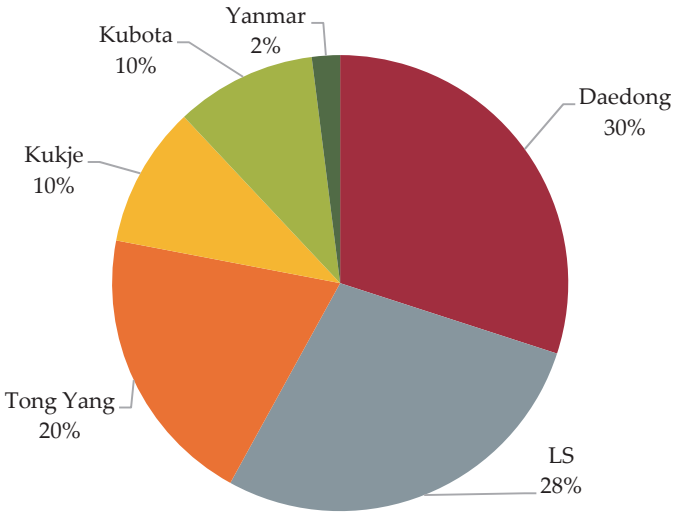
Kubota currently sells in excess of 1,000 tractors annually and has benefited from an aggressive marketing campaign aimed specifically at the Korean market. The establishment of its own subsidiary company, Kubota Korea, and a nationwide network of some 50 dealers have also contributed to the company's rapid rise in fortunes.

Table 14: South Korea: Suppliers of Agricultural Tractors and Their Market Shares, 2016

	Units	%
Daedong	3,700	30
LS	3,460	28
Tong Yang	2,470	20
Kukje	1,250	10
Kubota	1,220	10
Yanmar	250	2
Total	**12,350**	**100**

Source: Off-Highway Research

Chart 8: South Korea: Suppliers of Agricultural Tractors and Their Market Shares, 2016



Source: Off-Highway Research

The full list of suppliers is shown below. Dealer networks tend to be dense but composed of small businesses, alongside the powerful farmers' co-ops.

Table 15. Korea: Distribution Networks of Agricultural Tractors, 2017

Manufacturer	Distributor
Daedong	Daedong Industrial Co. Ltd
John Deere	Daedong Industrial Co. Ltd;
	Kukje Machinery Co. Ltd
Kubota	Kubota Korea Co. Ltd
Kukje	Kukje Machinery Co. Ltd
LS	LS Mtron Ltd
Massey-Ferguson	Asia A Tec Co. Ltd
New Holland	LS Mtron Ltd
Tong Yang	Tong Yang Moolsan Co. Ltd

Source: Company Information

POPULATION AND END-USERS

The wheeled tractor has come to achieve a much more important role during recent years and the population of active machines is now estimated to be around 300,000 units. Thirty years ago the dominant source of power for cultivation was 750,000 power tillers, while there were only 12,000 wheeled tractors. Since then the tractor population has never ceased to grow, while the power tiller peaked at 960,000 in 1998 and is now down to 600,000 units.

FORECAST

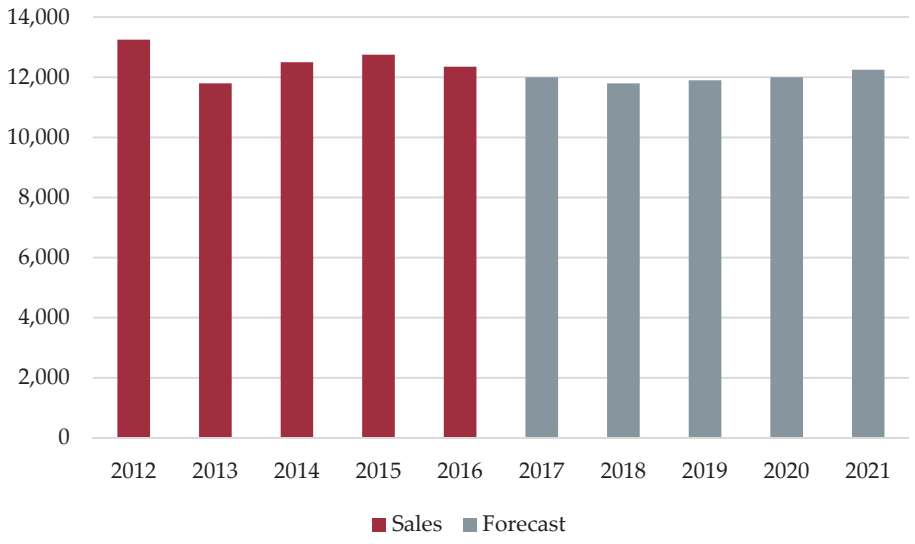
Most suppliers are confident that annual demand will be maintained in a range of 11,000 to 12,000 units per year, although fluctuations in the world price of rice will inevitably affect investment into farm machinery in any given year.

Table 16. South Korea: Forecast Sales of Agricultural Tractors, 2017-2021 (Units)

2017	2018	2019	2020	2021
12,000	11,800	11,900	12,000	12,250

Source: Off-Highway Research

Chat 9. South Korea: Sales and Forecast Sales of Agricultural Tractors, 2012-2021 (Units)



Source: Off-Highway Research

MACHINES AVAILABLE

Table 17. South Korea: Agricultural Tractors Available, 2017

Manufacturer	Model	Engine HP	Engine Manufacturer	Product Source
Daedong	L330	30	Daedong	Korea
	L3503	35	Daedong	Korea
	D400	40	Daedong	Korea
	D4351	43	Daedong	Korea
	LX430	43	Daedong	Korea
	LX470	47	Daedong	Korea
	D470	47	Daedong	Korea
	D500	50	Daedong	Korea
	LX480	50	Daedong	Korea
	D581	58	Daedong	Korea
	LX60	60	Daedong	Korea
	D652	65	Perkins	Korea
	LX68	68	Daedong	Korea
	D702	70	Perkins	Korea
	D852	85	Perkins	Korea
Kubota	L430/430M	42	Kubota	Japan
	L500	50	Kubota	Japan
	MZ553	55	Kubota	Japan
	GM56	56	Kubota	Japan
	MZ603	60	Kubota	Japan
	GM64	64	Kubota	Japan
	MZ653	65	Kubota	Japan
	MZ703	70	Kubota	Japan
	GM73	73	Kubota	Japan
	MZ763	76	Kubota	Japan
	GM82	82	Kubota	Japan

Source: Company Information (Continued)

Table 17. South Korea: Agricultural Tractors Available, 2017 Continued)

		Engine		
Manufacturer	Model	HP	Manufacturer	Product Source
Kubota (Continued)	MZ853	85	Kubota	Japan
	GM90	89	Kubota	Japan
	MZ953	95	Kubota	Japan
	M125X	125	Kubota	Japan
Kukje	2100	21	Kukje	Korea
	2400	22	Kukje	Korea
	2800	26	Kukje	Korea
	AF325	32	Kukje	Korea
	3510	35	Kukje	Korea
	AF365	36	Kukje	Korea
	AF455	45	Kukje	Korea
	4715H	47	Kukje	Korea
	4720	47	Kukje	Korea
	4805	48	Kukje	Korea
	5305	53	Kukje	Korea
	5805	58	Cummins	Korea
	KS 7505 K3	75	Iveco	Korea
	KS 8205 K2	82	Iveco	Korea
	KS 9205 K1	92	Iveco	Korea
LS	S28	28	Daedong	Korea
	R28	26	Mitsubishi	Korea
	R32	32	Mitsubishi	Korea
	R36	36	Mitsubishi	Korea
	R41	39	Mitsubishi	Korea
	R50	45	Mitsubishi	Korea
	N41	41	LG Mitsubishi	Korea
	N47	47	LG, Mitsubishi	Korea
	N60	57	Mitsubishi	Korea
Tong Yang	T302	31	Mitsubishi	Korea
	T352	36	Mitsubishi	Korea
	T502	50	John Deere	Korea
	T483	54	Caterpillar	Korea
	T552	55	John Deere	Korea
	T720s	72	John Deere	Korea
	T793	79	Caterpillar	Korea
	T893	89	Caterpillar	Korea
	T993	99	Caterpillar	Korea

Source: Company Information

ASPHALT FINISHERS

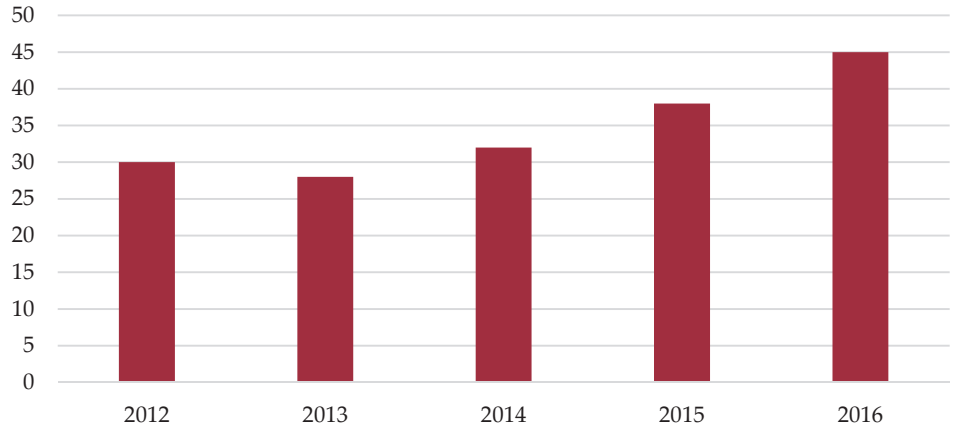
MARKET SIZE AND TRENDS

Table 18. South Korea: Sales of Asphalt Finishers, 2012-2016
(Units)

2012	2013	2014	2015	2016
30	28	32	38	45

Source: Off-Highway Research

Chart 10. South Korea: Sales of Asphalt Finishers, 2012-2016
(Units)



Source: Off-Highway Research

In the years before the Asian Financial Crisis the asphalt finisher market regularly reached 50 units per year. After that sales slumped and annual demand fell to an average of 20 units for the ensuing ten years. The instigation of new highways construction in recent years has, however, led to a welcome recovery in demand during the period under review, with sales once again approaching pre-Crisis levels.

The choice of asphalt finisher type made by the authorities in Korea is quite limited. The conviction that tracked pavers bring a better mat is total and past practices are rigidly adhered to. Fairly fast operation is expected, so the Japanese products are not popular because of their much lower throughput. American products fail on the lack of density in the mat, and all machines sold have a double tamper in the screed.

As a result, the market essentially consists of crawler machines with a working width from 2.5 to 4.5 metres and a 100 horsepower engine. Almost no larger units are ever imported.

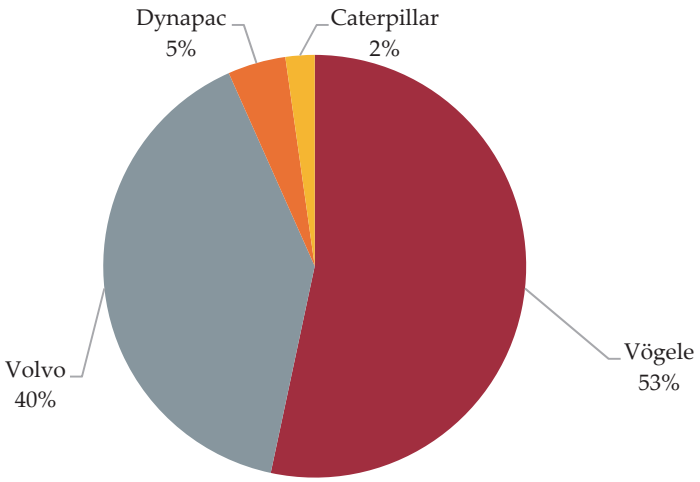
MARKET SHARES

Table 19. South Korea: Suppliers of Asphalt Finishers and Their Market Shares, 2016

	Units	%
Vögele	24	53
Volvo	18	40
Dynapac	2	5
Caterpillar	1	2
Total	**45**	**100**

Source: Off-Highway Research

Chart 11. South Korea: Suppliers of Asphalt Finishers and Their Market Shares, 2016



Source: Off-Highway Research

The asphalt finisher market is very small and exploited by specialists.

VÖGELE

The leader now is **Vögele**. The account was with Sam Joo International Corp. in the 1990s but the Wirtgen group then transferred the franchise to the Sambo Heavy Industries company in 1999. In 2001 it took the Hamm compaction equipment franchise, concentrating all Wirtgen group products on one company. With the approval of the German manufacturer, one of the group's companies now uses the trading name of 'Wirtgen Korea'. Sales typically consist of a mix of the Super 1800 and 1900 models, in addition to around ten used asphalt finishers per year.

VOLVO

Volvo has been selling the former ABG product line since 2007 and has established itself as the leading challenger to Vögele. Ingersoll-Rand ABG was previously sold

in Korea for many years by Hae In, the Caterpillar dealer, and for a short time by Ingersoll-Rand Korea. Hae In has taken up Caterpillar's international line of pavers but markets only a limited range of its Italian-built machines.

Dynapac, now marketed under the parent company's Atlas Copco brand, is sold by the U Young organisation.

The full list of potential suppliers is shown below.

Table 20. South Korea: Distribution Networks of Suppliers of Asphalt Finishers, 2017

Manufacturer	Distributor
Caterpillar	Hae In Corp
Dynapac	U Young Industrial
Vögele	Sambo Heavy Industries
Volvo	Volvo Construction Equipment Korea

Source: Off-Highway Research

POPULATION AND END-USERS

The population of active machines, based on official data of machines registered, is around 900 units.

FORECAST

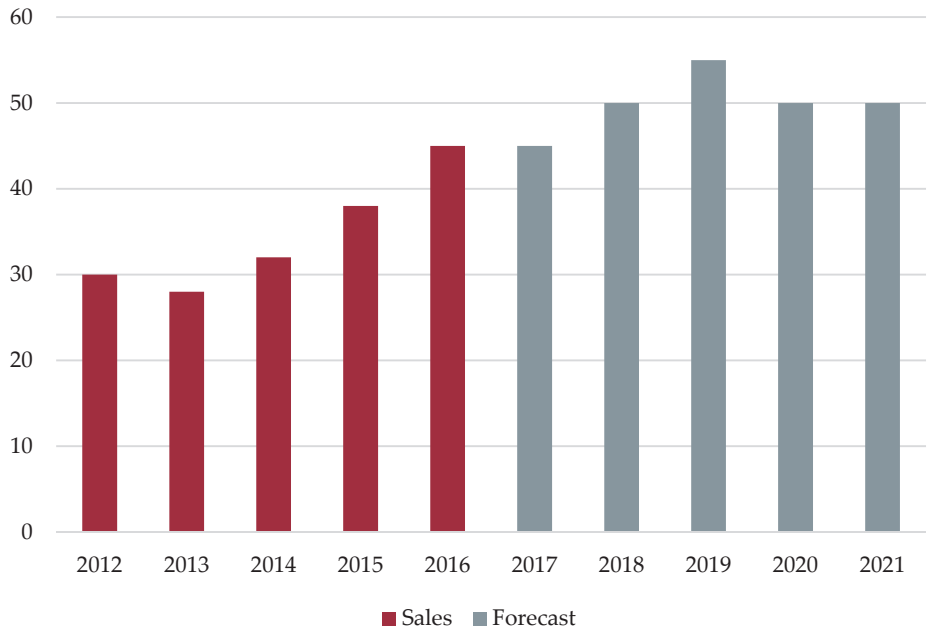
The outlook for sales of asphalt finishers should be promising in light of the government's proposed infrastructure construction plans. If these plans are realised, annual demand should be maintained at an average level of 50 units per year throughout the forecast period under review.

Table 21. South Korea: Forecast Sales of Asphalt Finishers, 2017-2021 (Units)

2017	2018	2019	2020	2021
45	50	55	50	50

Source: Off-Highway Research

Chart 12. South Korea: Sales and Forecast Sales of Asphalt Finishers, 2012-2021 (Units)



Source: Off-Highway Research

MACHINES AVAILABLE

Table 22. South Korea: Asphalt Finishers Available, 2017

			Engine		
Manufacturer	Model	HP	Manufacturer	Paving Width	Product Source
Caterpillar	AP-650B	125	Caterpillar	2.4-8.0	Italy
	AP-1055D	222	Caterpillar	3.1-13.0	Italy
	AP-800D	130	Caterpillar	2.4-8.0	Italy
	AP-1000D	222	Caterpillar	3.1-13.0	Italy
Dynapac	F6C/DF65C	71	Deutz	1.7-4.4	Germany
	SD2500CS	193	Cummins	2.0-10.0	China
	SD2550CS	264	Cummins	2.0-14.0	China
	F161-8W	208	Cummins	2.5-9.0	Germany
Vögele	Super 1600	134	Perkins	2.5-8.0	Germany
	Super 1800	174	Perkins	2.5-10.0	Germany
	Super 1603	134	Perkins	2.5-7.0	Germany
	Super 1803	174	Perkins	2.5-8.0	Germany
Volvo	ABG 5820	152	Deutz	2.5-8.0	Germany
	ABG 7820	231	Deutz	2.5-10.0	Germany

Source: Company Information

BACKHOE LOADERS

MARKET SIZE AND TRENDS

Table 23. South Korea: Sales of Backhoe Loaders, 2012-2016
(Units)

2012	2013	2014	2015	2016
-	2	1	1	-

Source: Off-Highway Research

The effort to convince the mainstream of Korean construction of the virtues of the multipurpose backhoe loader has been without success. The small excavator at 5.5 tonnes is the current replacement but even 20 years ago, when that product did not exist in large quantities, it proved impossible even for an organisation as powerful as Samsung to market successfully the Case machine of the time. The same was later true of Daewoo trying to launch the New Holland backhoe loaders.

One factor alone was kind to the product, the surge of golf course construction in the good years of the early 1990s. The landscaping specialists accepted the small backhoe and sales rose from the mid-1980s level of 50 units per year to 110. In 1992, the golf course boom faded and sales fell to about 20 units. When 5.5 tonne mini excavators sold well, the backhoe loader disappeared. The incremental number of machines sold in recent years have gone to the golf course construction industry and a few local authorities.

PRODUCTION

Hyundai has produced a two-model range of backhoe loaders in limited volumes at its Ulsan factory since 2010, although the company does not sell the product in its domestic market.

MARKET SHARES

Only the **JCB** importer, Jae In International, and the **Case** importer, Samjung Construction Machinery, market the backhoe loader, although neither company has secured more than an incremental volume of sales during the last 10 years. JCB sold a single 1CX model in 2015.

Table 24. South Korea: Suppliers of Backhoe Loaders and Their Market Shares, 2015-2016

	2015		2016	
	Units	%	Units	%
JCB	1	100	-	-
Total	**1**	**100**	**-**	**-**

Source: Off-Highway Research

Table 25. South Korea: Distribution Networks of Suppliers of Backhoe Loaders, 2017

Manufacturer	Distributor
Case	Samjung Construction Machinery
JCB	Jae In International

Source: Off-Highway Research

POPULATION AND END-USERS

100 machines are left over from the efforts of various suppliers of the past, who have included Kukje (John Deere); Samsung, Kilwoo and Shinjoo (Case); Hando (JCB); and Hae In (Caterpillar).

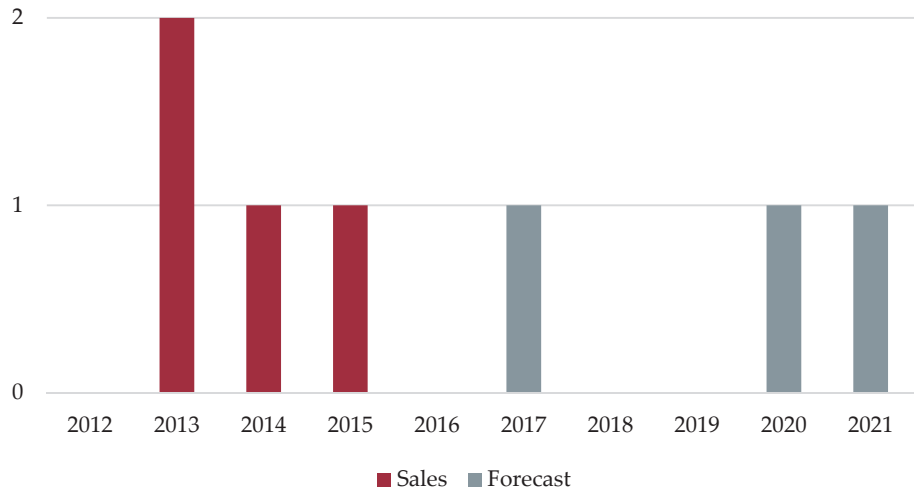
FORECAST

Table 26. South Korea: Forecast Sales of Backhoe Loaders, 2017-2021 (Units)

2017	2018	2019	2020	2021
1	-	-	1	1

Source: Off-Highway Research

Chart 13. South Korea: Sales and Forecast Sales of Backhoe Loaders, 2012-2021 (Units)



Source: Off-Highway Research

It does not seem likely that users will change their minds about the viability of the backhoe loader, especially in view of the comprehensive range of mini excavators now available.

MACHINES AVAILABLE

Table 27. South Korea: Backhoe Loaders Available, 2017

Manufacturer	Model	Engine HP	Manufacturer	Operating Weight (Kg)	Product Source
Case	580 Super R	97	FPT	7.9	Italy
	590 Super R	111	FPT	8.1	Italy
	695 Super R	111	FPT	8.7	Italy
JCB	3CX	85	JCB	7.6	India
	3CX Super	92	JCB	7.6	India
	4CX	100	JCB	8.4	India

Source: Company Information

COMPACTION EQUIPMENT

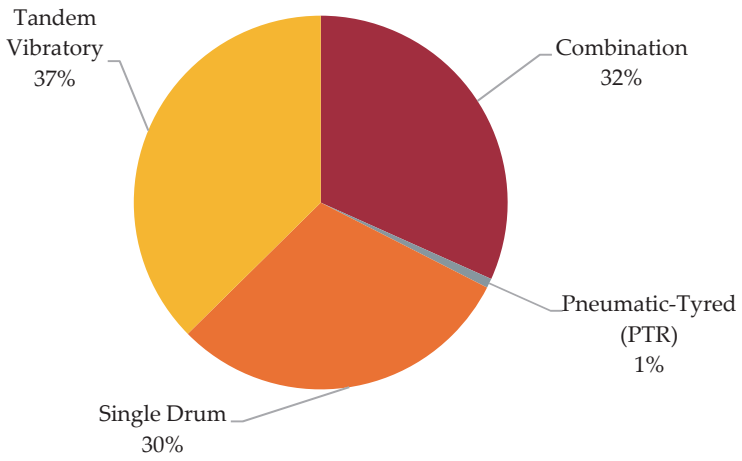
MARKET SIZE AND TRENDS

Table 28. South Korea: Sales of Compaction Equipment by Type, 2015-2016 (Units)

	2015	2016
Combination	40	39
Pneumatic-Tyred (PTR)	2	1
Single Drum	70	37
Tandem Vibratory	80	46
Total	**192**	**123**

Source: Off-Highway Research

Chart 14. South Korea: Sales of Compaction Equipment by Type, 2015-2016 (Units)



Source: Off-Highway Research

Compaction equipment is all imported. Users employ a narrow range of machines, directed by official recommendations. Asphalt compaction on new roads tends to be done in three stages. The finisher is followed by a tandem roller to achieve the initial compaction, then a static roller to complete it. This applies to both the base courses and the wearing course. The final sealing of the wearing course surface is done by a tyred roller (also called a PTR). The techniques are modified for higher quality surfaces such as airports and main highways but essentially the country's engineers stay with the principle that asphalt requires a non-vibrated roller to finish the surface. In respect of street repairs, patching is done by the use of simple one-way plates, of which there are several small Korean manufacturers. Larger repairs use a combination roller, offering passes with tyres and vibrated steel rolls in one machine. Pedestrian rollers are little used and few are sold.

Earth compaction has to be carried out by a single-drum roller of at least 10 tonnes in weight, according to official requirements. Therefore, almost all earth rollers weigh 11 tonnes.

The compaction market is extremely volatile. It can double or halve in a period as short as a year, mainly as a result of the extreme financial fragility of the buyers, which are in the main small specialists, involved in surfacing or concentrating on the hire of the necessary plant. The Asian Financial Crisis had the effect of almost totally eradicating the possibility of selling new compaction equipment. The market dropped by 90 per cent in 1998 and in 1999 was at a level equivalent to a quarter of the norm of the 1990s. The slump endured until 2007, when the soil roller market showed some strength, although volumes have since failed to exceed 200 units per year. The main reason is that new compaction equipment was replaced almost entirely by used machines.

Used static, combination and self-propelled rollers from Japan have traditionally dominated all sectors in terms of sales, although the introduction of Tier IV emissions regulations has restricted the flow of imports significantly in recent times. During the early part of the new millennium, the market reached the condition where around 50 new rollers were sold alongside approximately 1,000 used machines, almost all from Japan. Thereafter even this area showed signs of being swamped and Japanese imports declined to 600 units (Sakai products almost all come from Indonesia so play hardly any role in the figures). Essentially Korea was buying the surplus plant of the stricken Japanese construction industry since 1998.

As the population section of the report will show, the number of machines registered has never ceased to rise, even after 1997, and the flow from Japan has had a considerable impact on all sectors of the business. The impact is heaviest on low usage machines, such as PTRs, as they perform quite adequately in old age. The one sector that showed some life is earth compactors, where several American and European names have a high reputation and some customers are willing to buy the new machines in preference to the Japanese products available from used equipment sources. Almost all the 100 units sold in 2015-2016 will have been in the 11 tonne category. Larger sizes are dearer but rarely absolutely necessary. This type of roller can be employed on the preparation of housing, factory and office sites as well as on roads, dams and other civil engineering works.

PRODUCTION

The demand for rollers is so volatile that production in Korea cannot be justified economically. **Samsung** formerly had a licence to produce certain models of **Sakai** for sale in Korea. Production was erratic and the last runs were in 1993 to 1996. Two types were produced, a 10 tonne self-propelled machine and a 15 tonne PTR. The manufacturer's domestic sales organisation sold large volumes of imported Sakai rollers at the same time and the rationale for local production was rejected in the mid-1990s.

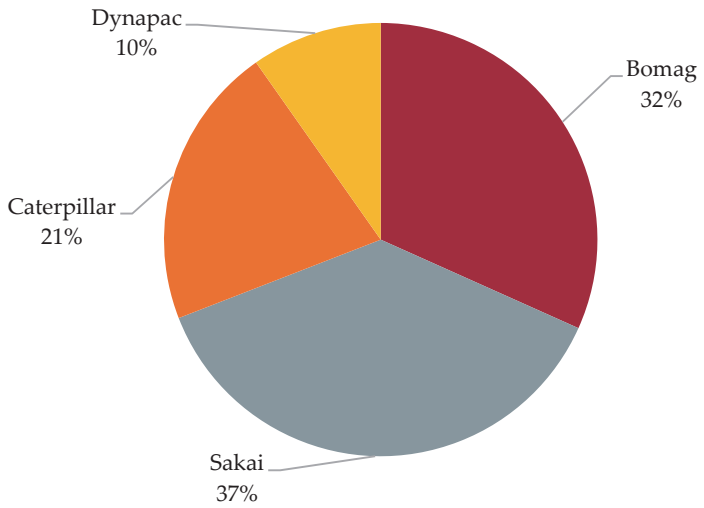
MARKET SHARES

Table 29. South Korea: Suppliers of Compaction Equipment and Their Market Shares, 2016 (Units)

	PTR	Soil Compactor	Tandem Vibratory	Combination	Total	% share
Sakai	1		20	25	46	37
Bomag		15	12	12	39	32
Caterpillar		17	9		26	21
Dynapac		5	5	2	12	10
Total	1	37	46	39	123	100

Source: Off-Highway Research

Chart 15. South Korea: Suppliers of Compaction Equipment and Their Market Shares, 2016 (Units)



Source: Off-Highway Research

SAKAI

Sakai, marketed by YK Construction Equipment, is the perennial market leader, although it does not sell the company's range of single drum soil compactors in South Korea due to that product's non-compliance with Tier IV regulations.

BOMAG

Bomag is a franchise that has changed hands frequently, in spite of its high international prestige. It is now in the hands of Nama Worldwide, having been previously represented by **Doosan Infracore**. Hae In sold **Caterpillar** and **Ingersoll-Rand** products in different divisions of its organisation until **Volvo** bought the Ingersoll-Rand road building product lines in 2007 and put its own name on them in 2008.

DYNAPAC

Dynapac divides its franchise, with the heavy side being handled by U-Young Industrial and the light by one of its former sub-dealers. U-Young normally sells 10-15 units of Dynapac's Swedish and Chinese ranges in Korea each year and is involved in a number of sales by Dynapac to the international contractors.

Table 30. South Korea: Distribution Networks of Suppliers of Compaction Equipment, 2017

Manufacturer	Distributor
Bomag	Nama Worldwide
Caterpillar	Hae In Corp.
Dynapac	U Young Industrial
Hamm	Wirtgen Korea
Sakai	YK Construction Equipment
Volvo	Volvo Construction Equipment Korea

Source: Off-Highway Research

POPULATION AND END-USERS

The population has risen from 3,700 units in 1995 to 6,500 units in 2017. The low volume of new machine sales has, until recently, been fuelled by imports from Japan.

The largest concentration of compaction equipment is kept in the capital for repairs. The rental companies specialising in earthmovers for the main contractors are the largest owner grouping but civil engineers and construction companies still own about 35 per cent of the compaction equipment registered.

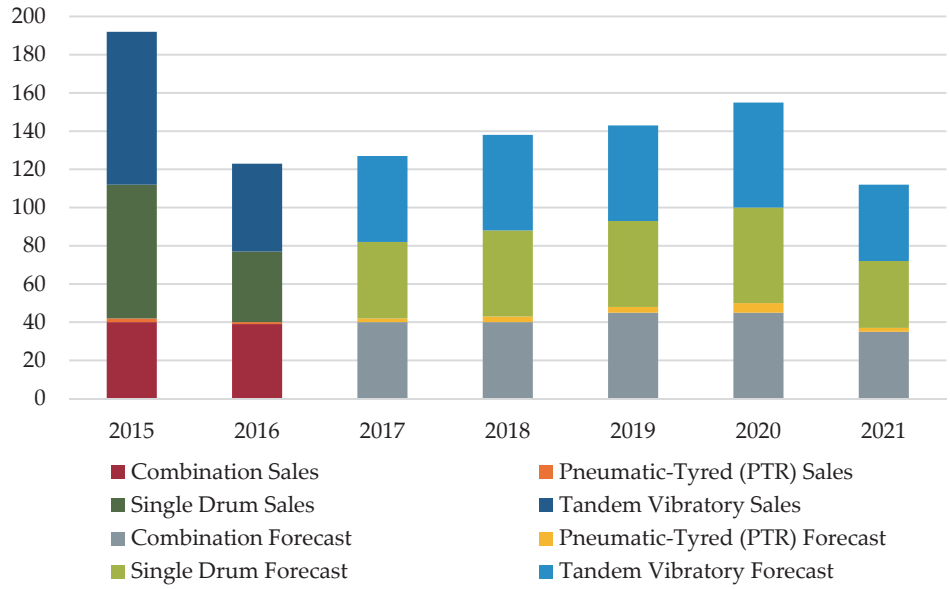
FORECAST

Table 31. South Korea: Forecast Sales of Compaction Equipment, 2017-2021 (Units)

	2017	2018	2019	2020	2021
Combination	40	40	45	45	35
Pneumatic-Tyred (PTR)	2	3	3	5	2
Single Drum Vibratory	40	45	45	50	35
Tandem Vibratory	45	50	50	55	40
Total	127	138	143	155	112

Source: Off-Highway Research

Chart 16. South Korea: Forecast Sales of Compaction Equipment, 2015-2021 (Units)



Source: Off-Highway Research

The imposition on compaction equipment of the rules concerning engine emissions has virtually eliminated the import of used equipment from Japan. The idea that the large volume of used compactors could in the future be replaced by sales of new machines has not been realised. Compaction equipment is long-lived and relatively easy to recondition, since much of its value consists simply in the steel used to achieve a certain operating weight. Users have to a large extent recycled the old compaction equipment already in the country until they really need to buy new machinery.

Unfortunately, there seem to be few projects where competition is so pressing that the contractor must buy top productivity machinery in the near future. Within the forecast period, the government has announced its plans for several new national highway and associated infrastructure projects. If those plans go into action, the outlook for compaction equipment should be bright.

Given that the country has 100,000 kilometres of main highways, there are some prospects of network development but nothing dramatic. To maintain the network and make some modest additions, the compaction equipment market might rise towards 150 units per year. The number of compactors in the national fleet will continue to fall, as the existing fleet of ageing machines is gradually turned to scrap metal and exported to China.

MACHINES AVAILABLE

Table 32. South Korea: Compaction Equipment Available, 2017

Manufacturer	Model	HP	Engine Manufacturer	Operating Weight (Kg)	Product Source
PTRs					
Sakai	TZ701	94	Hino	15.0	Japan
Soil Compactors					
Bomag	BW 211PD-40	131	Deutz	11.9	China
Caterpillar	CS-533E	132	Caterpillar	10.8-12.4	China
Dynapac	CA 252D	146	Cummins	9.6	Sweden
Hamm	3410	129	Deutz	10.5	Germany
	3411	129	Deutz	11.3	Germany
Volvo	SD100D	125	Cummins	10.4	China
Bomag	BW161AHD-4	101	Deutz	10.9	China
	BW202AD-4	131	Deutz	11.5	China
Caterpillar	CB534D	130	Caterpillar	10.4	China
	CB564D	130	Caterpillar	12.6	China
Dynapac	CC422	127	Cummins	11.2	China
	CC522	127	Cummins	12.6	China
	CC622	127	Cummins	13.2	China
Hamm	HD75	75	Deutz	7.4	Germany
	HD90	115	Deutz	9.1	Germany
	HD110	128	Deutz	10.6	Germany
Sakai	SW800	109	Isuzu	10.2	Japan
	SW850	121	Isuzu	12.4	Japan
	SW900	140	Isuzu	13.0	Japan

Source: Company Information

CRAWLER DOZERS

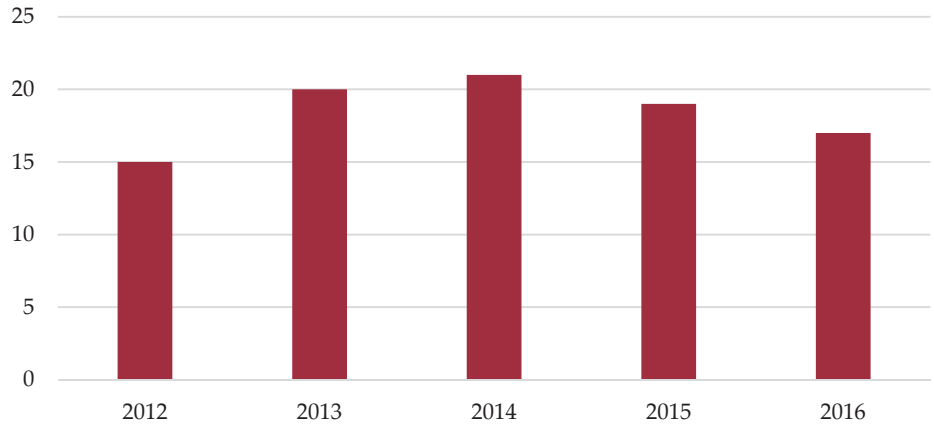
MARKET SIZE AND TRENDS

Table 33. South Korea: Sales of Crawler Dozers, 2012-2016
(Units)

2012	2013	2014	2015	2016
15	20	21	19	17

Source: Off-Highway Research

Chart 17. South Korea: Sales of Crawler Dozers, 2012-2016
(Units)



Source: Off-Highway Research

The crawler dozer enjoys much less status in the construction industry today than when it was entirely an imported, mostly American tool. Building land is so restricted that the hydraulic excavator and tipper truck are much more appropriate. Nevertheless, the product retains a presence in land reclamation and development, in addition to civil engineering. Golf course construction accounted for a relatively large volume of small dozers in the past, although this sector has declined in importance in recent years.

There was a massive peak of sales in 1990-1991 during the property boom, which coincided with the agricultural reform that necessitated the formation of new paddy fields for the larger farms. Sales reached 800 units in a single year and the major construction equipment manufacturers gained confidence in the product. The agriculture programme came to an end and the market settled around 160 units per year in 1995 to 1997.

The Asian Financial Crisis had the same dire effect on dozers as on other products. Sales fell to a minimal level but in the case of the dozer they have not recovered at all. Buyers did content themselves with used machines from Japan in the period from 1999 onwards, although recent new emissions legislation has put a stop to that.

The new machines sold today are very small by international standards.

70 horsepower machines are more employed in construction but the trend of usage is against the dozers and in favour of hydraulic excavators, including the 5.5 tonne mini excavators. Rental companies are not enthusiastic to keep small crawler dozers available, as they sense that users are not looking for them so much as for small excavators.

PRODUCTION

There is no domestic production of crawler dozers, although in 1989 Samsung and Daewoo began to assemble licensed products for sale under their own name in Korea. Before that time Hyundai and Samsung had gained manufacturing experience with contracts for the assembly of units destined mainly for clients selling them in the North American market. At that time it looked as if the crawler dozers would take a role in the industry, if not one as large as the hydraulic excavator. That did not happen and the last Korean crawler dozer was made in 2006.

Hyundai forged a link with Dresser of the USA in 1986 to manufacture crawler dozers and loaders for sale under the Dresser name abroad and the Hyundai name in Korea. The quantities delivered varied widely and by the early 1990s the Hyundai brand machines amounted to only 40 per year. The need for the Korean product within Dresser diminished as it used its Polish licensee more and production lapsed in the middle of the decade. Hyundai launched its own design for the North American market in 1989. At that time success in North America was the prize that all Korean manufacturers sought but after an initial burst of enthusiasm on the part of the American dealers, demand all but ceased in the downturn of 2001. Very few were built after that, 26 according to Off-Highway Research estimates, spread over six years.

Others participated at different times. **Halla** was the pioneer of crawler dozer production in Korea, with production running from 1977 to 1997. **Daewoo** made a 40 horsepower model based on a design by Furukawa of Japan from 1989 to 1993, followed by its own design of 80 horsepower that lasted until 2001. **Samsung** made 1,000 units for **Case** between 1987 and 1993. In 1989 it started to make **Komatsu** models under licence and in 1993 launched some Samsung models, a small 45 horsepower design and, aimed more at the world market, a 240 horsepower machine of nearly 25 tonnes' weight, the SD250. Output of the total range went to over 300 units per annum in 1990-1991 but fell back to 100 units by 1993 and in the last year of production was about 70 units. It did not survive the take-over by Volvo.

MARKET SHARES

Table 34. South Korea: Suppliers of Crawler Dozers and Their Market Shares, 2015-2016

	2015		2016	
	Units	%	Units	%
Caterpillar	19	100	17	100
Total	**19**	**100**	**17**	**100**

Source: Off-Highway Research

Without local competition, **Caterpillar** has dominated the market. The dealer Hae In sells 70 per cent of its volume in the utility size D3 from Japan, most of the rest in the D5 and D6 sizes. No other manufacturer has sold any units within the last three years.

Table 35. South Korea: Distribution Networks of Suppliers of Crawler Dozers, 2016

Manufacturer	Distributor
Caterpillar	Hae In
Komatsu	Junjin
Liebherr	Gintex Korea

Source: Off-Highway Research

POPULATION AND END-USERS

The population of machines is in gentle decline, having fallen by 20 per cent in the last 10 years, as the machine loses out to small tracked excavators.

The largest concentration of crawler dozers is in the capital and the surrounding province of Gyeonggi, followed by Gwangju. The main form of ownership is the small sub-contractor, sometimes known as renters but always with a driver. A small volume of larger dozers are used in power plants and coal handling applications.

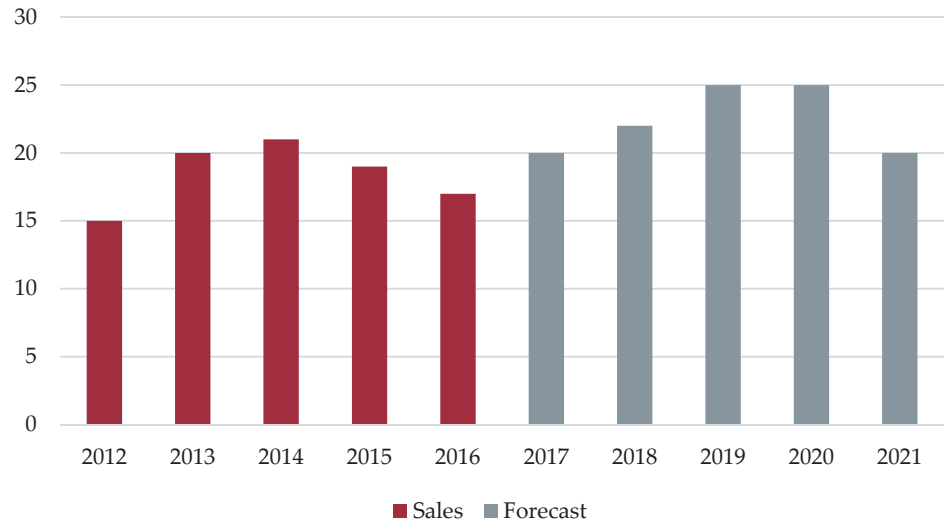
FORECAST

Table 36. South Korea: Forecast Sales of Crawler Dozers, 2017-2021 (Units)

2017	2018	2019	2020	2021
20	22	25	25	20

Source: Off-Highway Research

Chart 18. South Korea: Sales and Forecast Sales of Crawler Dozers, 2012-2021 (Units)



Source: Off-Highway Research

The domestic market for crawler dozers seems to have all but disappeared. In the longer term, the forecast shown above may be too pessimistic. Forthcoming infrastructure projects could employ new machines and so demand should at least be sustained at current levels.

MACHINES AVAILABLE

Table 37. South Korea: Crawler Dozers Available, 2017

Manufacturer	Model	HP	Engine Manufacturer	Operating Weight (Kg)	Product Source
Caterpillar	D6R	159	Caterpillar	16.8	Japan
	D7G Series II	201	Caterpillar	20.6	Japan
	D7R Series II	201	Caterpillar	24.8	Japan
	D8R	310	Caterpillar	38.5	USA
	D9T	410	Caterpillar	47.9	USA
	D10T	580	Caterpillar	66.0	USA
	D11R/CD	850	Caterpillar	104.4	USA
Komatsu	D41E-6/P-6	110	Komatsu	10.5	Japan
	D61EX/PX-15	150	Komatsu	15.9	Japan
	D65E-12/P-12	190	Komatsu	19.3	Japan
	D68ESS-1	155	Komatsu	19.1	Japan
	D85ESS-2	261	Komatsu	27.2	Japan
	D155A-6	360	Komatsu	41.7	Japan
	D275A-5	452	Komatsu	50.8	Japan
	D375A-6	636	Komatsu	70.3	Japan
	D475A-5	900	Komatsu	110.7	Japan

Source: Company Information

CRAWLER LOADERS

MARKET SIZE AND TRENDS

Table 38. South Korea: Sales of Crawler Loaders, 2012-2016 (Units)

2012	2013	2014	2015	2016
2	1	1	-	-

Source: Off-Highway Research

The crawler loader has fallen completely out of favour in Korea. Although in the past there were imports and some local licensed products, both have stopped. After 1997 there were no sales at all until 2003. The only area where they are irreplaceable is in steel works for slag handling. The Caterpillar dealer, Hae In, has sold machines to contractors working in the various plants of Posco and its competitors, although this type of user can make one machine last 15 years.

PRODUCTION

From the mid-1980s, two manufacturers had manufacturing contracts with American companies that gave them some experience of the crawler loader. From 1986 to 1991 **Hyundai** made machines for Dresser and itself. **Samsung** had a contract to manufacture crawler loaders for Case from 1987 to 1993 but the volumes called up were quite small, no more than 100 units per year at any time. It never sold these under its own name.

MARKET SHARES

The **Caterpillar** dealer, Hae In, is the only supplier active in the market, although it has not sold any new machines during the last two years.

Table 39. South Korea: Distribution Networks of Suppliers of Crawler Loaders, 2017

Manufacturer	Distributor
Caterpillar	Hae In
Liebherr	Gintex Korea

Source: Off-Highway Research

POPULATION AND END-USERS

The construction industry no longer uses crawler loaders. The steel industry numbers around 20 large Posco facilities and around 60 other installations of various sizes belonging to its competitors (the two sides make about half each of the steel made in Korea). There are perhaps 70 crawler loaders still at work in the plants.

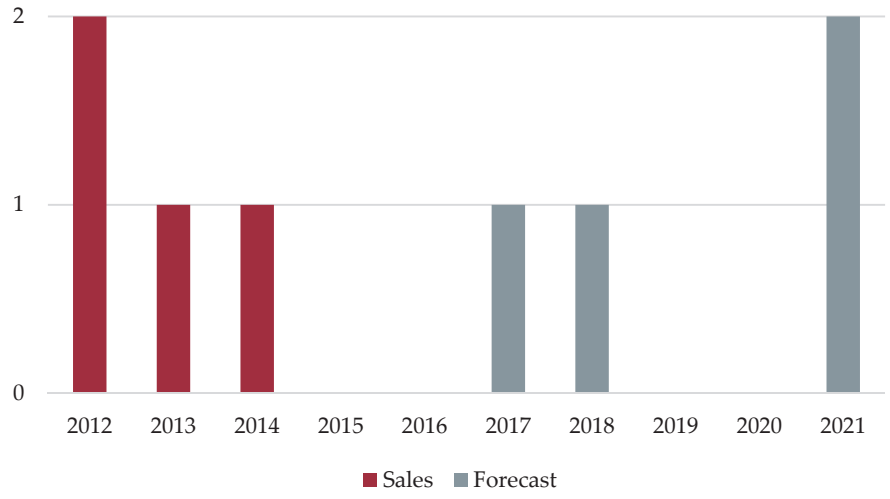
FORECAST

Table 40. South Korea: Forecast Sales of Crawler Loaders, 2017-2021 (Units)

2017	2018	2019	2020	2021
1	1	-	-	2

Source: Off-Highway Research

Chart 19. South Korea: Sales and Forecast Sales of Crawler Dozers, 2012-2021 (Units)



Source: Off-Highway Research

On the evidence of recent years it is likely that only an incremental number of sales will be recorded during the forecast period.

MACHINES AVAILABLE

Table 41. South Korea: Crawler Loaders Available, 2017

		Engine			
Manufacturer	Model	HP	Manufacturer	Operating Weight (Kg)	Product Source
Caterpillar	939D	90	Caterpillar	9.5	Japan
	953D	148	Caterpillar	15.6	France
	963D	189	Caterpillar	20.5	France
	973D	242	Caterpillar	26.3	France

Source: Company Information

DUMP TRUCKS

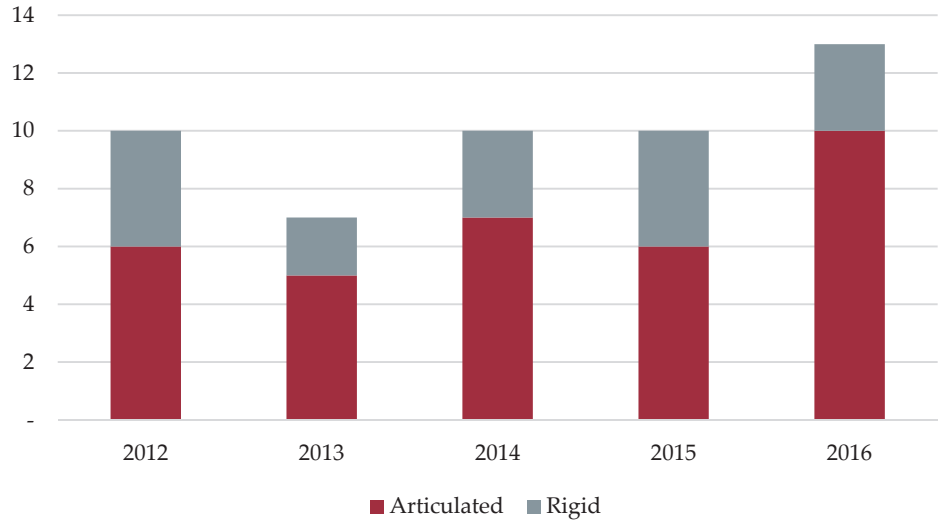
MARKET SIZE AND TRENDS

Table 42. South Korea: Sales of Dump Trucks by Type, 2012-2016 (Units)

	2012	2013	2014	2015	2016
Articulated	6	5	7	6	10
Rigid	4	2	3	4	3
Total	**10**	**7**	**10**	**10**	**13**

Source: Off-Highway Research

Chart 20. South Korea: Sales of Dump Trucks by Type, 2012-2016 (Units)



Source: Off-Highway Research

The **articulated dump truck** is almost non-existent in Korea. In the late 1980s, some Volvo trucks were sold but they were overrun by the locally made on-off highway truck. The price of an imported truck is much higher and so the less robust machine made in Korea is preferred. Furthermore, the small-scale nature of Korean quarries and their well maintained sites dictate that there is little requirement for the versatility of articulated dump trucks. The growth of the on-off highway trucks typified the prosperity of the construction industry in the 1990s, with the population rising to approximately 51,000 units by 1997. After the Asian Financial Crisis the numbers decreased but it was not at all to the benefit of the imported articulated dump truck.

It is impossible for the true off-highway articulated trucks to compete on price. Further disadvantages for them are that they are not allowed to run on the roads and they are seen by potential customers as not having a sufficiently high top speed.

The small volume of machines sold are concentrated in the 40 tonne capacity sector, although incremental sales of trucks below 30 tonnes are also made.

Rigid dump trucks are a different matter. This is not a large market but the limestone and cement industries need trucks and have bought regularly over the years. The quarrying operations in limestone for the cement industry and the steel foundries are of varying sizes and have been the main buyers of rigid trucks recently. The sizes bought have been mainly of 60 and 100 tonnes' capacity.

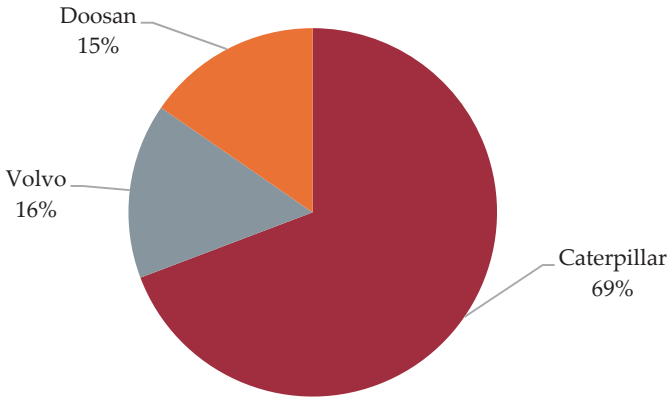
MARKET SHARES

Table 43. South Korea: Suppliers of Articulated Dump Trucks and Their Market Shares, 2016

	2016			
	Rigid	Articulated	Total	%
Caterpillar	3	6	**9**	**69**
Volvo	-	2	**2**	**15**
Doosan	-	2	**2**	**15**
Total	**3**	**10**	**13**	**100**

Source: Off-Highway Research

Chart 21. South Korea: Suppliers of Articulated Dump Trucks and Their Market Shares, 2016



Source: Off-Highway Research

In articulated dump trucks, only Volvo, Caterpillar and Doosan actively market the product.

In rigid dump trucks, **Caterpillar** is the leading marque, and typically enjoys a 100 per cent market share. The best area for it is the 90 tonne 777 model sold to the very big cement producers but it also sells a small number of 60 tonne 775s.

Table 44. South Korea: Distribution Networks of Suppliers of Dump Trucks, 2017

Manufacturer	Distributor
Caterpillar	Hae In
Komatsu	Junjin CSM
Terex	Volvo Construction Equipment Korea
Volvo	Volvo Construction Equipment Korea

Source: Off-Highway Research

POPULATION AND END-USERS

The population of articulated dump trucks amounts to approximately 80 units. The rigid truck population is estimated at 400 units, including repatriated units from international contracts. 80 per cent are in use in limestone quarries, the remainder in coal transport and a few in civil engineering.

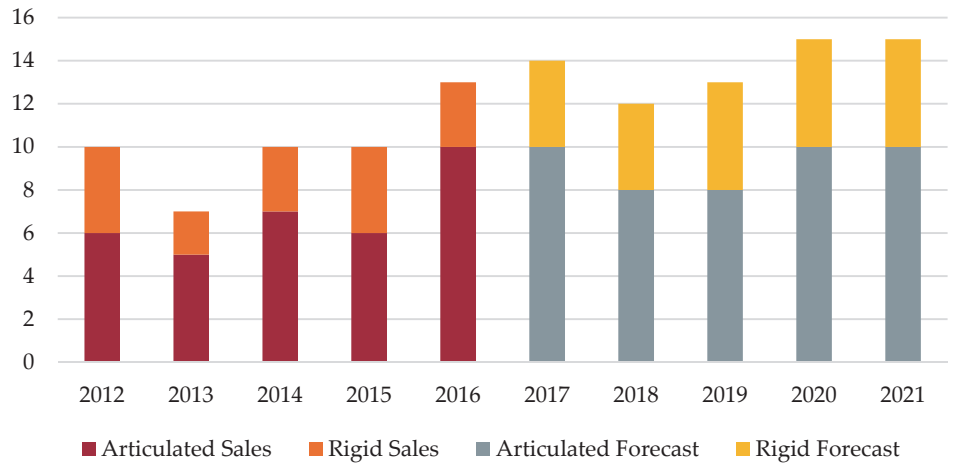
FORECAST

Table 45. South Korea: Forecast Sales of Dump Trucks by Type, 2017-2021 (Units)

	2017	2018	2019	2020	2021
Articulated	10	8	8	10	10
Rigid	4	4	5	5	5
Total	**14**	**12**	**13**	**15**	**15**

Source: Off-Highway Research

Chart 22. South Korea: Sales and Forecast Sales of Dump Trucks, 2012-2021 (Units)



Source: Off-Highway Research

Volvo Korea and Hae In should be able to sustain a small amount of interest in articulated dump trucks. The forecast for rigid dump trucks implies small regular investment by the cement industry but no wholesale adoption of rigid dump trucks by the civil engineers.

MACHINES AVAILABLE

Table 46. South Korea: Dump Trucks Available, 2017

Manufacturer	Model	Engine HP	Engine Manufacturer	Operating Weight (Kg)	Product Source
Articulated					
Caterpillar	725	309	Caterpillar	23.6	UK
	730	325	Caterpillar	28.1	UK
	735	406	Caterpillar	32.7	UK
	740	457	Caterpillar	38.0	UK
Doosan	DA 30	375	Scania	28.0	Norway
	DA 40	500	Scania	40.0	Norway
Volvo	A25D	298	Volvo	24.0	Sweden
	A30D	336	Volvo	28.0	Sweden
	A35D	389	Volvo	32.5	Sweden
	A40D	420	Volvo	37.0	Sweden
Rigid					
Caterpillar	773E	740	Caterpillar	54.4	India
	775F	787	Caterpillar	63.5	USA
	777D	1,000	Caterpillar	91.0	India
	777F	1,016	Caterpillar	91.0	USA
	785C	1,348	Caterpillar	150.0	USA
	789C	1,770	Caterpillar	195.0	USA
	793D	2,337	Caterpillar	240.0	USA
	797B	3,370	Caterpillar	380.0	USA
Komatsu	HD325-7	488	Komatsu	36.5	Japan
	HD465-7	739	Komatsu	55.0	Japan
	HD785-5	1,010	Komatsu	91.0	Japan

Source: Company Information

HYDRAULIC EXCAVATORS

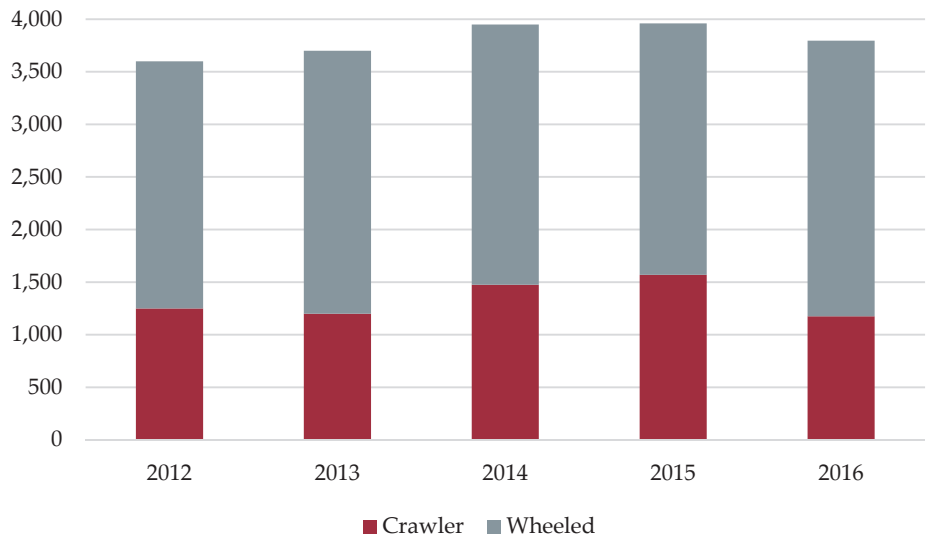
MARKET SIZE AND TRENDS

Table 47. South Korea: Sales of Hydraulic Excavators by Type, 2012-2016 (Units)

	2012		2013		2014		2015		2016	
	Units	%	Units	%	Units	%	Units	%	Units	%
Crawler	1,250	35	1,200	32	1,475	37	1,570	40	1,175	31
Wheeled	2,350	65	2,500	68	2,475	63	2,390	60	2,620	69
Total	**3,600**	**100**	**3,700**	**100**	**3,950**	**100**	**3,960**	**100**	**3,795**	**100**

Source: Off-Highway Research

Chart 23. South Korea: Sales of Hydraulic Excavators by Type, 2012-2016 (Units)



Source: Off-Highway Research

It is important to note that this section of the report relates to wheeled and crawler excavators above 6 tonnes, and does not include reference to the 5.5 tonne machines, a particular favourite of Korean contractors and nearly 4,000 units of which are sold annually. Off-Highway Research categorises this size of machine as a mini excavator, although in the Korean construction equipment industry the term mini excavator is typically used to describe machines below 3.5 tonnes.

Hydraulic excavators have a history in Korea of being the chosen implement of the construction industry. Local production began in 1977 when Daewoo and Halla started production of crawler excavators under licence. In 1983 Samsung took over Korea Heavy Industries and started production of a Poclain design, which created enough productive capacity within the country for it to be self-sufficient in this particular machine during the construction boom of the 1980s.

Hyundai then joined the industry and in the speculative boom of the mid-1990s nothing could hold the hydraulic excavators back. In 1996, sales reached a fevered level of 8,000 units, so that this one small country stood in third position in the entire world in terms of excavators sold. The Asian Financial Crisis, of course, did real damage, with the market collapsing to only 1,200 units in 1999.

The pace of recovery was variable but by 2007, ten years after the financial crash, the market returned to a more realistic level of 4,000 units. Despite fluctuations in economic growth, demand has remained extremely stable during the period under review, largely as a result of buoyant growth in the construction sector.

WHEELED EXCAVATORS

The market for wheeled excavators now accounts for 60-70 per cent of total excavator demand above 6 tonnes. Wheeled excavators, working in cities, where most Koreans live, are ubiquitous throughout the country and are typically found working on a large array of inner city development projects. Their sales have outnumbered the crawler excavators in all but two of the years since the turn of the century.

Wheeled excavators were not the original choice and until the late 1980s, the dominant technology in excavators was that of the crawlers that had evolved from a base of crawler-mounted rope excavators and cranes. Wheeled excavators were hardly visible until Daewoo developed its own products in 1989, as the Hitachi licence lapsed. The conviction spread among the other manufacturers that a 12 tonne wheeled excavator had a place in the market. The wheeled machine was suddenly enthusiastically endorsed as the "city excavator" and wheeled excavators took a third of the sales. After the financial crisis the wheeled undercarriage machines were more suitable for the less ambitious projects of the era. The time of major highway and railway construction was over and the wheeled excavators came with the right dimensions for work in city sites.

Wheeled excavator sales are overwhelmingly in the 14 tonne category. Buyers want little else and the manufacturers seem to have other sizes mainly to satisfy international markets. The proportion of the wheeled excavator market in this size now accounts for 90-95 per cent. It can be transported very easily and most owners will have on-highway trucks of matched size to take away spoil. They have no interest in anything larger.

CRAWLER EXCAVATORS

The crawler excavator market seems equally determined to polarise. The crawler excavator is barely sold at all in the categories dominated by the wheeled excavator.

Interest in the 20 tonne crawler, which 20 years ago accounted for a third of the market, has almost entirely disappeared.

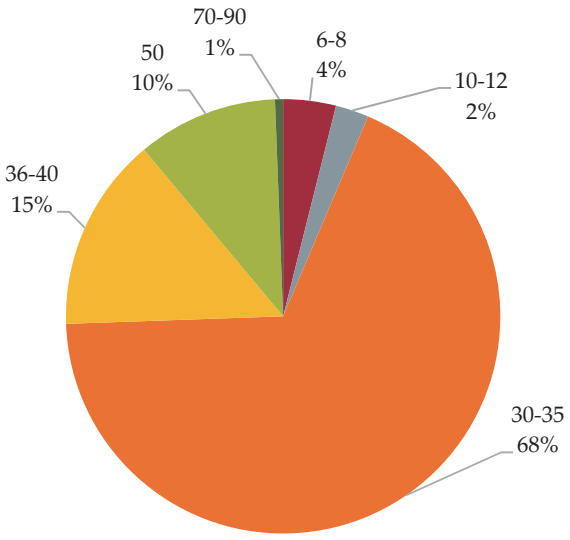
The bulk of demand is in machines of 29-30 tonnes, which account for 60-70 per cent of total sales, followed by the 36 tonne sector, which capture 10-15 per cent of the market. For a long time local excavator production did not yet extend beyond this level and in consequence, all models above that level were imported. Crawler excavators of 50-100 tonnes constitute around 10 per cent of annual demand and are bought by the quarries involved in concrete production. The clients are not small, highly indebted rental operators and owners but rather quarry owners with financial disciplines to follow and investment plans to fulfil.

Table 48. South Korea: Sales of Crawler Excavators by Weight Category, 2015-2016

	2015		2016	
Tonnes	Units	%	Units	%
6-8	20	1	46	4
10-12	77	5	29	3
13-14	113	7	-	-
18-20	129	8	1	-
25-27	14	1	-	-
30-35	936	60	799	68
36-40	144	9	170	14
50	111	7	123	11
70-90	26	2	7	1
Total	**1,570**	**100**	**1,175**	**100**

Source: Off-Highway Research

Chart 24. South Korea: Sales of Crawler Excavators by Weight Category, 2016



Source: Off-Highway Research

Table 49. South Korea: Sales of Wheeled Excavators by Weight Category, 2015-2016

Tonnes	2015 Units	%	2016 Units	%
13-14	2,245	94	2,462	94
19-20	145	6	158	6
Total	**2,390**	**100**	**2,620**	**100**

Source: Off-Highway Research

PRODUCTION

Table 50. South Korea: Production of Hydraulic Excavators by Type, 2015-2016 (Units)

		2015	2016
Volvo	Crawler	7,500	7,500
	Wheeled	1,200	1,250
	Total	**8,700**	**8,750**
Hyundai	Crawler	6,000	5,800
	Wheeled	1,100	1,000
	Total	**7,600**	**7,250**
Doosan	Crawler	5,750	5,500
	Wheeled	1,600	1,800
	Total	**7,350**	**7,300**
Total	Crawler	19,250	18,800
	Wheeled	3,900	4,050
Grand Total		**23,150**	**22,850**

Source: Off-Highway Research

VOLVO

Volvo bought the construction equipment activities of Samsung Heavy Industries in 1998. The factory in Changwon is the company's core production plant for crawler excavators (it also has excavator assembly plants in USA, Germany, France, Russia, China, India and South America), and produces machines from 5 to 95 tonnes, including the latest E Series, launched in 2014 and equipped with Tier IV Final engines. It also produces 5 tonne wheeled excavators and three models of standard wheeled excavators between 14 and 20 tonnes. In addition, Changwon is the Volvo Group's primary machining centre for hydraulic excavator main control valves and supplies this critical component to all the other Volvo excavator plants worldwide.

The Changwon plant is built on a large site of 119 hectares but only 41 hectares are available for use. The company has substantial component manufacturing facilities on site and can make 50,000 motor and pumps sets; 24,000 power train assemblies and over 120,000 cylinders per year. The capacity in terms of excavators is 16,000 units per year. It currently employs 1,100 permanent staff and around 700 sub-contractors.

The arrival of the D series of hydraulic excavators in 2011 provided the impetus to project the plant towards increased production volumes, and in 2011 and 2012 output rose to 15,000 units (including 5.5 tonne wheeled and crawler excavators). The subsequent collapse of the Chinese market, one of the company's main export destinations, saw production fall to below 11,000 units in both 2015 and 2016, although volumes are forecast to exceed 14,000 units in 2017 in response to the recovery in the Chinese market.

HYUNDAI

Hyundai has made hydraulic excavators at the site in its Ulsan shipyard since 1989. The company proved to be a very aggressive competitor and there was a fierce battle between it and the established suppliers during the early 1990s. Hyundai wanted to reach high volume quickly and it did so. Production reached nearly 4,000 units by 1997 and by that time it also had a plant working in China. Recovery after the Asian Financial Crisis was difficult and excavator production fell to just above 1,000 machines in 1999. Exports to Europe and North America faltered and the plant's output still lay below the 2,000 unit level in 2001.

Huge growth in the company's export business in recent years, however, has transformed the production figures. All manufacturing in Korea takes place in the huge Ulsan shipyard. The large fabrication shop makes heavy items such as undercarriages, booms and upper frames and has a covered are of 47,000 m^2. The assembly shop next to it covers 32,000 m^2. The current range of products encompasses 18 crawler excavator models with operating weights from 1.7 to 118 tonnes, and three models of wheeled excavators ranging from 5.8 to 21 tonnes. The excavators made in Korea are for the world market.

DOOSAN

Doosan Infracore is the inheritor of one of the oldest companies in Korea, Daewoo Heavy Industries. The Asian Financial Crisis brought the end of the old form of the firm, Daewoo Heavy Industries. It became a shell, with two main successor companies, DHI & M or Daewoo Heavy Industries & Machinery (making construction equipment, fork lift trucks, engines, machine tools and defence products) and Daewoo Shipbuilding and Marine Engineering Co. Ltd. DHI & M was sold in 2005 to Doosan Group. Doosan formed the company Doosan Infracore to succeed DHI & M. From the first day of 2007 it employed the **Doosan** name alone.

The history of involvement with hydraulic excavators goes back to 1977, when Daewoo took a licence to produce Hitachi crawler excavators. After the expiry of this agreement Daewoo continued to use some elements of Hitachi technology and the excavator range was still designated DH, Daewoo-Hitachi until 1993, when the

in-house design, known as the Solar range, took over. The DX range replaced it progressively from 2007 onwards.

Production of excavators below 30 tonnes is based at the Incheon plant. Located on a site of 9.6 hectares, it has a covered area of 52,000 m² and fulfils many functions, from machining to final assembly and still provides components for use in other plants. Its main product is hydraulic excavators. Doosan Infracore Incheon is situated very near its port, ideal for shipping but it has a road through the middle and its capacity is fully utilised. In 2010 Doosan opened a second production plant in Gunsan, which assembles excavators above 30 tonnes, although its main product is wheeled loaders.

The production level in hydraulic excavators has varied quite widely over the years. The strong market in Korea helped to push output over 5,000 units by 1997 but the Asian Financial Crisis struck hard and more than halved production. The rapid expansion in the company's export trade in recent years, however, has seen standard size excavator production volumes stabilise at over 7,000 units.

COMPONENT SOURCING

Table 51. Korea: Component Sourcing for Hydraulic Excavators, 2017

Component	Doosan	Hyundai
Engines	Doosan	Cummins, Hyundai (for domestic market only)
Hydraulic Pumps	Kawasaki, Tong Myung and others	Kawasaki (Tong Myung for domestic market)
Hydraulic Valves	In-house	Toshiba, Parker, Kawasaki, Tong Myung
Hydraulic Cylinders	Korean sub-contractors	In-house
Drive Motors	Tong Myung	Kawasaki, Tong Myung
Swing Motors	Kayaba, Tong Myung, Jeil	Kawasaki, Tong Myung
Swing Gears	Shinil	Jeil, Shinil
Frames	In-house	In-house
Booms, Arms	In-house	In-house
Undercarriage	In-house	HSC
Cabins	Dabo	Myung Sung and in-house
Buckets	Korean sub-contractors	Korean sub-contractors
Steel Tracks	INI	INI

Component	Volvo
Engines	Volvo, Deutz
Hydraulic Pumps	Kawasaki, Flutek
Hydraulic Valves	Kawasaki, Nabtesco, In-house
Hydraulic Cylinders	In-house
Drive Motors	Kayaba, Bosch Rexroth
Swing Motors	Kawasaki, Tong Myung
Swing Gears	Shinil
Frames	In-house
Booms, Arms	In-house
Undercarriage	In-house
Cabins	Sungjin, Press Kogyo
Buckets	Korean sub-contractors
Steel Tracks	INI, Daechang

Source: Company Information

All manufacturers except one fabricate the chassis, boom and undercarriage. For buying in engines and hydraulic pumps and motors the manufacturers have considerable purchasing power but some of them manufacture major elements themselves.

The engine supply used to be dominated by Cummins but its only assured business today is in the export versions of the Hyundai hydraulic excavators. Volvo has installed its engines in its excavators and Doosan Infracore uses its own engines. In hydraulics, the Japanese supplier Kawasaki has a high market share, only successfully challenged by Tong Myung, the local manufacturer. Volvo Changwon has its own products; some produced under licence from Toshiba.

All the suppliers have facilities for the fabrication of the upper works and the chassis, since many of them have added this manufacturing activity to the allied technology of shipbuilding. Swing rings, however, are imported from Germany and Japan. Undercarriage systems are a mixture of European technology and products from INI, which took over the bankrupt Kangwon Industries. It is the undisputed leader in this field and has a shop for the manufacturing of undercarriage parts in Pohang City, the heart of the Korean steel industry. It supplies most of the needs of the local producers and exports 50 per cent of production to Japan, where its main buyers are Komatsu, Sumitomo and Hitachi.

MARKET SHARES

CRAWLER EXCAVATORS

As in the mini and wheeled excavator sectors, the market is dominated by the three domestic manufacturers who between them account for over 90 per cent of annual sales.

VOLVO

Although **Volvo** has traditionally been perceived as a premium brand with higher pricing levels, it has been compelled to market its products more aggressively during recent times in order to keep pace with its two domestic rivals in what has become an increasingly competitive sector.

DOOSAN

Doosan has been the perennial market leader during the period under review, although ceded market share in 2016 to Volvo.

HYUNDAI

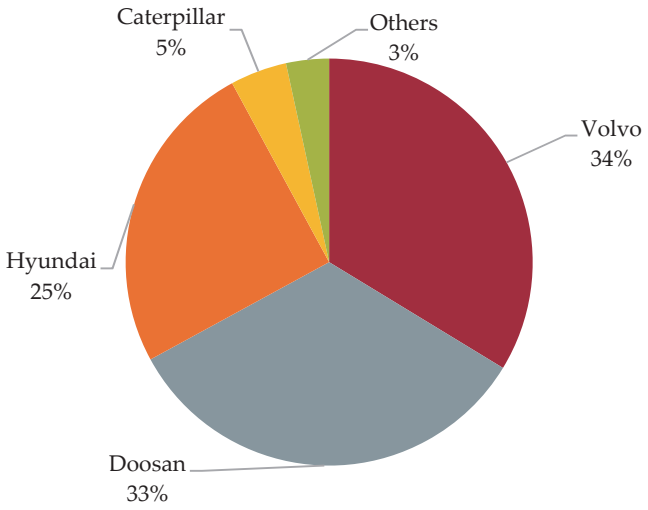
Hyundai is regularly placed number three in the domestic market, although an aggressive marketing campaign in 2017 has resulted in significantly increased market share in both crawler and wheeled excavator sectors.

Table 52. South Korea: Suppliers of Crawler Excavators and Their Market Shares, 2015-2016

	2015		2016	
	Units	%	Units	%
Volvo	369	24	396	34
Doosan	631	40	392	33
Hyundai	453	29	294	25
Caterpillar	61	4	53	5
Others	56	3	40	3
Total	**1,570**	**100**	**1,175**	**100**

Source: Off-Highway Research

Chart 25. South Korea: Suppliers of Crawler Excavators and Their Market Shares, 2016



Source: Off-Highway Research

Imports have traditionally had a minuscule role in the excavator market. The only successful importer is Hae In Corp., which sells **Caterpillar** excavators from Japan (below 50 tonnes) and China (over 50 tonnes). Hae In offers a very high level of after-sales service in comparison to most importers, but it cannot get away entirely from the price problem and the extremely strong desire of most Koreans to buy local products. As a result, it focuses on business with government departments and larger corporate customers.

Both **Hitachi** and **Komatsu** are represented in Korea but effectively only compete in the mini excavator sector below 3.5 tonnes. Of the other suppliers, Yanmar, **Kubota** and **Kobelco** are all very successful in the mini excavator sector, but do occasionally sell small quantities of 7-8 tonne midi excavators.

WHEELED EXCAVATORS

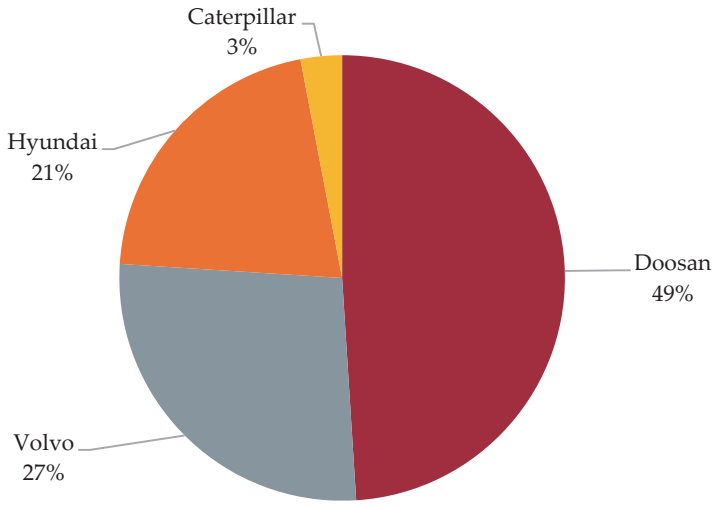
In the wheeled excavator sector, only the three domestic suppliers and Caterpillar offer machines. The wheeled excavator market concentrates on a single size and there is little to choose in technical differences between the 14 tonne machines of the three Korean manufacturers.

Table 53 South Korea: Suppliers of Wheeled Excavators and Their Market Shares, 2015-2016

	2015		2016	
	Units	%	Units	%
Doosan	1,067	45	1,298	49
Volvo	707	30	699	27
Hyundai	556	23	550	21
Caterpillar	60	2	73	3
Total	**2,390**	**100**	**2,620**	**100**

Source: Off-Highway Research

Chart 26. South Korea: Suppliers of Wheeled Excavators and Their Market Shares, 2016



Source: Off-Highway Research

Table 54. South Korea: Distribution Networks of Suppliers of Hydraulic Excavators, 2017

Manufacturer	Distributor
Caterpillar	Hae In
Doosan	Doosan Infracore
Hitachi	Soosan Service
Hyundai	Hyundai Construction Equipment
Komatsu	Junjin CSM
Liebherr	Gintex Korea
Volvo	Volvo Construction Equipment Korea
Yanmar	YK Construction Equipment

Source: Off-Highway Research

POPULATION AND END-USERS

The population figures, based on official data of machines registered, make no distinction between sizes. Based on the Off-Highway Research data for mini excavators and standard excavators, one can estimate that 20,000 of the machines shown below were mini excavators and the rest over 6 tonnes.

Table 55. Korea: Population of Hydraulic Excavators, 2005-2015 (Units)

2005	2015
101,650	143,750

Source: Official Statistics

The largest concentration of hydraulic excavators is in the capital and the surrounding province of Gyeonggi. The main form of ownership is the small sub-contractor/owner-operator. The second leading user group is the large industrial companies that have their own construction companies within the group.

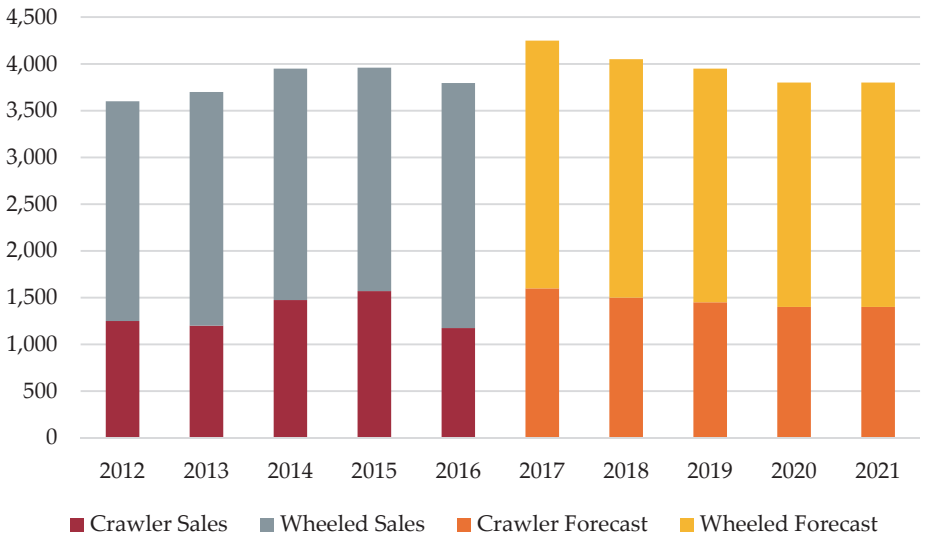
FORECAST

Table 56. South Korea: Forecast Sales of Hydraulic Excavators, 2017-2021 (Units)

	2017	2018	2019	2020	2021
Crawler	1,600	1,500	1,450	1,400	1,400
Wheeled	2,650	2,550	2,500	2,400	2,400
Total	**4,250**	**4,050**	**3,950**	**3,800**	**3,800**

Source: Off-Highway Research

Chart 27. South Korea: Sales and Forecast Sales of Hydraulic Excavators, 2012-2021 (Units)



Source: Off-Highway Research

The market has remained buoyant during the first half of 2017 and suppliers expect this year will represent the peak of the current demand cycle. The current volume of inner city redevelopment projects will continue to sustain demand for wheeled excavators in particular, whilst the predicted flow of public works projects should ensure the market maintains its customary level of stability for the short to medium term at least.

MACHINES AVAILABLE

Table 57. South Korea: Crawler Excavators Available, 2017

Manufacturer	Model	HP	Engine Manufacturer	Service Weight (Tonnes)	Product Source
Caterpillar	307D/SB	54	Caterpillar	7.2-8.4	Japan
	308D SB	55	Caterpillar	8.0	Japan
	315D/DL	115	Caterpillar	16.4-16.8	Japan
	318C	125	Caterpillar	19.7	Japan
	319D	115	Caterpillar	20.0	Japan
	320D	138	Caterpillar	19.8	Indonesia
	320D L	138	Caterpillar	21.0	Japan
	323D L	138	Caterpillar	22.4	Japan
	345D L	345	Caterpillar	45.0	Japan
	349D L	379	Caterpillar	47.6	Japan
	374D L	476	Caterpillar	71.1	Japan
	390D L	476	Caterpillar	85.0	Japan
Doosan	DX140LC	95	Doosan	14.0	Korea
	DX180LC	118	Doosan	17.7	Korea
	DX225LC	148	Doosan	21.5	Korea
	DX255LC	166	Doosan	24.6	Korea

Source: Company Information (continued)

Table 57. South Korea: Crawler Excavators Available, 2017 (Continued)

Manufacturer	Model	HP	Engine Manufacturer	Service Weight (Tonnes)	Product Source
Doosan (continued)	DX300LC	197	Doosan	29.3	Korea
	DX350LC	271	Doosan	35.2	Korea
	DX420LC	292	Doosan	40.9	Korea
	DX480LC	329	Doosan	47.5	Korea
	DX520LC	329	Doosan	49.9	Korea
Hitachi	ZX70	52	Isuzu	6.4	Japan
	ZX110	85	Isuzu	10.4	Japan
	ZX120	88	Isuzu	12.0	Indonesia
	ZX160LC	110	Isuzu	15.7	Japan
	ZX180LC	119	Isuzu	17.9	Japan
	ZX200-3	147	Isuzu	19.8	Indonesia
	ZX240-3	177	Isuzu	23.4	Japan
	ZX270-3	188	Isuzu	27.3	Japan
	ZX330LC-3	271	Isuzu	31.6	Indonesia
	ZX400LCH-3	271	Isuzu	39.0	Japan
	ZX470H-3	348	Isuzu	47.1	Japan
	ZX520LC-3	348	Isuzu	52.0	Japan
	ZX670LC-3	462	Isuzu	68.0	Japan
	ZX870LC-3	532	Isuzu	83.0	Japan
	EX1200-6	760	Hitachi	144.0	Japan
	EX1900-6	1,086	Hitachi	192.0	Japan
	EX2500-6	1,400	Cummins	248.0	Japan
	EX3600-6	1,944	Hitachi	361.0	Japan
	EX5500-6	2,800	Cummins	522.0	Japan
	EX8000-6	3,880	Hitachi	811.0	Japan
Hyundai	Robex 110-7	85	Mitsubishi	11.2	Korea
	Robex 140LC-7	115	Cummins	14.0	Korea
	Robex 160LC-7	126	Mitsubishi	17.4	Korea
	Robex 180LC-7	126	Mitsubishi	18.2	Korea
	Robex 210LC-7	150	Cummins	21.7	Korea
	Robex 210LC-7 LR	150	Cummins	24.4	Korea
	Robex 250LC-7	178	Cummins	25.2	Korea
	Robex 290LC-7	213	Cummins	29.3	Korea
	Robex 320LC-7	259	Cummins	32.2	Korea
	Robex 360LC-7	280	Cummins	36.5	Korea
	Robex 450LC-7	353	Cummins	44.9	Korea
	Robex 500LC-7	325	Cummins	48.8	Korea
	Robex 800LC-7	510	Cummins	82.3	Korea
JCB	JS200	127	Cummins	20.0	India
	JS210	172	Isuzu	21.7	India
Kobelco	SK75-8	55	Isuzu	7.3	Japan, China
	SK130-8	99	Isuzu	14.7	Thailand
	SK200-8	153	Isuzu	20.2	Thailand
	SK210LC-8	153	Isuzu	20.6	Thailand
	SK250/LC	184	Isuzu	24.6-25.1	Thailand
	SK330-8	264	Isuzu	33.6	Thailand
	SK350LC-8	264	Isuzu	34.3	Thailand
	SK480LC-8 ME	326	Isuzu	51.2	China
	SK850LC ME	496	Isuzu	78.7	China

Source: Company Information

Table 57. South Korea: Crawler Excavators Available, 2017 (Continued)

Manufacturer	Model	HP	Engine Manufacturer	Service Weight (Tonnes)	Product Source
Komatsu	PC70-8	65	Komatsu	6.6	Thailand
	PC130-8	86	Komatsu	13.0	Thailand
	PC160	113	Komatsu	16.0	Thailand
	PC200-8	143	Komatsu	20.8	Thailand
	PC300LC-8	241	Komatsu	31.5	Thailand
	PC300-8	241	Komatsu	33.5	Thailand
	PC350-8	242	Komatsu	32.3	Japan
	PC450-8	330	Komatsu	43.0	Japan
	PC600-8	385	Komatsu	56.6	Japan
	PC600-8R	429	Komatsu	60.0	Japan
	PC750-8	454	Komatsu	73.2	Japan
	PC800-8	454	Komatsu	75.6	Japan
	PC1250-8	672	Komatsu	110.9	Japan
	PC2000-8	956	Komatsu	200.0	Japan
	PC4000-6	1,775	Cummins	398.0	Germany
Liebherr	R9110	757	Cummins	110	France
	R984C	685	Cummins	125	France
	R9250	1,287	Cummins	253	France
	R9350	1,500	Cummins	310	France
	R9400	1,675	Cummins	350	France
	R996B	3,000	Cummins	652	France
	R9800	4,000	Cummins, MTU	804	France
Volvo	EC140B	93	Volvo	15.2	Korea
	EC180B	109	Volvo	19.0	Korea
	EC210B	143	Volvo	21.9	Korea
	EC240B	168	Volvo	25.8	Korea
	EC290B	192	Volvo	29.9	Korea
	EC330B	247	Volvo	34.0	Korea
	EC360B	247	Volvo	38.4	Korea
	EC460B	306	Volvo	47.9	Korea
	EC700B	424	Volvo	70.0	Korea

Source: Company Information

Table 58. South Korea: Wheeled Excavators Available, 2017

Manufacturer	Model	HP	Engine Manufacturer	Service Weight (Tonnes)	Product Source
Doosan	DX140W	130	Doosan	15.3	Korea
	DX160W	130	Doosan	16.1	Korea
	DX190W	155	Doosan	18.8	Korea
	DX210W	160	Doosan	20.8	Korea
Hyundai	R140W-7	115	Cummins	14.0	Korea
	R170W-7	116	Mitsubishi	17.5	Korea
	R200W-7	166	Cummins	20.5	Korea
Volvo	EW145B	122	Volvo	15.0	Korea
	EW160C	142	Volvo	18.0	Korea

Source: Company Information

MINI EXCAVATORS

MARKET SIZE AND TRENDS

This report uses the internationally accepted definition of a mini excavator as a compact excavator of less than six tonnes' service weight. The history of the market in Korea developed differently from the rest of the world, with early users having no choice but the 4.5 tonne and soon the 5.5 tonne mini excavators produced by the three local suppliers. These machines still dominate and inside the country tend to be known as '5 tonne excavators'.

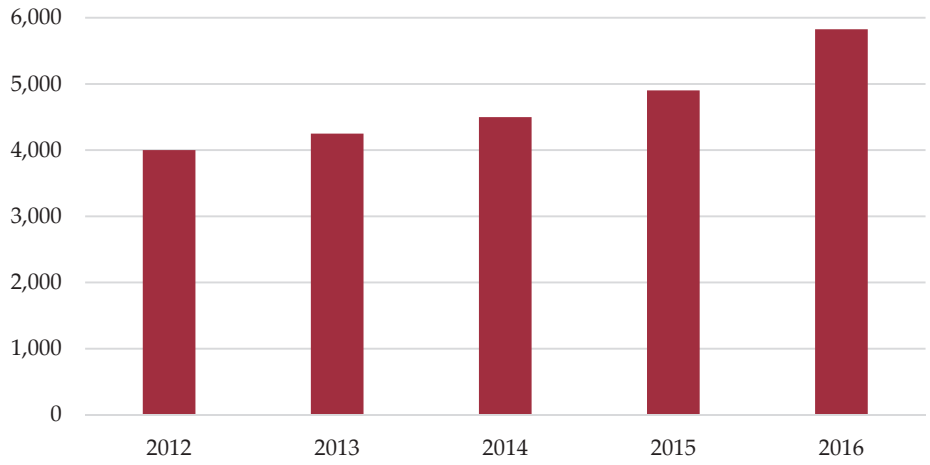
There is now a rapidly growing market of machines smaller than 3.5 tonnes and inside Korea often only they are referred to as 'mini excavators'. Finally, to add to the confusion the unusually popular wheeled versions of the 5.5 tonne excavators are often excluded from the definition. To repeat, as the Off-Highway Research definition is a compact excavator of less than 6 tonnes' service weight, it will always include all wheeled and crawler models of any size.

Table 59. South Korea: Sales of Mini Excavators, 2012-2016
(Units)

2012	2013	2014	2015	2016
4,000	4,250	4,500	4,904	5,828

Source: Off-Highway Research

Chart 28. South Korea: Sales of Mini Excavators, 2012-2016
(Units)



Source: Off-Highway Research

After the beginning of mini excavator production in 1977 with a Kubota licensed design made by Daewoo, sales grew to 500 units annually in the early 1980s. Competitors joined it, one by one and the market soared from 1,100 units in 1987 to nearly 5,000 machines in 1997. After the Asian Financial Crisis, the fall was not as severe as in other forms of excavators, mainly because mini excavators work in

cities. The infrastructure of the cities continued to evolve, that is to say, new parts were added, new housing areas opened, new commercial zones built and at the same time parts of the structure needed repair. Sales fell to just above 2,500 units in 1998 and stayed around that level for the next five years.

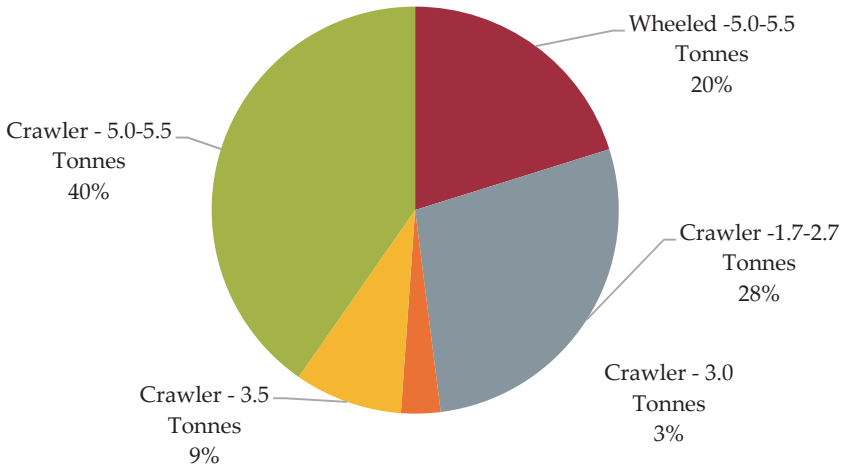
2007 marked the beginning of a change in the market. Demand for the country's favourite 5.5 tonne crawler excavators grew strongly thanks to a strong tide of urban works; and the market for machines below 3.5 tonnes advanced at last, with a number of new Japanese participants coming into contention. As a result, sales of mini excavators exceeded 4,000 units for the first time.

Table 60. South Korea: Sales of Mini Excavators by Type, 2016

	2016 Units	%
Wheeled		
5.0-5.5 Tonnes	1,175	20
Crawler		
1.7-2.7 Tonnes	1,622	28
3.0 Tonnes	182	3
3.5 Tonnes	500	9
5.0-5.5 Tonnes	2,348	40
Total	**5,827**	**100**

Source: Off-Highway Research

Chart 29. South Korea: Sales of Mini Excavators by Weight Category, 2016 (Tonnes)



Source: Off-Highway Research

During the period under review the market has undergone significant expansion, primarily as a result of the continuing rise in popularity of machines under 3.5 tonnes, and in 2016 reached an historical high of 5,800 units. Aggressive promotion of the concept by Yanmar, and to a lesser extent Kubota and Kobelco, has overcome

contractors' initial reluctance to accept that the smaller capacity machines could offer a viable alternative to the ubiquitous 5.5 tonne product. Indeed, sales of mini excavators below 3.5 tonnes increased by 35 per cent in 2016 alone, and are forecast to grow further still in the short to medium term.

The main body of the market is still the 5.5 tonne excavator, in both crawler and wheeled configuration, which account for some 60 per cent of total annual demand. The sector remains the preserve of the three domestic manufacturers who capture 90 per cent of the 5 tonne crawler market and 100 per cent of the wheeled sector. Essentially, it is a light backhoe loader without the loading bucket. The user has a considerable digging force for light town work, certainly of a different class from the very light mini excavators. In function, it almost approaches the backhoe loader, although it is not as powerful as the latest models seen in Europe. Significantly, the market for 7.5 tonne excavators barely exists in Korea and contractors accept that the 5 tonne machine does the same job but slower.

The Korean market is unique in its appetite for 5 tonne excavators on wheeled undercarriages. Given the amount of work that such machines do on the streets it is perhaps unsurprising that they constitute 33 per cent of machines sold in that weight category and 20 per cent of the total mini excavator market. It is now back at about 20 per cent of the market for larger mini excavators but can hardly be a favourite product of the three local manufacturers, who have to have separate assembly lines for it and are obliged to buy parts for them from Japan in very low volumes.

In the classes below 5 tonnes, the 1.7 tonne machine predominates, accounting for around 40 per cent of excavator sales below 3.5 tonnes. The 3.5 tonne model has assumed increasing importance during the last three years and in some cases has become the preferred option to the 5.5 tonne machine due to its ease of transportation and superior manoeuvrability in confined jobsites. It now accounts for around 30 per cent of sales below 5 tonnes. The bulk of remaining sales fall within the 2 tonne category, while micro excavators below 1 tonne achieve sales of around 250-300 units per year.

PRODUCTION

Table 61. South Korea: Production of Mini Excavators by Manufacturer and Type, 2016 (Units)

Wheeled	
Hyundai	450
Volvo	400
Doosan	525
Crawler	
Volvo	2,000
Doosan	1,500
Hyundai	1,300
Total	**6,175**

Source: Off-Highway Research

VOLVO

Volvo produces both crawler and wheeled varieties of its 5 tonne class mini excavators in Changwon. Mini excavators below this size are imported from its factory in France. No other size is made in Changwon but the company is now the largest producer of mini excavators in Korea.

DOOSAN

Doosan is the inheritor of the pioneering work done by Daewoo, which began more than 30 years ago with a licence from Kubota of Japan. In 1994 it bought the designs of the bankrupt Hanix Industry in Japan and created the Solar range, with a number of small products below the industry standard 5.2-5.3 tonne types. In 2003 it moved production of these to China, where the products are assembled on the Doosan Yantai site by a Korean sub-contractor, Hanyang. This same company assembles the 5.5 tonne models on wheels and tracks (as well as a single model of midi excavator) in a 10,000 m^2 site near Incheon on behalf of Doosan Infracore. Doosan's factory in Incheon now produces mini excavators in the 2.7, 3 and 3.5 tonne classes.

HYUNDAI

Hyundai began in 1989 with a licence from Hanix of Japan but eventually created its first in-house design in 1998 and began exporting it. It continued refining the product but volumes remained well below 1,000 units per annum and production was put into an area of the Ulsan plant that made low volume products, namely mini excavators and skid-steer loaders. The volumes broke through the 1,000 unit barrier in 2004 and have continued to grow since then. The agreement with Nagano Industry in Japan, which made a number of smaller mini excavators for Hyundai, is no longer operational.

COMPONENT SOURCING

The manufacturers have considerable purchasing power only if they incorporate the 5 tonne machine into the context of their purchasing for standard excavators. That is difficult to achieve, for many of the components are of different dimensions. The table shows a variety of hydraulics suppliers. Local manufacturers build such units, with licences from Japan, Kawasaki and Toshiba being mentioned frequently.

Manufacturers fabricate the chassis, boom and undercarriage in-house but on occasion will use local sub-contractors. All three of them are in heavy engineering centres and low volume work can be placed with small workshops. That is often the case with the mini excavators, where Hyundai builds them on a separate line from the higher volume standard excavators and Doosan subcontracts final assembly in its entirety.

Table 62. South Korea: Component Sourcing for Mini Excavators, 2016

Component	Doosan	Hyundai
Engines	Yanmar	Yanmar
Hydraulic Pumps	Toshiba, Doosan Motrol	Tong Myung
Hydraulic Valves	Kayaba	Toshiba, Parker, Kawasaki, Tong Myung
Hydraulic Cylinders	Korean sub-contractors	In-house
Drive Motors	Kayaba, Doosan Motrol	Kawasaki, Tong Myung
Swing Motors	Kayaba, Doosan Motrol	Kawasaki, Tong Myung
Swing Gears	Shinil	Jeil, Shinil
Frames	In-house	In-house
Booms, Arms	In-house	In-house
Undercarriage	In-house	HSC
Cabins	Dabo	Myung Sung & in-house
Buckets	Korean sub-contractors	Korean sub-contractors
Rubber Tracks	Taejin	Taejin
Steel Tracks	HSC	HSC

Component	Volvo
Engines	Yanmar
Hydraulic Pumps	Bosch Rexroth
Hydraulic Valves	Toshiba
Hydraulic Cylinders	In-house
Drive Motors	Tong Myung
Swing Motors	Tong Myung
Swing Gears	Shinil
Frames	In-house
Booms, Arms	In-house
Undercarriage	In-house
Cabins	Sunjin
Buckets	Korean sub-contractors
Rubber Tracks	-
Steel Tracks	INI

Source: Company Information

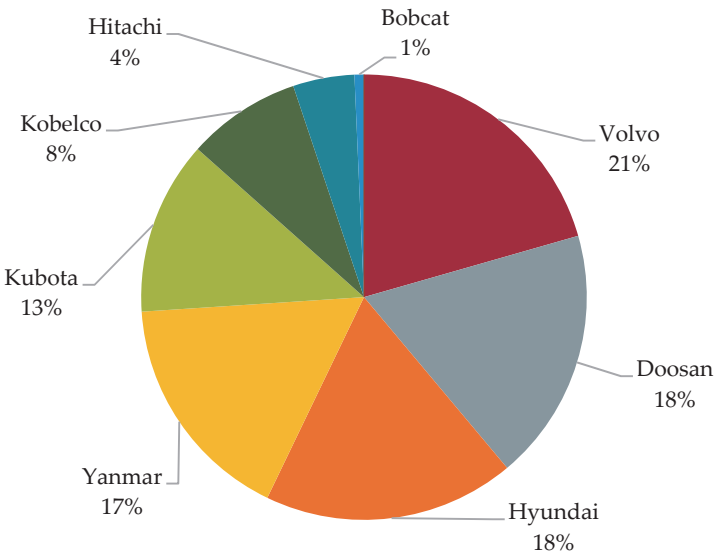
MARKET SHARES

Table 63. South Korea: Suppliers of Mini Excavators and Their Market Shares, 2015-2016

	2015		2016	
	Units	%	Units	%
Volvo	975	20	1,198	20
Doosan	1,562	32	1,069	18
Hyundai	922	19	1,063	18
Yanmar	700	14	980	17
Kubota	380	8	735	13
Kobelco	245	5	482	8
Hitachi	100	2	260	4
Bobcat	20	-	40	1
JCB	-	-	1	-
Total	**4,904**	**100**	**5,828**	**100**

Source: Off-Highway Research

Chart 30. South Korea: Suppliers of Mini Excavators and Their Market Shares 2016



Source: Off-Highway Research

In the context of a rapidly evolving market structure the market share picture has become less simple. In the first decade of the new millennium **Doosan** and **Volvo** shared 80 per cent of the market in almost equal proportions and imports played almost no part. Since then the wheeled type of machine, a local manufacturers' monopoly, has gained sales, while the machines below 5 tonnes have doubled their share of the market, to the advantage of the importers. **Volvo** achieved overall market leadership in 2016 by virtue of its high share of the 5 tonne crawler excavator sector, but the independent **Yanmar** importer has carved out a niche for itself, winning around 40 per cent of the rapidly growing mini excavator market below 5 tonnes. More recently it has been joined by three other Japanese manufacturers who between them accounted for 25 per cent of total mini excavator demand in 2016.

The important 5 tonne market is very closely fought between Doosan and Volvo. They both have very large sales networks and offer a wheeled machine as well as the better-selling crawler model of 5 tonnes. Volvo's products from France sell in very small numbers indeed. **Hyundai** entered the market after them and has climbed from 10 per cent of the market in the early 1990s to nearly 20 per cent during the last two years.

In the small machine sectors below 4 tonnes **Kubota** has firmly established itself as the leading challenger to the traditional dominance of Yanmar and has been particularly active in sales promotion during recent years. **Kobelco** has also emerged as a serious contender, while **Hitachi** sells 200-300 units per year.

Table 64. South Korea: Distribution Networks of Suppliers of Mini Excavators, 2017

Manufacturer	Distributor
Bobcat	Doosan International Korea
Doosan	Doosan Infracore
Hitachi	Soosan Service
Hyundai	Hyundai Construction Equipment
Kobelco	Samjung
Kubota	Kamco
Volvo	Volvo Construction Equipment Korea
Yanmar	YK Construction Equipment

Source: Off-Highway Research

POPULATION AND END-USERS

There are no official statistics for the mini excavator population, separated from the standard excavators but since the sales figures are quite reliable it is reasonable to say that the park is equivalent to six years of sales, that is to say 28,000 units. The machines are rented, both with and without a driver. This means that in effect the work of the mini excavator on site is part of either an earthmoving contract negotiated on a time basis by a sub-contractor or that the machine is being rented directly by the contractor, who then provides his own driver.

A minority are directly owned contractor machines and in the country, some are involved in landscaping, including paddy field reshaping. As farms change hands and start to be organised into larger units, so the fields need to be reshaped and the mini excavator is an ideal tool. Mini excavators below 5 tonnes are increasingly used by the utility companies for trenching applications as well as in the demolition sector on inner city redevelopment projects.

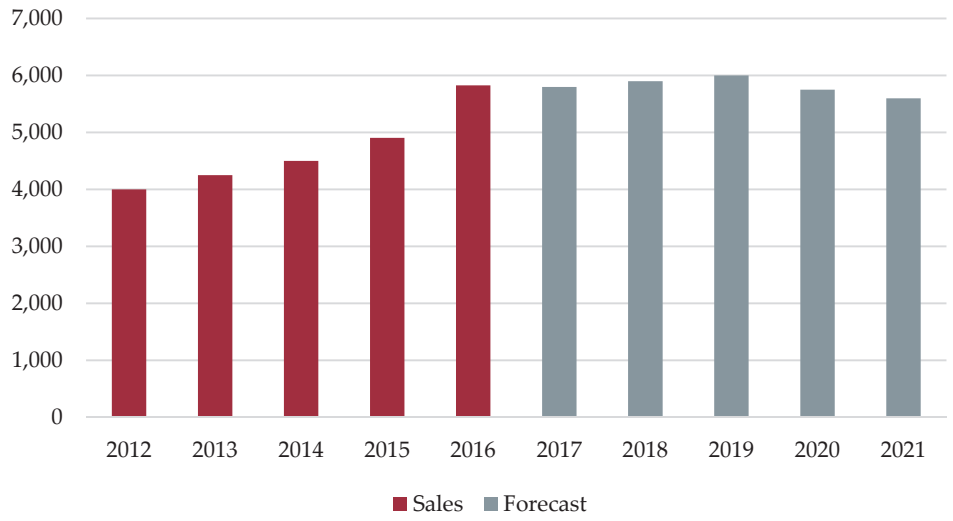
FORECAST

Table 65. South Korea: Forecast Sales of Mini Excavators, 2017-2021
(Units)

2017	2018	2019	2020	2021
5,800	5,900	6,000	5,750	5,600

Source: Off-Highway Research

Chart 31. South Korea: Sales and Forecast Sales of Mini Excavators, 2012-2021
(Units)



Source: Off-Highway Research

The mini excavator market has undergone rapid growth during the last 10 years and in 2016 reached its highest recorded level, primarily as a result of buoyant demand for machines below 5 tonnes. The preponderance of inner city redevelopment projects already underway, and planned for the future, suggest a positive outlook for mini excavators in the short to medium term.

The forecast also assumes that the country will keep its distinctive high usage of the 5 tonne types, since the market for eight tonne excavators has shown virtually no sign of expansion. Furthermore, the ingrained popularity of the 14 tonne standard wheeled excavator for larger urban projects is likely to hinder any such development.

MACHINES AVAILABLE

Table 66. South Korea: Mini Excavators Available, 2017

Manufacturer	Type	Model	Engine HP	Engine Manufacturer	Service Weight (Tonnes)	Product Source
Bobcat	Standard	E08	10	Kubota	1.1	Czech Republic
		E10	10	Kubota	1.2	Czech Republic
		E14	13	Kubota	1.3	Czech Republic
		E16	13	Kubota	1.5	Czech Republic
		E25	25	Kubota	2.6	USA
		E26	22	Kubota	2.7	USA
		E32	31	Kubota	3.2	USA
		E35	31	Kubota	3.3	USA
		E45	40	Kubota	4.6	USA
		E50	48	Kubota	4.9	USA
		E55	48	Kubota	5.6	USA
Hitachi	Zero tailswing	ZX10U-2	12	Yanmar	0.9	Japan
		ZX17U-2	15	Yanmar	1.9	Japan
		ZX22U-2	20	Yanmar	2.2	Japan
		ZX27U-2	26	Yanmar	2.8	Japan
		ZX30U-2	30	Yanmar	3.1	Japan
		ZX30U-3F	30	Yanmar	3.1	Japan
		ZX35U-2	30	Yanmar	3.5	Japan
		ZX35U-3F	30	Yanmar	3.5	Japan
		ZX40U-2	40	Yanmar	4.4	Japan
		ZX40U-3F	40	Yanmar	4.4	Japan
		ZX50U-2	40	Yanmar	4.7	Japan
		ZX50U-3F	40	Yanmar	4.7	Japan
Hyundai		R35-7	27	Mitsubishi	3.3	Japan
		R55-7	53	Yanmar	5.7	Korea
	Zero tailswing	R36N-7	27	Mitsubishi	3.6	Korea
JCB		8015	18	Perkins	1.6	UK
		8017	19	Perkins	1.7	UK
		8018	18	Perkins	1.8	UK
		802 Super	32	Perkins	2.5	UK
		8027 Super	27	Perkins	2.8	UK
		803 Plus/Super	26	Perkins	3.0	UK
		804 Super	27	Perkins	3.5	UK
		8052	43	Perkins	5.2	UK
		8060	57	Perkins	6.0	UK
	Zero tailswing	8027 ZTS	27	Perkins	2.7	UK
		8032 ZTS	27	Perkins	3.2	UK
Kobelco	Zero tailswing	SK20SR	21	Yanmar	2.2	Japan
		SK27SR	21	Yanmar	2.6	Japan
		SK30SR	28	Yanmar	3.1	Japan
		SK35SR	28	Yanmar	3.7	Japan
		SK40SR	41	Yanmar	4.6	Japan
Kubota	Standard	KX61	23	Kubota	2.5	Japan
		KX101	28	Kubota	3.5	Japan
		KX057	46	Kubota	5.5	Japan

Source: Company Information

Table 66. South Korea: Mini Excavators Available, 2017 (continued)

Manufacturer	Type	Model	Engine HP	Engine Manufacturer	Service Weight (Tonnes)	Product Source
Yanmar		SV08	10	Yanmar	1.0	Japan
	Zero tailswing	ViO10	13	Yanmar	1.2	Japan
		ViO17	14	Yanmar	1.7	Japan
		ViO20	20	Yanmar	2.3	Japan
		ViO25	20	Yanmar	2.7	Japan
		ViO35	25	Yanmar	3.3	Japan
		ViO55	40	Yanmar	4.7	Japan
		ViO57	40	Yanmar	5.3	Japan

Source: Company Information

MOBILE COMPRESSORS

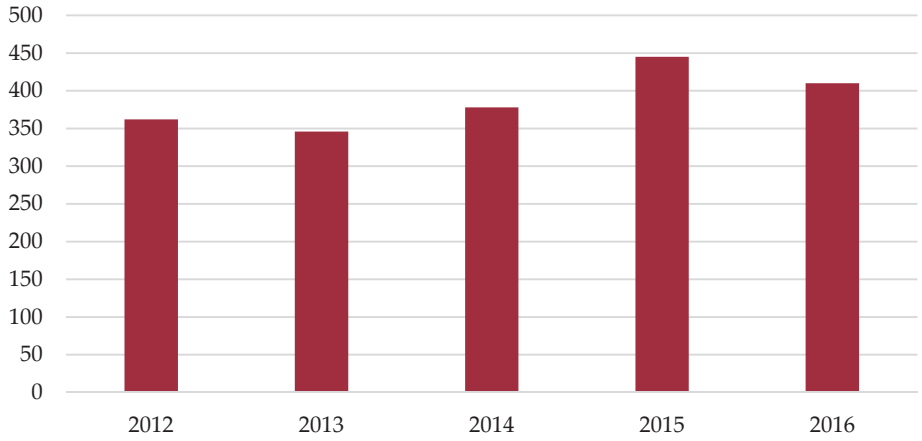
MARKET SIZE AND TRENDS

Table 67. South Korea: Sales of Mobile Compressors, 2012-2016 (Units)

2012	2013	2014	2015	2016
362	346	378	445	410

Source: Off-Highway Research

Chart 32. South Korea: Sales of Mobile Compressors, 2012-2016 (Units)



Source: Off-Highway Research

The product analysed here is the mobile, screw type compressor, driven by a diesel engine and may be mounted on wheels or a skid. Almost all the units sold are mounted on skids, rather than on wheels. Unloading cranes lift them off the rental companies' trucks and it is convenient to store them in stacks. In the yards they are often mixed with generators, which are boxed in similar sized casings; on the urban job site is it similarly convenient to save space by storing them in stacks.

The age of using small mobile compressors in conjunction with air hammers and breakers has passed in Korea for the hydraulic breaker mounted on an excavator arm has replaced it. At least a dozen Korean companies manufacture breakers and the population of excavators is huge and varies in size. Annual sales of all sizes of mobile compressor reached 600 units in the mid-1990s as large mobile compressors found a place in foundation works and in civil engineering for ports, new roads and airports.

After 1997 the demand for the services of large mobile compressors and associated tools decreased dramatically. 75 per cent of them lay completely unused and demand fell to around 30 units per year for three consecutive years. After 2004 the market picked up at last, reaching 220 units by 2010, although this was largely

attributable to the increased activities of Korean contractors overseas, not to any trend in the domestic market about using small compressors and hammers.

High-pressure models dominate the market. The 7 bar machines familiar elsewhere are a minority and today's sales are of machines working at 10, 12 or even 18 bar. They are often used in drilling applications, for instance, in the cleaning of the area round the drill head or the powering of smaller, exploratory drillings. The compressors concerned are often truck-mounted rather than on wheels. All the buyers of large machines are thinking of civil engineering applications and no machine smaller than 6.0 m^3/min is sold. The first popular size is at 10 m^3/min, and then there is a gap until 20 m^3/min, where much of the current requirement lies. This band of sizes extends to around 30 m^3/min, the output down the last unit being more determined by the specification requested.

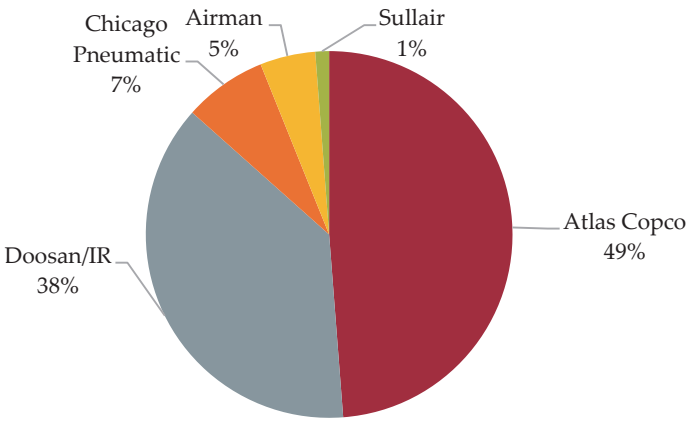
MARKET SHARES

Table 68. South Korea: Suppliers of Mobile Compressors and Their Market Shares, 2016

	2016	
	Units	%
Atlas Copco	200	49
Doosan/IR	155	38
Chicago Pneumatic	30	7
Airman	20	5
Sullair	5	1
Total	**410**	**100**

Source: Off-Highway Research

Chart 33. South Korea: Suppliers of Mobile Compressors and Their Market Shares, 2016



Source: Off-Highway Research

In the area of low-pressure machines, working at 7 bar, **Airman** shares the market with **Doosan**. In high-pressure machines **Atlas Copco** is the clear market leader, with **Chicago Pneumatic** and **Doosan** trailing behind.

Ingersoll-Rand separated from its long time importer, Hae In Corp. in 2006. Ingersoll-Rand Korea took over the account but then in the latter part of 2007 Doosan Infracore bought the parent company's mobile compressor lines. This resulted in the creation of a new company, Doosan Infracore International Korea, which took over those product lines.

Atlas Copco mobile compressors are marketed by the Swedish manufacturer's own sales subsidiary company, which was established in 1983.

Since 2000, Soosan Service has been the sole agent for **Airman** mobile compressors. This company, created in 1996, separated from the Soosan Group and now fulfils the role of supporting Soosan products in Korea, as well as a number of imported products.

Table 69. South Korea: Distribution Networks of Suppliers of Mobile Compressors, 2017

Manufacturer	Distributor
Airman	Soosan Service
Atlas Copco	Atlas Copco Korea
Chicago Pneumatic	Atlas Copco Korea
Doosan	Doosan Infracore International

Source: Off-Highway Research

POPULATION AND END-USERS

There are no official statistics regarding the population of mobile compressors, although suppliers interviewed for the purposes of this study estimate that approximately 6,000 machines are in active use throughout the country. Rental companies own about 60 per cent of the machines, industry a further 25 per cent. The rest is in quarries or with contractors.

FORECAST

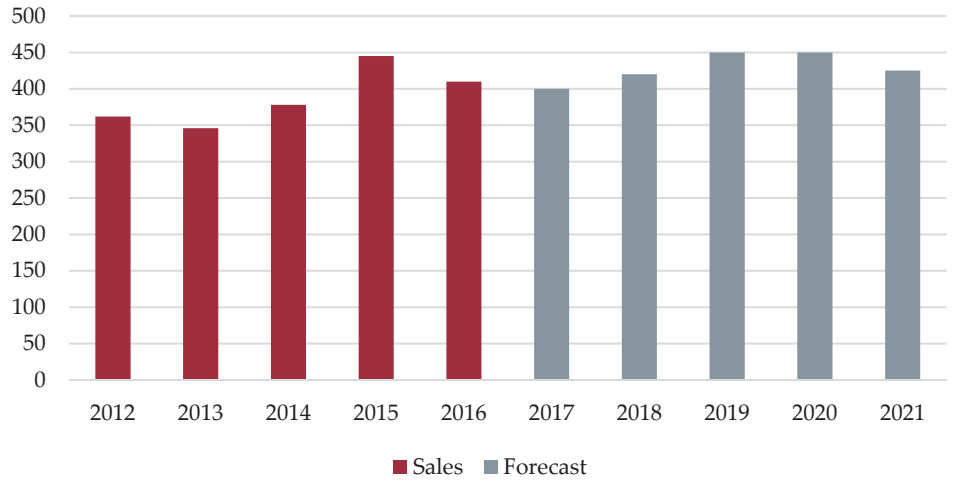
The level of civil engineering work planned for the years to come and replacement business for contractors working on plant installation for the oil refining and petrochemical industries should be sufficient to maintain a stable volume of new sales in the short to medium term. Concentrating on high outputs and high pressures, the suppliers could stay at a yearly rhythm of 400-450 units per year.

Table 70. South Korea: Forecast Sales of Mobile Compressors, 2017-2021 (Units)

2017	2018	2019	2020	2021
400	420	450	450	425

Source: Off-Highway Research

Chart 34. South Korea: Sales and Forecast Sales of Mobile Compressors, 2012-2021(Units)



Source: Off-Highway Research

MACHINES AVAILABLE

Table 71. South Korea: Mobile Compressors Available, 2017

Manufacturer	Model	Air Delivery (m^3/Min)	HP	Engine Manufacturer	Weight (Kg)	Product Source
Airman	PDS130S	3.5	38	Shibaura	880	Japan
	PDS185S	5.0	52	Nissan	915	Japan
	PDS265S	7.5	83	Yanmar	1,480	Japan
	PDS390S	11.0	110	Isuzu	2,240	Japan
	PDS655S	18.5	160	Hino	3,550	Japan
	PDS750S	21.2	196	Hino	3,675	Japan
Note: A wide range of high pressure models from PDSE900 (8.8 bar) to PDSK900S (25.5 bar) is also available. Box types are available from 1.5 to 11.0 m^3/min.						
Atlas Copco	XAS37	2.5	21	Kubota	450	Belgium
	XAS47	2.6	26-29	Kubota/Deutz	635	Belgium
	XAS57	3.0	31	Deutz	685	Belgium
	XAS67	3.7	44	Deutz	800/850	China
	XAS77	4.3	42	Deutz	800/850	China
	XAS97	5.3	48	Deutz	800/850	China
	XAS186	11.1	114	Deutz	1,800	Belgium
	XAS426	25.0	222	Mercedes	2,300	Belgium
Note: All the above have a working pressure of 7 bar. A range of high-pressure models is also available.						

Source: Company Information (Continued)

Table 71. South Korea: Mobile Compressors Available, 2017 (Continued)

Manufacturer	Model	Air Delivery (m^3/Min)	HP	Engine Manufacturer	Weight (Kg)	Product Source
Chicago Pneumatic	CPS70	2.0	25	Kubota	552	China
	CPS90	2.5	26	Kubota	556	China
	CPS110	3.0	32	Deutz	730	China
	CPS130	3.7	44	Deutz	918	China
	CPS150	4.3	43	Deutz	960	China
	CPS185	5.3	49	Deutz	960	China
	CPS275	7.9	82	Cummins	1,500	China
	CPS400	11.8	129	Cummins	1,680	China
Note: All the above have a working pressure of 7 bar. A range of high-pressure models is also available						
Doosan	7/21	2.0	22	Ingersoll-Rand	650	Czech Republic
	7/31E	3.0	34	Ingersoll-Rand	800	Czech Republic
	7/41	4.0	46	Ingersoll-Rand	805	Czech Republic
	7/51	5.0	61	Ingersoll-Rand	900	Czech Republic
	7/71	7.1	80	Ingersoll-Rand	1,120	Czech Republic
	7/120	12.0	125	Ingersoll-Rand	1,800	Czech Republic
Note: A range of higher-pressure models at 10 to 12 bar is available in various sizes from 5.6 m^3/min to 42.5 m^3/min.						

Source: Company Information

MOBILE CRANES

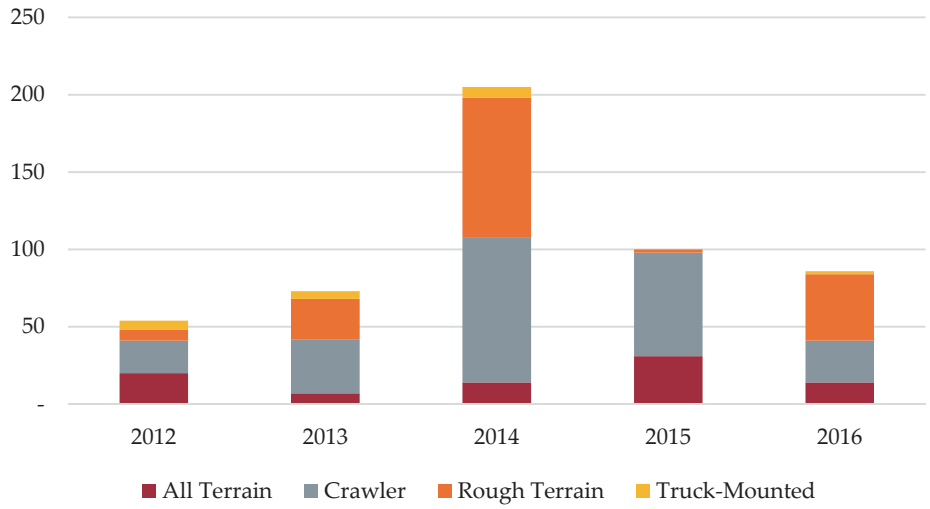
MARKET SIZE AND TRENDS

Table 72. South Korea: Sales of Mobile Cranes by Type, 2012-2016 (Units)

	2012	2013	2014	2015	2016
All Terrain	20	7	14	31	14
Crawler	21	35	94	67	27
Rough Terrain	7	26	90	2	43
Truck-Mounted	6	5	7	-	2
Total	**54**	**73**	**205**	**100**	**86**

Source: Off-Highway Research

Chart 35. South Korea: Sales of Mobile Cranes by Type, 2012-2016 (Units)



Source: Off-Highway Research

The construction boom before 1997 prompted a massive import of cranes, most of the purchases being made by rental companies. The market for telescopic cranes was dominated by the local products in the 25 to 50 tonne sizes. The huge amount of high-rise construction undertaken meant that Korea was a very important market for crawler cranes. Crawler cranes were of similar capacities, with a small amount of local production from 1993 to 1997. Imported cranes came in all sizes from 7.5 tonne products mounted on light Japanese truck chassis to the very largest of all terrain types from Germany.

The Asian Financial Crisis brought a rapid end to all that. 95 per cent of all crane owners went bankrupt and the industry was reborn, with drivers taking over as one-man businesses. After 1998 there was nothing wrong with the crane business in Korea; it is just that it was not in new cranes. Relative to the population of 7,000 cranes the imports were not massive, about 200 units per year from 2000 onwards.

The imports used were 20 and 50 tonne rough terrain cranes from Japan; 20 to 50 tonne truck cranes from the same source; and a limited number of European all terrain cranes from the manufacturers' workshops or the brokers of Rotterdam.

After 2005 the new crane market changed dramatically for the better. Two factors drove the market upwards. The government put restrictions on the emissions of the engines of imported cranes, whether they were new or old, and most older cranes were barred as imports. Sales of rough terrain cranes have done well in 2014 and 2016 but that was mostly to international contractors and the all terrain cranes bought were not purchased by people who had wanted a used crane.

The other big change is the huge surge in ordering by the shipyards that are almost entirely responsible for the change in the crawler crane business. Some suppliers began to convince the shipyards to use crawler cranes as pick and carry cranes, picking up the massive pieces that go to make the modern oil tankers and other ships made in Korea. The business enjoyed a cyclical boom, with ship-owners keen as never before to replace ageing vessels. Sales have gone directly to some yards, while many have gone to rental companies. They expect high utilisation in the yards, so they will buy new cranes that might from time to time go into the less steady businesses of tower crane erection for housing and bridge building.

TRUCK-MOUNTED CRANES

The market for new truck-mounted telescopic cranes disappeared temporarily when Hyundai ceased manufacturing them in 2002. Even today, sales of new machines are insignificant, although some used units are imported from Japan on an annual basis. Truck-mounted cranes have increasingly been replaced by all terrain cranes, which offer greater rigidity due to their ability to carry larger counterweights, and are more manoeuvrable as a result of their all-wheel steer capability.

ALL TERRAIN CRANES

Before the Asian Financial Crisis the market for large all terrain cranes was a healthy 25 units per year, all of them in the over 100 tonne category. The erection of tower cranes for high-rise buildings was their forte but they also played a significant role in bridge building. From 1998 to 2005 inclusive the market was effectively dead, although from 2006 the business finally came back to life. Sales are almost exclusively made to the rental companies and comprise primarily 80-100 tonne types. Above that level incremental sales occur of anything from 220 to 500 tonnes, with no consistent pattern evident in the buying.

ROUGH TERRAIN CRANES

The rough terrain crane market has come back to life mainly thanks to business with international contractors and their preference in sizes is influenced by their

applications, which centre on industrial plant construction for petroleum refining and chemicals. They order cranes mostly in the 30 and 45 tonne sizes, although in the past there has been some interest in 70 tonne sizes.

The domestic market has used old Japanese rough terrain cranes and from the registration data one can see the favoured sizes. In the past the rental companies bought 20 per cent 20 tonne cranes; 20 per cent 45 to 80 tonne types; and 60 per cent the jobbing cranes of 30, 40 and 45 tonnes.

CRAWLER CRANES

Crawler cranes continue to sell in relatively strong numbers due to their widespread popularity within the petrochemical and shipbuilding industries. They are also frequently utilised in power plants, on major infrastructure projects and in wind farm construction.

Within the shipbuilding sector, the leading size is 200-250 tonnes, where units have been bought for pick and carry duties. This allows the yard to do without the massive multi-wheel transporters that have become common in many sites. That apart, the sizes bought vary widely. Some smaller Chinese units have arrived in the market but equally the power station programme and some heavy civil engineering are inspiring sales up to 750 tonnes from the traditional sources of the USA, Germany and Japan.

PRODUCTION

Very high sales of imported mobile cranes in the late 1980s persuaded Daewoo and Samsung to start crane production, using licensed designs. Truck cranes were the favoured products but Samsung also undertook some crawler crane manufacture until it was taken over by Volvo. Hyundai created its own formulation of the classic Japanese truck crane in the early 1990s, employing a Mitsubishi carrier and a boom made by Kobe Steel in Japan. Production was about five units per month before the crisis of 1997 but the company never made more than 20 units after that and stopped in 2002. Samsung produced mobile cranes in Changwon until 1997; Daewoo dropped its crane production in 1998.

MARKET SHARES

The **all terrain** crane market is 100 per cent supplied from Germany, with **Liebherr** and **Grove** accounting for 80-100 per cent of annual demand. **Terex Demag** occupies third place in the market whilst **Tadano Faun** sells very few units.

Grove and **Tadano** dominate the market for new **rough terrain** cranes. Grove products are sold by the Manitowoc office in Seoul, and are the favourite of the Korean contractors working today in the Middle East and Asia Pacific. With a 35-

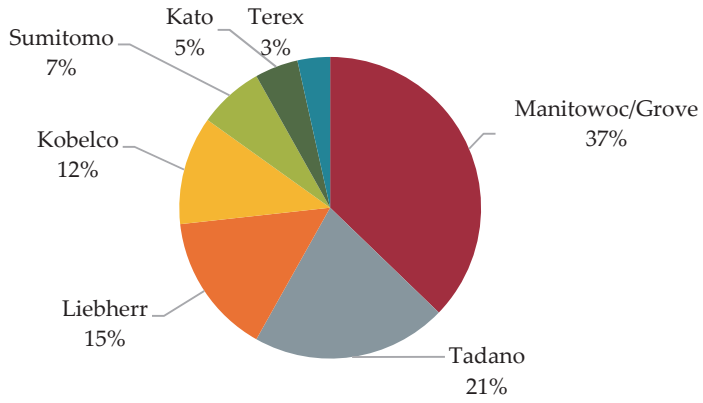
year history in Korea, the manufacturer has been able to capitalise on the strengths of the Grove line after its acquisition by the American parent some years ago.

Table 73. South Korea: Suppliers of Mobile Cranes and Their Market Shares, 2016

	All Terrain		Crawler		Rough Terrain		Truck-Mounted		Total	
	Units	%	Units	%	Units	%	Units	%	Units	%
Manitowoc/Grove	4	30	8	30	20	46			32	37
Tadano					16	37	2	100	18	21
Liebherr	10	70	3	11					13	15
Kobelco			10	37					10	12
Sumitomo			6	22					6	7
Kato					4	9			4	5
Terex					3	7			3	3
Total	**14**	**100**	**27**	**100**	**43**	**100**	**2**	**100**	**86**	**100**

Source: Off-Highway Research

Chart 36. South Korea: Suppliers of Mobile Cranes and Their Market Shares, 2016



Source: Off-Highway Research

Sales of new **crawler** cranes were very rare before 2006, given the easy availability of used machines in Korea or in nearby markets such as Japan. New machines come with a high price tag, so the companies that have won orders are those that have a reputation, not least in the field of after sales service.

Kobelco has been by far the most successful in recent years. Second in the market comes Kilwoo Corp., a long-time representative of Sumitomo and now doing excellent business with 250 and 275 tonne cranes from **Hitachi-Sumitomo** for the shipyards. Chinese cranes from **Sany** and **Fushun** have found buyers in recent years, although the ship yards' predilection for ultra-high quality in their products and processes has hindered their market penetration.
The full list of suppliers is shown below.

Table 74. South Korea: Distribution Networks of Suppliers of Mobile Cranes, 2017

Manufacturer	Distributor
Grove	Manitowoc Crane Group Korea
Hitachi-Sumitomo	Kilwoo Corp.
IHI	Deico Tech
Kato	Daesan Trading Co.
Kobelco	Kobelco Construction Machinery Japan
Liebherr	Liebherr Mobile Cranes Korea Ltd
Manitowoc	Manitowoc Crane Group Korea
Tadano	Tadano Korea
TEREX-Demag	Ilshin Co.
XCMG	PM Machinery

Source: Off-Highway Research

POPULATION AND END-USERS

The population figures are based on official data of machines registered and in 2016 amounted to approximately 10,000 units. The largest concentration of cranes is in the capital and in the industrial city of Busan. Nearly all mobile cranes belong to rental companies or to crane drivers who work for themselves.

FORECAST

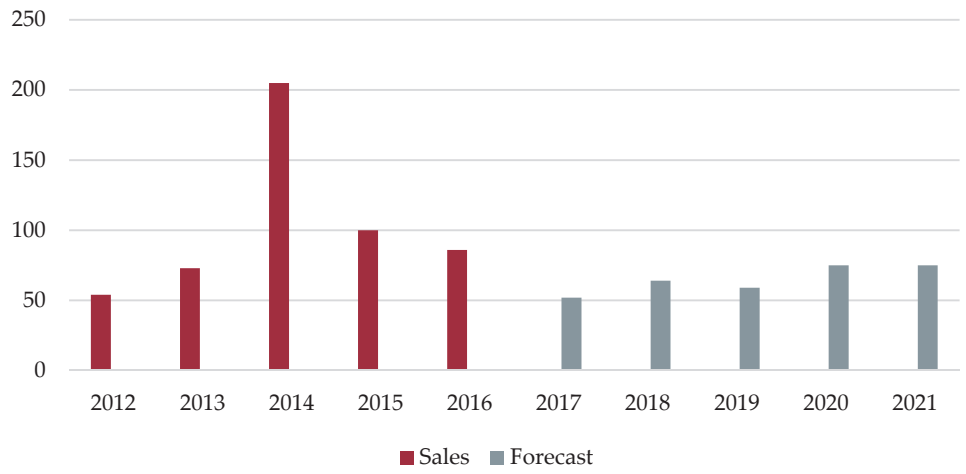
Various factors are at work at the same time, influencing the likely sales of mobile cranes. The introduction of Tier IV Final emissions legislation means that the import of used cranes from Japan will be superseded by sales of new cranes. In addition, the plethora of old cranes in Korea, many of which are over 20 years old, dictates that the replacement market should remain buoyant in medium to long term. The planned government expenditure on construction over the next five years will also help to sustain the market for new cranes.

Table 75. South Korea: Forecast Sales of Mobile Cranes, 2017-2021 (Units)

	2017	2018	2019	2020	2021
All Terrain	15	20	20	30	30
Crawler	25	30	30	35	35
Rough Terrain	10	10	5	5	5
Truck-Mounted	2	4	4	5	5
Total	**52**	**64**	**59**	**75**	**75**

Source: Off-Highway Research

Chart 37. South Korea: Sales and Forecast Sales of Mobile Cranes, 2012-2021 (Units)



Source: Off-Highway Research

MACHINES AVAILABLE

Table 76. South Korea: All Terrain Cranes Available, 2017

Manufacturer /Type	Model	Max Lift Capacity (Tonnes)	Engine HP	Engine Manufacturer	Product Source
Liebherr	LTM 1030-2.1	35	278	Mercedes-Benz	Germany
	LTM 1040-2.1	40	278	Mercedes-Benz	Germany
	LTM 1050-3.1	50	367	Liebherr	Germany
	LTC 1055-3.1	55	460	Liebherr	Germany
	LTM 1070-4.1	70	367	Liebherr	Germany
	LTM 1090-4.1	90	197+476	Liebherr	Germany
	LTM 1095-4.1	95	197+503	Liebherr	Germany
	LTM 1100-4.1	100	197+476	Liebherr	Germany
	LTM 1100-5.2	100	197+503	Liebherr	Germany
	LTM 1130-5.1	130	197+503	Liebherr	Germany
	LTM 1160-5.1	160	197+503	Liebherr	Germany
	LTM 1200-5.1	200	197+503	Liebherr	Germany
	LTM 1220-5.2	220	245+503	Liebherr	Germany
	LTM 1250-6.1	250	245+612	Liebherr	Germany
	LTM 1300-6.1	300	245+612	Liebherr	Germany
	LTM 1400-7.1	400	326+612	Liebherr	Germany
	LTM 1500-8.1	500	326+680	Liebherr	Germany
Tadano Faun	ATF60	60	123+354	Mercedes-Benz	Germany
	ATF80	70	123+394	Mercedes-Benz	Germany
	ATF110	110	177+517	Mercedes-Benz	Germany
	ATF160	160	184+517	Mercedes-Benz	Germany
	ATF220	220	188+530	Mercedes-Benz	Germany

Source: Company Information

Table 76. South Korea: Crawler Lattice Cranes Available, 2017 (Continued)

Manufacturer /Type	Model	Max Lift Capacity (Tonnes)	Engine HP	Engine Manufacturer	Product Source
Hitachi-Sumitomo	SCX300	30	147	Hino	Japan
	SCX400	40	147	Hino	Japan
	SCX500	50	177	Isuzu	Japan
	SCX550	55	177	Isuzu	Japan
	SCX700	70	177	Isuzu	Japan
	SCX800-2/HD	80	284	Mitsubishi	Japan
	SCX900/HD	90	247	Mitsubishi	Japan
	SCX1200-2	120	247	Mitsubishi	Japan
	SCX1500-2	150	247	Mitsubishi	Japan
	SCX2000	200	315	Mitsubishi	Japan
	SCX2500	250	315	Mitsubishi	Japan
	SCX2800-2	275	364	Mitsubishi	Japan
	SCX3500	300	405	Mitsubishi	Japan
Kobelco	CKE600	60	213	Hino	Japan
	CKE700	70	213	Hino	Japan
	CKE800	80	213	Hino	Japan
	CKE900	90	331	Hino	Japan
	CKE1100	110	331	Hino	Japan
	CKE1350	135	331	Hino	Japan
	CKE1800	180	331	Hino	Japan
	CKE2500	250	315	Mitsubishi	Japan
	SL4500	400	429	Hino	Japan
	SL6000	550	429	Hino	Japan
Liebherr	LR 1350/1	350	362	Liebherr	Germany
	LR 1400/2	400	402	Liebherr	Germany
	LR 1750	750	536	Liebherr	Germany
	LR 11250	1,000	870	Cummins	Germany
Sany	SCC800C	80	253	Cummins	China
	SCC1000C	100	249	Cummins	China
	SCC1500C	150	314	Cummins	China
	SCC2500C	250	335	Cummins	China
	SCC3200	320	405	Cummins	China
	SCC4000	400	518	Cummins	China
	SCC6300	630	544	Cummins	China
Zoomlion	QUY50	55	180	Weichai	China
	QUY70	70	238	Weichai	China
	QUY80	80	271	Weichai	China

Source: Company Information

Table 76. South Korea: Rough Terrain Cranes Available, 2017 (Continued)

Manufacturer /Type	Model	Max Lift Capacity (Tonnes)	Engine HP	Engine Manufacturer	Product Source
Grove	RT540E	35	152	Cummins	USA
	RT765-2E	60	210	Cummins	USA
Kato	SR-300L	30	268	Mitsubishi	Japan
	SR-700L	70	344	Mitsubishi	Japan
Tadano	GR-120NL	12	170	Mitsubishi	Japan
	GR-300EX	30	175	Cummins	Japan
	GR-700EXL	70	225	Mitsubishi	Japan
Terex	A300	30	143	Iveco	Italy
	A350	35	143	Iveco	Italy
	RC35	35	159	Cummins	Italy
	RC40	42	159	Cummins	Italy
	A400	35	151	Cummins	Italy
	A450	40	151	Cummins	Italy
	RC45	44	159	Cummins	Italy
	A600/C	60	205	Cummins	Italy
Truck-Mounted					
Kato	NK-550VR	55	350	Mitsubishi	Japan
Sany	QY25C	25	261	Shanghai	China
	QY50C	50	310	Cummins	China
	QY100	100	200+476	Mercedes	China
Tadano	TL-300E	30	275	Nissan	Japan
	GT 550	55	350	Nissan	Japan
XCMG	QY50K	50	280	Dongfeng	China
Zoomlion	QY25E431	25	271	Weichai	China
	QY50D531	50	336	Weichai	China
	QY70V533	70	376	Weichai	China

Source: Company Information

MOTOR GRADERS

MARKET SIZE AND TRENDS

Table 77. South Korea: Sales of Motor Graders 2016
(Units)

2012	2013	2014	2015	2016
2	-	1	3	1

Source: Off-Highway Research

The last five years have been very poor for motor grader sales. The market for new motor graders was already very quiet before the Asian Financial Crisis and since then, it has hardly existed at all. The population, however, has grown since 1997, thanks to imports of second-hand machines.

The most popular machines are in the 160 to 190 horsepower range. Few of the largest graders are ever imported.

PRODUCTION

From the earliest days, it was considered that the motor grader would be a strategically useful tool to make in Korea because of its usefulness for the Army. That theory was not supported by the financial reality, because the potential national need each year was so small. **Halla** made Fiatallis graders from 1977 to 1991. **Samsung** took a licence in 1985 to produce Komatsu designs for sale only within Korea and ceased production in 1995.

MARKET SHARES

Table 78. South Korea: Suppliers of Motor Graders and Their Market Shares, 2016

	2016	
	Units	%
Caterpillar	1	100
Total	**1**	**100**

Source: Off-Highway Research

The only supplier with any recent record of success is **Caterpillar**, which has supplied the Korean market regularly for many years with its well-respected graders from the USA. Recent sales concerned the model 140. Komatsu re-entered the market through Junjin CSM in 2007, although has only sold a small number of machines in the past ten years.

Table 79. South Korea: Distribution Networks of Suppliers of Motor Graders, 2017

Manufacturer	Distributor
Case	Samjung Construction Machinery
Caterpillar	Haein Corporation
Komatsu	Junjin CSM

Source: Off-Highway Research

POPULATION AND END-USERS

The population figure, based on official data of machines registered, currently equates to 750 units. The population reached a peak in 2000 of 1,000 and has now set itself on a path of gentle decline.

The largest concentration of motor graders is in the capital. The rental companies specialising in earthmovers for the main contractors are the largest owner grouping but civil engineers and construction companies still own about 40 per cent of the motor graders themselves.

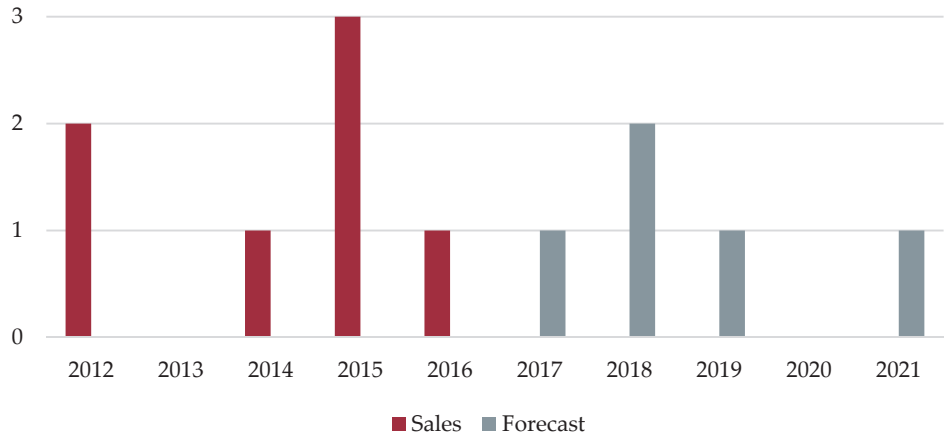
FORECAST

Table 80. South Korea: Forecast Sales of Motor Graders, 2017-2021 (Units)

2017	2018	2019	2020	2021
1	2	1	-	1

Source: Off-Highway Research

Chart 38. South Korea: Sales and Forecast Sales of Motor Graders, 2012-2021 (Units)



Source: Off-Highway Research

Given the behaviour of the market in the last five years it is impossible to suggest that demand will suddenly be satisfied by new motor graders. Sales of new

machines will be purely for the high productivity contractors who feel that they can justify paying two to three times the price of a normal used machine.

MACHINES AVAILABLE

Table 81. South Korea: Motor Graders Available, 2017

Supplier	Model	Service Weight (Tonnes)	Diesel Engine HP	Diesel Engine Manufacturer	Product Source
Case	835C	12.2	133	CNH	Germany
	856C	16.2	190	CNH	Germany
Caterpillar	120K	12.0	145	Caterpillar	China
	12K	13.7	170	Caterpillar	China
	140K	14.1	190	Caterpillar	China
	160K	15.1	205	Caterpillar	China
Komatsu	GD511A-1	10.8	135	Komatsu	Japan
	GD611A-1	12.5	155	Komatsu	Japan
	GD661A-1	13.3	180	Komatsu	Japan
	GD655-3A	14.1	190	Komatsu	Japan

Source: Company Information

ROUGH TERRAIN LIFT-TRUCKS

MARKET SIZE AND TRENDS

Table 82. South Korea: Sales of Rough Terrain Lift Trucks, 2012-2016 (Units)

	2012		2013		2014		2015		2016	
	Units	%	Units	%	Units	%	Units	%	Units	%
Masted	-	-	-	-	-	-	-	-	-	-
Telescopic	12	100	10	100	15	100	13	100	19	100
Total	**12**	**100**	**10**	**100**	**15**	**100**	**13**	**100**	**19**	**100**

Source: Off-Highway Research

The rough terrain lift truck is not a product that has reached any degree of popularity yet, although there is evidence to suggest that the telescopic handler is finding increasing popularity on larger farms. The use of fork-lift trucks in industry is for all practical purposes so far confined to traditional industrial types.

In construction, there is a shortage of suitable applications. The house building sector is not the rich field for the use of telescopic handlers that it is in the USA or parts of Europe. Some suppliers believed it was possible to introduce the concept but the problem is that all the alternatives are cheap and made in Korea.

The alternatives, which are also in use in the much larger industrial construction sector, are the cheap, small tower crane for on-site handling and crude electric lifts for the bringing of materials to the desired height. Unloading cranes are fitted to locally manufactured trucks by specialists like Soosan. They have lift capacities from 500 kg to 2 tonnes but can lift to great heights as their booms are substantial. They can, of course, stay on site to perform handling tasks if requested and so work as more than mere delivery trucks. Sales now run between 1,000 and 1,500 per year, effectively blocking all possibility of success for telescopic handlers.

In the agricultural sector, the preponderance of small farms hinders acceptance of the telehandler, although more recently the leading supplier, Manitou, has been successful in promoting the concept to larger, richer farms. Here the machines are used primarily in compost and fertiliser handling applications.

PRODUCTION

In spite of the large volume of industrial fork lift truck manufacture in Korea, no local production of rough terrain lift trucks exists to date. Daewoo created a substitute by putting a work platform on a telescopic arm anchored on a wheeled excavator chassis. It went on sale in 2002 but was not an orthodox telescopic handler and did not succeed.

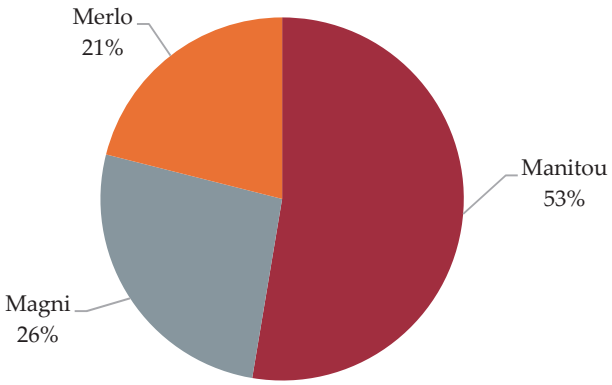
MARKET SHARES

Table 83. South Korea: Suppliers of Telescopic Rough Terrain Lift Trucks and Their Market Shares, 2016

	2016	
	Units	%
Manitou	10	53
Magni	5	26
Merlo	4	21
Total	19	100

Source: Off-Highway Research

Chart 39. South Korea: Suppliers of Telescopic Rough Terrain Lift Trucks and Their Market Shares, 2016



Source: Off-Highway Research

The only recent successes have been won by **Manitou**, and the two Italian manufacturers **Magni** and **Merlo**. The only other supplier actively marketing the product is **JCB**, which sold a single telehandler in 2013.

Table 84. South Korea: Distribution Networks of Suppliers of Rough Terrain Lift Trucks, 2017

Manufacturer	Distributor
JCB	Jaein Tech Co.
Magni	Han Ho
Manitou	YK Construction Equipment Co.
Merlo	Livemac

Source: Off-Highway Research

POPULATION AND END-USERS

The population is estimated at 120 units, in construction, industry and agriculture.

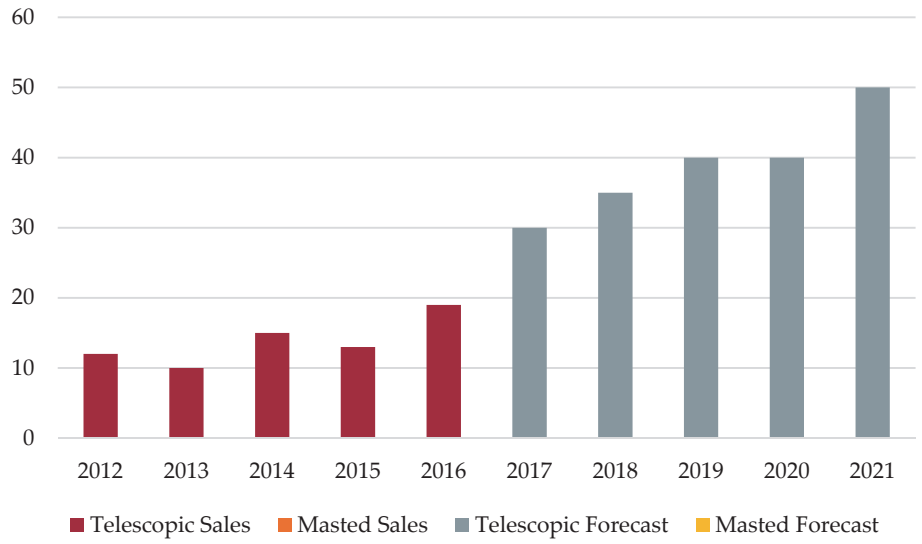
FORECAST

Table 85. South Korea: Forecast Sales of Rough Terrain Lift Trucks by Type, 2017-2021 (Units)

	2017	2018	2019	2020	2021
Masted	-	-	-	-	-
Telescopic	30	35	40	40	50
Total	**30**	**35**	**40**	**40**	**50**

Source: Off-Highway Research

Chart 40. South Korea: Sales and Forecast Sales of all Rough Terrain Lift Trucks, 2012-2021 (Units)



Source: Off-Highway Research

According to the leading supplier of telescopic handlers, the medium term outlook appears increasingly favourable. Safety issues are an increasing concern in the construction sector and the traditional use of access platforms attached to the load beds of trucks is now frowned upon. Promotion of the telescopic handler's superior safety credentials has received some acceptance and the market finally appears to be growing. There is also a widespread belief that the housebuilding sector will eventually take on board the concept, albeit in the longer term. In agriculture the use of telehandlers in material handling applications is forecast to increase rapidly as more of the larger farms realise the economic benefits of the product.

MACHINES AVAILABLE

Table 86. South Korea: Rough Terrain Lift Trucks Available, 2017

Type/ Manufacturer	Model	Engine HP	Engine Manufacturer	Operating Capacity (Tonnes)	Maximum Lift (Metres)	Product Source
Telescopic	T2250	75	Kubota	2.2	5.0	France
Bobcat	TL360	100	Perkins	3.0	6.0	France
	TL470	100	Perkins	3.5	7.0	France
	TL470HF	130	Perkins	2.5	7.0	France
	T35100/L/SL	100	Perkins	3.5	10.0	France
	T35120L/SL/MP	100	Perkins	3.5	11.6	France
	T40140	100	Perkins	4.0	13.6	France
	T40170	100	Perkins	4.0	17.2	France
	TR38160	102	Iveco	3.8	15.7	Italy
	TR45190	144	Perkins	4.5	18.4	Italy
	TR50210	144	Perkins	5.0	20.3	Italy
	TR40250	144	Perkins	4.0	21.1	Italy
JCB	515-40	51	Kohler	1.5	4.0	UK
	520-40	49	Perkins	2.0	4.0	UK
	520-50	76	JCB	2.0	5.0	UK
	524-50	78	JCB	2.4	5.0	UK
	527-58	110	JCB	2.7	5.8	UK
	531-70	75-110	JCB	3.1	7.0	UK
	541-70	75-110	JCB	4.1	7.0	UK
	536-60	100-125	JCB	3.6	6.2	UK
	535-95	75-110	JCB	3.5	9.5	UK
	533-105	75-110	JCB	3.3	10.5	UK
	535-125	75-110	JCB	3.5	12.5	UK
	535-140	75-110	JCB	3.5	14.0	UK
	540-140	75-110	JCB	4.0	14.0	UK
	540-170	110-125	JCB	4.0	17.0	UK
	550-80	125	JCB	5.0	8.1	UK
	TM180	62	JCB	1.8	4.5	UK
	TM220	75	JCB	2.2	4.6	UK
	TM320	125	JCB	3.2	5.2	UK
	515-40	60	Perkins	1.5	4.0	UK
	520-40	51	Perkins	2.0	4.0	UK
	520-50	83	Perkins	2.4	5.3	UK
	527-55	82-100	JCB	2.7	5.5	UK
	526-56	85-100	JCB	2.6	5.0	UK
	527-58	100	JCB	2.7	6.8	UK
	536-60/Plus/Super	100-130	JCB	3.6	6.2	UK
	531-70/Plus/Super/Xtra	100-130	JCB	3.1	7.0	UK
	536-70/Plus/Super/Xtra	100-130	JCB	3.6	7.0	UK
	541-70/Super/Xtra	100-130	JCB	4.1	7.0	UK
	535-95/Plus/Super	110-125-145	JCB	3.5	9.5	UK
	550-80/Plus/Pack145	125-145	JCB	5.0	8.1	UK
	TM180	62	Deutz	1.8	4.5	UK
	TM220	75	Deutz	2.2	4.6	UK
	TM320/ SMax	130-145	JCB	3.0	5.0	UK
Manitou	MLT 625-75H	51	Kubota	2.5	5.9	Italy
	MLT 627	101	Perkins	2.7	5.5	Italy
	MLT634-120/PS	121	Perkins	3.4	6.1	Italy
	MLT735-120/PS	121	Perkins	3.5	6.9	Italy
	MLT840-115/PS	115	Deere	4.0	7.6	Italy

Source: Company Information (continued)

Table 86. South Korea: Rough Terrain Lift Trucks Available, 2017 (Continued)

Type/ Manufacturer	Model	Engine HP	Engine Manufacturer	Operating Capacity (Tonnes)	Maximum Lift (Metres)	Product Source
Manitou (Continued)	MLT84—137/PS	137	Deere	4.0	7.6	Italy
	MLT845-120/H	121	Perkins	4.5	7.6	Italy
	MLT1035	101	Perkins	3.5	9.6	Italy
	MT625	75	Kubota	2.5	5.9	France
	MT732	95	Perkins	3.2	6.9	France
	MT932	95	Perkins	3.2	9.0	France
	MT1030 ST	100	Perkins	3.0	10.0	France
	MT1235 ST	100	Perkins	3.5	12.0	France
	MT1435 HSL	100	Perkins	3.5	13.	France
	MT1435 SLT	100	Perkins	3.5	13.6	France
	MT1440/H/A/HA	100	Perkins	4.0	13.5	France
	MT1840/H/A/HA	100	Perkins	4.0	17.5	France
	MHT780	144	Perkins	8.0	6.8	Italy
	MHT860	144	Perkins	6.0	8.1	Italy
	MHT10120	175	Mercedes-Benz	12.0	9.6	Italy
	MHT7140	175	Mercedes-Benz	14.0	7.0	Italy
	MHT10180	175	Mercedes-Benz	18.0	9.7	Italy
	MHT10225	175	Mercedes-Benz	22.5	9.7	Italy
	MRT-X1440	101	Perkins	4.0	13.8	Italy
	MRT-X1640	101	Perkins	4.0	15.8	Italy
	MRT-X1840	101	Perkins	4.0	17.9	Italy
	MRT-X2150	150	Mercedes-Benz	5.0	20.6	Italy
	MRT-X2540	150	Mercedes-Benz	4.0	24.6	Italy
	MRT-X3050	216	Mercedes-Benz	5.0	29.6	Italy
Merlo	P25.6	75	Kubota	2.5	5.9	Italy
	P28.8L/Plus/Top	101	Perkins	2.8	8.2	Italy
	P32.6L/Plus/Top	101	Perkins	3.2	6.4	Italy
	P34.7/Plus/Top	102	Deutz	3.4	7.0	Italy
	P34.10/Plus/Top	102	Deutz	3.4	9.7	Italy
	P36.7/Plus/Top	102	Deutz	3.6	7.0	Italy
	P36.10/Plus/Top	102	Deutz	3.6	9.7	Italy
	P37.12/Plus	101	Perkins	3.7	11.5	Italy
	P38.12/Plus	101	Perkins	3.8	11.6	Italy
	P38.13/Plus	101	Perkins	3.8	12.6	Italy
	P38.14/Plus	101	Perkins	3.8	13.6	Italy
	P39.10/Plus	102	Deutz	3.9	10.3	Italy
	P40.9/Plus	101	Perkins	4.0	9.1	Italy
	P40.16	102	Perkins	4.0	15.6	Italy
	P40.17	102	Perkins	4.0	16.7	Italy
	P45.18HM	145	Iveco	4.5	17.8	Italy
	P55.9CS	140	Deutz	5.5	8.6	Italy
	P60.9CS	140	Deutz	6.0	8.6	Italy
	P60.10	101	Perkins	6.0	9.6	Italy
	P65.14HM	145	FPT	6.5	13.9	Italy
	P72.10	101	Perkins	7.2	9.6	Italy
	P75.9CS	140	Iveco	7.5	8.6	Italy
	P80.9HM	145	Iveco	8.0	9.1	Italy
	P101.10HM	145	Iveco	10.0	9.8	Italy
	P120.10	145	Iveco	12.0	9.8	Italy
	27.8	102	Deutz	2.7	8.2	Italy
	29.6	102	Deutz	2.9	6.4	Italy

Source: Company Information

(continued)

Table 86. South Korea: Rough Terrain Lift Trucks Available, 2017 (Continued)

Type/ Manufacturer	Model	Engine HP	Engine Manufacturer	Operating Capacity (Tonnes)	Maximum Lift (Metres)	Product Source
Merlo (Continued)	30.6Classic/Top	115	Deutz	3.0	6.0	Italy
	30.9Classic/Top	115	Deutz	3.0	8.6	Italy
	38.14	102	Perkins	3.8	13.8	Italy
	38.16	102	Perkins	3.8	15.7	Italy
	R40.26 MCSS	145	Iveco	4.0	26.0	Italy
	R40.30 MCSS	176	Iveco	4.0	29.2	Italy
Masted JCB	926	84	JCB	2.6	6.5	UK
	930	84	JCB	3.0	6.5	UK
	940	84	JCB	4.0	6.5	UK
Manitou	MC30	84	Perkins	3.0	3.7	France
	MC40	95	Perkins	4.0	3.7	France
	MC50	95	Perkins	5.0	3.7	France
	MC60	95	Perkins	6.0	4.0	France
	MC70	95	Perkins	7.0	4.0	France
	M26.2/4	95	Perkins	2.6	3.7	France
	M30.2/4	95	Perkins	3.0	3.7	France
	M40.4	95	Perkins	4.0	3.7	France
	M50.4	95	Perkins	5.0	3.7	France
	MA460	101	Perkins	6.0	4.0	France
	MA470	101	Perkins	7.0	4.0	France

Source: Company Information

SKID-STEER LOADERS

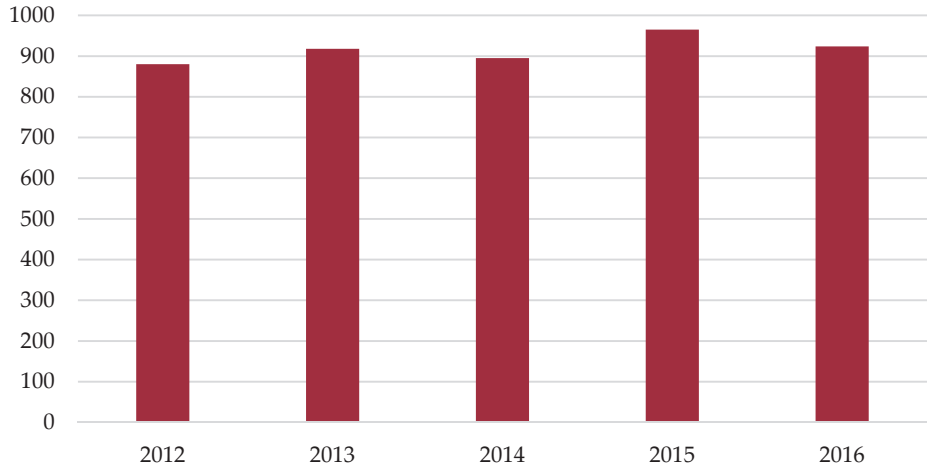
MARKET SIZE AND TRENDS

Table 87. South Korea: Sales of Skid-Steer Loaders, 2012-2016
(Units)

2012	2013	2014	2015	2016
880	918	895	965	924

Source: Off-Highway Research

Chart 41. South Korea: Sales of Skid-Steer Loaders, 2012-2016
(Units)



Source: Off-Highway Research

During the 1980s, the skid-steer loader was entirely an imported special machine, with all the connotations of higher price and difficult supply that that status traditionally brings in Korea. For industry the alternative was a locally made fork lift truck with a bucket attached and for agriculture it was either manual labour or a small tractor with a loader. Sales stayed at a level of 200 units per year, all of them machines shipped from the USA at considerable cost and suffering a high tariff.

In 1990, **Hyundai** began to sell in Korea a 600 kilogramme model that had been developed separately from the range made in the Ulsan plant since 1986 for Trak International. This constituted the first Korean-designed product and was thus a milestone in the development of the product's role. As a result, the skid-steer loader began a period of growth that lasted for seven years.

It was taken up by the rental companies possessing fork lift truck fleets, often being routed through the fork lift marketing organisations, so it was inevitable that it should end up primarily as an industrial loader. It was also adopted by stevedoring companies in the ports and by the distribution and transport industries, all of them major users of fork lift trucks. At first sales were concentrated on the 600 to 800 kilogramme capacity area, with the result that the actual sales performance was

below what it could be. When Daewoo made smaller machines after 1993 the range of prices became wider and more customers were tempted to try the machine.

The strength of the construction boom also helped to build up interest in the product, because its usefulness as a job-site tidier was undeniable. Demand during those times was often over 750 units per year and the population was increasing at a rapid rate. It was enough to guarantee that it would be considered for more of those applications for which it was rejected 10 years earlier. The skid-steer loader survived the 1997 catastrophe quite well. By 2007 sales had passed 800 units and in recent years have stabilised at a level of 900-1,000 units per year.

In the last few years the preference in sizes has altered considerably. Previously, 40 per cent of sales went to machines of 600 to 700 kilogramme operating capacity, whereas now, with increased usage in construction, the heavier 800 to 1,000 kilogramme category has come to the fore. This is much to the advantage of the big American manufacturers as they have wide ranges of sizes in their catalogues. On the other hand, it is realistic to point out that in spite of a theoretically large number of machines of over 1,000 kilogramme lift capacity being available, few machines over 900 kilogrammes are bought each year. Better by far are the sales of the established small machines just under or just over 600 kilogrammes. They are now the second biggest category of all.

All the above relates to machines for use in construction. The government insists on a minimum weight for such machines of two tonnes and licences them accordingly. There is, however, also a market in farming, specifically in handling manure in animal sheds. Compact track loaders have not proved popular in Korea due to their high retail prices compared to conventional wheeled machines, and fewer than 20 units are sold annually.

PRODUCTION

Manufacturing of skid-steer loaders began in 1986 when **Hyundai** started to build units in its Ulsan plant for the North American company Trak International for sale worldwide by that company. These were part of a larger range created by Trak, and Hyundai was able to sell them in Korea in small quantities. It also had sales territories in Taiwan and Scandinavia under the agreement but in general, the 10 year agreement was mainly a manufacturing contract. More recently, Hyundai has stopped production of skid-steer loaders at the Ulsan plant and has entered an agreement with a local OEM production company which manufactures Hyundai branded machines under licence.

In 1992 **Daewoo**, which had imported **Ford** skid-steer loaders until 1990, began production of skid-steer loaders at its fork lift truck plant in Incheon. The range was

designed to be a full assault on the skid-steer loader market and from 1996 to 1998 it even had a manufacturing plant in New Brunswick, Georgia USA.

In 2007 Doosan acquired the Bobcat business, the world's largest manufacturers of skid-steer loaders. The new owners understandably examined the viability of two separate product lines and multiple centres of production, and the decision was subsequently taken to end production in Incheon.

Bawoo Company, based in Jeonbuk, is a small specialist manufacturer of agricultural machinery. It was founded in 1990 and in 1993 introduced its first mechanical skid-steer loader onto the domestic market. Today, it produces a limited range of small capacity loaders aimed specifically at the domestic agricultural market, and achieves a market share of around five per cent.

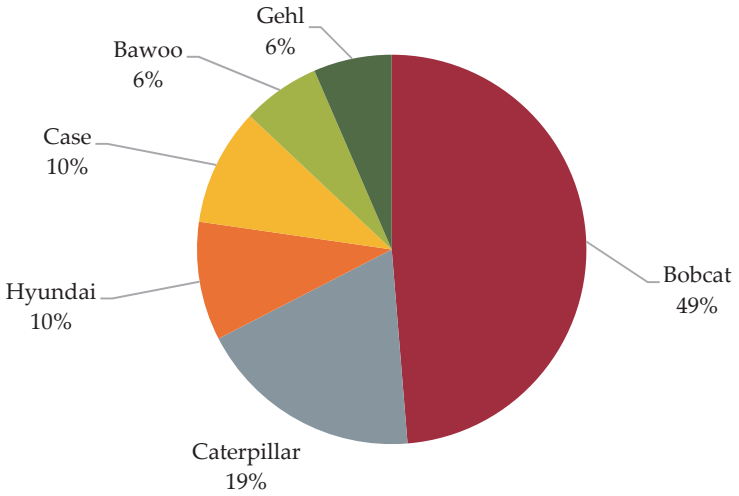
MARKET SHARES

Table 88. South Korea: Suppliers of Skid-Steer Loaders and Their Market Shares, 2016

	2016	
	Units	%
Bobcat	450	49
Caterpillar	173	19
Hyundai	91	10
Case	90	10
Bawoo	60	6
Gehl	60	6
Total	**924**	**100**

Source: Off-Highway Research

Chart 42. South Korea: Suppliers of Skid-Steer Loaders and Their Market Shares, 2016



Source: Off-Highway Research

BOBCAT

The leader of today is **Bobcat**. In 2000, Hae In changed to selling the new Caterpillar line, and in 2001 Ingersoll-Rand Korea took over from a short-lived Bobcat company. It sold direct in Seoul and Gyeonggi province, with dealers recruited for the rest of the country and by 2003 it was the market leader.

HYUNDAI

For the whole of the 1990s the market leader in most years was **Hyundai**. Although Hyundai had only a very small range it had a large and aggressive sales network, seeing the skid-steer loader as a mainstream product. Hyundai then entered a period of doubt characterised by the negotiations with Canadian skid-steer loader manufacturer Thomas that came to nothing. Domestic sales stagnated for three years while the market grew by 60 per cent; others were making the running.

CATERPILLAR

Caterpillar has established itself as the leading challenger to Bobcat and the dealer Haein has marketed the product with great success. Its most important market areas have been road maintenance, demolition, waste handling and agriculture. It has sold 150 machines in the last two years.

Hyundai and **Case** vie for third place, with local manufacturer **Bawoo** and **Gehl** accounting for the remainder of sales, primarily to the agricultural sector.

Table 89. South Korea: Distribution Networks of Suppliers of Skid-Steer Loaders, 2017

Manufacturer	Distributor
Bawoo	Direct sales
Bobcat	Doosan International Korea
Case	Samjung Construction Machinery
Caterpillar	Haein
Gehl	YK Construction Equipment
Hyundai	Hyundai Construction Equipment
JCB	Jaein International

Source: Off-Highway Research

POPULATION AND END-USERS

Skid-steer loaders have increased in popularity significantly during the last ten years, with the population growing by more than 50 per cent. The leading customer group quoted by all suppliers is rental. These companies offer the product to construction and to industry and it can be taken that at present the largest application by far is in industry. The skid-steer loader is also popular with small contractors working in the road maintenance sector, around 80 per cent of whom

specify the machine with cold planer and sweeper attachments, and in many cases snow blowers.

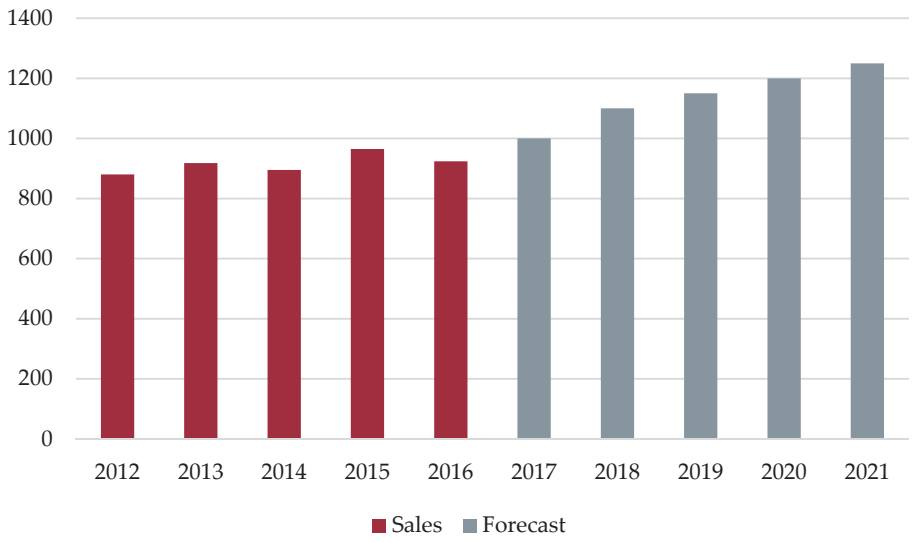
FORECAST

Table 90. South Korea: Forecast Sales of Skid-Steer Loaders, 2017-2021 (Units)

2017	2018	2019	2020	2021
1,000	1,100	1,150	1,200	1,250

Source: Off-Highway Research

Chart 43. South Korea: Sales and Forecast Sales of Skid-Steer Loaders, 2012-2021 (Units)



Source: Off-Highway Research

The outlook for skid-steer loaders appears positive according to suppliers interviewed for the purposes of this report. The product is ideally suited to the plethora of renovation projects in inner city areas and is likely to benefit from the rising trend towards the use of compact equipment generally.

MACHINES AVAILABLE

Table 91. South Korea: Skid-Steer Loaders Available, 2017

Manufacturer	Model	HP	Engine Manufacturer	Operating Capacity (Kg)	Product Source
Bobcat	S130	46	Kubota	590	USA
	S185	56	Kubota	839	USA
	S220	75	Kubota	998	USA
	S250	75	Kubota	1,134	USA
	S300	81	Kubota	1,361	USA
	S330	85	Kubota	1,524	USA
Case	410	51	Case	680	USA
	420	59	Case	794	USA
	430	80	Case	910	USA
	435	78	Case	1,090	USA
	440	89	Case	998	USA
	445	80	Case	1,134	USA
	465	90	Case	1,361	USA
Caterpillar	216B	50	Caterpillar	635	USA
	226B	57	Caterpillar	680	USA
	236B	71	Caterpillar	793	USA
	242B	57	Caterpillar	952	USA
	246C	73	Caterpillar	975	USA
	252B	70	Caterpillar	1,134	USA
	256C	82	Caterpillar	1,066	USA
	262C	82	Caterpillar	1,225	USA
	272C	90	Caterpillar	1,474	USA
Gehl	SL3840	35	Yanmar	476	USA
	SL4240	46	Yanmar	670	USA
	SL4640	62	Deutz	748	USA
	SL5240	62	Deutz	862	USA
	SL5640	82	Yanmar	998	USA
	SL6640	82	Yanmar	1,179	USA
	V270	84	Yanmar	1,225	USA
	SL7810	99	Cummins	1,805	USA
JCB	135	48	Kohler	612	USA
	155	56	Kohler	703	USA
	175	56	Kohler	794	USA
	190	62	Kohler	862	USA
	205	60	Perkins	930	USA
	225	74	JCB	1,021	USA
	260	74	JCB	1,179	USA
	280	74	JCB	1,270	USA

Source: Company Information

WHEELED LOADERS

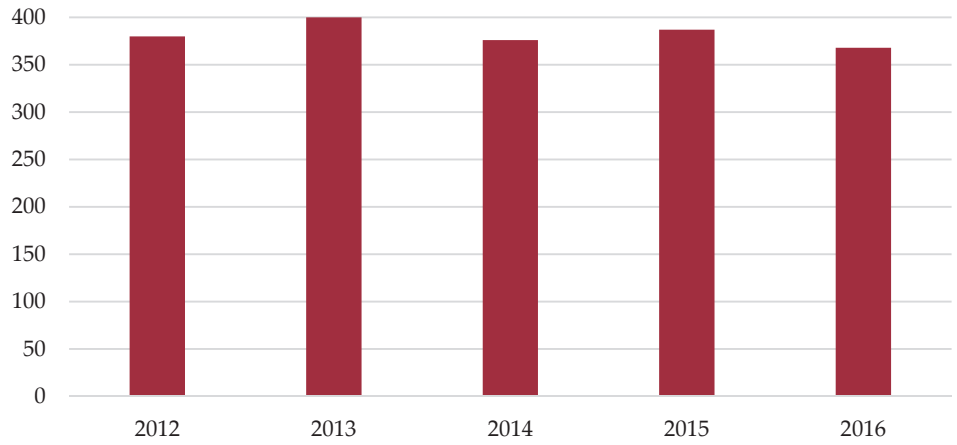
MARKET SIZE AND TRENDS

Table 92. South Korea: Sales of Wheeled Loaders, 2012-2016 (Units)

2012	2013	2014	2015	2016
380	400	376	387	368

Source: Off-Highway Research

Chart 44. South Korea: Sales of Wheeled Loaders, 2012-2016 (Units)



Source: Off-Highway Research

The wheeled loader is an important tool of the construction industry and the level of sales reflects the prosperity of the country. The market is essentially a mature one and demand has stabilised at an annual level of 350-400 units.

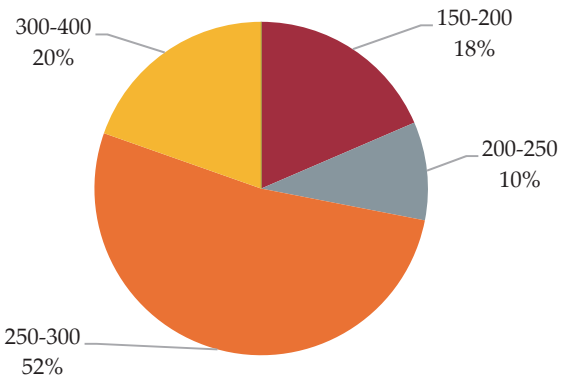
Tighter emissions legislation has effectively ended the importing of used wheeled loaders, which in past years amounted to some 150 units annually. As a result, the market for new machines has become firmer and is sustained by the regular fleet replacement programmes of the material production industries.

Table 93. South Korea: Sales of Wheeled Loaders by Horsepower Category, 2015-2016

	2015		2016	
Horsepower	Units	%	Units	%
150-200	51	13	68	18
200-250	64	16	35	9
250-300	205	53	192	52
300-400	66	17	72	20
Over 400	1	-	-	-
Total	**387**	**100**	**368**	**100**

Source: Off-Highway Research

Chart 45. South Korea: Sales of Wheeled Loaders by Horsepower Category, 2016



Source: Off-Highway Research

The structure of the market is somewhat unusual, in that there is no sales of small machines to work on utility maintenance, as they do in Europe and Japan. Wheeled loader demand is reflecting new construction and land development, with the cement industry as a significant factor. There is no market for wheeled loaders below 100 horsepower. The heart of the market has moved in the last ten years from 150-200 horsepower up to 275-300 horsepower. The latter category accounts for 50-55 per cent of unit sales.

As in other products, it is the local machines that have historically dominated the market and the chosen sizes are still illustrated in the distribution of sales. Up to 2002 four out of every five machines sold were local products. The Korean manufacturers had chosen to make loaders in the 2.2 to 4.5 m^3 bucket size categories, with engines of 125 to 280 horsepower. Obliged by high tariffs on imports to choose those machines, the buyers went for 160 horsepower in the 1990s and opt for 275 horsepower today. In earlier years the largest machines over 250 horsepower constituted a minority of the market but the Korean producers have followed their rivals upwards in size. Sales of loaders over 300 horsepower have gone from only 20 machines in 2001 to 72 in 2016.

PRODUCTION

Although for a long time Korean wheeled loaders have been relatively unknown on the world market, in comparison to the crawler excavators, production of them has a fairly long history. Halla made thousands of Fiatallis licensed wheeled loaders from 1977 to 1997, nearly all for the domestic market. Another defunct maker was Gold Star, assembling small numbers of Kawasaki kits from 1991 to 1994.

Table 94. South Korea: Production of Wheeled Loaders by Manufacturer, 2015-2016 (Units)

	2015	2016
Hyundai	1,690	1,180
Doosan	1,435	1,050
Total	**3,125**	**2,230**

Source: Off-Highway Research

In buying Samsung Volvo purchased a business with a solid involvement with wheeled loaders and a domestic market share approaching 50 per cent, employing its own designs in five models from 117 to 295 horsepower. Most production went to the domestic market. Volvo retained two of the Samsung models, sold under the Samsung name until the end of 2002.

HYUNDAI

Hyundai did not involve itself with loaders until 1990, when two Cummins-powered models, at 185 and 270 horsepower, were launched. The designs were entirely original to Hyundai, although well-known international components were employed. Export sales date back only to 1993 and the company has had a full range on offer effectively since 1999.

Production takes place at the same Ulsan plant as the hydraulic excavators. After 1997 the output fell severely because of failing export demand and steep increases in the cost of imported components. Growing export volumes in recent years have seen production output recover to healthier levels once more.

DOOSAN

Doosan inherited a product line from Daewoo that was less than 15 years old. After flirting unsuccessfully with Hanomag of Germany, it put into production a range of original Daewoo designs in 1993. Today the range comprises seven model types from 142 to 380 horsepower. The plant in Incheon manufactures the DL200, DL220 and DL250 models, while production of the DL350 and above takes place at its plant in Gunsan.

COMPONENT SOURCING

Hyundai employs imported Cummins engines while Doosan uses both its own and imported Scania units. It is in the matter of transmissions, however, that the dependence on imported products is most clear. ZF and Dana have major links with the Korean manufacturers. All Doosan loaders have Graziano axles, while Hyundai uses axles from all three.

Table 95. South Korea: Component Sourcing for Wheeled Loaders, 2017

Component	Doosan	Hyundai
Engines	Doosan, Scania	Cummins
Torque Converters	ZF/Dana	ZF
Hydraulic Pumps	Doosan Motrol	Kawasaki (Tong Myung for domestic market)
Hydraulic Valves	In-house	Toshiba, Parker, Kawasaki, Tong Myung
Hydraulic Cylinders	Korean sub-contractors	In-house
Chassis	In-house	In-house
Axles	Graziano	Graziano, Dana, ZF
Arms	In-house	In-house
Cabins	Dabo	Myung Sung & in-house
Buckets	Korean sub-contractors	Korean sub-contractors
Tyres	Various	Hankook, Kumho, Michelin

Source: Off-Highway Research

Both companies manufacture the structural pieces in-house. Chassis, cabins, arms and loading towers are all fabricated in the supplier's facility. The hydraulics employed originate mostly from Korea.

FOREIGN TRADE

Korea came to exporting wheeled loaders late and its products have no significant advantages over the competition. Major markets in the world have turned over to buying locally produced machines. Most wheeled loaders sold in Europe are made there; the same applies to North America. With good support systems for the users, the local manufacturers could keep their customers from looking elsewhere. In 2016 the two Korean companies combined sold around 470 wheeled loaders in Western Europe and in North America fewer than 800 units.

The secret of the export effort has been to aim at Asia or try to find customers in the mining markets of the rest of the world – South Africa, Peru, Chile or Australia. It is not easy, for in many markets buyers look for a package, with lavish support on the site, making it all the more difficult for any new entrant to make an impression.

As regards imported products, the major change has been the introduction after 2002 of **Volvo** loaders from Sweden. **Caterpillar** brings in from the Japan and the USA all its models but the dealer admits that a 50 per cent price premium will always make imports a minority taste. They now gain about 20 per cent of the market.

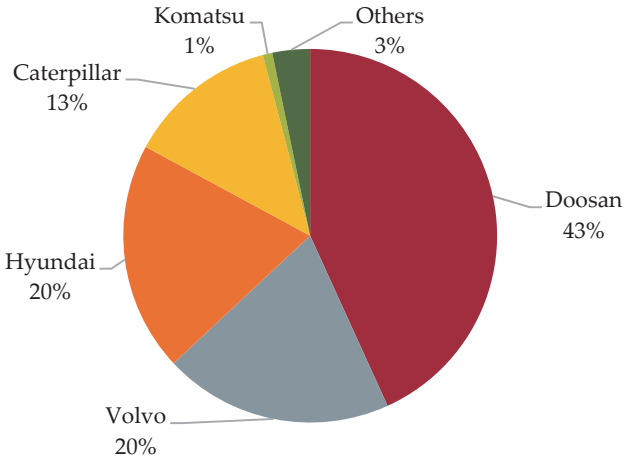
MARKET SHARES

Table 96. South Korea: Suppliers of Wheeled Loaders and Their Market Shares, 2016

	2016 Units	%
Doosan	159	43
Volvo	73	20
Hyundai	73	20
Caterpillar	48	13
Komatsu	3	1
Others	12	3
Total	**368**	**100**

Source: Off-Highway Research

Chart 46. South Korea: Suppliers of Wheeled Loaders and Their Market Shares, 2016



Source: Off-Highway Research

DOOSAN

Doosan has maintained its market leadership throughout the period under review and currently sells more than double the volume of wheeled loaders achieved by its two domestic rivals.

VOLVO

Volvo would clearly not have expected to sustain the size of the Samsung market share when introducing loaders made in Sweden. In the event it managed a very strong performance in the early years, in 2003-2004 winning nearly 30 per cent but then fell back to between 20 and 25 per cent.

HYUNDAI

Hyundai currently secures a similar market share to Volvo.

CATERPILLAR

The other successful importer is Haein, marketing **Caterpillar** products from Japan. The products have been present for a long time on the market, selling more easily in the days when they were, in effect offering a high quality alternative to the Halla products. During the best years for selling plant to the quarries and cement producers many large Caterpillar units were sold but the strength of the three local producers marginalised them after 1997. By 2001 the market share was back at 20 per cent but the volume was heavily reduced. Caterpillar remains as the market leader in the sizes of 300 horsepower and above.

Table 97. South Korea: Distribution Networks of Suppliers of Wheeled Loaders, 2017

Manufacturer	Distributor
Caterpillar	Haein
Doosan	Doosan Infracore
Hyundai	Hyundai Heavy Industries
Komatsu	Junjin CSM
Volvo	Volvo Construction Equipment Korea
Wacker Neuson	Everdigm

Source: Off-Highway Research

POPULATION AND END-USERS

The collapse in demand for the services of wheeled loaders after the 1997 financial crisis caused utilisation to fall to ruinously low levels. They are still far below the levels in hydraulic excavators and show clearly why demand for new wheeled loaders has not recovered, as it has in other machines.

In the case of loaders below 250 horsepower the main form of ownership is the small sub-contractor, sometimes known as renters but always with a driver, as with the mini excavator. Larger machines are bought by the aggregates sector and cement production industry, both of which operate regular fleet replacement programmes, a significant contributory factor to the stability of the wheeled loader market.

FORECAST

Table 98. South Korea: Forecast Sales of Wheeled Loaders, 2017-2021 (Units)

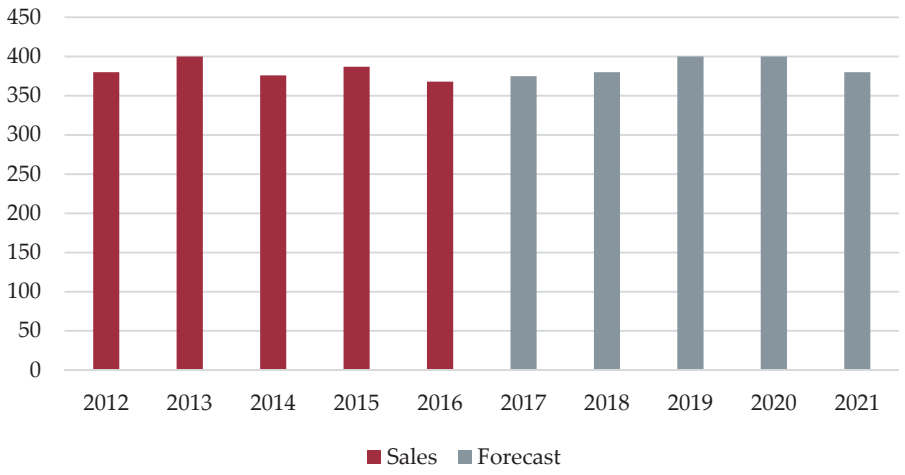
2017	2018	2019	2020	2021
375	380	400	400	380

Source: Off-Highway Research

The wheeled loader market is a traditionally very stable sector and little change can be expected to demand in the short to medium term. The product is not used in the civil engineering sector and so any future growth here will not directly impact on demand. It will, however, contribute to the willingness of the aggregates and

materials production sectors to implement regular replacement programmes, and thereby sustain buoyant demand for medium to large wheeled loaders during the forecast period.

Chart 47. South Korea: Sales and Forecast Sales of Wheeled Loaders, 2012-2021 (Units)



Source: Off-Highway Research

MACHINES AVAILABLE

Table 99. South Korea: Wheeled Loaders Available, 2017

		Engine		
Manufacturer	Model	HP	Manufacturer	Product Source
Case	821F	230	FPT	Italy
Caterpillar	904B	52	Caterpillar	UK
	906	61	Caterpillar	UK
	908	84	Caterpillar	UK
	914G	95	Caterpillar	UK
	924G	114	Caterpillar	UK
	928G	125	Caterpillar	UK
	930G	150	Caterpillar	UK
	938K	168	Caterpillar	USA
	950K	200	Caterpillar	China
	962K	215	Caterpillar	China
	966K	265	Caterpillar	China
	972H	291	Caterpillar	China
	980H	322	Caterpillar	China
	988H	481	Caterpillar	USA
	990H	636	Caterpillar	USA
	992G	880	Caterpillar	USA
	994F	1,600	Caterpillar	USA

Source: Company Information

Table 99. South Korea: Wheeled Loaders Available, 2017 (Continued)

		Engine		
Manufacturer	Model	HP	Manufacturer	Product Source
Doosan	DL 200	139	Weichai	China
	DL 220	143	Weichai	China
	DL 250	155	Weichai	China
	DL 300	230	Weichai	China
	DL 350	221	Weichai	China
	DL 400	284	Weichai	China
	DL 450	305	Weichai	China
	DL 500	340	Weichai	China
Hitachi	ZW80	61	Kubota	Japan
	ZW90	71	Kubota	Japan
	ZW100-G	83	Kubota	Japan
	ZW120-G	91	Kubota	Japan
	ZW140	130	Cummins	Japan
	ZW150	144	Cummins	Japan
	ZW180	172	Cummins	Japan
	ZW220	220	Isuzu	Japan
	ZW250	240	Isuzu	Japan
	ZW310	295	Mercedes-Benz	Japan
Hyundai	HL730-9	125	Cummins	Korea
	HL740-9	147	Cummins	Korea
	HL757-9	197	Cummins	Korea
	HL760-9	219	Cummins	Korea
	HL770-9	284	Cummins	Korea
	HL780-9	353	Cummins	Korea
Komatsu	WA120-3	85	Komatsu	Japan
	WA200-3	110	Komatsu	Thailand
	WA320-3	163	Komatsu	Thailand
	WA380-3	187	Komatsu	Thailand
	WA470-5	261	Komatsu	Japan
	WA500-3	320	Komatsu	Japan
Volvo	L60E	140	Volvo	Sweden
	L60F	156	Volvo	Sweden
	L70F	170	Volvo	Sweden
	L90F	174	Volvo	Sweden
	L110E	210	Volvo	Sweden
	L120E	224	Volvo	Sweden
	L150E	272	Volvo	Sweden
	L180E	303	Volvo	Sweden
	L220E	352	Volvo	Sweden
	L350F	535	Volvo	Canada

Source: Company Information

MANUFACTURER PROFILES

DAEDONG

Address	Daedong Industrial Co. Ltd 2493, Nambusunhwan-ro Seocho-gu Seoul 137-864
Tel	+82 (0) 2 3470 7470
Website	www.daedong.co.kr
Key Personnel	Kim Joon-sik, Joint Chairman Ha Chang-wook, Joint Chairman
Employees	Approximately 800.

HISTORY

Established in 1947, Daedong made its first agricultural tractors in 1968, with a licensed design from Kubota of Japan. It is also a major producer of power tillers, a line that it began in 1962. In the 1970s, it founded subsidiaries producing gears and chains. In 1993, it began a joint venture in China, which it converted to a full subsidiary in 2007. It took a licence from Ford New Holland to produce certain of its tractor models but the licence has now expired. It continued importing built-up tractors from the UK until 2005 but now imports John Deere tractors. In Europe and North America its products sell under the Kioti brand name, while in 2008 it began shipping compact tractors to Bobcat for sale initially in North America

The joint venture to manufacture farm machinery in China has ended. A 100 per cent subsidiary was founded in 2007 to sell imported products

MANUFACTURING FACILITIES

Daedong operates a foundry in Dalsung-gun. Daedong Gear Co. Ltd makes a wide range of gears in Sacheon City, while Han Kuk Chain Ind. Co. makes conveyors and forklifts in Ansung-gun. The Research and Development centre is located in Changyoung, south Gyeongsang province.

The single plant in Daegu covers 82,267 m2, on a total site area of 23.1 hectares. It comprises a machining shop and assembly plant for engines, a sheet metal plant and two final assembly shops, one for agricultural tractors, combine harvesters and rice transplanters, the other for power tillers.

PRODUCT RANGE

Daedong produces six series of compact tractors comprising 20 models ranging from 24 to 110 horsepower. In international markets, Daedong is best known for being the manufacturer of Kioti brand tractors, as sold in North America and Europe. A major feature of the range up to 50 horsepower is the availability of a hydrostatic

transmission, marked HST in the table below, which shows the products homologated for sale in the EU. Models may differ in other markets.

Table 100. Daedong Industrial Co. Ltd: Summary of Agricultural Tractor Range Offered in Korea, 2017

Horsepower	No of Models	Engines
Agricultural Tractors		
CS Series (24hp)	2	Daedong
CK Series (24-40hp)	4	Daedong
DK Series (45-55hp)	4	Daedong up to 45 horsepower; Perkins from 60 upwards
NX Series (45-58hp)	4	Perkins
RX Series (57-72hp)	3	Perkins
PX Series (80-110hp)	3	John Deere

Source: Company Information

PRODUCTION

Daedong has a diversified production programme. Tractor production declined in line with the reduction in the domestic market in the 1990s and the effort to compensate with new export volume only really began in 2001-2002. It has been very successful, raising output from 8,000 units to 20,000 units in 2016. The production centres on the 30 to 55 horsepower sizes. The larger tractors with Perkins engines have a production volume around 500 units annually.

In addition to its agricultural tractor range, Daedong produces a range of power tillers, combine harvesters and rice transplanters. The company also builds its own engines, in single, three and four cylinder forms.

COMPONENT SOURCING

Table 101. Daedong Industrial Co. Ltd: Component Sourcing for Agricultural Tractors, 2017

Component	Supplier
Engines	Daedong, Perkins, Doosan
Transmissions	In-house
4WD Axles	In-house
Pumps	Jeil
Hydraulic Systems	In-house
Cabs	Samwoo
Tyres	Various

Source: Company Information

Daedong makes engines for tractors up to 55 horsepower; it uses Perkins and Doosan engines for products above 70 horsepower. Hydraulic components come from a variety of Korean suppliers.

EXPORTS

For many years Daedong had 70 per cent of the domestic tractor market and dominated the massive volume sector of power tillers. Export was not a priority. That changed in the 1990s and the company built up its Kioti brand in North America well. It founded a sales company there in 1993 and now exports 10,000 tractors per year, 90 per cent of them under 60 horsepower.

DOMESTIC SALES

Daedong has been in the market since 1968 and is well ahead of all rivals. In tractors it has a market share of around 30 per cent in its domestic market. It has an 80 per cent share of the power tiller market and over 30 per cent of the rice transplanters.

DOOSAN INFRACORE

Address	Doosan Infracore Co., Ltd. 27F Doosan Tower 275, Jangchungdan-ro Jung-gu Seoul 04563
Tel	+82 (0)2 3398 2556
Website	www.doosaninfracore.com
Key Personnel	Sohn Dong-youn, President and CEO
Employees	3,919 (excludes employees of Doosan Bobcat).

History

Doosan Infracore is the inheritor of one of the oldest companies in Korea, Daewoo Heavy Industries. It was founded in 1937 as the Chosun Machine Works and was renamed Korean Machinery Industries in 1963. It became part of the Daewoo Group in 1976 and was known as Daewoo Heavy Industries (DHI) until the fall of the Daewoo Group after 1997.

The Asian Financial Crisis brought the end of the old Daewoo Heavy Industries. Eventually the company Daewoo Heavy Industries became a shell, with two main successor companies, DHI & M or Daewoo Heavy Industries & Machinery (making construction equipment, fork lift trucks, engines, machine tools and defence products) and Daewoo Shipbuilding and Marine Engineering Co. Ltd.

DHI & M was formed in 2000 and became majority owned by two state institutions, Korea Asset Management Co. (35 per cent) and the Korea Development Bank (22 per cent). It spun off various former activities, sold off financial and idle fixed assets and achieved the full working out of its debt programme by 2002. After pressure in parliament about the funds employed in Korea Asset Management Co., it decided to raise money by starting with DHI & M and sold it in 2005 to Doosan Group. Doosan formed the company Doosan Infracore to succeed DHI & M. From the first day of 2007 it employed the Doosan name alone.

Doosan Infracore is a mixture of mechanical engineering activities. Doosan Group has vowed to keep all of them and the simplest method of defining Doosan Infracore is to look back at the history of its products.

Chosun Machine Works, founded in 1937, went into diesel engine production in 1958. Korean Heavy Industries, the successor, added agreements with Kubota and Isuzu in the 1960s, followed by a major licensing of MAN technology in 1970. Fork lift truck assembly began in 1967 with a licence from Komatsu, which in effect gave it about two-thirds of the local market and an annual production volume of around 3,000 units. From 1983 to 1993, DHI supplied around 10,000 lift trucks per year to

Caterpillar, mainly to North America. In 1994, a Daewoo range of lift trucks to succeed the American designs began to appear.

Construction equipment began in 1977 with agreements to manufacture two Hitachi hydraulic excavators and some models of the P&H mobile crane range. It rapidly gained a very high market share in excavators but was persuaded by the government to give up its crane range in the interest of having only one crane producer in the country. Soon afterwards, it took up a licence to make Kubota mini excavators. The company signed a deal with Hanomag to make wheeled loaders in 1989 but few were ever made and production lapsed in 1991. The company then created its own range of standard wheeled loaders. 1989 also marked the launch of a crawler dozer licensed from Furukawa for the local market, which was replaced in 1993 with a Daewoo design.

In 1991 DHI adopted 100 per cent home-grown technology for its hydraulic excavators, opened a small plant in Belgium and launched a range of skid-steer loaders. In 1992 Daewoo signed an agreement with Grove Crane of the USA to manufacture mobile cranes (but that foundered in the Asian Financial Crisis).

In 1994, the company acquired the technology of the bankrupt Hanix Industry mini excavator company of Japan. Although an effort to establish a sales bridgehead by this route proved to bear little fruit, it did give the Daewoo engineers the basis for a range of mini excavators launched in the same year. It launched crawler dozers and its own brand of fork lift trucks in the same year and, finally, it took the enormously important step of founding a company in China to manufacture hydraulic excavators. The Chinese operation added fork lift trucks in 1998 and machine tools in 2004.

On 31 July 2007 the company acquired the Bobcat, Utility Equipment and Attachment lines of Ingersoll-Rand of the USA, with the benefits for Doosan Infracore being, of course, the addition of compact construction equipment to its portfolio. In 2008 it announced the purchase of its major supplier of hydraulic components, Tong Myung.

OWNERSHIP

Doosan Infracore is a subsidiary of Doosan Group and operates more than 40 financially consolidated or subsidiary companies (based on annual reports) around the world. As of the end of 2016, the number of its shares issued stood at 207,455,314, of which the largest shareholder, Doosan Heavy Industries & Construction, owned a 36.40% stake. Its equity capital stood at KRW 1,037.3 billion.

The shareholding of Doosan Infracore is as follows.

Table 102. Doosan Infracore Ltd: Shareholder Structure, 2017

(%)

Doosan Heavy Industries & Construction	36.4
Individual Investors	39.97
Institutions	9.09
Foreign Investors	14.53
Other Investors	0.01

Source: Company Information

TURNOVER

Table 103. Doosan Infracore: Financial Highlights, 2015-2016

(Won Millions)

	2015	2016
Net Sales	5,964,894	5,729,550
Operating Income (Loss)	95,087	490,818
Net Income (Loss)	859,505	115,985
Total Assets	**11,383,173**	**10,026,809**

Source: Company Information

In 2016, Doosan Infracore posted KRW 5,729.6 billion in sales. Operating income moved into the black, recording KRW 490.8 billion, which amounts to a year-over-year jump of KRW 585.9 billion. It is attributable to improvements made in the cost structure, sales from China, and the profitability of Doosan Bobcat. Net income also moved into the black, recording KRW 116 billion. This year-over-year rise of KRW 975.5 billion is due to the increase in operating income and a reduction in interest costs following to the sale of Machine Tools Business Group (BG).

Doosan Bobcat's sales performance has been stable, backed by its solid leadership in the North American market. 2016 was slightly down, due to conservative inventory practices of dealers in response to growing market uncertainties surrounding the US presidential election.

In 2016, Doosan Bobcat's sales totalled KRW 3,879.1 billion, a year-over- year decline of KRW 112.3 billion, while operating income came to KRW 414 billion, up KRW 25.4 billion from the year before.

MANUFACTURING FACILITIES

The plant in Incheon was the birthplace of the company's construction equipment in 1976. There are now three manufacturing locations in the original construction equipment group, supported by three OEM assembly sites that supply finished product.

Korea: The Incheon plant, on a site of 9.6 hectares, has a covered area of 52,000 m² and fulfils many functions, from machining to final assembly and still provides components for use in other plants. Its main product is hydraulic excavators with service weights below 30 tonnes. The company now employs two sub-contractors in Incheon, Hanyang and Sunjin to assemble certain products as listed above. Doosan Infracore Incheon is situated very near its port, ideal for shipping but it has a road through the middle and its capacity is fully utilised.

Table 104. Doosan Infracore: Construction Equipment Plants, 2017

Business Group/Location	Main Products
Business Group Construction Equipment	
Incheon, Korea	Crawler excavators, wheeled excavators, wheeled loaders, diesel engines
Gunsan, Korea	Crawler excavators, wheeled loaders
Yantai, China	Crawler and wheeled excavators, mini excavators
Sub-Contractors	
Hanyang, Korea	Mini excavators; 7 tonne excavators
Sunjin, Korea	Wheeled excavators; wheeled loaders
Sunjin, China	Mini excavators under 5 tonnes
Business Group Doosan Infracore International	
(Bobcat)	
Gwinner, ND, USA	Skid-steer loaders, compact attachments
Bismarck, ND, USA	Mini excavators
Pontchâteau, France	Telescopic handlers
Dobris, Czech Republic	Skid-steer loaders, mini excavators
Suzhou, China	Mini excavators, skid-steer loaders
Attachments	
Litchfield, MN, USA	Compact attachments
Carrolton, GA, USA	Compact attachments
Petersburg, VA, USA	Heavy attachments
Lyon, France	Hydraulic hammers
(Utility)	
Mocksville, NC, USA	Mobile compressors, gensets, lighting
Unicor, Czech Republic	Gensets
SIRC, China	Large mobile compressors, lighting

Source: Company Information

The solution to achieve greater production in Korea was to add a new plant and in 2008 the company began site preparation for a new facility at Gunsan on the Western Yellow Sea coast. The 61 hectare site is in the Gunsan National Industrial Complex, a new area built around a brand new port. Construction was completed in August 2009, and production started in January 2010. The plant currently manufactures crawler excavators above 30 tonnes and the bulk of the wheeled loader range.

China: In 1994 DHI took the very important step of founding a company in China, in the coastal city of Yantai. This manufactures hydraulic excavators, fork lift trucks (since 1998) and machine tools (since 2004). The Yantai site is now home to several activities. The main excavator plant occupies 74,000 m² of covered area on a site of 21.3 hectares; the Korean company Sunjin occupies part of the site assembling mini excavators and Samwoo Tech does the same in respect of fork lift trucks; and there

is a 16,000 m² assembly building for machine tools occupying 7.7 hectares in one corner. Finally, there is also space for 20 suppliers on site. The whole complex covers 33.5 hectares.

A second facility was built in 2008 in Suzhou, Jiangsu Province, dedicated to forklifts and compact excavators. At a cost of $192 million the 24 hectare complex began production in the first half of 2009.

Bobcat: Bobcat Company Worldwide has five local production plants in four countries in USA, Europe and China.

DII Attachments: This division produces around 80 attachments such as buckets, quick couplers, angle brooms, pallet forks and sweeper for large as well as compact construction equipment. These products are sold under brand names such as TRAMAC, Ingersoll Rand, Montabert, Bobcat and Geith. DII Attachments has three production sites in North America and three in Europe, with more than 1,000 employees.

Portable Power: Doosan Infracore Portable Power (DIPP) builds and sells air compressors, lighting systems and generators used on construction sites. It has production sites in North America, Czech Republic and China with around 700 employees.

PRODUCTION

Table 105. Doosan Infracore Ltd.: Production of Construction Equipment in Korea, 2015-2016
(Units)

	2015	2016
Crawler Excavators	5,750	5,500
Mini Excavators – Wheeled	500	525
Mini Excavators – Crawler	1,400	1,500
Wheeled Excavators	1,600	1,800
Wheeled Loaders	1,435	1,050
Total	**10,685**	**10,375**

Source: Off-Highway Research

COMPONENT SOURCING

Table 106. Doosan Infracore: Component Sourcing for Construction Equipment Made in Korea, 2017

Component	Mini Excavators	Hydraulic Excavators	Wheeled Loaders
Engines	Yanmar	Doosan, Yanmar	Doosan, Cummins
Hydraulic Pumps	Toshiba, Doosan Motrol	Kawasaki, Doosan Motrol	Doosan Motrol
Hydraulic Valves	Kayaba	In-house	In-house
Hydraulic Cylinders	Korean sub-contractors	Korean sub-contractors	Korean sub-contractors
Drive Motors	Kayaba, Doosan Motrol	Doosan Motrol	-
Swing Motors	Kayaba, Doosan Motrol	Kayaba, Doosan Motrol, Jeil	-
Swing Gears	Shinil	Shinil	-
Transmissions	-	-	ZF, Dana
Frames	In-house	In-house	In-house
Booms, Arms	In-house	In-house	In-house
Undercarriage	In-house	In-house	In-house
Cabins	Dabo	Dabo	Dabo
Buckets	Korean sub-contractors	Korean sub-contractors	Korean sub-contractors
Rubber Tracks	Taejin	-	-
Steel Tracks	HSC	HSC	-

Source: Company Information

The Incheon facility builds some of the major structural pieces for the products made there but has to subcontract as well. It also assembles engines for hydraulic excavators and wheeled loaders. The hydraulics come from Doosan Motrol, a local Kawasaki licensee recently acquired by Doosan and from Kawasaki Japan. Doosan Infracore uses a large number of Korean vendors for small items. The Incheon plant also makes control blocks for excavators. The Chinese plant supplies frames, hydraulic and fuel tanks, counterweights and pins to Korea.

DISTRIBUTION

The domestic network is composed of around 20 independent dealers, comprising over 40 outlets. There are 25 designated repair shops and some 60 parts dealers.

In the rest of the world the strategy has been to locate and foster independent dealers, as much as possible on the basis of one dealer per country. There are full sales and product support centres in China (Yantai); Europe (Belgium, France, UK and Germany); North America and South Africa. These are subsidiaries of Doosan Infracore that trade with the Doosan construction equipment dealers in their regions. In all other countries, the dealers do business directly with Korea.

There are parts stocks in Korea, Belgium, UK, China, USA and South Africa.

The largest centre for spare parts stocking and supply is the After Sales Service Centre at Ansan, near Seoul. The first warehouse was completed in 1995 and is the main source for fast-moving spare parts, although domestic customers also benefit from a warehouse in Gwang-ja.

The worldwide network has further warehouses in Yanta and Suzhou, China; Leipzig, Germany; Dubai; Singapore; Americana, Brazil; Chicago, USA; Cardiff. UK.

DOMESTIC SALES

Table 107. Doosan Infracore Ltd: Sales of Construction Equipment in Korea by Type, 2015-2016
(Units)

	2015	2016	% Market Share 2016
Mini Excavators	1,562	1,069	18
Wheeled Excavators	1,067	1,298	49
Crawler Excavators	631	392	33
Wheeled Loaders	164	159	43

Source: Off-Highway Research

Doosan is still the dominant market leader in wheeled excavators and wheeled loaders; it was also leader in mini and crawler excavators in 2015, but lost market share in 2016 to Volvo and was placed second in both product sectors.

HYUNDAI CONSTRUCTION EQUIPMENT

Address	Hyundai Construction Equipment Co. Ltd 1 Cheonha-dong Dong-gu Ulsan
Tel	+82 (0)52 235 1809
Website	www.hyundai-ce.com
Key Personnel	Kong Ki-yound, CEO and President

History

The Hyundai Group is best known for its construction, shipbuilding and automotive interests. Its involvement with construction equipment began in 1986 when it secured 10 year contracts to manufacture crawler dozers and loaders for Dresser and skid-steer loaders for Trak International. The site chosen was the Ulsan shipyard, which had been built in 1972 and had specialised in super tankers up to that point.

HHI signed a contract with Nissan Kizai to build mini excavators for sale in Korea and with Yale for industrial fork lift trucks, on the same basis, in 1987. In 1988 the major step was taken – when its own-designed hydraulic excavators were launched. Hyundai has never been encumbered by licence arrangements in this and developed its own wheeled loaders, launched in 1990, wheeled excavators (1990) and skid-steer loaders (1991). In 1992, the mini excavator was changed to a Komatsu licensed design.

In 1995, the company opened a plant in China. The Series-3 hydraulic excavators commenced introduction in 1996, the Series-3 wheeled loaders in 1999. In the same year, the company introduced a wheeled mini excavator and a crawler dozer, aimed at the North American market.

HHI separated from the Hyundai Group in February, 2002, a move for the Hyundai Heavy Industries Group that included taking over Hyundai Samho Heavy Industries and the Hyundai Mipo Dockyard. HHI, Hyundai Heavy Industries Co. Ltd., operated its construction equipment activities as a division of the company and overseas subsidiaries were affiliated directly to the main group company.

The only major company structure change for construction equipment came in 1995, when HHI founded its joint venture with Changzhou Forestry Machinery in China, aimed at setting up the production of crawler excavators. This partner is better known as Changlin. The two set up a second plant there in 2003, one year after HHI had set up a second joint venture to take over a vacant fork lift truck plant in Beijing, China.

In April 2017 Hyundai Heavy Industries announced the separation of the Construction Equipment division from the mother company Hyundai Heavy

Industries Co., Ltd. The new company was officially established with the name Hyundai Construction Equipment Co., Ltd on April 1, 2017. All activities of HHI's Construction Equipment division moved to the new company beginning of April. The decision to spin off its other business divisions into four separate entities was taken with a view to insulating the group from a financial crisis at any one of its divisions and to increase their independent competitiveness. The breakup splits the operations into businesses focused on shipbuilding and offshore projects, electric machinery, construction equipment, and industrial robots.

According to the company, the spinoff is based on a restructuring plan which was started last year. For the Construction Equipment division, the move is said to offer great possibilities and an improved agility. The newly established mother company will be able to make independent decisions in the interest of the industries and markets worldwide. Despite the fact that the new company is named Hyundai Construction Equipment, the company has emphasised that both Forklift and Construction Equipment are equally managed with the same goal to grow the market share.

For Europe, it was decided that the name of the company would change to Hyundai Construction Equipment Europe and that its European headquarters would move to Tessenderlo, Belgium. This €30 million investment project, completed in 2016, comprises a land area of 81 000 m² and includes a new headquarters, a new warehouse, a training facility, an event hall and a showroom.
The subsidiaries of the company specifically involved in construction equipment are as follows:

Table 108. Hyundai Construction Equipment Co., Ltd.: Construction Equipment Related Subsidiaries, 2017

Company	Function	Location
China		
HHI China Investment Co. Ltd.	Holding company	Beijing, China
Changzhou Construction Machinery Co. Ltd	Manufacture of construction equipment components	Changzhou, China
Beijing Hyundai Jingcheng Construction Machinery	Sale and manufacture of construction equipment and fork lift trucks	Beijing, China
Hyundai Jiangsu Construction Machinery Co. Ltd	Sale and manufacture of construction equipment	Changzhou, China
Europe		
HCE Europe NV (Belgium)	Sale of construction equipment and fork lift trucks	Geel, Belgium
North America		
HCE Americas Inc.	Sale of construction equipment and fork lift trucks	Atlanta, Georgia

Source: Company Information

JOINT VENTURES

Table 109. Hyundai Heavy Industries Co. Ltd: Joint Ventures in Construction Equipment, 2017

Location	% Owned by HHI	Joint Venture Partner and %
Changzhou, China		
Changzhou Hyundai Construction Machinery	**60**	**Changlin (40)**
Hyundai (Jiangsu) Construction Machinery	**60**	**Changlin (40)**
Beijing, China		
Beijing Hyundai Jingcheng Construction Machinery	**60**	**Jingcheng M&E Holding Co Ltd (40)**

Source: Company Information

The plants in Korea are 100 per cent HHI owned, as a division, not in a separate subsidiary. HHI has joint ventures only in China. The partner in Changzhou is the Changlin Group, a publicly quoted company that originates in the manufacture of forestry machinery begun in 1961 in Changzhou. It is presently majority controlled by the China Foma Forestry Machinery Group Corporation. It has been in the past a partner of Komatsu in a castings business. It is a major wheeled loader producer but derives about 10 per cent of its turnover from making parts for the joint ventures.

In Beijing the minority partner is the manager of various industrial assets of the City of Beijing. One of its other possessions is Beijing Jingcheng Heavy Machinery Co. Ltd, which is the owner of three construction equipment plants making mobile cranes, backhoe loaders and rigid dump trucks.

TURNOVER

The construction equipment division of Hyundai Heavy Industries Ltd. recorded revenues of KRW 2,171.3 billion and new orders of US$ 1.62 billion. The figures shown above include fork lift trucks, which are counted as a construction equipment product within HHI.

Employees: Excluding the overseas subsidiaries, Hyundai Construction Equipment employs 1,300 people. Of these around 800 people work at the Ulsan factory.

MANUFACTURING FACILITIES

All manufacturing in **Korea** takes place at the site in a corner of the huge Ulsan shipyard, where the company makes around 30 per cent of the entire world's ships every year. The large fabrication shop makes heavy items such as undercarriages, booms and upper frames. The hydraulics shop, on the other hand, is a small facility with a very high degree of automation, making cylinders of all sizes, for in-house use and sale to others.

The company has three plants in **China**. The oldest is the joint venture plant in Changzhou that dates back to 1995 and is owned 60 per cent by HHI. It grew fast and was the largest producer of crawler excavators in the country in 2002 and 2003. Production there was devoted exclusively to the local market and the phenomenal growth of that demand prompted the setting up of a new assembly plant in the same city. The older plant moved into the production of structural pieces.

The third plant in Beijing began in 2002 and is also a joint venture. It was originally earmarked by HHI to build fork lift trucks and mini excavators, but then expanded to include excavators in the category of less than 18 tonnes. The plant has been recently closed, although it is feasible that production will be resumed in the future dependent on developments in the Chinese market.

Changzhou Hyundai has twin production lines for undercarriages and superstructures and a stationary line for the assembly of 30 tonne crawler excavators. The Hyundai (Jiangsu) site took over the final assembly of excavators in 2004.

In **India**, the plant in Chakan, near Pune, was opened in 2009, with a capacity of 3,500 excavators per year.

In **Brazil** a new construction equipment plant was opened in 2013 in Itatiaia, Rio de Janeiro state. Built with an investment of US$ 175 million, the 562,000 m² factory has an annual production capacity of 4,000 units, including excavators, wheeled loaders, and backhoe loaders.

PRODUCT RANGE

Table 110. Hyundai Construction Equipment Co. Ltd: Summary of Construction Equipment Range Offered in Korea, 2017

Product	No of Models	Sizes	Source
Mini Excavators	7 (1 wheeled)	1.7 to 5.9 tonnes	HHI
Wheeled Excavators	2	14 and 20 tonnes	HHI
Crawler Excavators	11	8.3 to 118 tonnes	HHI
Wheeled Loaders	9	148 to 384 hp	HHI
Skid-steer Loaders	2	650 and 860 kg	OEM partner
Fork Lift Trucks	19 diesel, 5 LPG, 16 electric	1.5 to 16.0 tonnes	HHI

Source: Company Information

Mini excavators from 1.5 to 3.6 tonnes were previously sourced from Nagano of Japan, although the conclusion of this agreement means that the complete range is now built at Hyundai's own plant in Ulsan.

The excavators made in Korea are for the world market; the products made in China are only for that market. In Korea, the hydraulic excavators have Hyundai engines and the designation of the models is different.

The wheeled loader range comprises 16 models, although only nine models are marketed in Korea. Backhoe loaders are also made in Ulsan, although are not marketed in Korea.

PRODUCTION

Table 111. Hyundai Heavy Industries Co. Ltd: Production of Construction Equipment, 2015-2016
(Units)

	2015	2016
Mini Excavators – Wheeled	425	450
Mini Excavators – Crawler	1,200	1,300
Wheeled Excavators	1,100	1,000
Crawler Excavators	6,000	5,800
Wheeled Loaders	1,690	1,180
Total	**10,415**	**9,730**

Source: Off-Highway Research

The mini excavators produced in Korea centre on the model in the 5 tonne class, with some addition of the 3.5 tonne zero tail swing model. For a long time mini excavators were supplied only to the home market (hence the low volumes) but exports now account for about half of production.

In September 2016 Hyundai announced the signing of a strategic alliance with CNH Industrial for the OEM supply of mini excavators. Under the 10-year-long-agreement with renewal option, CNH Industrial will market four mini excavator models that will be supplied as complete products by Hyundai through OEM production, and ten other mini excavator models in the form of complete knock down kits through license production. Thanks to the agreement, Hyundai expects to double its sales of compact excavators, over the next 10 years. Deliveries of mini excavators produced under the agreement began in mid-2017.

The production of standard hydraulic excavators has grown to around 7,000 units in 2016. Hyundai has worked hard to implement its international sales development plan and exports now account for more than 85 per cent of orders.

Wheeled loader production volumes are not large on an international scale but they have more than doubled during the last 15 years.

Skid-steer loaders are no longer manufactured in-house, and the two-model range is now outsourced to an OEM supplier in Korea and marketed under the Hyundai brand name.

COMPONENT SOURCING

Table 112. Hyundai Heavy Industries Co Ltd: Component Sourcing for Construction Equipment Made in Korea, 2017

Component	Mini Excavators	Hydraulic Excavators	Wheeled Loaders
Engines	Mitsubishi, Kubota	Mitsubishi, Cummins, Hyundai (for domestic market only) , Scania, Perkins	Cummins, Scania, Hyundai
Hydraulic Pumps	Tong Myung	Kawasaki (Tong Myung for domestic market)	Kawasaki (Tong Myung for domestic market)
Hydraulic Valves	Toshiba, Parker, Kawasaki , Tong Myung	Toshiba, Parker, Kawasaki, Tong Myung	Toshiba, Parker, Kawasaki, Tong Myung
Hydraulic Cylinders	In-house	In-house	In-house
Drive Motors	Kawasaki, Tong Myung	Kawasaki, Tong Myung	-
Swing Motors	Kawasaki, Tong Myung	Kawasaki, Tong Myung	-
Swing Gears	Jeil, Shinil	Jeil, Shinil	-
Frames	In-house	In-house	In-house
Booms, Arms	In-house	In-house	In-house
Undercarriage	HSC	HSC	In-house
Cabins	Myung Sung & in-house	Myung Sung & in-house	Myung Sung & in-house
Buckets	Korean sub-contractors	Korean sub-contractors	Korean sub-contractors
Rubber Tracks	Taejin	-	-
Steel Tracks	HSC	HSC	-

Source: Company Information

The fabrication plant builds all the major structural pieces for the products made in Ulsan. Cummins, Mitsubishi, Scania and Perkins supply engines for exported hydraulic excavators and Cummins and Scania for all wheeled loaders. Mitsubishi and Kubota supply engines for mini excavators. The exception is the use of Hyundai engines for the excavators sold in Korea. The hydraulics come from Tong Myung, a local Kawasaki licensee, for the machines sold in Korea, while for export models Kawasaki is preferred. HCE uses a large number of Korean vendors for small items, especially firms located in Ulsan.

EXPORTS

The Korean plant is the source for all export markets except China. The export ratio is highest in respect of wheeled loaders simply because the Korean market is not very large. The export ratio of the standard crawler excavators is high. The domestic market for wheeled excavators is unusually strong and for that reason Hyundai sells more than half of its production in Korea.

DISTRIBUTION

HCE has changed its strategy towards the domestic distribution network. Where previously the company sold the construction equipment through a nationwide network of company owned depots, it now operates through 16 independent dealers.

In the rest of the world the strategy has also been to utilise independent dealers, as much as possible on the basis of one dealer per country. It has two major overseas centres in Europe (Geel, Belgium) and North America (Elk Village IL). The distribution in China is undertaken by the two joint ventures.

The main centre for spare parts stocking and After Sales Service Centre at Eumsong, 200 kilometres south of Seoul was opened in May 2005 as the successor to a very smaller facility at the Ulsan plant. There a further five warehouses.

DOMESTIC SALES

Table 113. Hyundai Heavy Industries Co. Ltd: Sales of Construction Equipment in Korea by Type, 2015-2016
(Units)

	2015	2016	% Market Share 2016
Mini Excavators	922	1,063	18
Wheeled Excavators	556	550	21
Crawler Excavators	453	294	25
Wheeled Loaders	56	73	20
Skid-Steer Loaders	258	91	10

Source: Off-Highway Research

In the volume standard excavator sectors, Hyundai lies in third position, some way behind its domestic rivals, Volvo and Doosan. It is more successful in mini excavators, where it achieved joint second place with Doosan in 2016, and in the much smaller volume wheeled loader market, where it shared second place with Volvo in 2016. Skid-steer loader volumes have varied widely in recent years, although the company regularly achieves a creditable third place behind Bobcat and Caterpillar with a share of 10 per cent.

VOLVO CONSTRUCTION EQUIPMENT

Address	Volvo Group Korea Co., Ltd. Volvo Construction Equipment 160 Doosan Volvo-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do
Tel	+82 55 260 7004
Website	www.volvoce.co.kr
Key Personnel	Wisoo Suk, President
Employees	1,100 plus a further 700 temporary staff.

HISTORY

Volvo bought the construction equipment activities of Samsung Heavy Industries in 1998. Of the seven Volvo excavator plants worldwide, the plant in Changwon is the company's core worldwide source for crawler excavators, and produces wheeled and crawler excavators from 5 to 95 tonnes. It also has the capability of manufacturing the company's full series of excavators, including B, C, D as well as the latest Tier IV Final compliant E Series, introduced in 2014. Changwon also serves as the headquarters of the Volvo Construction Equipment Korea sales and marketing organisation.

The Changwon plant has been building construction equipment since 1975. From 1983 to 1998 the Samsung Heavy Industries era brought an increasing involvement in the construction equipment business. At different times it made under licence Poclain excavators, Komatsu dozers, wheeled loaders and motor graders, Yanmar mini excavators, Tadano truck cranes and Hitachi crawler cranes. As contract business it also made Clark fork lift trucks, and Case to build crawler loaders and dozers.

Volvo took over in 1998. It changed the colour of the excavators to grey and yellow in September 1999, and then changed the name to Volvo in 2000. Samsung brand wheeled loaders survived for local sale until 2002.

MANUFACTURING FACILITIES

Table 114. Volvo Construction Equipment Korea Ltd: Changwon Plant, 2017

Location	Area ('000m²)	Main Products
Total Site	1,188	-
Covered Area	136.1	-
Power Train Shop	10.8	Axles, swing drives, track drives
Hydraulic Components Shop	9.5	Pumps, swing motors, track motors, valve blocks
Final Painting	6.7	-
Construction Equipment Manufacturing	95.3	Hydraulic excavators

Source: Company Information

The Changwon plant is built on a large site of 119 hectares but only 41 hectares are available for use. The company has substantial component manufacturing facilities on site and can make 50,000 motor and pumps sets; 24,000 power train assemblies and over 120,000 cylinders per year. The capacity in terms of excavators is 16,000 units per year on a single shift.

The facilities were expanded after the purchase as well as updated from the unsatisfactory condition of the past. In 2001 Volvo spent Won11.8 billion on warehouses, followed by Won24 billion on production facilities in 2004. It then spent Won15 billion from 2004 to 2006 building a two-storey research centre, named the Virtual Product Development Centre, the industry's first development lab employing virtual simulation technologies. More recently, it has invested in a machining centre for excavator main control valves, which it also supplies to the other Volvo excavator plants worldwide.

PRODUCT RANGE

Table 115. Volvo Construction Equipment Korea Ltd: Summary of Construction Equipment Range Offered in Korea, 2017

Product	Type	No of Models	Sizes	Source
Made In Korea				
Mini Excavators	Wheeled	1	5 tonnes	Korea
	Crawler	2 standard, 2 narrow radius	5 and 8 tonnes	Korea
Wheeled Excavators*		3	14 to 20 tonnes	Korea
Crawler Excavators*		3 narrow radius, 13 standard	14 to 95 tonnes	Korea
		2 pipelayer		
Imported				
Mini Excavators Under 5 Tonnes	Crawler	1 standard	3.5 tonnes	France
Wheeled Loaders		8	150 to 550 hp	Sweden
Articulated Dump Trucks		3	30 to 45 tonnes' payload	Sweden
Asphalt Finishers		2	2.5 to 10.0 m paving width	Germany

* The named types do not constitute the whole range made in Korea for the world market
Source: Company Information

The table above shows the range sold to Korean customers. Volvo has a wide range of construction equipment but selling prices are very low in Korea and its European products are difficult to sell. The mini excavator range is most successful with the Korean style of 5 tonne machine and, with effect from 2016, 3.5 tonne machines have been imported from Volvo's factory in France. The wheeled loaders, however, all come from Europe and perform very well in respect of market share.

The road machinery, which began sales in mid-2007 after the purchase from Ingersoll-Rand, currently consists rely of two models of ABG finishers from Germany; a limited range of Volvo compactors will be launched in Korea in 2018.

The Changwon plant is building in 2017 more excavator types than are sold in Korea, as it is the world source for many machines. In what the company labels as mini excavators it builds a single wheeled machine of 5 tonnes and four crawler types in the five and eight tonne categories, including two narrow radius versions. The standard excavators made at present are the latest Tier IV Final compliant E Series versions, which comprise 16 crawler models, two pipelayer machines and three wheeled excavator models.

PRODUCTION

Table 116. Volvo Construction Equipment Korea Ltd: Production of Construction Equipment, 2012 -2016
(Units)

2012	2013	2014	2015	2016
14,900	13,200	12,100	10,500	10,600

Source: Off-Highway Research

The above table highlights total production of wheeled and crawler excavators from 5 to 95 tonnes. Significantly, production in 2017 is set to rise once again to 14,000 units, according to the company, as a result of the recovery in the Chinese market. Volvo does not divulge production volumes by machine type, although Off-Highway Research estimates that 5 tonne mini excavators alone are likely to account for some 25 per cent of total output in Changwon.

Volvo does produce excavators elsewhere on a more modest scale. The Konz factory in Germany began production of wheeled excavators in 1999, and later a limited range of crawler models, and has increased output significantly in recent years as a result of the growing Volvo market share in the region. Production in the Shanghai plant in China began in 2003 and, later, at a second plant in Linyi. Other excavator production facilities include Bangalore, India; Pederneiras, Brazil; and Shippensburg, USA. Production at Volvo's excavator plant in Kaluga, Russia has recently been suspended due to declining volumes.

COMPONENT SOURCING

Table 117. Volvo Construction Equipment Korea Ltd: Component Sourcing, 2017

Component	Mini Excavators*	Hydraulic Excavators
Engines	Yanmar, Kubota	Volvo, Deutz
Transmissions	Dana	ZF
Axles	Dana	ZF
Pumps	Bosch Rexroth	Kawasaki, Flutek
Motors	Nachi, Bosch Rexroth	Kawasaki, Kayaba, Bosch Rexroth
Valves	Kayaba, Nabtesco, In-house	Kawasaki, Nabtesco, In-house
Cabs	Sungjin, Topmetal	Press Kogyo, Sungjin
Tyres	Various (Korea)	Various (Korea)
Tracks	Daechang, Dongil	Daechang, INI

* Under 6 tonnes

Source: Company Information

EXPORTS

2001 was in effect the first year of the new era, as the plant shipped out the 'B' series to Europe and North America. Shipments reached 3,000 units and it is a tribute to the massive amount of effort made that in 2017 exports will be four times as large. Europe is the most important destination for standard excavators, with China and Asia Pacific being the other main export territories.

Distribution: Volvo has 13 branches and two independent sales agents in Korea. The branches provide after sales service but there are also four independent parts and service dealers. The parts warehouse is in Incheon and the training and demonstration centre in Songtan, south of Seoul.

DOMESTIC SALES

Table 118. Volvo Construction Equipment Korea Ltd: Sales of Construction Equipment in Korea by Type, 2015-2016 (Units)

	2015	2016	% Market Share 2016
Mini Excavators	975	1,198	20
Wheeled Excavators	707	699	27
Crawler Excavators	369	396	34
Wheeled Loaders	64	73	20
Articulated Dump Trucks	-	2	20
Asphalt Finishers	10	18	40

Source: Off-Highway Research

Volvo achieved market leadership in mini excavators in 2016. It has a large sales network and offers a wheeled machine as well as the better-selling crawler model of 5 tonnes. It also sells a 3.5 tonne model from France, albeit in small numbers, as they cannot match the Doosan Chinese products in price. Volvo was also the leading

brand in standard crawler excavators in 2016, although it lies someway behind Doosan in the wheeled excavator sector.

In the low volume markets for asphalt pavers and articulated dump trucks the company normally has very high market shares, whilst it competes on close terms with Hyundai for second position in the wheeled loader market.

Table 119. South Korea: Leading Distributors of Construction Equipment and Their Franchises, 2017

	Articulated Dump Trucks	Asphalt Finishers	Backhoe Loaders	Compaction Equipment	Crawler Dozers	Crawler Excavators	Mini Excavators	Mobile Compressors	Mobile Cranes	Motor Graders	Rigid Dump Trucks	RTLTs	Skid-Steer Loaders	Wheeled Excavators	Wheeled Loaders
Daijeon Machinery						Hitachi	Hitachi								
Doosan Infracore	Doosan					Doosan	Doosan							Doosan	Doosan
Doosan Infracore International Korea							Bobcat	Doosan					Bobcat		
Everdigm															Wacker Neuson
Gintex Korea					Liebherr	Liebherr					Liebherr			Liebherr	Liebherr
Haein Corp.	Caterpillar			Caterpillar	Caterpillar	Caterpillar				Caterpillar	Caterpillar		Caterpillar	Caterpillar	Caterpillar
Hyundai Construction Equipment						Hyundai	Hyundai						Hyundai	Hyundai	Hyundai
Jaein International			JCB			JCB	JCB					JCB	JCB	JCB	JCB
Junjin CSM	Komatsu				Komatsu	Komatsu	Komatsu			Komatsu	Komatsu			Komatsu	Komatsu
Kamco							Kubota								
Liebherr Mobile Cranes Korea									Liebherr						
Manitowoc Korea									Manitowoc, Grove						
PM Machinery									XCMG						
Samjung Construction Machinery						Kobelco, Case	Airman, Kobelco						Case		

Source: Off-Highway Research (Continued)

Table 119. South Korea: Leading Distributors of Construction Equipment and Their Franchises, 2017 (Continued)

	Articulated Dump Trucks	Asphalt Finishers	Backhoe Loaders	Compaction Equipment	Crawler Dozers	Crawler Excavators	Mini Excavators	Mobile Compressors	Mobile Cranes	Motor Graders	Rigid Dump Trucks	RTLTs	Skid-Steer Loaders	Wheeled Excavators	Wheeled Loaders
Sandvik Sunjun						Hitachi					Hitachi				Hitachi
Tadano Korea									Tadano						
U-Young		Dynapac		Dynapac											
Volvo Construction Equipment	Volvo	Volvo				Volvo	Volvo				Terex			Volvo	Volvo
Wirtgen Korea		Vogele		Hamm											
YK Construction Equipment				Sakai		Yanmar	Yanmar					Manitou	Gehl		

Source: Off-Highway Research

DISTRIBUTOR PROFILES

HAE IN CORPORATION

Table 120: Hae In Corp: Summary Information

Address	Haein Bldg, 86 Dongsan-ro, Seochu-gu, Seoul 06783
Tel	+82 2 3498 4611
Web	www.haein.com
Employees	349
Franchises	
Brand	**Products**
Atlas Copco	Drilling machinery
Caterpillar	Construction equipment and engines
Jungheinrich	Forklift trucks
MCF	Forklift trucks
Metso	Mobile crushers
Vermeer	Forestry machinery, directional drills

Source: Company Information

Established in 1960, Hae In Commerce Co. Ltd. became the dealer for Caterpillar and other construction equipment manufacturers in Korea. Before 2000, it was the Bobcat dealer and from 1985 to 2006 it represented Ingersoll-Rand in some construction equipment products. In October 2006 it took up Atlas Copco portable compressors and in October 2007 took certain Terex products, although it has since relinquished the latter franchise. Whilst Atlas Copco compressors are now marketed through that company's wholly owned subsidiary in Korea, Hae In is responsible for the Swedish manufacturer's line of drilling equipment. Metso mobile crushers and Vermeer forestry equipment are more recent additions to the portfolio.

SALES

Table 121: Hae In Corp.: Sales of Construction Equipment, 2016 (Units)

	2016
Articulated dump trucks	6
Asphalt finishers	1
Compaction equipment	26
Crawler dozers	17
Crawler excavators	53
Motor graders	1
Rigid dump trucks	3
Skid-steer loaders	173
Wheeled excavators	73
Wheeled loaders	48
Total	**401**

Source: Off-Highway Research

80 per cent of revenue comes from the Caterpillar side of the business. Mainstream Caterpillar construction equipment sells in Korea with a huge difference in price compared to the local alternatives. Volumes are therefore small and confined to areas where the Korean products do not exist, for example crawler dozers and compaction equipment. Large mining excavators and wheeled loaders remain the company's main focus, whilst skid-steer loaders are its largest selling volume product. Hae In does not market the Caterpillar range of telehandlers, backhoe loaders or mini excavators.

STRUCTURE OF DISTRIBUTION

Hae In expanded its branch network regularly during the 1990s, but after a review in 2006 concluded that it did not need so many small buildings and their associated costs. The head office is in the Seocho business district of Seoul and there are 15 branches nationwide. The mechanical handling division employs sub-dealers in smaller cities and for marine engine sales there are eight authorised dealers and two key influencers.

JAEIN INTERNATIONAL

Table 122. Jaein International: Summary Information

Address	Room 531, Samsung Lacville, 751 Janhang-dong, Ilsan-gu, Gyeonggi-do
Tel	+82 31 900 8510
Web	www.jaeinint.co.kr
Employees	9
Franchises	
Brand	**Products**
JCB	Construction equipment
RoadTec	Road building machinery

Source: Company Information

JCB awarded the franchise to Jae In International in 2003. Jae In has a big challenge in marketing the JCB range, as many of its strengths are in product types that have little demand in Korea. It has developed the farm machinery market, with skid-steer loaders and micro excavators and has made some progress with rough terrain lift trucks.

SALES

Table 123: Jaein International.: Sales of Construction Equipment, 2016 (Units)

	2016
Mini Excavators	1
Total	1

Source: Off-Highway Research

Unfortunately the JCB products face insuperable obstacles in most areas. During the last five years the company has sold two mini excavators, one skid-steer loader, one telescopic handler, and a single 1CX backhoe loader.

STRUCTURE OF DISTRIBUTION

The workshop and warehouse are located in the Ilsan area north-west of Seoul. Seven agents in different provinces supply a service capability.

KAMCO

Table 124 KAMCO: Summary Information

Address	11F Yangjae Tower, 262 Gangnam-daero, Gangnam-gu, Seoul 06265
Tel	+82 2 2058 1028
Web	www.koreakubota.co.kr
Employees	60
Franchises	
Brand	**Products**
Kubota	Construction equipment, agricultural machinery

Source: Company Information

Two former employees of Daedong started Kamco in conjunction with Marubeni Corp. in March 2000. The purpose was, and still is, to import and sell Kubota farm machinery and, since 2008, mini excavators. In 2004 Kubota took over the Korean investors' shares, in view of the greater need for working capital that had arisen as the business prospered. Kamco is owned 80 per by Kubota Ltd and 20 per cent by Marubeni Corp.

The company sells Kubota agricultural tractors, combine harvesters and rice transplanters. The Japanese plants ranges are very wide and for this market the company limits itself to two small types of 40-50 horsepower for paddy work, a medium range of five models up to 90 horsepower and a single example of the bigger M series. Mini excavators have become increasingly important during the last three years for the company and it lies in second place behind Yanmar in the market for mini excavators below 3.5 tonnes.

SALES

Table 125: Kamco.: Sales of Construction Equipment, 2016
(Units)

	2016
Mini Excavators	735
Total	**735**

Source: Off-Highway Research

The company has taken full advantage of the growing market for mini excavators and aggressive promotion of the product in the sub-3.5 tonne classes has earned it a high volume of sales during the last two years in particular.

Kamco has also achieved remarkable progress with the Kubota agricultural equipment range and typically sells over 1,000 agricultural tractors annually. Combined sales of combine harvesters and rice transplanters account for some 2,000 units per year.

STRUCTURE OF DISTRIBUTION

The sales staff is based at a city centre office in the Gangnam area of Seoul. The workshop is in Gimje city, north Jeolla province. 40 dealers spread round the country sell Kubota products.

LIEBHERR MOBILE CRANES KOREA

Table 126 Liebherr Mobile Cranes Korea: Summary Information

Address	Fine Bldg 4F, 673-5 Deungchon-dong, Gangseo-gu, Seoul 157-130
Tel	+82 2 2659 2290
Web	www.liebherr-korea.com
Employees	10
Franchises	
Brand	**Products**
Liebherr	Mobile cranes

Source: Company Information

The Liebherr mobile cranes division based in Ehingen, Germany founded this subsidiary in 2004. It followed on the use of an agent, then the Dong Gun company until in 1995 and a service agent, Liebe Yoon Ltd.

The company sells only the products of Liebherr Ehingen, all terrain and crawler cranes. Harbour and ships' cranes pass via INTES and tower cranes via Gintex, which also handles Liebherr earthmoving machinery.

SALES

Table 127: Liebherr Mobile Cranes Korea.: Sales of Construction Equipment, 2016
(Units)

	2016
Mobile cranes	13
Total	13

Source: Off-Highway Research

Liebherr is the leading supplier of all terrain cranes, as it is in most other global markets.

STRUCTURE OF DISTRIBUTION

The sales staff is based at a city centre office in the Gangseo area of Seoul. Two service people live in the south and there three after sales staff in the Seoul office. The company uses outside workshops where necessary.

MANITOWOC CRANE GROUP KOREA CO. LTD

Table 128. Manitowoc Crane Group Korea Co. LTD: Summary Information

Address	Rm502-4dong, 775 Kyungin-ro, Youngdeungpo-gu, Seoul 07299
Tel	+82 2 3439 0400
Web	www.manitowoccranes.com
Key Personnel	Jong Seoung Park
Employees	8
Franchises	
Brand	**Products**
Manitowoc	Crawler cranes
Grove	All terrain cranes, Rough terrain cranes

Source: Company Information

Manitowoc's Korean subsidiary company was established 40 years ago to import the Manitowoc range of crawler cranes and Grove all terrain and rough terrain product lines.

SALES

Table 129: Manitowoc Crane Group Korea: Sales of Construction Equipment, 2016 (Units)

	2016
Mobile cranes	32
Total	32

Source: Off-Highway Research

Manitowoc was the leading crane supplier overall in 2016 with sales of 32 units, although this volume was augmented by shipments to Korean contractors working overseas in regions such as the Middle East and Asia Pacific.

With a 40-year history in Korea, the manufacturer has been able to capitalise on the strengths of the Grove all terrain, and specifically the rough terrain crane lines following its acquisition by the American parent some years ago. In crawler cranes, Manitowoc is the perennial market leader in the sectors above 300 tonnes, whilst the 80-110 tonne sector remains an important niche market for the company's Kobelco-sourced machines.

TADANO KOREA

Table 130 Tadano Korea: Summary Information

Address	Rm 302 Koram Venture Town, 907-1 Daechi-dong, Gangnam-gu, Seoul 135-280
Tel	+82 2 714 1600
Web	www.tadanokorea.com
Employees	7
Franchises	
Brand	**Products**
Tadano	Mobile cranes

Source: Company Information

Tadano took over the company known as Tadano Korea from its Korean partner in December 2006. The company sells only Tadano products, in reality limited to rough terrain cranes from Japan and only an incremental volume of all terrain cranes from Germany.

SALES

Table 131: Tadano Korea.: Sales of Construction Equipment, (Units)

	2016
Mobile cranes	18
Total	**18**

Source: Off-Highway Research

Sales in 2016 comprised 16 units of rough terrain cranes and two truck-mounted types.

STRUCTURE OF DISTRIBUTION

The sales staff is based at a city centre office in the Gangnam area of Seoul. Two service engineers are in place and use an authorised workshop near Seoul.

WIRTGEN KOREA

Table 132 Wirtgen Korea: Summary Information

Address	Sambo Heavy Industries Co., 115-9 Goji-ri, Jeongnam-myeon, Hwaseong-si, Gyeonggi-do
Tel	+82 31 668 1449
Web	www.wirtgenkorea.com
Key Personnel	Reagan Kim, President
Employees	22
Franchises	
Brand	**Products**
Wirtgen	Milling machines
Hamm	Compaction equipment
Vögele	Asphalt finishers

Source: Company Information

The owner of Sambo HI, Reagan Kim, worked in the 1980s for the Wirtgen road machinery importer and then for one of its rivals, Jin Yang, selling Bitelli products. In 1989 he set up his own company, which eventually became Sambo HI. In 1991 the company took over the Wirtgen franchise, to which it added Marini pavers and, in 1995 the Vibromax 2000 range of compaction equipment, which lasted until 2001, when it took the Hamm compaction equipment franchise, one year after taking up Vögele asphalt finisher.

This concentration of all Wirtgen group products on one company follows a worldwide pattern. With the approval of the German manufacturer, one of the group's companies now uses the trading name of 'Wirtgen Korea'.

SALES

Table 133: Wirtgen Korea.: Sales of Construction Equipment, 2016 (Units)

	2016
Asphalt finishers	24
Total	**24**

Source: Off-Highway Research

Wirtgen Korea is the dominant market leader in asphalt pavers with its German sourced Vögele machines, and in 2016 secured a market share of 60 per cent. Uncompetitive pricing means it is unable to compete successfully in the compaction equipment sector, although occasional sales of Hamm rollers are effected.

YK CONSTRUCTION EQUIPMENT

Table 134 YK Construction Equipment: Summary Information

Address	YK Construction Equipment Co. Ltd.,B-1602,Dusan-ro, Geumcheon-gu, Seoul 08584
Tel	+82 70 4884 0607
Web	www.sunnyyk.co.kr
Key Personnel	Kilsu Song, Managing Director
Employees	7
Franchises	
Brand	**Products**
Gehl	Skid-steer loaders
Manitou	Telescopic handlers
Sakai	Compaction equipment
Yanmar	Mini excavators

Source: Company Information

The owner of YK Construction Equipment, Mr Chae, was the head of the imported construction equipment section of Samsung HI, then Volvo Korea, until early 1999. He started his company in May of that year. Convinced of the possibilities of mini excavators, he has proved himself correct and is by far the market leader in the sectors below 5 tonnes. YK Construction Equipment also holds the accolade of being the largest Yanmar mini excavator dealer in the world.

Mr Chae took up the **Sakai** compaction equipment franchise in 1999 and that of Yanmar in 2000. He backed the **Yanmar** ViO series of ultra-narrow mini excavators, avoiding confrontation with the main Korean offering of the 5 tonne standard mini excavator and **Gehl** skid-steer loaders, which made a good start straightaway. The rapid progress of the company since its foundation shows that it is possible to challenge the established suppliers successfully. YK took on **Kawasaki** wheeled loaders in 2008 but has since relinquished the franchise.

SALES

Table 135: YK Construction Equipment: Sales of Construction Equipment, 2016 (Units)

	2016
Compaction equipment	46
Mini excavators	980
Skid-steer loaders	60
Telescopic handlers	10
Total	**1,096**

Source: Off-Highway Research

YK is the undisputed leader in the segment of mini excavators below 3.5 tonnes, which in 2016 reached a historically high level of around 2,500 units. The Yanmar account currently constitutes 70-80 per cent of YK's annual turnover.

Gehl skid-steer loaders were once market leaders, when imported goods had only very restricted channels, such as the international trading arm of Samsung, Mr Chae's former employer. YK has not regained that position in the face of strong competition from Doosan Bobcat and Caterpillar, but regularly sells 60 to 100 units per year, 70 per cent of which go to the agricultural sector.

Manitou telehandlers are sold in limited volumes, although YK has recently succeeded in promoting the concept to larger farms for fertiliser handling applications. Sakai compactors continue to account for up to 100 units per year, although the company is unable to compete in the single drum soil compactor sector due to its machines not complying with current Tier IV Final regulations.

Used equipment is an area of increasing interest for YK, and the company is an active exporter of equipment to developing Asian markets, in particular Vietnam, Indonesia and the Philippines.

STRUCTURE OF DISTRIBUTION

The company has 13 dealers in place for sales and service of construction equipment; farm machinery, that is to say small skid-steer loaders, telehandlers and mini excavators below two tonnes, also have 13 supporting dealers

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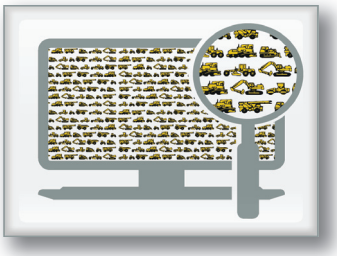

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Off-Highway Research

HEAD OFFICE

David C.A. Phillips
Off-Highway Research
Southfields,
Southview Road,
Wadhurst
East Sussex TN5 6TP
United Kingdom
T: +44 (0)1892 786270
F: +44 (0)1892 784086
E: mail@offhighway.co.uk
www.offhighway.co.uk

CHINA OFFICE

SHI Yang
Off-Highway Research
Room 2102,
Air China Plaza
No.36 Xiaoyun Road
Chaoyang District
Beijing 100027
China
T: +86 10 8447 5877
F: +86 10 8447 5878
E: mail@offhighway.com.cn
www.offhighway.co.uk

INDIA OFFICE

Samir Bansal
Off-Highway Research
Flat No. 111
Chiranjiv Tower
43, Nehru Place
New Delhi – 110019
India
T: +91 11 4652 5671 - 73
F: +91 11 4652 5674
E: mail@offhighway.co.in
www.offhighway.co.uk

SALES OFFICES

GLOBAL

Simon Battersby
Sales Account Manager
T: +44 (0)1892 786232
E: simon.battersby@offhighway.co.uk

FRANCE & BELGIUM

Hamilton Pearman
T: +33 1 45 93 08 58
E: hpearman@wanadoo.fr

ITALY

Fabio Potesta
Mediapoint and Exhibitons
T: +39 010.5704948
E: info@mediapointsrl.it
www.mediapointsrl.it

JAPAN

M Kawahara
Rayden Research Limited
T: +81 3 3212 3671
E: kawahara@ff.iij4u.or.jp
www.rayden.jp

TURKEY

Emre Apa
Apa Yayıncılık Ltd
T: +90 216 302 53 82
E: emre.apa@apayayincilik.com.tr
www.apayayincilik.com.tr

USA

Charles R. Yengst
Yengst Associates
T: +1 203 762 8096
E: mail@yengstassociates.com
www.yengstassociates.com