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## 2. Industrial Machine Sector

## 2.1. Machine tools

## 2.1.1 Supply and demand trend

#### (1) Outline

The amount of the production of machine tools in 2008 was \$1,249.1 billion, a decrease of 4.1% year on year for the first time in six years (based on the Ministry of Economy, Trade and Industry, "Annual Report of Machinery Statistics 2008"). According to the Japan Machine Tool Builders' Association, the amount of orders received, which had exceeded the result of the previous year for five consecutive years, stopped to top that in 2007 and amounted to \$1,301.1 billion. In the trend of export and import, the total amount of export was \$874.7 billion or a decrease of 1.9% from the previous year, and that of import was \$60.2 billion, suffering a sharp drop of 17.0% year on year (based on the Ministry of Finance, "Trade Statistics of Japan").

The machine tool industry in 2008 enjoyed favorable figures in the first half thanks to the good business results and positive capital investment of the industry in other countries. But in the second six months, affected by the global-scale recession started by the Lehman shock and also by the decreasing desire for capital investment abroad, the orders receipt, production and sales of machine tools showed a substantial decline.

#### (2) Production and demand

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		2002	2003	2004	2005	2006	2007	2008	Year-on-year ratio
Iron and steel/nonferrous metal		3,680	5,557	8,613	11,619	12,996	12,664	12,991	2.6
Metal products		9,732	15,209	22,067	22,641	21,030	21,582	19,218	-11.0
Machine manufacturers	General machines	120,190	160,512	264,502	302,287	330,108	319,284	248,456	-22.2
	(of which dies)	32,327	40,724	65,645	73,807	66,667	56,975	39,059	-31.4
	Electric machines	22,564	30,483	50,902	44,296	52,333	46,355	33,058	-28.7
	Automobiles	141,490	158,988	225,632	258,959	195,505	213,125	161,336	-24.3
	(of which automotive parts)	67,100	76,975	101,945	110,547	89,157	92,180	82,139	-10.9
	Shipbuilding and other transportation machines	14,287	12,074	17,328	23,942	27,066	29,796	30,798	3.4
	Precision machines	16,459	24,176	32,990	32,913	36,813	31,571	24,735	-21.7
	Subtotal	314,990	386,233	591,354	662,397	641,825	640,131	498,383	-22.1
Other manufacturers		14,197	24,507	37,643	33,333	37,719	34,794	21,099	-39.4
National/local governments/schools		2,125	1,873	1,842	1,588	2,100	2,072	2,199	6.1
Other demand sectors		610	1,644	2,971	6,081	8,368	8,164	7,973	-2.3
Trading firms/agencies		4,988	6,564	8,349	9,050	8,971	7,017	4,957	-29.4
Total, domestic demand		350,322	441,587	672,839	746,709	733,009	726,424	566,820	-22.0
Overseas demand		325,515	409,514	563,353	616,494	703,961	863,567	734,327	-15.0
Total amount of orders received		675,837	851,101	1,236,192	1,363,203	1,436,970	1,589,991	1,301,147	-18.2
of which NC machine tools		638,831	807,208	1,176,257	1,304,058	1,374,496	1,529,644	1,254,661	-18.0

#### Fig. 2.1.1 Orders received for machine tools by business category

Notes: 1. Figures for dies and automotive parts, which are included in those for general machines and automobiles, respectively, are shown in 2001 and after.

2. Due to rounding off, the total of year-on-year ratios is not 100.0 in some cases.

3. Figures with "-" are negative ones.

Source: Based on the Japan Machine Tool Builders' Association, "Handbook of Machine Tool Statistics."

The amount of orders for machine tools, which had been more than that in the previous year for five years running in 2007, fell by 18.2% in 2008 with \$1,301.1 billion. Due to the worldwide recession caused by the Lehman shock, businesses cut down their capital investment in machines, resulting in a substantial fall in demand for machine tools, which are known as the mother machines. Both domestic and overseas demand showed a great decrease: while domestic demand was \$566.8 billion or a decline of 22.0% year on year, overseas demand, which had contributed to increases in orders formerly, was \$734.3 billion, a fall of 15.0% (Fig. 2.1.1). In late 2006, overseas demand began to exceed domestic demand and in 2007, accounted for over a half (54.3%) of the total orders received. This figure rose to 56.4% in 2008, a rise of two percentage points (Fig. 2.1.2).



Fig. 2.1.2 Trend of the amount of orders received for machine tools

Source: Same as that for Fig. 2.1.1.

By business category, the orders received for domestic demand decreased in almost all business sectors: general machines (\$248.5 billion, down 22.2% year on year), electric machines (\$33.1 billion, down 28.7%), automobiles (\$161.3 billion, down 24.3%) and precision machines (\$24.7 billion, down 21.7%) (Fig. 2.1.3). Only the business category that achieved positive result was transportation machines, including aircraft and shipbuilding, with \$30.8 billion or an increase of 3.4%. It is supposed that expectations for the aircraft industry, as those for MRJs (Mitsubishi Regional Jets), small passenger jet developed by Mitsubishi Heavy Industries, led to an increased introduction of machine tools.



Fig. 2.1.3 Orders received for machine tools of the manufacturing industry by business category

The amount of production of machine tools in 2008 was \$1,249.1 billion or a decrease of 4.1% from the previous year, putting an end to the rising trend recorded in the previous five years just as seen in the case of the trend of orders received (based on the Ministry of Economy, Trade and Industry, "Annual Report of Machinery Statistics 2008"; Fig. 2.1.4).





Source: Based on the Ministry of Economy, Trade and Industry, "Annual Report of Machinery Statistics."

Source: Same as that for Fig. 2.1.1.

The production of machine tools in 2008 experienced a year-on-year decrease for almost all product types excluding special-purpose machines: lathes ( $\pm$ 307.8 billion, down 0.9% year on year), grinding machines ( $\pm$ 137.3 billion, down 2.7%), gear cutting machines and gear finishing machines ( $\pm$ 30.2 billion, down 3.5%), special-purpose machines ( $\pm$ 129.7 billion, up 0.4%), machining centers ( $\pm$ 371.1 billion, down 8.9%) and other metal machine tools, including numerically controlled (hereinafter "NC") drilling machines, NC boring machines and NC electric discharge machines ( $\pm$ 273.6 billion, down 3.4%). The production of machining centers showed an especially great decline: that of vertical machining centers fell as much as by 19.9% from the previous year ( $\pm$ 114.8 billion) and small type vertical machining centers with a back and forth stroke of less than 500mm suffered a considerable decline of 22.6% year on year ( $\pm$ 43.5 billion). The number of machine tools produced was more than 900 units until the third quarter (1,054 in the first quarter, 986 in the second quarter and 909 in the third quarter) but greatly decreased to 555 units in the fourth quarter (October to December) of 2008, indicating the serious impact of the Lehman shock.

## (3) Export and import

The amount of the export of machine tools in 2008 was ¥874.7 billion or a fall of 1.9% from the previous year, while that of import was ¥60.2 billion, a substantial decline of 17.0% year on year (Fig. 2.1.5).





By the destination of Japan's exports, the U.S. is the largest importer accounting for 23.6%, followed by China with 18.5% and Germany with 6.5%. The export to the U.S. was  $\pm$ 206.2 billion or an increase of 3.8% over the previous year, making the country an export market on a  $\pm$ 200 billion mark again after the figure had decreased in 2007. The export to China amounted to  $\pm$ 161.8 billion

Source: Based on the Ministry of Finance, "Trade Statistics of Japan."

or a decline of 3.3% year on year, ending the rising trends in the previous several years. The top exports in amount were machining centers with \$298.1 billion (34.1% of the total machine tool export; up 1.5% year on year), accompanied by lathes with \$249.5 billion (28.5%; down 3.9%). The figure for horizontal machining centers was especially high, reaching \$183.1 billion or 20.9% (up 1.9%).

The import of machine tools into Japan from Germany in 2008 was the largest, amounting to \$13.3 billion and accounting for 22.1% of the total, but decreased by 27.0% from the previous year. Germany was not only the country having a considerable fall of machine tool; the U.K. (\$0.76 billion, down 89.2% year on year), France (\$0.54 billion, down 50.0%) and the U.S. (\$5.87 billion, down 40.7%) also experienced a decline over 40%. The import from the U.S., which was the largest in 2006, changed violently; the figure was \$9.89 billion in 2007, a sharp decrease of 86.0% from 2006 when it was \$70.7 billion, and fell by 40.7% in 2008. This suggests that the vitality of the U.S. machine tool market has declined. The import of electric discharge machines recorded the largest amount of \$8.57 billion (14.2% of the total, down 23.5%).

#### 2.1.2 Results of operations and the trend of the machine tool industry

## (1) Trend of management and overseas business activities

Figure 2.1.6 shows the share of machining center and NC lathe manufacturers in the domestic production.

The domestic output of machining centers in 2008 amounted to ¥371.1 billion, a year-on-year decline for the first time in six years. The top five manufacturers in terms of domestic production estimated by Nihon Keizai Shimbun, Inc. all had the same ranking as in 2007. The domestic production of NC lathes was ¥302.7 billion, a decrease for the first time in six years as in the case of machining centers.



# Fig. 2.1.6 Share of machining center and NC lathe manufacturers in the domestic production

Note: The share figures are those estimated by Nihon Keizai Shimbun, Inc.

Source: Based on the "Nikkei Sangyo Shimbun," August 13, 2009 (for machining centers) and August 12, 2009 (for NC lathes).

Unit<sup>.</sup> ¥ million

The trend of management of the main listed machine tool manufacturers was as summarized below (Fig. 2.1.7):

Okuma, which ranked second in machining centers and third in NC lathes, was deeply affected by the worldwide fall in demand: the company's sales in 2008 were ¥167.4 billion (down 21.7% year on year) and its operating profit, ¥12.0 billion (down 60.3%). In particular, the sales in the third and fourth quarters of 2008 were the lowest after October 2005 when Okuma merged with Okuma Howa Machinery Ltd., and the company suffered a decrease both in earnings and profits for the first time in six quarters.

Okuma's sales were ¥82.4 billion (down 23.6% year on year) for machining centers and ¥42.0 billion (down 23.9%) for NC lathes, and its sales of compound processing machines and NC grinding machines had also negative growth (for the year ended in March 2009; consolidated). It is supposed that because Okuma had many customers in the general machine and automotive industries, the slackening in growth observed in these sectors greatly affected Okuma's performance. In overseas markets, too, the company experienced a rapid decrease in orders received as in the domestic market, due to declining demand in developing countries, mainly China, Russia, India and Brazil, which had led an expansion in overseas demand.

The sales of Mori Seiki, which gained third in machining centers and second in NC lathes, were \$157.2 billion in 2008 or a fall of 22.3% from the previous year, while its operating profit was \$5.92 billion, a sharp decline of 81.1% year on year (for the year ended in March 2009; consolidated). As in the case of Okuma described above, Mori Seiki had nearly 25% of its customers in automobile, two-wheel vehicle and other transportation machine industries and so was greatly affected by the decline of these industries. Makino Milling Machine, the fourth-ranking machining center manufacturer, suffered a decrease in sales (\$100.4 billion, down 24.4%) and an operating loss of \$0.26 billion (an operating profit of \$14.6 billion in the previous year) (for the year ended in March 2009; consolidated), too. Thus all of the major manufacturers were obliged to reduce their production.

	Japan	Asia	Europe	Americas	Eliminated or intercompany sales	Consolidated 2007	Consolidated 2008	2007/2008	
Okuma	152,660	11,792	28,211	32,871	-58,166	213,827	167,368	-21.7%	
Mori Seiki	142,236	5,027	47,087	30,971	-68,119	202,260	157,202	-22.3%	
Makino Milling Machine	103,986	23,471	12,370	26,633	-66,107	132,739	100,353	-24.4%	

Fig. 2.1.7 Sales of main machine tool manufacturers by region (consolidated)

Note: The classification method of regions differs from company to company but the regions were roughly divided into four here: Japan, Asia, Europe and the Americas.

Source: Based on the brief statements of accounts of the machine tool manufacturers.

From the viewpoint of overseas business activities, the business and capital cooperation between Mori Seiki and Gildemeister AG in Germany was an event deserving special mention. Guildemeister is a top machine tool manufacturer in the machine tool market in Europe and has diversified its products. In particular, the company is strong in compound processing machines, machining centers and lathes, internally produces spindle motors, ball screws and other main machine tool products and is characterized by the vertical integration of products. Mori Seiki says that it will be able to build a complementary relationship in the global market by cooperation with Guildemeister in regions and products. If the sales of the two companies are added up, the amount will be the largest one in the world.

#### (2) Technological innovation and the business environment

Okuma completed the integrated production system of double housing machining centers at its fourth and fifth plant in Kani, Gifu Prefecture, and strove to raise the productivity of this type of machining centers in which the company is strong. In May 2008, the company constructed a new distribution center in its head office and plant premises, where it is working to optimize its supply chain management (SCM). In addition, in January 2009, to cope with a rapid decrease in orders, Okuma temporarily suspended the operation of its Konan plant in Aichi Prefecture, one of its three domestic plants, shifting to a concentrated production at other two plants. Internationally, the company established strategies suitable for the management environment of each region; in the Americas, it took steps to secure large-scale contracts in the aircraft sector and reinforced sales to the medical appliance field, while in Asia, it developed business bases in India and defined Thailand as the control center of the ASEAN.

Mori Seiki is promoting "PQR555," the second medium-term management plan for the three years from 2008 to 2010. The basic policies of the plan are "to continue the growth policy by realizing stable growth in mature markets and working on positive expansion in market share in emerging markets" and "to establish a global management system by pursuing a higher level in human resources, quality and risk management." While the company aims at a stable growth in mature markets, including Japan, Europe and the Americas, it plans to achieve a yearly growth rate of 25% in emerging markets represented by BRIC.

As noted above, in the situation where capital investment intention is sluggish in Japan, the machine tool manufacturers lay stress on plans to expand their business abroad. In particular, they will focus on general-purpose machine tools different from products in the past intended for the markets where small-sized and low-price cars are key words, such as India on which the automotive industry, the major market for machine tool manufacturers, places hopes as a promising future market.

In the introduction of new products, Mori Seiki developed a high-precision and highly efficient compound processing machine (NT6600 DCG) and a vertical machining center (MV-1003L) for long and large-diameter parts in answer to a rising demand for larger and more productive machine tools in the field of resources, wind power generation, aircraft and railroads. Demand for machine tools in these fields is likely to remain great in 2009 and after, and other machine tool manufacturers will adopt similar strategies, too.

#### (3) Future prospects and problems

In 2009, uncertain economic prospects will remain and orders will tend to be inactive both in domestic and overseas markets. The level of orders for machine tools continued to record historical lows even in 2009 with no good prospect for recovery, thus it is considered by most insiders that the amount of orders received will continue to decrease in 2009, too.

Yamazaki Mazak took steps to cope with declining orders; for example, it began in July 2009 to suspend plant operation and give education to its employees on Fridays ("Nikkan Kogyo Shimbun," September 14, 2009). Like this, it is expected that many manufacturers will adjust or stop plant operation in order to deal with considerable fall in orders in 2009.

On the other hand, it is considered that the customer market of machine tool manufacturers will change, too; it may expand from the field of automobiles, semiconductors and the like to wind power generation and other new energy industries and the aircraft industry. As seen in the case of Okuma that strengthened measures for large-scale business talks in the aircraft field in the Americas, Japanese machine tool manufacturers will increase sales and service networks in the areas of their customer mixes in addition to efforts to develop new products. It is also expected that the division of machine tools and main machine tool manufacturers will become clearer according to the field of manufacturing industries on which countries place particular stress, and Japanese manufacturers will continue positive activities overseas in the foreseeable future.

#### 2.2. Forming machines

## 2.2.1 Supply and demand trend

## (1) Outline

The amount of production of forming machines in 2008 was ¥211.6 billion or a small increase of 0.7% over the previous year, showing a state of leveling-off (based on the Ministry of Economy, Trade and Industry, "Annual Report of Machinery Statistics 2008"). According to the Japan Forming Machinery Association, the orders received amounted to ¥275.8 billion or a decrease of 10.3% year on year, making a sudden change from 2007 when the amount was ¥307.5 billion, recording a figure over ¥300 billion for the first time in 16 years after 1991. The upward trend that started in 1995 ended.

The amount of export totaled to \$157.7 billion or a small growth of 0.8% year on year and that of import was \$16.7 billion, showing a considerable fall of 10.7%.

#### (2) Production and demand

The trend of production of forming machines is as shown in Figure 2.2.1. By the type of machine, almost all machines had a small increase or decrease. A higher growth rate was recorded by forging machines (¥13.2 billion, up 31.0% year on year) and wire forming machines (¥13.4 billion, up 30.4%). Mechanical presses had the largest portion of the production amount of all the machine

types and their output was \$139.8 billion (down 3.6%), which was smaller than in 2007 when the production was over \$140.0 billion. The performance of other types of forming machines differed according to the type: bending machines (\$12.1 billion, down 7.8%), hydraulic presses (\$26.7 billion, up 3.1%), shearing machines (\$6.4 billion, up 10.4%) and forging machines (\$10.1 billion, up 16.6%).



Fig. 2.2.1 Trend of the amount of production by main type of machine

Source: Based on the Ministry of Economy, Trade and Industry, "Annual Report of Machinery Statistics."

According to the size of mechanical presses having the largest portion of the amount, the amount of production in 2008 was ¥40.7 billion (down 16.4% from the previous year) for small mechanical presses less than 100t, ¥25.3 billion (up 15.7%) for medium-sized mechanical presses 100t or more but less than 500t and ¥73.8 billion (down 0.8%) for large mechanical presses over 500t. Of mechanical presses, the production of NC machines was ¥26.3 billion (down 19.4%) and that of NC punching machines, ¥12.9 billion (down 31.2%). In hydraulic presses, too, the output of NC hydraulic presses (¥10.6 billion) decreased by 12.4% year on year. Thus it can be pointed out that the ratio of NC machines to the production of forming machines has been declining.

Next, let's observe the changes in year-on-year ratios of orders for forming machines from the survey results on the business performance of the regular member manufacturers of the Japan Forming Machinery Association (Fig. 2.2.2). The amount of orders received in 2008 was \$275.8 billion (down 10.3% year on year), of which orders for press-type forming machines totaled to \$179.1 billion (down 11.6%) and those for sheet metal-type forming machines, \$96.7 billion (down 7.9%). While orders for press-type forming machines continued to fall off after 2006, those for sheet metal-type ones were about twice that in 2002 (\$45.7 billion) when it was considered that orders

reached the bottom but were less than orders in the previous year for the first time in six years, stopping the trend of expanding orders.



Fig. 2.2.2 Amount of orders received of forming machines

 Note:
 Some data differ from data in the 2008 edition because the source is different.

 Source:
 Based on the "Trend of Orders Received of All the Members of the Japan Forming Machinery Association" on the Association's website.

## (3) Export and import

The export of forming machines in 2008 amounted to \$157.7 billion or an increase of 0.8% over the previous year. By the type of machines, the export of pressing machines, which accounted for about 30% of the total export, was \$52.8 billion or a growth of 4.4% year on year, and that of forging machines and other die-stamping machines was \$22.5 billion or a year-on-year increase of 2.5%. Especially noteworthy was the growth rates of non-NC machines exported: the export amount of non-NC machines, such as bending machines, folding machines, straightening machines and flattening machines (including presses) was \$8.1 billion (up 24.8%; cf. \$9.7 billion and up 17.6% for NC machines); that of shearing machines (including presses and excluding punching machines and compound shearing machines) was \$2.9 billion (up 41.8%; \$1.6 billion and up 12.3% for NC machines); and that of punching machines and notching machines (including presses and compound machines). The export of non-NC forming machines had tended to decline in 2007 and before, but it is supposed that demand for these less expensive and multi-purpose machines increased in 2008.



Fig. 2.2.3 Trend of export and import of forming machines

Source: Based on the Ministry of Finance, "Monthly Trade Statistics of Japan."

The import of forming machines in 2008 amounted to \$16.7 billion or a decrease of 10.7% year on year. While the import of forging machines and die-stamping machines was \$4.8 billion and achieved a considerable year-on-year increase of 45.3% and that of hydraulic presses, \$2.0 billion (up 11.9%), the import of other main forming machines suffered a sharp decrease: that of NC punching machines and notching machines was \$1.3 billion or a fall of 40.3% year on year, and that of NC shearing machines, \$0.15 billion or a decrease of 80.6%. The amount of import of forming machines in the months of 2008 was smaller than that in the months of 2007 except in May, June and September; especially in October when the Lehman shock received much attention, the decrease ratio of import reached 44.8%. These figures suggest that businesses reduced their capital investment due to the cooling-down of the economy.

#### 2.2.2 Results of operations and the trend of the forming machine industry

#### (1) Trend of management

The results of operations of forming machine manufacturers are as summarized below:

The sales of Amada Co., a major manufacturer of sheet metal machines, were \$225.8 billion or a substantial decline of 20.6% from the previous year (for the year ended in March 2009; consolidated). Those of the company's sheet metal segment were \$166.7 billion or a drop of 20.6% year on year, and those of its press segment, \$8.5 billion or a decline of 32.6%.

By region, the ratio of the company's sales overseas exceeded its sales in Japan first in 2007 and was higher than that of its domestic performance in 2008, too: ¥100.6 billion in Japan and

¥125.1 billion overseas. The sales diminished both at home and abroad, by 25.7% and 15.8%, respectively, and the overseas sales amounting to ¥33.7 billion fell most in Asia, by 21.7%.

The observation of Amada's business activities indicates that the company is trying to expand its strong brand power as a major sheet metal manufacturer into the brand name of a comprehensive manufacturer of metal working machines. In November 2008, the company established a new solution center in Chicago, the U.S., for the "purpose of realizing efficient business in the eastern part of the U.S., mainly in Chicago where automobile, semiconductor, aircraft and other main industries are concentrated."<sup>1</sup> In the North American market, Amada used to carry out its business activities through Amada America in Los Angeles, its local subsidiary. But considering the fact that "(1) as a result of the burst of IT bubbles in 2001, IT industries in the west coast of the U.S. shifted their activities to China and Mexico and that 70% of the demand for sheet metal exists in the Midwest and eastward, that "(2) housing, food, security, medical appliance, transport plane, farm machines and tools and other domestic demand-led and machinery industries in the U.S. are concentrated in Chicago and its environs" and that "(3) under these situations, the manufacturer will have to meet the need not only for precision working but also for medium thick sheet working and diversification of processing shapes and will be able to estimate a promising market mainly in laser in the future," the company says it plans to continue its business activities in the U.S. at Loa Angeles in the west coast and Chicago in the Midwest. These strategies pay attention to the largest customer market for forming machine manufacturers and give much information to the industry where providing after-sales service at the location near the customer is regarded as very important.

Aida Engineering, a leader in press machines, also experienced a negative growth of 5.9% from the previous year with sales of  $\pm 60.7$  billion (for the year ended in March 2009; consolidated). The company stated that a marked slowdown in capital investment demand at home and abroad, mainly in the automobile and related industries that are the users of press machines, was an important cause of the fall in sales and that they were faced with an "adverse business environment"<sup>2</sup> in the second half of the year where the cancellation of orders and requests for postponement of delivery came one after another. It reported that its sales in the Americas were  $\pm 12.7$  billion or a fall of 20.5% year on year because the decrease in earnings was especially sharp in the market and capital investment in Japanese automobile-related industries in the region, which had been active in 2007, ended for the time being.<sup>3</sup>

#### (2) Technological innovation and the business environment

The worldwide recession started by the financial crisis in the U.S. is expected to become more serious in 2009 as in 2008, and forming machine manufacturers will face greater difficulties because they are seriously affected by the situation of the equipment and machine industry. In particular, unless automakers and other main user industries make a move to resume capital investment, no sign

<sup>&</sup>lt;sup>1</sup> Quoted from Amada Co., "Press Release," November 5, 2008.

<sup>&</sup>lt;sup>2</sup> Quoted form Aida Engineering, Ltd., "Brief Statement of Accounts" for the year ended in March 2009.

<sup>&</sup>lt;sup>3</sup> Sales in other regions: ¥43.2 billion (down 7.9%) in Japan, ¥12.7 billion (down 0.9%) in Asia and ¥11.6 billion in Europe (down 6.2%).

of recovery of orders is likely to be seen. But although the waves of recession have hit the world heavily, automakers have positively entered China, India and other emerging markets in succession, and there is the possibility that orders will increase in the markets different from those in the past. Aida is greatly dependent on the production trend of the automobile industry because it is estimated that 70% of its products are those for cars, and it could be supposed that the regions mentioned above will have high ratios of Aida's total sales in 2009.