

The construction equipment industry in

CHINA

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MARKET REPORT

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CHINA STAGE IV TO BE ENFORCED WITHOUT FURTHER POSTPONEMENT

Although there have been calls to postpone the enforcement of China Stage IV for non-road mobile machinery, it has now been clarified by the trade associations that the legislation will still take effect on 1st December 2022, as having been scheduled at the end of 2020. (See the February 2021 Market Report)

With the decline in the market for construction equipment, Chinese manufacturers have seen an increase in unsold machines which have been made in compliance with China Stage III regulations, but will not be allowed to be sold after the new standards come into effect. As a result, the CCMA was requested to lobby the government for a postponement of the enforcement until April 2023.

In its first press conference held on 22 July 2022, the CCMA said this request had been passed to the Department of Atmospheric Environment, Ministry of Ecology and Environment, but that manufacturers should still prepare themselves for an unchanged deadline for the introduction of the new emissions controls. In a recent seminar held in Changsha on 11 August 2022, which was designed to focus on a similar subject, the CCMA announced that in line with the final decision of the government, there will be no change to the date of enforcement of China Stage IV.

Following the enforcement of China Stage III from 1st April 2016, the upgrade to China Stage IV had been under review since 2018. The publication of this new standard had been postponed for a variety of reasons, including the effects of Covid-19 pandemic on the industry, before the date of enforcement was finally decided at the end of 2020. To date, the major engine suppliers and most foreign manufacturers have been well prepared for the implementation of China Stage IV. As a result, it was ruled that it would not be fair to make any further delay.

From a market viewpoint, in light of the weak domestic demand for construction equipment, which has fallen by almost 50 per cent in the first half of the year, the forecast is for annual sales to decline by 35-40 per cent and the trend may continue until next year. As a result, it would make little sense for the industry to change the implementation date of China Stage IV.

With the massive investment programmes that have been established for infrastructure development, there should be some improvement in equipment demand during the fourth quarter. Although this may not lead to much of an increase in overall demand, it may help reduce the stock of China Stage III machines before December. After that date, unsold products will have to be passed over to distributors, and be either put into their rental fleets, or sold as used equipment.

In the agricultural tractor sector, since the Spring of 2022 manufacturers have been reducing their stocks, with production being limited during the peak sales period. With the improved government subsidies for farmers' purchases, sales may be further helped before the introduction of China Stage IV. So, it seems likely that the agricultural machinery industry has been better prepared for the launch of the new emissions standards. In April 2016, when China Stage III went into effect, the agricultural machinery sector was allowed to sell stocks of China Stage II machines until December; but this year, the CAAMM, the trade association of the agricultural machinery industry, has not made a request for the postponement of China Stage IV.

DYNAPAC TO PRODUCE COMPACT ASPHALT FINISHER IN CHINA

On 20th July 2022, Dynapac announced that it would produce a compact asphalt finisher, the F1250CS model, in its Chinese manufacturing plant. As an intelligent product, it will only be produced in China, but will be available for both the local market and for exports. This decision underlines the importance of Dynapac China in Dynapac's global strategy.

This machine integrates its compact size with a strong performance. In addition to the dashboard operation mode, it can remotely control all the working functions through an innovative RC360 remote control system within 10 metres. This system ensures that the operator has an excellent view of the operation, and can stay away from the asphalt fumes. With this unique remote control, the paving operation becomes much safer and more intelligent since the operator can position himself wherever suitable rather than staying on the dashboard at the rear of the machine. The finisher will automatically stop when the remote control is tilted higher than 45 degrees, or the operator is 10 metres from the machine.

This compact model is powered by a four-cylinder 75 kW Deutz diesel engine. The engine features the latest common rail technology and after treatment technology, which is available as Tier 3/EU Stage III or Tier 4/EU Stage V emission standards to meet emissions requirements in different markets. Meanwhile, the hydraulic system is optimally adjusted to the power pack to generate excellent fuel efficiency.

This powerful compact finisher, installed with Dynapac's unique screed, ensures a perfect pavement quality, even when a job site has challenging requirements. The Dynapac V2400TV and TVE screed is available as a gas heated and electrical heated version and can be hydraulically extendable between 1.2 to 2.4 metres, which is the core of this compact finisher. Thanks to the multiple adjustments, such as the angle of attack and the deep bottom plates, this screed can deliver excellent pre-compaction and a smooth surface of 0.5 to 3.5 metres wide and a thickness of -120 millimetres or +200 millimetres. It is a multiple function finisher, which is capable of paving both the asphalt surface layer and stabilised soil layer.

It is a significant feature of the Dynapac F1250CS that it can realise the so-called negative paving (-120 millimetres thick) operation. This operation is especially useful for the repair and maintenance jobs. When the finisher drives out of the trenches or milling cuts, the screed can be positioned to a level below the finisher's tracks to do the paving, which is suitable to treat bridge joints and similar work. This not only increases the working efficiency but also improves the paving quality of joints.

This finisher is designed with a transport width of 1.44 metres and a transport length of 4.37 metres, so it is easy to transport by a small trailer and be used in confined areas. It can be used to pave in tight or narrow spaces, is very suitable to pave parking lots, public areas, bicycle path, trenches, and sidewalks, and is applicable for paving and maintaining city roads.

In the past, the smallest asphalt finishers for repair and maintenance jobs usually have a maximum paving width of 4.5 metres with a basic screed of 1.8 metres. In recent years, leading suppliers have recognised the potential of much smaller finishers when medium and large, or even super large asphalt finishers remain the mainstream of the market for the construction and repair of highways and expressways.

The two indigenous manufacturers, XCMG and Sany, have penetrated this niche market by launching their smallest finishers with a maximum paving width of about 3 metres. XCMG now has a RP355 model available, which has a basic paving width of 1.2 metres and a maximum paving width of 3.5 metres, and Sany is marketing its SAP30C-8 model, which features a basic paving width of 1.2 meters and a maximum paving width of 3.2 metres. Although demand for such small machines is small at the moment, it is believed that sales should increase in future when traditional manual labour undertaking paving jobs in confined spaces and road maintenance, is replaced by smaller machines.

With the introduction of this compact model, Dynapac now produces 13 models of asphalt finishers in China, of which three models of the F-C series multiple function asphalt finishers in the range of 10-11.5 metres maximum paving width have been specially developed for the Chinese market. These are the F2530CS, F2550CS and F3030C models, of which seven SD models and the F1250CS model are also destined for export.

GREENLAND: A NEW SUPPLIER OF ELECTRIC CONSTRUCTION EQUIPMENT

At the end of 2020, **Greenland Technologies Holding Corporation** (NASDAQ: GTEC) launched three lines of electric products consisting of six models in the United States under the brand HEVI, which are summarised in the table below. Formerly called the Greenland Acquisition Corporation and registered in the British Virgin Islands in 2017, Greenland is a blank check company formed to acquire one or more businesses or entities. It is worth mentioning that the Chairman of this company, Mr. Peter Zuguang Wang was the co-founder of Unitech Telecom (now a part of UTStarcom, NASDAQ: UTSI) and has over 20 years of experience in technology and management.

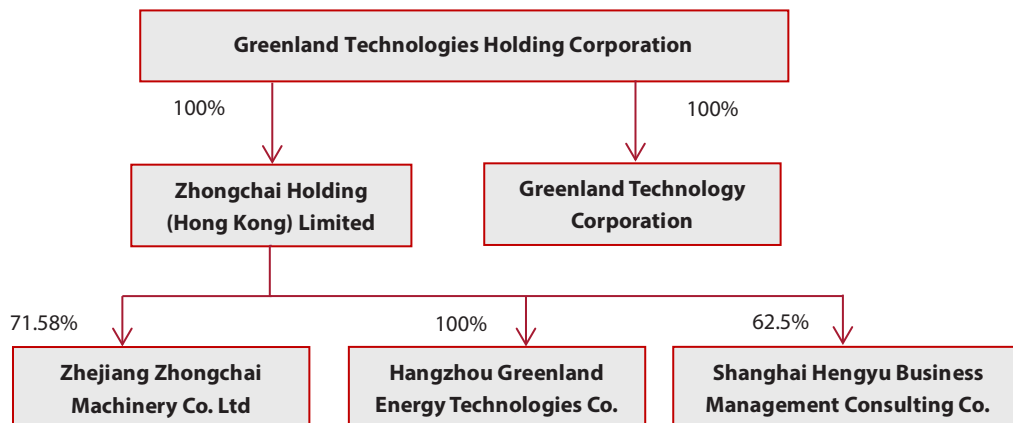
Table 1. Greenland: Machines available in the US, 2022

Product Type	Model	Battery Capacity	Rated Load (tonne)	Service Weight (tonne)	Working Hours
Wheeled Loaders	GEL-1800	141 kWh	1.8	5.2	9
	GEL-5000	182 kWh	5.0	18.0	8
Wheeled Excavators	GEX-8000	141 kWh	8.0	8.5	9
Industrial Forklift Trucks	GEF-1800	360 Ah	1.8	3.4	8
	GEF-2500	420 Ah	2.5	4.1	8
	GEF-3500	420 Ah	3.5	5.4	8

Source: Company Information

In 2019, Greenland merged with a leading developer and manufacturer of drivelines for material handling machinery in China, **Zhongchai Holding (Hong Kong) Limited** which soon afterwards changed its name. Now with its headquarters in East Windsor, New Jersey, Greenland develops and manufactures traditional transmission products for material handling machinery and electric industrial vehicles through Zhongchai Holding and its subsidiaries in China.

Chart 1. Greenland: Company structure, 2022



Source: Company information

With its 328 full-time employees (324 of them based in China), it recorded revenues of US\$98.84 million in 2021 after its sold 141,431 sets of transmission products last year, up from US\$66.86 million and 108,913 sets in 2020.

Table 2. Greenland: Financial highlights, 2020-2021 (USD million)

	2020	2021	% Change
Revenues	66.86	98.84	48
Gross Profit	12.81	19.59	53
Net Income	6.37	7.27	14

Source: Company information

In December 2020, Greenland set up a new division to focus on the production and sale of electric industrial vehicles including forklift trucks, wheeled loaders and wheeled excavators. The last two of these products are commonly defined as construction equipment, although their research and development started in 2019.

This year, Greenland will open an assembly facility and an experience centre in Baltimore, Maryland with an annual capacity of 500 units. The choice of factory location was made on the basis of the recently passed Maryland Clean Cars Act of 2022, which took effect on 1 July 2022. Like Electric Fujian released by the Fujian provincial government in China offering 10 per cent of the battery price to local manufacturers for each electric equipment sold in the province, this act provides an incentive to local buyers of electrical equipment, an equivalent of 20 per cent of their spending on equipment.

At present, all products are imported from China, and in particular the battery is supplied by CATL. In terms of specification and configuration, its products are similar to those available in China. Minimum charging time for each product varies from 1.5 hours to 3 hours with a 90 kW output charging facility. But all products can be charged with a 12 kW and 60 kW facility with much longer charging times. The warranty for a battery is the same as in China, which is 5 years. If a fully charged battery can only reach 75 per cent of its initial performance, it will be replaced by a new one. The warranty for mechanical parts is one year.

However, Greenland has overturned the traditional business models and practices in the construction equipment industry in many ways, which appears to be an extreme light-asset approach. First, it will not use dealerships and all models can be ordered directly from the company. It believes this should build up its price competitiveness compared to diesel powered machines.

Secondly, it will not use any proprietary parts in its products and will not produce any key components such as hydraulic parts in-house. Moreover, it encourages customers to do the service themselves or through its service partner TRG, a third party service provider with its headquarters in Westlake, Ohio, which is expected to replace conventional dealers in daily maintenance and repair. In doing so, the

company hopes to offer a maximum and simple access to parts and service to its customers.

Through its partnership with Princeton Nuenergy, a provider of cost-efficient, environmentally friendly lithium-ion battery recycling solution, Greenland will recycle the materials used in its lithium batteries. Working with another partner, Cyngn, an industrial autonomous vehicle technology company, Greenland will develop telematics and autonomous solutions for its product lines.

At present, the company only focuses on the US market, and it is understood that it will soon start localising content. The company has plans to further expand its product portfolio.

INDUSTRIAL FORKLIFT TRUCK MARKET RECORDS LOWER SALES AND CHANGES IN STRUCTURE

Table 3. China: Sales of industrial forklift trucks, six months ending June, 2021-2022 (Units)

Type	2021			2022		
	Domestic	Exports	Total	Domestic	Exports	Total
Electric	43,500	14,500	58,000	46,500	23,000	69,500
IC	213,000	35,000	248,000	164,000	43,500	207,500
Total	256,500	49,500	306,000	210,500	66,500	277,000

Source: Off-Highway Research

With a background of the Chinese and world economies still being impacted by Covid-19, the ongoing trade friction between China and the United States, and the influence of geopolitical conflicts, domestic sales and exports of industrial forklift trucks during the first half of 2022 showed signs of change. This reflects weak domestic demand and large production capacity.

Total sales of industrial forklift trucks by the Chinese industry suffered a year-on-year decline of about 10 per cent to 277,000 units during the first half of 2022. Of this volume, domestic sales accounted for 210,500 units, down by 18 per cent, while exports were 66,500 units, a substantial growth of 34 per cent.

On the domestic market, sales of electric trucks increased by seven per cent to 46,500 units, accounting for 22 per cent of total sales, up by five percentage points, while sales of IC forklifts reduced by 23 per cent to 164,000 units, accounting for 78 per cent of total demand. Although the volume of electric trucks is still much less than that of IC forklifts, the faster growth of electric machines will become a trend, and the new energy powered machines represented by lithium-ion batteries is becoming popular, and accounts for more than 50 per cent of total sales of electric trucks. This will increase in future when China Stage IV emissions standards become fully effective on 1st December 2022.

Exports during the first half of 2022 increased by 34 per cent, of which electric trucks increased by 59 per cent, while IC forklifts rose by 24 per cent. The United States and Europe remained the major export destinations, but emerging markets also showed strong demand. Exports are a feature of the industry, and each supplier works hard to develop its international markets. However, it is noteworthy that the two leading exporters, Hangcha and Heli, sharply increased their exports, and together they accounted for 53 per cent of all exports, up by eight percentage points. This is evidence of their strength in distribution and brand recognition on the international market.

When the domestic market fell and exports grew, the leading suppliers maintained their domestic market positions and increased exports more than others. As usual, during the first half of 2022, the two leading suppliers Heli and Hangcha achieved

very similar total sales, with Heli slightly leading Hangcha in the domestic market while Hangcha's exports are slightly greater than those of Heli. Domestically, Heli saw its sales decline by 18 per cent during the first half of 2022 and maintained a 33 per cent market share; Hangcha suffered a 20 per cent decline in domestic sales and accounted for about 32 per cent of domestic sales; Lonking saw its sales fall by 21 per cent, gaining a 15 per cent market share. Together, these three indigenous suppliers maintained a combined market share of 80 per cent.

Unlike other types of construction equipment that saw a decline in sales quarter by quarter during the first half of 2022, domestic sales of industrial forklift trucks remained flat during the first quarter, and suffered a decline in the second quarter. This trend was in line with the performance of the overall economy. Since the country is making every effort to revitalise the economy and encourages manufacturing and logistics activities, there is every optimism that demand for industrial forklift trucks will remain strong in the second half of the year, although there are many uncertainties.

However, the sharp growth in sales in the last two years and the large population established in the past five years might slow down demand over the short term, but the structure of demand will very likely see significant change.

ROAD DEVELOPMENT: UPDATED PLAN FOR THE NATIONAL SPINES TOWARDS 2035

On 12th July 2022, a new plan for developing the national highway system towards 2035 was jointly published by the National Development and Reform Commission and the Ministry of Transport, which is an update of the previous planning for 2013-2030. In line with this update, the total length of the national highways is to be extended by 60,000 kilometres, together with the reconstruction of a number of the existing lines, and therefore the road construction activities are set to be buoyant on account of these major projects.

Table 4. China: Summary of National Highway Systems, 2012-2035* (Kilometres)

	2012	2015	2016	2020	2021	2030*	2035*
National expressways	68,000	79,500	99,200	113,000	124,000	136,000	162,000
Ordinary lines	105,400	105,800	255,600	257,700	258,000	265,000	299,000
Total	173,400	185,300	354,800	370,700	382,000	401,000	461,000

* Targets of 2013-2030 plan.

** Targets of 2022-2035 plan, including 8,000 kilometres that may be done in longer terms.

Source: Ministry of Transport

The national highway system is on the top level of the functional road classification, and comprises national expressways and ordinary lines. The last plan made in 2013 was targeted at an extension to a total length of 401,000 kilometres by 2030, by building new lines but also merging the existing provincial or rural roads. The statistics in line with this plan was adopted from 2016, the start of the 13th FYP (2016-2020).

By the end of 2021, the total length of the national highways that had been put in place amounted to 382,000 kilometres. For the first nine years of the 2013-2030 plan, the national expressways have been extended by 82 per cent and the ordinary lines by 145 per cent. The construction plan that was set for the 14th FYP (2021-2025) is to complete the main lines of the planned national expressway system. With regards to the ordinary lines, they should be upgraded to better standards and the missing links be connected. In other words, most of the original goals that were set for 2030 should have been achieved by 2025.

Therefore, it is thought to be useful to summarise a current update of the plan for the national highway development. As indicated by the new plan, the total length of the national system will be increased by some 60,000 kilometres from that of the previous plan, which includes 26,000 kilometres of expressways and 34,000 kilometres of ordinary lines. It is remarkable that the national expressway network will be extended to 162,000 kilometres, which consists of 7 radiate lines from the Capital, 11 north-to-south and 18 east-to-west spines and 242 ring lines, parallel lines and feedlines.

As reported by the Ministry of Transport, at the end of 2021 the construction of national expressways had seen 124,000 kilometres completed and some 10,000 kilometres under construction. The gap with the 2035 target is about 28,000 kilometres, of which construction has yet to be started. Therefore, on average there will be some 2,700 kilometres to be completed annually between 2022-2035, compared with the annual progress of almost 3,000 kilometres between 2013-2021. In addition, it is estimated there would be another 30,000 kilometres to be expanded or reconstructed to meet growing traffic demand.

In the case of the ordinary lines, apart from the extension of 41,000 kilometres to be done between 2022-2035, or more than 2,900 kilometres per annum, most of the existing facilities will be upgraded. The statistics show that 28 per cent of the ordinary national highways, or 84,000 kilometres, were still below the standards of Class II or missing by the end of 2021. According to the Ministry, there will be a total of about 110,000 kilometres to be added or upgraded for the ordinary lines by 2035.

By considering the goals that have been set for the 14th FYP, the construction of national expressways should be kept at similar progress levels by 2025, but afterwards would see slower extension in the new lines, while the ordinary lines will see faster development after 2025. In any sense, the expansion and reconstruction of the existing facilities will become increasingly important, which should represent constant demand for surfacing machinery, while the needs for earthmoving equipment may change with the progress in the new lines.

Table 5. China: Development of intercity road networks, 2012-2025* (Kilometres)

	2012	2015	2016	2020	2021	2025*
Total length	4,237,500	4,577,300	4,696,300	5,198,100	5,280,700	5,500,000
- Expressways	96,200	123,500	131,000	1,610,000	169,100	190,000

* Targets of the 14th FYP (2021-2025).

Source: Ministry of Transport

It is noticeable that the national highways represent only a small part of the country's entire road network (7 per cent at the end of 2021), while undoubtedly it has an outstanding significance to facilitate the national transport activities. In the case of expressways, by the end of 2021 national expressways accounted for 73 per cent of the total, as there have been many expressways built at the local level, particularly in the more developed areas. It is estimated that upon their completion by 2035, national expressways may account for some 80 per cent of the country's total.

Viable funding programs will be vital for supporting such an extensive road development. The traditional funding resources have been the revenues from fuel tax, tolls on road and other public financing methods. The real estate investment trusts (REITs) are now to be introduced to the infrastructure sectors, which is hoped to minimise the risk exposure of public finances.

SANY PRODUCES ITS 30,000TH MINI EXCAVATOR IN THE RANGE OF UNDER 5 TONNES

On 19th July 2022, Sany Intelligent Mini Excavator Plant in Kunshan, Jiangsu Province, celebrated the production of its 30,000th mini excavator, with an SY35C model leaving the assembly line. The plant focuses on mini excavators in the classes under 5 tonnes, and therefore the mini excavators in this report refer to this smaller range, unless otherwise specified.

To penetrate Western markets and broaden its domestic market, Sany began to develop mini excavators in 2013 and produced its first unit, the SY16C model, in August 2013. It unveiled a zero tailswing 3.8 tonne model, the SY35U-9, in 2014, and launched a zero tailswing 5.2 tonne model, the SY50U-10, in 2016, which was changed to SY55U in 2017. In 2021, the company launched its first electric mini excavator, the SY19E model.

Table 6. Sany: Mini excavators available in the range under 5 tonnes, 2022

Model	HP	Engine manufacturer	Operating weight (Tonnes)	Product source
SY16C	14	Yanmar	1.8	Kunshan
SY18U*	20	Yanmar	2.0	Kunshan
SY19E**	-	-	2.0	Kunshan
SY26U*	21	Yanmar	2.7	Kunshan
SY35C	28	Yanmar	3.8	Kunshan
SY35U*	28	Yanmar	3.8	Kunshan

*Zero tailswing

**Electric

Source: Off-Highway Research

Through its intense efforts over the last decade, Sany has now streamlined its mini excavator portfolio to six models, which is made up of the C series of standard design, the U series of zero tailswing and the E series of the electric type. These products are not only sold on the domestic market, but are also exported to the European, North American, and Australian markets as well as other regions. In 2021, Sany accounted for 10 per cent of the total domestic market of mini excavators and 15 per cent of the total industry production in this sector.

Table 7. China: Domestic sales and production of mini excavators under 5 tonnes, 2017-2021 (Units)

Tonnes	2017	2018	2019	2020	2021
Domestic sales	4,990	7,220	9,380	11,830	15,550
% Change	+118	+45	+30	+26	+31
Production	3,125	8,170	17,650	23,350	32,550
% Change	+44	+161	+116	+32	+39

Source: Off-Highway Research

With the strong recovery and buoyant growth of the overall excavator market, domestic demand for mini excavators has seen a sharp growth over the last five years, with total sales increasing from about 5,000 units in 2017 to more than 15,000

units in 2021. During this time, machines in the 1-3 tonne class have grown in importance and machines in the 3.1-5 tonne range have yet to be developed. Mini excavators usually work in confined spaces, and frequently undertake tasks that were previously undertaken by manual labour, so there is doubtless much potential for further growth, even though the market is currently in a downturn.

Along with the sharp growth of mini excavators on the domestic market, exports have also increased dramatically over the last five years, which was the result of the efforts by both indigenous manufacturers and international suppliers. As a result, production of mini excavators has seen dramatic growth year-on-year over the last five years, from about 3,000 units in 2017 to more than 32,000 units in 2021.

As the market leader on the domestic market and a major exporter of excavators, Sany has a wide product range, a strong research and development ability, competitive component sourcing ability, large manufacturing capacity, and ambitious marketing and sales targets. It has three manufacturing facilities for excavators in Kunshan, Lingang and Chongqing, and the manufacturing activities of mini excavators take place at its Kunshan factory.

In September 2021, the Sany Intelligent Mini excavator Plant was put into operation, and this has realised the in-depth integration of information technology and manufacturing processes, and this factory has become a so called Lighthouse Plant featuring the highest flexible line in terms of low manpower, digitalisation, and intellectualisation in the construction equipment industry. The company is gradually increasing annual production capacity to 20,000 units in a bid to meet the ever-increasing demand for mini excavators and increase its presence on both the domestic market and exports.

SANY TO INVEST IN BATTERY PRODUCTION

On 2 August 2022, **Sany Lithium Energy Co. Ltd** was incorporated with a registered capital of RMB100 million. Its business scope includes the production of battery and battery components, the sale and rental of batteries, and energy-saving technology and services. The Sany Group holds an equity of 49 per cent directly and through its subsidiaries, and Mr. Liang Zaizhong has a 33.5 per cent shareholding. The founding of this company marks Sany's entry into the battery and energy storage market, and can be regarded as another milestone in Sany's pursuit of product electrification, one of the most important strategies of the company.

Last year, Sany founded the New-Energy Technology Committee for the management of new-energy related technological development, patents, forward-looking R&D and commercialisation. The group opened nine subsidiary companies and research institutes on electrification. Each business unit has also set up dedicated R&D teams or subsidiaries focusing on electrification. Electric models are now available in most of its product lines ranging from earthmoving equipment to port machinery.

In 2021, Sany sold over 1,000 units of electric engineering vehicles whose turnover approached RMB1 billion, and the company claims that it was the largest supplier of electric truck-mounted mixers, electric dump trucks and electric mobile cranes. During the first seven months of this year, it sold close to 1,700 electric heavy trucks and its market share of 15 per cent further underpinned its leadership in this market after it ranked first in 2021 with sales of some 1,500 units.

Overseas demand has also started to emerge. Since 2021, the company has exported electric mini excavators, driverless electric wide-body trucks and electric telescopic crawler cranes. In July 2022, its electric truck-mounted concrete mixer passed the WVTA (Whole Vehicle Type Approval) of the EU.

During the first half of this year, its R&D investment into electrification increased by over 100 per cent over the same period in 2021. Over this period, the number of developers in this field has expanded from some 1,000 people to over 2,600 people. By the end of this year, over 50 per cent of the R&D workforce in the group will be focusing on electrification. At the time of writing this report, over 60 models of electric products have been developed and over 300 patents have been awarded, and some 130 new ones are in development.

In particular, Sany has formally released its battery swapping stations and achieved initial sales. The first fully automatic station was unveiled in last November, which was able to complete as many as 168 battery swapping services a day. When it made its first delivery in Zibo, Shandong in June this year, the time required for each service was shortened from five minutes to 1.9 minutes and the number of batteries

available in the station increased from seven to 10. With the option of battery swapping, investment in new electric products can be considerably reduced.

Since Sany formulated its three-pillar strategy of digitalisation and intelligentisation, electrification, and internationalisation, it has been partnering with key participants in the industrial chain. In line with the three new-energy solutions, full battery, battery swapping and hydrogen fuel cells, its in-house R&D and joint R&D with its strategic partners will focus on five areas, battery cells, electric axles, VCUs (Vehicle Control Units), battery charging and swapping stations, as well as fuel cell systems and control technology.

Table 8. Sany: Strategic partners in electrification development, 2022

Year	Company Name	Major Area of Cooperation
2020	Contemporary Amperex Technology Co. Ltd.	Battery supply, product development
2021	GCL Energy Technology Co. Ltd.	Product development, promotion & sales, supply of battery swapping station, power supply
2022	Hubei Eve Power Co. Ltd. Teld New-Energy Co. Ltd.	Energy trading, battery production, charging service, battery echelon use & recovery scheme, energy storage microgrids
	Battery Science & Technology Co. Ltd.	Battery bank, recycle of retired batteries, building of battery recycle network

Source: Off-Highway Research

Nevertheless, the rising prices of batteries, the soaring demand for electric automobiles, as well as the lack of production capacity and R&D resources allocated to construction equipment and engineering vehicles in the supply chain have certainly brought challenges and constrains to Sany, which could be acutely felt in the future given its ambition in electrification. Like in the conventional diesel-engine product markets, the intensified competition will eventually drive down the profitability of suppliers of electric products if they offer homogenous products and outsource key components. All these factors have justified the founding of Sany Lithium Energy.

SHUDAO FULLY EMBRACES ELECTRIFICATION

Founded on 28 May 2021, **Shudao Investment Group Co. Ltd** is the result of the consolidation of Sichuan Transportation Construction Group Co. Ltd and Sichuan Railway Industrial Investment Group Co. Ltd. With a workforce of some 50,000 employees, this very large group has over 330 wholly owned or controlled companies including three listed companies, namely, Sichuan Road & Bridge Co. Ltd (SRBC), Sichuan Expressway Co. Ltd, and Sichuan Shudao Equipment & Technology Co. Ltd. The accumulated length of expressways it has built and operated exceeds 10,000 kilometres. Of particular note, over 3,360 kilometre of expressways and over 2,200 kilometres of railways were under construction at the end of 2021, accounting for 80 per cent and 83 per cent of their respective totals in Sichuan.

After its turnover reached US\$34,549 million (RMB220 billion) and its net profit reached US\$428 million (RMB7.5 billion) last year, Shudao entered the Fortune 500 this August, the first time for a state-owned enterprise in Sichuan to do so.

Table 9. Shudao: Financial highlights, six months ending June 2022

	RMB Mn	% Y-on-Y change
Turnover	100,000+	+3
Gross Profit	460+	+28
Investment Completed	74,300	+16
- Investment on key projects completed	61,700	+46

Source: Company Information

When it was founded, the group announced its intention to become a leader in low-carbon and intelligent construction. As the key member of Shudao, SRBC has made rapid progress through the so-called shift from fuel to electricity initiative. Several trial projects have commenced this year, such as the 10 kilometre Ningnan-Huidong tunnel.

The plan is to migrate to electrification by product, which currently includes wheeled loaders, excavators, dump trucks and truck-mounted concrete mixers; by terrain such as plateaus, hills and plains; and by jobsite such as bridges, tunnels, and pavement. Moreover, Shudao will complete the construction of the power grid in time to ensure the power supply for these equipment. The ambitious target is to achieve full electrification by 2025.

In 2021, SRBC introduced the BYD Company as its strategic shareholder. BYD has been engaged in new energy vehicles and fuel-engine vehicles, handset components and assembly services, rechargeable batteries and photovoltaics businesses. Last year, it recorded operational revenues of RMB216 billion and a net profit of RMB3 billion. More importantly, it sold close to 600,000 new-energy automobiles and has remained the largest supplier in this market for nine consecutive years. Its expertise in battery and electrification will be instrumental to Shudao's pursuit of green

construction. In addition, Shudao has the intention to set up a joint venture with Fudi Battery, a subsidiary of BYD that focuses on battery production.

At the beginning of this year, SRBC, BYD and several manufacturers have jointly set up the Innovation Lab for Low-Carbon and Intelligent Construction. This lab focuses on electrification and intelligentisation of construction equipment. In particular, it aims to develop and promote standards on electric and intelligent machinery, battery modularisation, battery charging and swapping solutions, battery connectors for heavy-duty commercial vehicles and construction equipment. A seminar was held by the lab in July 2022 with the participation of some leading manufacturers of construction equipment, including LiuGong, Sany, SDLG, XCMG, all of which offer different types of electric construction equipment.

SRBC will shortly start the construction of several new expressways, such as the Xichang-Shangri-La Expressway and the Kangding Yulin-Xin Du Qiao Expressway. Most equipment used in and purchased for these projects will be battery-driven as a result of its decision to fully embrace electrification. The immediate demand includes 50 electric wheeled loaders, hundreds of dump trucks and truck-mounted concrete mixers. In the near future, it will purchase other electric products including excavators, crawler dozers, asphalt finishers, compaction equipment and skid-steer loaders.

Possibly, Shudao will probably have the country's largest fleet of electric construction equipment by the end of this year. Nevertheless, its ambition goes beyond being merely a user of these products. It wants to be their co-developer by participating in product development and offering testing projects for new products. Whoever wants to provide electric construction equipment will probably need to share their intellectual property with Shudao.

Shudao has been working on its own standards for electric equipment. The medium-term plan is to use batteries produced by the joint venture that will be founded. It will then install them on wheeled loaders and excavators supplied by its partners from the construction equipment industry according to its standards. Meanwhile, Shudao and these manufacturers might jointly develop other key components in electric products.

Shudao is a typical example of how the emerging and increasing demand for electric products, as well as the early and ambitious adopters, are changing the traditional business model and the competitive landscape in the industry. These large and powerful pioneers have not only recognised the economic and environmental benefits brought by electrification, but have also realised their importance to the manufacturers. They want a slice of the action, given the potential of electrification in the industry. Since no international supplier of construction equipment has officially released full battery products in China, their opportunities to do business

with this company in the future is not very promising. On 18 May and 8 August this year, the company signed strategic partnership agreements with XCMG and Sany.

FINANCIAL RESULTS - FIRST HALF

DINGLI

Table 10. Dingli: Financial highlights, first half, 2021-2022 (RMB million)

	6 months ending June		% Change
	2021	2022	
Sales			
- Access platforms and other products	2,496.1	2,844.5	14
- Other businesses	81.4	100.0	23
Total	2,577.5	2,944.5	14
Operating income (loss)			
- Access platforms and other products	700.1	751.2	7
- Other businesses	52.5	72.0	37
- Tax, costs and depreciation	(190.9)	(180.9)	-5
- Investment earnings	16.8	14.5	-14
- Asset disposal and others	19.1	20.4	7
Total	597.7	677.3	13
Net profit	506.7	574.1	13

Source: Company Information

Dingli recorded a year-on-year growth of 14 per cent in its half-year turnover, with slower growth in the second quarter. In fact, domestic sales saw a year-on-year fall of 23 per cent in the first six months, so, it was overseas sales that contributed to the current growth. Exports increased year-on-year by 72 per cent to RMB1,679.3 million, accounting for 57 per cent of the total half-year turnover.

With the fundraising of RMB150 million through a new issue in 2021, the company has continued to build a new factory of high-reach intelligent access platforms, which is designed to have an annual production capacity of 4,000 units. The construction has now seen the civil works completed, and it will be equipped with digitised systems for design, production, and management.

Gross margins in the manufacturing lines have now reduced to 26 per cent, despite the continuing rise in sales. Overheads were reduced, and although the costs for distribution, administration and R&D continued to rise, financial costs were reduced substantially, because of gains in the volatile foreign exchange markets. On the other hand, the increase in depreciation due to credit impairment was small. As a result, the company achieved an improvement in profits alongside the rise in sales.

In the first half of the year, the receivables account increased by 55 per cent to RMB2.5 billion at the end of June, and inventories increased to RMB1.4 billion. Net operating cash flow was improved, but remained negative, but with the abundant holding of cash and cash equivalents, the company is believed to remain financially strong.

The joint ventures with the various foreign partners had recorded improved revenues, while CMEC and Teupen posted declining profitability. These are helping

Dingli's sales in the important markets in Europe and the US, and they also have significant implications in supporting product development and re-engineering.

Table 11. Dingli: Financial highlights of joint ventures, first half, 2021-2022 (RMB million)

	% Dingli Shares	Product Lines		Turnover		Net Profit	
				2021	2022	2021	2022
Magni	20	Access platforms	Euro Mn	128.0	198.7	7.9	19.6
CMEC	25	Access platforms	US\$ Mn	105.5	147.4	6.3	2.2
Teupen	24	Access platforms	Euro Mn	17.7	21.0	1.3	0.3

Source: Dingli Information

The anti-dumping and anti-subsidy investigations on Chinese imports of access platforms by the US Department of Commerce is now about to increase the tax barriers against Dingli's exports to the US. While the company has prepared for a review of this investigation, it may have to make up the expected losses in the American market by increasing exports elsewhere, and the cost of production is set to be controlled to offset any potential impact.

HUATIE

Table 12. Huatie: Financial highlights, first half, 2021-2022 (RMB million)

	6 months ending June		
	2021	2022	% Change
Turnover			
- Rental of aerial work platforms	379.8	756.4	99
- Rental of supporting and protection steel	580.4	589.2	2
- Underground repair and maintenance	102.1	96.2	-6
Total	1,062.3	1,441.8	36
Operating Income (Loss)			
- Rental of aerial work platforms	187.3	335.4	79
- Rental of supporting and protection steels	312.7	270.2	-14
- Underground repair and maintenance	42.2	43.9	4
- Tax, Costs and Depreciation	(272.1)	(365.5)	34
- Investment Earnings	2.9	15.4	431
- Asset Disposal and Others	13.9	21.2	53
Total	286.9	320.6	12
Net Profit	239.5	276.8	16

Source: Company Information

Huatie reported a year-on-year growth of 36 per cent in its rental revenues, which is primarily attributed to the rental of aerial work platforms that accounted for over 50 per cent of total turnover in the first half. The rate of growth was reduced in the second quarter, as a result of the slower revenues from the sectors of supporting and protection steel, and underground repair and maintenance.

As a result, the rental of aerial work platforms is the largest revenue earner, and the principal source of profits. With the decline in the gross margins of the different rental businesses, the major increases in administration and financial costs, and the surge in the depreciation due to credit impairment, the company's profitability posted a slower rate of improvement than revenues.

Receivables continued to rise to RMB2.4 billion, or 14 per cent higher than the level at the end of 2021. Inventories were halved, on the other hand, as a result of the much reduced costs for performing rental contracts. Net operating cashflow rose, and the company increased its holding of cash and cash equivalents.

Rental of aerial work platforms doubled in turnover, to RMB756.4 million, accounting for 52 per cent of revenues. However, the sector's gross margins were reduced to 44 per cent, although this is still a strong level.

Zhejiang Hornet Building Machinery and Equipment, the main operational body of access rental that has a number of subsidiaries nationwide, recorded a year-on-year rise of 97 per cent in its turnover to RMB747.7 million, and net profit more than doubled to RMB101.0 million.

During the period, the company had continued to increase its fleet of platforms to over 59,000 units, with 12,000 units being added in the six months. Of this total

number of platforms under its management, machines of sub-rental amounted to over 6,700 units, which may help generate revenues without increasing the company's asset burden. The rental rates were affected by the lockdowns due to the pandemic, but were restored to over 80 per cent by the end of June. The company now has over 170 operational centres nationwide in 400 cities, with the network being actively supported by on-line promotion.

HANGCHA

Table 13. Hangcha: Financial highlights, first half, 2021-2022 (RMB million)

	6 months ending June		
	2021	2022	% Change
Turnover			
- Machinery sales and service	6,923.7	7,010.0	1
- Others	443.1	514.4	16
Total	7,366.8	7,524.4	2
Operating income (loss)			
- Machinery sales and service	1,168.0	1,187.2	2
- Others	17.5	24.4	39
- Tax, costs and depreciation	(659.8)	(696.4)	6
- Investment earnings	98.1	59.0	-40
- Adjustment due to fair value	(9.9)	(31.4)	217
- Asset disposal and others	14.0	27.7	98
Total	627.8	570.5	-9
Net profit	545.6	492.0	-10

Source: Company Information

Although sales fell in the second quarter, Hangcha saw a 2 per cent year-on-year rise in half-year turnover. For the six months sales of forklift trucks amounted to 85,000 units, a drop of 10 per cent from the same period of last year, although the fall was partly made up by sales of other types of vehicles.

The decline is primarily because of the weak demand in the domestic market, although the company continued to achieve strong export growth, with overseas sales rising by over 50 per cent in volume, and by over 80 per cent in value. The company, as a result, remains confident in reaching its annual sales target.

The gross margins in its manufacturing lines have remained steady. There was a strong rise in distribution costs, but depreciation was reduced, and as a result, the company's profitability fell by some 10 per cent. Net operating cash flow was improved.

TONLY

Table 14. Tonly: Financial Highlights, First Half, 2021-2022 (RMB Million)

	6 Months Ending June		
	2021	2022	% Change
Turnover			
- Wide Body Trucks	1,762.1	2,402.3	36
- Tunnel Trucks, and others	52.1	-	-
- Spare Parts	33.7	73.2	117
- Machine Services	1.2	2.1	75
- Others	31.9	53.5	68
Total	1,881.1	2,531.1	35
Operating Income (Loss)			
- Wide Body Trucks	326.5	402.2	23
- Tunnel Trucks, etc.	14.7	-	-
- Spare Parts	8.2	28.7	250
- Machine Services	0.9	0.1	-89
- Others	14.8	12.1	-18
- Tax, Costs and Depreciation	(164.0)	(197.6)	20
- Investment Earnings	3.4	-	-
- Asset Disposal and Others	0.9	7.9	778
Total	205.6	253.3	23
Net Profit	182.3	222.9	22

Source: Company Information

Shaanxi Tonly, a leading supplier of wide body trucks, posted a year-on-year rise of 35 per cent in its half-year turnover. The company attributed the growth to improving demand from the opencast coalmines that have been increasing their production capacities to meet increasing power demand. Export revenues also recorded a year-on-year rise of 30 per cent to RMB284.3 million, accounting for 11 per cent of turnover during the period.

However, the even faster rise in the cost for raw materials and wages has seen a significant deterioration in the gross margins of its key product line. The company imposed strict control on the rise in overheads, although R&D expenditures were increased substantially; on the other hand, growing sales have seen a rise of 80 per cent in the deterioration due to credit impairment. As a result, the company registered a year-on-year rise of over 20 per cent in profits.

Receivables continued to rise rapidly by 72 per cent, to RMB1.5 billion at the end of June. Although sales grew strongly, instalment or financial leasing are increasingly chosen by customers to pay, resulting in delayed payments and greater exposure to risk of default, for which the company had to increase the provisions for bad debts. On the other hand, inventories reduced by 1 per cent to RMB649 million. Net operating cashflow was doubled due to the strong sales, but with negative cashflow in investment and fund raising, the company reduced its holding of cash and cash equivalents.

Wide body trucks accounted for 95 per cent of the company's turnover in the first half of the year, and they also played a vital role in supporting profitability, although

gross margins were reduced to below 17 per cent during the period. With the funds raised from its IPO in 2021, a new manufacturing facility for production and R&D activities was scheduled to be completed by the end of 2021, but this has now been postponed to the end of October 2022, the result of pandemic lockdowns.

The subsidiary Xi'an Tonly Heavy Industry operates after-sales service and rental, and had revenues of RMB64.7 million in the first half of the year, with a net profit of RMB3.1 million.

In the light of the changing demand towards the application of new technologies, Xi'an MainFunc was set up in 2018, and this specialises in the R&D of autonomous operation, hybrid drive control, IOV and IOT, but had posted losses in the first half of the year. Another subsidiary, Tonly New Power, was registered in June 2022, for developing the electrification of its wide body trucks.

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