

Current Status and Future Prospects of Taiwan Machine Tool Industry

Bryan CHEN

CEO, President of Yeong Chin Machinery Co., Ltd.

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Abstract

Machine Tool is called “The Mother of Industry”. Even with the lack of strong support of domestic specific industries for machine tool such as automotive and aerospace industries. Taiwan has become the world’s 4th largest exporter at the end of 2013. 95% Taiwan machine tool builders (M.T.Bs) are SMEs. The experience of Taiwan machine tool industry is remarkable. In spite of facing the fierce competition and challenges, the cluster advantage and synergy from strategic alliance create unique Taiwan’s advantages. This paper aims to provide some perspectives for both operation and future product development of Taiwanese MTBs based on their strength and weakness.

Keywords: Taiwan, Machine Tool builders, Cluster advantage, M-team, supply chain, SMEs

1. Market Overview

Taiwan is one of the most important machine tool industry that has its own brands for international marketing. Taiwan has become the 7th largest producer and the 4th largest exporter in the world at the end of 2013 (see Table 1). The Taiwan machine tool industry is based on many small and medium enterprises. More than 95% manufactures are small and medium enterprises and they are mostly located in the central Taiwan, Taichung. As their benefit, machine tool builders (M.T.Bs) and component makers form a short supply chain. Most small and medium enterprises mainly dedicate to assembly, or machinery and maintenance business for specific industry, or for cooperation with equipment manufactures and downstream applications. Generally speaking, very few M.T.Bs can manufacture both upstream components and machine tools.

Taiwan's machine tool industry is typical export-oriented. Take the year 2013 for example (see Table 2). Taiwan's machine tool export dependence is 78.2%.

As we can see in Table 2, Taiwan, Italy and Japan markets are highly exported-oriented. South Korea and the United States are moderately export-oriented, while China is less export-oriented.

Regarding import dependence in 2013, for example, leading countries for machine tools such as Japan, South Korea and Germany, have a strong export value, yet very low proportion of imports (see Table 3). Their machines are mostly homemade, thus have higher competitiveness in the domestic market. Presently in Taiwan, 39% of users use imported machine tools (see Table 3). In electronics and automotive industries, it is required to use high-end machine tools to manufacture more sophisticated and complex equipment, which are mostly imported from Japan, Switzerland and Germany. Therefore, improving product quality of machine tools to meet needs of precise manufacturing has been an urgent and important demand in the Taiwan industry.

Table 1 Performance of Global Machine Tool Industry in 2013

Rank	Production			Consumers			Export			Import		
	Country	\$-Millions	Annual Growth (%)	Country	\$-Millions	Annual Growth (%)	Country	\$-Millions	Annual Growth (%)	Country	\$-Millions	Annual Growth (%)
--	Global	848.9	-9.90%	Global	755.1	-8.80%	Global	449.4	-9.70%	Global	355.7	-12.60%
1	China, P. Rep.	249.8	-10.80%	China, P. Rep.	113.6	-12.20%	Germany	104.9	0.20%	China, P. Rep.	103.0	-24.60%
2	Germany	146.9	6.20%	United States	80.4	-9.00%	Japan	89.3	-32.10%	United States	52.6	-10.60%
3	Japan	123.3	-32.40%	Germany	70.7	8.40%	Italy	45.5	2.80%	Germany	28.7	-7.70%
4	Italy	57.1	1.90%	South Korea	44.8	0.30%	Taiwan	35.5	-16.20%	Mexico	20.0	12.5%
5	South Korea	53.1	-3.30%	Japan	42.0	-29.10%	China, P. Rep.	28.1	2.60%	Russia	16.2	-8.10%
6	United States	49.6	-0.50%	Mexico	22.5	8.40%	Switzerland	27.0	-5.40%	Brazil	14.9	3.60%
7	Taiwan	45.4	-16.20%	Italy	20.8	0.30%	South Korea	22.2	-13.10%	South Korea	13.9	-7.10%
8	Switzerland	31.3	-4.70%	Russia	16.8	-11.50%	United States	21.8	3.40%	Turkey	11.6	4.00%
9	Spain	12.2	11.30%	Brazil	16.3	-11.10%	Spain	11.1	10.50%	France	9.2	-4.80%
10	Austria	11.0	9.40%	Taiwan	14.4	-11.50%	Belgium	9.5	4.30%	Italy	9.2	4.90%

Source: Gardner Publication Inc.(2013) (1) sorted by Precision Machinery Research and Development Center, Taiwan

Table 2 2012-2013 World Machine Tool Export

Unit: \$-Millions						
Rank	Country	2013 Export	2012 Export	Annual Growth	2013 Export Proportion of Production Value	Global Share
1	Germany	10,491.2	10,474.1	↑ 0.16%	71.43%	23.3%
2	Japan	8,927.3	13,138.4	↓ -32.1%	72.42%	19.9%
3	Italy	4,548.4	4,424.4	↑ 2.8%	79.65%	10.1%
4	Taiwan	3,548.0	4,236.0	↓ -16.2%	78.20%	7.9%
5	Switzerland	2,697.5	2,851.3	↓ -5.4%	86.21%	6.0%
6	China, P. Rep.	2,810.0	2,740.0	↑ 2.6%	32.14%	6.3%
7	South Korea	2,216.0	2,551.0	↓ -13.1%	41.76%	4.9%
8	United States	2,178.7	2,106.4	↑ 3.4%	43.96%	4.8%
9	Spain	1,112.0	1,006.0	↑ 10.5%	91.25%	2.5%
10	Austria	952.2	912.9	↑ 4.3%	293.89%	2.1%
	Others	5,459.5	5,311.6	↑ 2.8%		12.1%
	Total	44,940.8	49,752.1	-9.7%		100.0%

Source: Taiwan Machine Tool & Accessory Builders' Association, April.2014. (4) (6)

Table 3 2012-2013 World Machine Tool import

Rank	Country	2013 Import	2012 Import	Annual Growth	2013 Import Proportion of Consumption
1	China, P. Rep.	10300.0	13,660.0	↓ -24.6%	90.6%
2	United States	5262.4	5,883.4	↓ -10.6%	65.5%
3	Germany	2868.5	3,109.1	↓ -7.7%	40.6%
4	Mexico	2002.2	1,780.5	↑ 12.5%	89.2%
5	Russia	1618.1	1,760.8	↓ -8.1%	94.5%
6	Brazil	1488.1	1,435.8	↑ 3.6%	88.9%
7	South Korea	1386.0	1,492.0	↓ -7.1%	31.0%
8	Turkey	1162.0	1,117.4	↑ 4.0%	83.0%
9	France	923.0	969.5	↓ -4.8%	92.3%
10	Italy	916.3	873.1	↑ 4.9%	44.1%
13	Japan	797.4	771.5	↑ 3.4%	19.0%
16	Taiwan	640.0	647.0	↓ -1.1%	39.3%
	Others	6046.9	7,119.3	↓ -15.1%	
	Total	35,410.9	40,619.4	-12.8%	

Source: Taiwan Machine Tool & Accessory Builders' Association, April.2014. (4) (6)

2. Features of Taiwan Machine Tool Industry

70% to 80% of Taiwan machine tools are exported. As for Japan, South Korea and China, they have strong backup from automotive industry and domestic market. With the lack of the support from domestic market and specific industry for machine tools and component industry, Taiwan has developed a comprehensive marketing strategy to survive in global foothold. It is rare and worth knowing. The following summarizes the characteristics of Taiwan's machine tool industry.

2-1 Mainly located in central Taiwan

More than 70% of M.T.Bs are located in central Taiwan. The cluster effect is obvious. With the promotion of "Central Taiwan Precision Machinery Innovation Development community" by the government, machine tools, mold and components makers form a research alliance. In addition, the establishment of Taichung City Precision Machinery Innovation Technology Park and Chiayi Dapumei Precision Machinery Park has become a corridor of machinery.

2-2 Complete supply chain

Except for electronic control equipment that are mostly imported, domestic manufacturers can quickly supply complete products for steel, cast iron components, transmission components, precision bearings and other components.

2-3 Exported Oriented and highly rely on Mainland China

As shown in Table 1, Taiwan Machine Tool industry is high export dependent. Therefore, competitiveness of the industry is drastically affected by the foreign exchange rate fluctuation. Besides, China accounts for 33.6% of Taiwan Machine Tool export. (2)

2-4 Medium and small enterprises are major

There are more than 1,500 M.T.Bs in Taiwan, and most of them are small and medium enterprises. With 98% of them have less than 100 employees. With limited financial resources and low number of employees, talent recruitment is not easy at all. Even the biggest domestic manufacturers in Taiwan reach the medium-size turnover in the international market.

2-5 Industry Village – unique competitiveness

Taiwan machine tool industry is composed of major factories and components plants in central Taiwan. With the unique and complete supply chain in the world, Taiwan has been considered to be one of the most competitive countries. Through division of labor, it not only effectively reduces the amount of investment by M.T.Bs but also greatly improves efficiency. The large-scale component makers can also export after supplying to the M.T.Bs their products, with the increase in export volume, economies of scale are also expanding. This is an advantage for components industry.

Resource, scale, research and development capacity of Taiwan's small and medium enterprises cause the lower competitiveness against rival international companies. Yet, M.T.Bs are more dependent on subcontractors' specialization. According to a research by Industrial Economics and Knowledge (IEK) (3), M.T.Bs not only directly use key components, but also rely on outsourcing; OEM accounts for 66% of operating costs (direct materials for 54%, OEM for 12%). It is a critical issue to help subcontractors reduce inventory in order to avoid excessive industrial division, which may cause "Bullwhip effect" in cooperation and collaboration system. These are what manufacturers urgently need to improve. For this reason, five main domestic M.T.Bs set up an alliance to expand the industrial strength.

2-6 "M-Team" of Taiwan Machine Tool Industry

Although Taiwan machine tool builders are the fourth largest exporter in the world, with affordable products, complete network of labor division and customization capabilities, Taiwan is threatened by the external and internal environment as shown in Table 4.

In view of the above-mentioned environmental threats, difficulties, and global competitive pressures, Taiwan's major M.T.Bs realize the importance of effective integration of the supply chain to enhance the global competitiveness of Taiwan's machine tool brands. Since 2006, with the guidance of Industrial Development Bureau, Ministry of Economic Affairs, and Corporate Synergy

Development Center (CSD), the two leading M.T.Bs, Yeong Chin Machinery (YCM) and Victor Taichung, together with 18 subcontractors, jointly execute "Dual-core M.T.B. Collaboration Plan" (M-Team). For promoting 5Sⁱ, Total Productive Management (TPM) and Toyota Production System (TPS) have been implemented to reduce waste, to improve quality and to shorten delivery. Through mutual cooperation and linkage of various divisions, M.T.Bs and subcontractors work together to achieve the goal of "high-quality, accurate delivery."

Table 4 Threats and Dilemmas of Taiwan Machine Tool

External Environmental Threats	Internal Environmental Dilemma
1. Raw material's price has increased, which reduces manufacturers' profit and thus spoils cost advantage.	1. Small-scale enterprises, inadequate capacity of developing key technologies
2. Tax-free threshold has increased for exporting machine tools. ECFA early harvest list did not open major products	2. Professional and technical personnel are grossly inadequate
3. Fierce price competition for low-end products	3. Shortage of international professionals
4. High International market competition in this industry, powerful international firm size and finance	4. Offshore migration of industry, losing cluster advantages
5. Rapid rise of China machine tool industry	5. Lack of research and innovation, making the product difficult to upgrade
6. Bilateral and regional Signed Free Trade Agreement threatens Taiwan's competitiveness	6. Rapid growth of component manufacturers, gradually reducing dependence on the M.T.Bs
	7. High product homogeneity increases, price competition, less differentiated products
	8. The accuracy and lifetime of components are not as good as products from abroad, thus key components are relied on import.
	9. The proportion of using domestic machinery by local high-tech industries is still low.
	10. Excessive dependence on export, especially on China (over 30%).

Source: organized by this research

Since 5 core M.T.Bs of M-Team have grown in strength, 29 professional module factories like Keyarrow and Habor, 5 components makers and 9 process service providers

(see Table 5) have joined afterwards. After above-mentioned manufacturers signed contracts with Synergy Development Center, this alliance covers important and key component makers. This is to enhance quality, to shorten delivery, to reduce inventory, and then to create competitiveness of Taiwan machine tool industry alliance.

Table 5 M-Team Member

Manufacturer	Affiliated Subcontractor
Victor Taichung Machinery Works Co., Ltd.	Chen Sound, Avex Technology, Weiyu Machinery, Keyarrow, Tai-Wen Precision, Carrier-Tech, Tyfer Industrial
Yeong Chin Machinery Co., Ltd.	Deta, Gifu, Dex, Habor, Fongei, Keyarrow, Joyful, Tien Ding
Tongtai Machine & Tool Co., Ltd.	Auto Cam, GSA, Defender, Dashing, Saynen, HSL
Litz Hitech Corp.	Royal, Spintech, Abontech, PMI, Keyarrow, Ju Jiang, Jyh Shen, Kiwa, Tanshing
Quaser Machine Tools Inc.	Keyarrow, Jea Sheng

Source: organized by this research

Through the integration of system resources and advantages of regional industry clusters to create business values, the effectiveness in the machine tool industry have been improved. In the future, as this basis for vertical integration and horizontal development, the supply chain will be enriched sound and perfect.

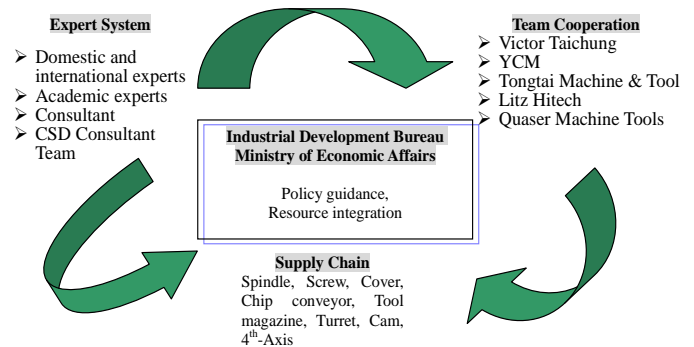


Figure 1 M-Team Composition System (Source: organized by this research)

3. Conclusion and Opportunities

The average quality level of Taiwan machine tools is nearly close to that of Japanese or German machine tools. Yet, basically the Cost Performance Index of Taiwan is comparable to Europe, America and Japan. What we have to do is to enhance the stability of quality and to develop high precision, high speed, and large machines with high-end technology.

First, Taiwan's industry should strive for end-market demands (automotive, transportation, aerospace, energy and mechanical equipment) to develop the entire line-ups of machine tools, to upgrade technology capabilities and to expand their enterprise scale. Domestic machine tool industry should continue to develop high-end and perspective products, to create application technology to offer a complete solution for customers. This is to cope with the challenges of present and future market.

As for higher-value markets, such as high-precision, high-performance and high-speed applications, now the policy is to promote "intelligent machining service centers." By improving product design capability and innovative production value, with strengthened global sales and service, Taiwan machine tool industry will become one of the world's best choice.

Second, it is crucial to cultivate highly qualified technical manpower. At present, more and more top universities have been involved in machine tool related researches. In addition, with many professional and experienced experts' consulting and industry cooperation, we enthusiastically invest in personnel training to improve product performance.

Third, as for low-end machine tool market, Taiwan would need to be aware of the competition from emerging industrialized countries (South Korea, China). Due to professional division of labor and flexible adaption traits of Taiwan machine tool industry, most products and components are outsourced. M.T.Bs and components supplier cooperate with each other. However, how the Taiwan machine tool industry maintains its current competitiveness is a primary issue.

Fourth, Taiwan machine tool export is too much relied on China (over 30%). Government authority ought to cooperate with other economic systems or industries to actively expand market and to diversify market risk.

Lastly, in mediate machine tool market dominated by Europe, Japan and the U.S.,(5) strengthening the development of high value-added products has become an important issue for Taiwan M.T.Bs. According to 2013 export statistics of Taiwan machine tools (6), the export value gap between Taiwan and Italy has widened up to US\$ 1 billion. It shows that Taiwan should not only consider price and cost, but also think about how to improve the product added value, customization and differentiation. In addition, strengthening end-user service (machining application and intelligent application) and gradually breaking through the bottleneck of key components provide integrated solution for end-markets.

Reference:

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