

## **Real State of Mold & Die Industries in Asia and Their Relationship with Japan's Mold & Die Industry**

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This chapter deals with the issue of “how to develop mold and die industries in Asia.” Section 1 introduces the activity of the international associations. Section 2 presents the rough picture of the real state of mold and die industries in Asia. Section 3 examines various issues concerning with the cooperation efforts for the development of these industries in Asia and makes some proposals.

### ***1. International Mold and Die Associations***

#### ***1.1. FADMA (Federation of Asian Die & Mould Associations)***

FADMA was set up in 1992. Preparations for its establishment were started in the latter part of 1990. A question of the admission of China and Taiwan to the Federation was solved by inviting both to be members. This reflected the fact that Taiwan is a major supplier, while China a major consumer. The compromise reached was to register Taiwan as Chinese Taipei.

1st term 1992-1995 (Presiding nation: Japan, Mr.Kuroda)

2nd term 1995-1997 (Presiding nation: Japan, Mr.Kamiya)

3rd term 1997-2000 (Presiding nation: Taiwan)

The present membership comprises 11 nations: Japan, South Korea, Taiwan, Hong Kong, China, Malaysia, Singapore, Thailand, the Philippines, India, and Indonesia.

Present executive:

Honorary President: Mr.Shoichi Kuroda (independent)

President: Mr. William II. Chi (Taiwan)

Vice President: Mr. Anil C. Kilachand (India)

Treasurer: Mr. Hsu Tung Ming (Singapore)

The list of nations that are likely to join in the near future includes Australia, Pakistan, Cambodia, and Myanmar. China supports Pakistan's membership. Vietnam has not yet been added to the list.

FADMA's roles and functions are outlined below:

*(1) Keep track of trends in member nations' mold and die industries.*

*(2) Standardize specifications and terminology.*

In ISTMA (explained later), it is strongly believed that Europe should lead the establishment of ISO standards, which might make it difficult for Asia's viewpoints to be reflected. Technical terms in Japanese tend to be omitted. For example, "guide pin," a term commonly used in Japan's mold and die industry might not find its way into the terminology of ISO standards. ISO insists upon the strict use of documentation. In Japan, many shops are owned and operated by families who do not go the length of documenting small changes in the specifications of orders—these are more often than not confirmed

verbally. They also accept orders from customers over the phone without demanding any documentation.

*(3) Promote unity and technical cooperation among member nations.*

Solving the overlap between member nations is important. A developing nation may not need cutting-edge technology, therefore FADMA offers advice on what level of technology should be introduced.

The Board of Directors convenes once every year. It met in India in 1998, and the next meeting scheduled in Manila on June 23, 1999. A Board meeting accompanies such events as the exhibiting of new technologies and products, and the touring of factories. The meeting also provides opportunities for individual firms from member nations to share information and views with each other.

A General Assembly of FADMA is convened once every three years. The last meeting was hosted by Malaysia in 1997. The next meeting was originally scheduled to be held in Indonesia in 2000, but the nation reportedly intends to pull out of this due to economic difficulties. Japan was asked to serve as a replacement host, but it cannot accept the proposal for financial and staffing reasons. Singapore is most likely to be the venue for the next meeting.

FADMA is not a gathering of the representatives of states but invites each Asian nation's industry association to become a member. The member associations actively take part in FADMA's activities. The participating nations' government agencies a great deal of confidence in FADMA's leadership. FADMA's activities should continue to serve as the frame of reference for the policy-makers in charge of each nation's mold and die industry.

Cambodia does not have an association to represent its mold manufacturers, so it should be assisted in establishing one so it can become a member of FADMA. Thailand's assistance in Myanmar to form a mold and die manufacturers association has yet to bear fruit.

### ***1.2. ISTMA (International Special Tooling and Machining Association)***

ISTMA comprises three regional bodies: ISTMA Asia, ISTMA Europe and ISTMA America. ISTMA Asia's three members are Japan, South Korea and Taiwan. ISTMA America's three members are the United States, Canada and Argentina. ISTMA Europe's 12 members are Belgium, Finland, France, Germany, Britain, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and Switzerland. The three regional bodies take turns to provide a President, Vice President and Treasurer. The tenure of each post is three years. In the current term (1998 through May 2001), the President represents the Americas, Vice President Asia and Treasurer Europe. In the next term (starting May 2001), ISTMA Asia is to elect the President, ISTMA Europe the Vice President and ISTMA the Treasurer. The elected Board of Directors convenes 2 or 3 times annually, and elects officers. The officers appoint general managers.

## ***2. Asia's Mold and Die Industries***

After the United States, Japan is the world's second largest supplier of molds and dies and is the world's largest exporter of molds and dies. If statistics are compared internationally, it should be noted that definitions and classifications may differ depending on the sources. Statistics given in ISTMA's report (April 1998) cover special tooling which, in addition to molds and dies, includes pressing, stamping or punching tools for metal-working, specific-application jigs and fixtures, and standard tooling components. A study of country-by-country sales of molds and dies in 1996 shows that the U.S. ranked No. 1 with US\$2,986 million, followed by Japan with US\$2,125 million and Germany with US\$1,320 million. According to the ISTMA Japan Branch's report (May 1998), Japan's mold and die sales amounted to 440,140 million yen in 1996 and 544,744 million yen in 1997.

The number of workers of all FADMA member nations' mold and die industries totals 600,000, of which 400,000 are from China. It is estimated that Japan accounts for 60% of Asia's total production. According to statistics in 1994 (including machine tools), Japan's production totaled US\$3,467 million, South Korea's US\$1,287 million, and Taiwan's US\$1,273 million. In 1996, South Korea's production amounted to US\$2,041 million, and Japan's US\$4,043 million.

### *Japan*

90% of Japan's mold and die industry comprises firms whose number of employees is 20 or less. Compared with the Japan Machine Tool Builder's Association's membership of approximately 100, that of the Japan Die & Mould Industry Association (founded in 1957) is much larger at 573. As annual sales of both industries stand at 1 trillion yen each, the average size of firms in the mold and die industry is smaller. The industry's largest firms

employ several hundred workers on average. These include Ogihara, Ikegami, Showa Seiko, Kuroda Precision, Miyazu, and Mitsui High-tec. The remaining smaller firms employ 20 workers or less. The Japan Die & Mould Industry Association consists of the headquarters and the three branch offices in charge of Eastern, Western and Central Japan, respectively. As explained later, the Association finds it imperative to accelerate the member firms' globalization efforts.

### *Taiwan*

The Taiwan Mold & Die Industry Association (TMDIA) was founded in 1990. Its membership exceeds 900. The number is estimated to reach 4,000-5,000, if smaller nonmember firms were included. Taiwan's mold and die industry's workers number 100,000. Mr. Terry Kuo (Kuo Taiming), chairman of Hon Hai Precision Industry, and former TMDIA chairman, qualifies as the world's 100 wealthiest individuals. TMDIA's present chairman, Mr. William H. Chi operates the world's second largest stapler maker, after Max. In Japan, the owners of many mold-making shops have entered the trade as apprentices. Their Taiwanese counterparts have been educated in the United States, and few have difficulties operating CAD/CAM programs. Clusters of smaller shops have developed. Shops are specialized in each step of the manufacture process, and are linked horizontally. In this system, investment efficiency is better than if shops individually invest in all machinery to handle all steps of the manufacturing process. For instance, if one company has all the necessary equipment to manufacture all necessary parts to fabricate a personal computer. In many instances, the owners of shops forming a group are related by blood. The main family orchestrates the division of operations, such as grinding, within

the group. In Japan, shops tend to operate independently and with many different types of machines. In South Korea, groups are pyramidal. Samsung does business only with Samsung. Mold and die-making training institutions have been mushrooming. There are some instances where an institution whose current enrollment is 6,000-10,000 enlists a new intake of 3,000.

### ***Hong Kong***

Until ten or so years ago, Hong Kong had remained the mold and die-making hub of Asia. Following the return to Chinese sovereignty, Hong Kong's mold and die industry has weakened dramatically as it has shifted production to China. The disappearance of the border has made technical exchanges easier, triggering an influx to Shenzhen and Shanghai of manufacturers seeking to take advantage of cheaper labor. Engineers have remained in Hong Kong. Many shipments from Hong Kong to China come from Taiwan. 42% of Taiwan's total exports are channeled via Hong Kong to China. Hong Kong's trading houses have shown themselves reliable import agents for China. Hong Kong is trying to change from a manufacturing hub to a financial center.

### ***China***

China's mold and die industry is the world's largest in the total numbers of firms and workers. The number of workers exceeds 400,000, most of them employees of state firms. However, nearly all State-operated shops are bankrupt with only township and village-operated shops remaining operable. While pay is a 20th that of Japan, molds cost a 10th as much as in Japan. This indicates that the efficiency is lower. The quality of products is also poor.

### *Singapore*

Singapore's mold and die industry is represented by the Singapore Precision Engineering and Tooling Association. FADMA's secretariat is also located there. Singapore is enthusiastic about promoting the industry. Singapore plays a vital role in the manufacture of state-of-the-art molds and dies. The government has been guiding the industry's development. As the manufacturing sector lacks workforce, the industry finds it almost impossible to increase the production volume significantly. It may become Asia's technical education and training center. One prominent training institution is the Institute of Technical Education. Government, universities and the industry work in cooperation. Chinese language ability is seen as a competitive advantage in business.

### *Malaysia*

The government has been steering the mold and die industry's development in the same way as Singapore. The industry is given top priority under the government's industrial policy. However, the government tries to promote too wide a range of industries, from automobiles to communications, to give the industry the support it needs. The manufacturing sector's labor shortage constitutes a bottleneck. The automotive industry, Malaysia's key industry, suffers from high cost and quality problems as too much emphasis on the promotion of Proton hampers competition. The industry operates only on a small scale, so it has to depend on imports from Japan and other nations to procure molds and dies.

Proton's local procurement rate is 85% as calculated in the number of components used, however the actual rate is significantly lower. In another key sector, the electronics

industry, which is centered upon the manufacture of ICs, suppliers of molds and dies are overly concentrated in the Penang district. While demand for molds and dies for home appliances exceeds supply, domestic products cannot compete with imports in either pricing or quality. The market for precision molds for pressing is under-supplied, as suppliers are limited to only one or 2 Japanese manufacturers. There is a large number of mold and die manufacturers, and a number of industry associations. Prominent mold and die manufacturer associations are based in Selangor (automotive sector) and in Penang (electronics sector). Many mold and die manufacturers are operated by Chinese that are rarely supported by the government, which adopts a bumiputra-oriented policy. The industry associations are not organized nationally, and have trouble taking concerted steps. There is also a lack of cooperation with Singapore, a problem that needs to be resolved.

### ***Thailand***

The Thai Tool and Die Industry Association was founded in 1994. (Its predecessor, Forum, was founded in 1981.) The number of Thailand's mold and die manufacturers is estimated at 400. Too many industrial sectors have emerged at the same time and workers change jobs too readily, a factor that has made it difficult for the mold and die industry to accumulate technology. Unfortunately, the nation cannot prosper unless the mold and die industry grows. Furthermore, high tariffs are imposed on imports, despite the fact that the industry cannot grow without being exposed to competition. The tariff rate has been upped to 35% (as an emergency safeguard). Tariffs must be eliminated in order to promote imports.

The automotive sector already has all essential support sectors, including mold manufacturers, ready at hand, if Japanese suppliers are included, meaning that further

investment in the support sector should not be required in the immediate future. A source of greater concern is the outcome of efforts to establish a system of mutual supply of parts within the ASEAN region, as AFTA's creation calls for international division of labor. Following the slump in domestic demand, the automotive sector has been trying to become more export-oriented. How far and smoothly this will progress must also remain closely monitored. The transfer of technology and the providing of business management guidance should be continued for the benefit of local Thai manufacturers. For the moment, the electronics sector faces even more difficult hurdles. Thailand is highly likely to become the world's HDD supply base. This will not be possible, however, before the number of suppliers of precision molds and dies increases.

### ***India***

India lacks all essentials of mold and die-making. The picture is similar to that of Japan's mold and die industry around 1960. Ten car-making firms have been launched simultaneously. They have imported (initially from Japan and later from Taiwan and South Korea) or produced in-house all the molds and dies they need. India's mold and die industry association now has a membership of 110 firms. The number would reach approximately 400 if nonmembers were also counted. The number of workers in the industry is estimated at 8,000. The disparity in size between the nation's major mold and die manufacturers (500 or more employees) and the smaller manufacturers is huge. The major manufacturers build all types of molds and dies, including pressing molds, plastic molds and die cast molds. They have introduced a complete set of state-of-the-art mostly European equipment, including Charmilles's electrical discharge machine, Jung Blohm's surface grinding machine, Waldrich Siegen's MCs, etc. CAD plays a central role in the

production of their drawings. The majority of owners have been educated at Britain's universities, and Europe has been their biggest market. Their ties with Japan are only marginal. The largest mold manufacturer, controlled by a financial conglomerate, employs 2,000 workers. There are 100 million highly educated people, and their work ethics are especially strong. India has the potential to grow as a net exporter of molds and dies.

### ***South Korea***

The Korea Die and Mould Industry Cooperative has a membership of 300 firms. The total number of the nation's mold and die manufacturers is estimated at 1,700. Controlled by the financial conglomerates, the mold and die industry has little room for growth. This might make the nation's recovery from the economic crisis all the more difficult. Taiwan is more recession-resistant because its machine tool and mold and die industries are stronger.

### ***The Philippines***

The Philippine Die and Mold Association has a membership of 90 firms. These manufacturers' main products are IC molds and connector molds. Precision molds for use in the electronics sector are in extremely short supply. Difficulties arise if mold and die manufacturers switch customer industries. Isuzu Motor experienced trouble when it launched an engine plant, because all suppliers were solely those of IC molds. The root of this problem appears to lie with the ways in which institutions provide technical education and training.

### ***3. The Role of Japan***

#### ***3.1. Japan's Mold and Die Industry***

Molds and dies constitute the mother tool of manufacturing. Building a product whose dimensions are precise to 1/100th of a millimeter requires a mold whose dimensions are precise to 1/1,000th of a millimeter. Production upon demand and the ordering of one-off products which require special skills to make have been common practices in Japan's mold and die industry. This has nurtured specialized small shops, which have become the industry's backbone. These shops have built long-running business ties with particular customers. This has allowed the industry to accumulate the skills that are attuned to the needs of customers, as noted by Saito (1997). Yet, as product life cycle becomes shorter, customers are demanding higher precision, speedier delivery, and lower pricing. This, coupled with the increasing difficulty of attracting new workers, has made the mold and die industry's operating environment more and more difficult. One of the immediate reasons that has made the industry's future precarious is the shifting of production to other Asian nations. In this regard, Japan's mold and die industry has to adopt a stance of joining other Asian nations in establishing a regional system of division of labor. In other Asian nations, even mold and die industries engage in aggressive sales and marketing efforts, and regional business ties and relations have begun developing outside Japan. The days are gone when Japan's mold and die manufacturers could afford to serve only their domestic customers, and they now must cultivate customers abroad, too. This will be a good test of their marketing power.

#### ***3.2. Technology for Making Molds and Dies***

What is the secret of making molds and dies? This is a frequently asked question, which is always answered in the negative, because there is no secret in the first place. Essentially, the technology needed for making molds and dies comprises the common techniques of manufacturing, including machining, such as cutting, grinding and drilling, as well as electronics. The types of molds and dies are varied, the generic ones including pressing molds, plastic molds, die cast molds and rubber molds. The specific techniques used for making them differ according to the type and all techniques must be made ready at hand. The technology cannot be digested without experiencing all types of molds and dies.

Demand for secondhand Japanese general-purpose machines is potentially strong in other Asian nations, but such machines are rarely exported because of the risks involved under the PL law. The trade control law requires exporters of such machines to obtain the maker's authorization, but manufacturers are not enthusiastic about exporting such machines. Taiwan's manufacturers export inexpensive machines to Southeast Asian nations.

In the world market, as a result of increased competition, quality has been rising in importance. Cheap labor cost alone no longer ensures competitiveness. Manufacturers must attain a certain technological level. The United States (National Institute for Metalworking Skills) has been working to establish skill standards, and such movement needs to be closely monitored.

From this perspective, manufacturing precision molds and dies in Asia outside Japan still remains difficult and as such, it would be wiser for other Asian nations to utilize Japanese imports instead. Imposing high tariffs on such imports might undermine their efforts to develop the domestic capability to build precision molds and dies.

### ***3.3. Lagging Behind in Globalization***

Many of the members of the Japan Die and Mould Industry Association, which consists mostly of smaller firms, lack global viewpoints. Some members even show reluctance to pay FADMA's membership dues, which cost ¥150,000 a year. The Association is operated on a volunteer basis by Kuroda Precision and other members, who despite their busy schedule, take time off to offer their unpaid service.

Taiwan's many shop owners have been educated in Europe or the United States, and do not hesitate to undertake their operations globally. In the Asian region, virtually no national borders stand in the way of movement of mold and die-making technology. The fact that Japanese manufacturers do not use Chinese or English on a daily basis is a huge drawback which they must work hard to make up for. South Korean, Japanese, Philippine and Indian manufacturers have no Chinese (Cantonese) language ability. The fact that South Korean and Taiwanese makers use Japanese does not favor Japanese makers, because they are in competition with each other.

Japanese associations should gear up their efforts to gather information, especially via FADMA and ISTMA, in full recognition that gathering information constitutes the key to strength.

### ***3.4. CAD Connections***

CAD changes the way molds and dies are made. More and more customers tend to supply drawings electronically rather than physically. At present, roughly ten Japanese mold and die manufacturers engage actively in development of the market Asia-wide. The

connections these manufacturers have established with customers by sharing CAD systems are weak. Their Asian competitors did not take any courses in physical drafting, as they have been familiar with CAD from the beginning. In this light, they rarely produce physical drawings, as they are skilled at operating CAD. Taiwan's manufacturers are connected to their customers in the U.S. through the medium of CAD. The customers participate in design-in sessions by using CAD communication and electronic mail. In some cases, even the revision or finalization of drawings is handled electronically via CAD. Japan is the only country where drawings must be approved and finalized physically. Considering traffic congestion on communication networks, the time gap between Japan and the U.S. should favor Trans-Pacific customer-supplier exchanges. Communication is Japanese manufacturers' weak point. Mold and die-making shops in particular might have difficulties keeping pace with the growing moves to build CAD-based connections with the U.S.

### ***3.5. Standardization***

Japan's mold and die industry maintains few links with Asia's fellow industries. If nothing is done now, Japan may become isolated. As Europe's manufacturers have been expanding aggressively in Asia, the indications are that negotiations to establish new arrangements (e.g. ISO standards) will proceed without Japan's participation, possibly placing Japan in a position where it is in danger of becoming isolated even from the world. In the area of standardization of mold and die specifications, for instance, standards for drawings have not been unified internationally. This might create a problem if, for example, the front and rear compartments of a TV are built separately in Japan and Taiwan, because the finished

surfaces might not be even in roughness. For this reason, Japanese manufacturers once proposed international unification of the specifications of surface patterns, only to win little support abroad. Later, Singapore made a similar proposal, which has triggered a standardization movement in Asia. Europe has joined the movement, which has been under way outside Japan, and efforts are now being made to upgrade the unified specifications into ISO standards. If ISO adopts these standards, Japan would have no choice but to accept them. Terminology, specifications, die set size, etc. are going to become internationally standardized under Singapore's leadership.

### ***3.6. Coexistence with Asia***

In Japan, mold and die shops do not manufacture products using their molds and dies. If Japanese mold and die manufacturers move into other Asian nations, the lack of engineers who can use their molds and dies might stand in their way. Such an obstacle would not have arisen in the early days when they made simple molds for pressing buckets; however, molds and dies today are much more sophisticated. Japanese manufacturers cannot expand in other Asian nations without assisting customers in educating and training engineers for using their molds and dies. With the exception of a few cases, all Japanese mold and die makers faring well in other Asian nations manufacture products themselves using their molds and dies.

At present, it still remains better for Asia (excluding Japan) to import molds and dies from Japan. Making a given mold takes 100 hours in Japan, while it takes 300 hours in Asia. If this is factored in, Japanese molds and dies offer more value than their prices indicate as they are also less expensive than their Taiwanese competitors. Japanese

manufacturers price their molds and dies low because they are conditioned to believe that they do not, the molds and dies would not sell. The division of labor between Japan and Asia should be feasible and viable. Imposing tariffs on mold and die imports is not an effective way of promoting domestic manufacturing. Actually using molds and dies in order to assimilate the newer technology is the first step Asia should consider.

For its part, Japan has yet to set up a window which Asia may refer to for assistance if it imports Japanese molds and dies. The Japan Die & Mould Industry Association is a non-profit organization, and is not in a position to introduce prospective foreign importers to its member manufacturers. Arrangements for after-sales service in Asia are also yet to be prepared. For this purpose, a cooperatively-operated maintenance and repair cooperative should be established.

TDK (Thailand) once purchased molds from S, a Japanese supplier, only to find it impossible to procure maintenance service locally. TDK canceled further purchases, and it became uncertain whether it could continue operating there. TDK anticipated incorrectly that it could operate in Thailand in the same environment in which it did in Japan. Any Japanese manufacturer considering entering Thailand now should realize that not all conditions that are needed for the undertaking of enterprises are ripe yet. Using molds and dies requires extensive overall skills, which must be ready at hand. This is not possible without a geographically clustered pool of enthusiastic engineers as found in Ota Ward, Tokyo. Such clusters of engineers are now evident in Taiwan, which means that if a certain mold is needed, a web of engineers may be counted upon to offer all necessary skills.

Japan's mold and die manufacturers have advanced into other Asian nations mainly to provide maintenance for their Japanese customers, but were obligated to make low-end molds and dies on the side as the maintenance work alone is not self-sustaining. It is

difficult for Japanese manufacturers to decide to enter other Asian nations for the main purpose of making molds and dies. Kuroda Precision entered Malaysia in January 1997 and has been making motor-building molds there. It advanced there, ready to lose money, at the strong request of a Japanese customer, who asked it to set up a maintenance shop there. Kuroda realized there was little prospect of the business being profitable, but had to accept the request because sales to the customer might suffer. Currently, Kuroda is more profitable in Malaysia than in Japan. In Malaysia, few mold and die engineers have been educated and trained because there are very few mold and die shops, and therefore very few trained operators for mold and die manufacturing. Consequently, instead of selling its molds directly, Kuroda had to use them to press products for sale. As this brought it further downstream, a flood of orders began coming in. Kuroda now earns profits not from molds but from pressed products.

### ***3.7. Relocation to Asia***

Compared to 30 years ago, it is easier today for Japanese makers to enter other Asian nations to manufacture molds and dies. The key to success is what type of molds and dies they make. The production of plastic and rubber molds are viable. And while molds for the cabinets of TVs and video recorders may be produced there, molds for the interior parts may not. Furthermore, Japan is the only country in Asia where precision pressing molds can be manufactured successfully. Due to the fact that Malaysians are diligent workers, certain molds and dies are better be made in Malaysia than in Japan. Malaysians have good eyesight, and much detail is clearer to their naked eyes without the aid of the microscope. Because of these advantages, molds and dies which are suitable for

production there should be made there, however the tendency for the demands of Japanese manufacturers to take precedence will need to be overturned.

The traditional framework for making molds and dies differs among Asian nations. For example, it is based on apprenticeship in Japan, but is patriarchal in Taiwan. Therefore, exporting the Japanese style may not be suited to industries in other Asian nations.

In Japan, large set manufacturers have sustained mold and die shops by demanding loyalty in return for protection. These shops are not allowed to go downstream and make products using their molds and dies. Customers use only one manufacturer, but supply them with orders even in times of a slump; however, Taiwan's mold and die shops supply numerous customers.

As explained earlier, a mold and die industry can be full-fledged only after all essential skills are ready at hand. In the field of cutting, for example, technology and skill relating to bites, steel, revolutions per minute, hardening, etc. must be accumulated. Furthermore, experts on such skills must be nurtured. Despite this, Japanese manufacturers tend to seek only the expertise needed to meet their demands. A Japanese manufacturer already familiar with carbide may not show enthusiasm about cultivating hardening skills locally. It may also be viable for a Japanese manufacturer to move to another Asian nation and make one particular type of mold independently; however, it would contribute little to the local mold and die industry's accumulation of essential skills. In Thailand and Malaysia, the mold and die industries have yet to acquire the level of skills required. Their trust in NC machine tools are too strong for them to believe that measuring operations are necessary. They are preoccupied with molds and dies, and show little interest in jigs and fixtures. The making of molds and dies or jigs and fixtures is not viewed as a high-status job, and does not attract competent engineers.

The know-how necessary to put NC machine tools to effective use is yet to be developed. Using an NC machine tool for the manufacture of a single type of mold is not efficient because the programming takes much time. The programming of an NC machine tool must be complete before the machining process can be started. Turning-on and -off must be the only operations during the machining. Electric discharge wire cut machines cannot be performed without using a NC machine tool, but as far as the forming process goes, manual cutting can save time and increase flexibility. CAD/CAM is not necessarily required, and in almost all cases, CAD suffices. The work that CAD is not designed to handle can be completed easily in a traditional manner.

The need for the teaching of skills is frequently heard being pointed out. However, it should be recognized in the first place that, as explained above, there remain many views regarding skills, which must be addressed. Then, a language barrier surfaces as few Japanese instructors have a good command of English. On the receiving end, there remain certain attitudes, which must be corrected. These include the overprizing of manuals as an alternative to spending many years training on-the-job, and the workshop-shyness among the highly educated public. Japan's way of accumulating skills can not always be applied readily in other Asian nations.

### ***3.8. Japan's Framework for Support***

Asia's nations give top priority to their mold and die industries under their industrial policy, and support them by mobilizing every resource, including government agencies, that they can use. They put special emphasis on education in order to develop superior mold and die engineers and business managers. As a result of such efforts, the mold and die industry has

won high status in some countries – a situation that assures a promising future. Japan's mold and die industry is in danger of suffering from a severe shortage of engineers as the inflow of a new workforce dwindles. In reaction to this, the Japan Die & Mould Industry Association must boost its PR drive to familiarize the general public with the industry's importance. Japan's mold and die industry cannot actively pursue business opportunities or extend significant support overseas unless its domestic base is strong. From a different perspective, deepening its ties with other Asian nations should lead to the strengthening of its domestic foundation.

Japan's mold and die manufacturers must bolster their sales and marketing power if they intend to expand abroad. The efforts currently being made by individual manufacturers to develop sales/marketing/maintenance arrangements overseas are not enough. The industry should consider the possibility of establishing a joint marketing/maintenance consortium.

In Ota Ward, many mold and die shops still prefer being supplied with physical rather than electronic drawings by their customers. A cooperative CAD center may be established to convert electronic drawings into physical ones on their behalf. It should also be given the marketing function to channel orders from customers in other Asian nations to the Japanese shops. Different customers use different CAD systems, and it is difficult for mold and die suppliers to independently develop the ability to handle them all. For their benefit, the cooperative center should be utilized to offer the capability of handling all types of CAD systems.

In promoting the transfer of technology to other Asian nations, greater emphasis should be placed on developing managers to supervise the mold and die manufacturing process. Such supervisors should be allowed to come up with ways of developing skilled

workers in conformity with the culture of their local industry.

What support is most wanted in other Asian nations? There are some cases in which a training institution has a state-of-the-art machine installed but lacks an instructor who is capable of demonstrating it. Local needs cannot be identified accurately without stepping up government-industry cooperation. As explained throughout this report, a lot of effort remains to be made in order to meet the varied demands of the mold and die industries of Japan and other Asian nations. These include the establishment of a Japan-Asia joint promotion center, the coordination of government-industry support efforts, and the development of skilled workers along with stepped-up manufacturing and marketing efforts in Asia.

## ***References***

Eiji Saito, "Kanagata-sangyo Kenkyu Shiron" (Essay in the study on mold and die industry), Chushokigyo-kiho, 1997, No.4. ( in Japanese )

Eiji Saito, "An International Comparative Study on the Die and Mould Industry :Interview-based Researches of Plastic Injection Mould Manufacturers in Japan, Korea and Tai-wan," in *Asian-Pacific Economies and Small Business*, Nakaoka et al. ed.,Osaka University of Economics, 1998.

Kosuke Nishino, *Nihon no Kanagata-sangyo wo yomu (Reading the Japanese Mold and Die Industry)*, Kogyochosakai, 1998. ( in Japanese ) .