

2. Results of the Questionnaire

The general situation of the Korean die and mold industry was presented in the previous section.

In this research, a questionnaire survey for die and mold companies was carried out to find out current tendencies, changes in the die and mold industry, strategies of individual companies, future prospects, etc.

The title of the questionnaire was “Investigation report about company management and international competitiveness in die and mold industry”. It consisted of 45 questions in eight categories; general information of die and mold makers, employee composition, manufacturing environment, manufacturing innovations, cost reduction strategies, features of the employees, opinions for international cooperation with Asian countries and future views of the die and mold industry, and 20 questions regarding business strategies in the die and mold industry.

The questionnaires were sent to 685 member companies of the "Korea Die and Mold Cooperative", and 52 companies among them replied. Replies from 25 plastic mold companies and 16 companies producing mainly press die were mainly investigated.

2.1 Die and mold company's management situation

First, the companies having increased gross sales were grater in number than those showing decreased gross sales. 26(63.4%) among the 41 responding companies indicated that the gross sales had increased over the past two years, while 11 companies (26.8%) underwent decreased gross sales. In the press die industry; the number of companies having increased gross sales was the same as that was having decreased gross sales. In the case of the plastic mold industry, companies with increased gross sales outnumbered four times than companies with decreased gross sales (refer to Figure 10).

The main causes of decreased gross sales are reduced unit price and decrease of the customer orders, as shown in Figure 11. However, there were a few occasions where customers moved abroad or changed subcontractor to abroad. Customer relocation to Southeast Asia or China is not yet becoming a main factor for decreased gross sales.

Companies having increased gross sales indicated that an increase of customers was the main reason for the increase of gross sale, while increased competitiveness in quality and delivery time was the second leading factors, as shown in Figure 12. These two factors seem to have a complementary relationship: Korean die and mold companies succeeded in new market entries with improved quality and reduced delivery rather than

Fig. 10 Changes of Gross Sales -Compared with 1999

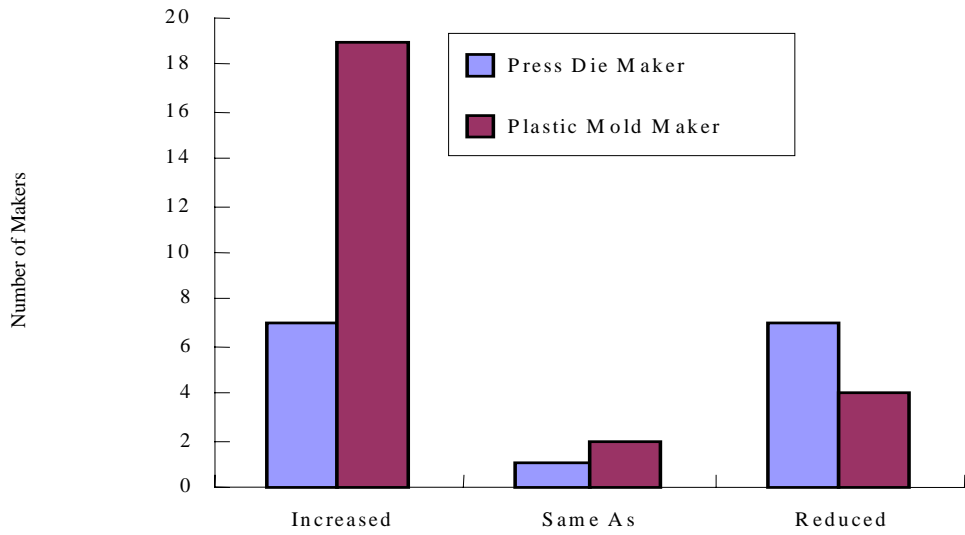
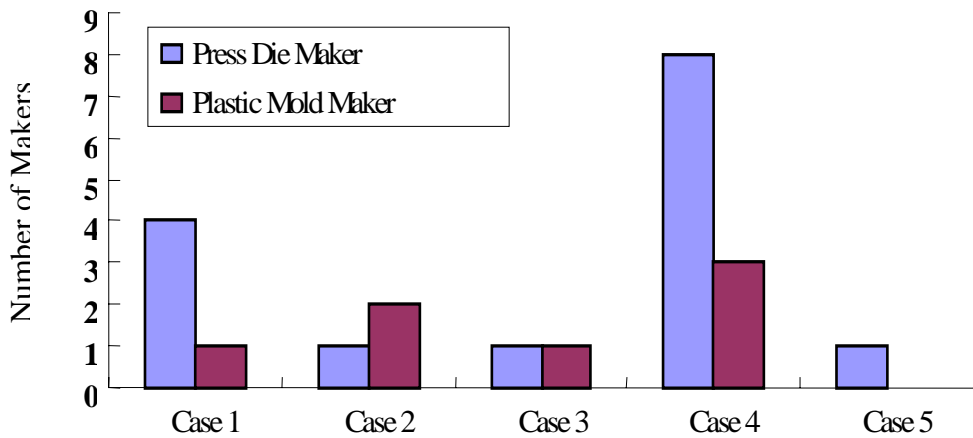
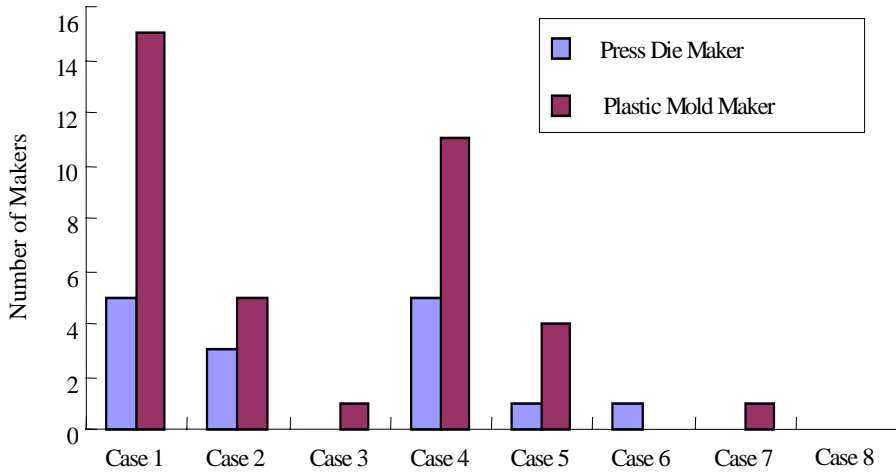


Fig. 11 Reasons of Decreased Gross Sales



- Case 1: Customers are reduced
- Case 2: Customers moved abroad
- Case 3: Customers changed benders to abroad
- Case 4: Unit prices are reduced
- Case 5: Others

Fig. 12 Reasons of Increased Gross Sales



Case 1: New customers are increased

Case 2: Developing time of customers is reduced

Case 3: Cost reduction in process and material cost

Case 4: Increased competitiveness in quality and delivery time

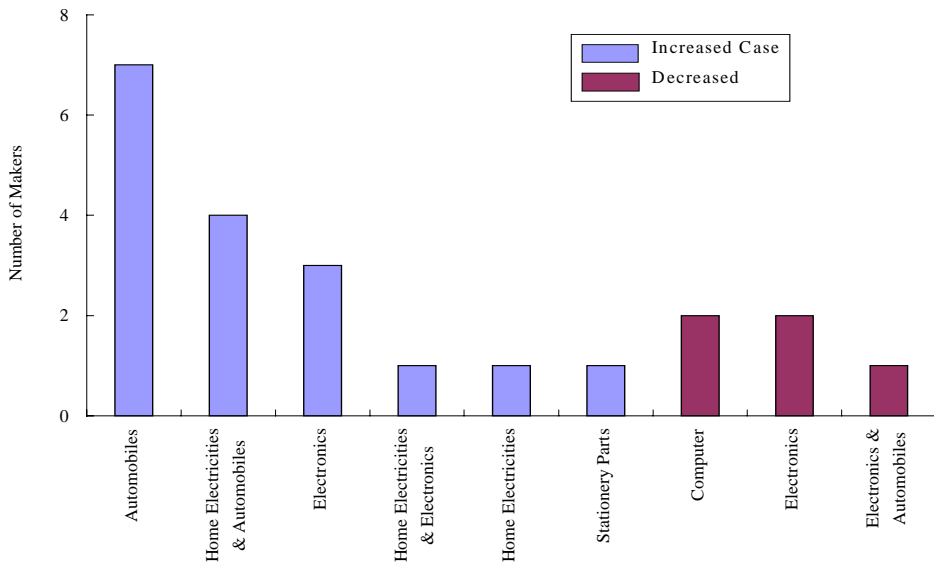
Case 5: Specialized in high precision items

Case 6: Succeeded in recycling

Case 7: Reduced competitors

Case 8: Others

Fig. 13 Market of Plastic Molds in the View-Point of Increased/Decreased Gross Sales



through cost reductions in manufacturing and materials.

Some characteristics of companies were investigated to determine the causes of increased or decreased gross sales, and the results are shown in Figures 13-16. The figures show that most companies that achieved increased gross sales are related to automotive industry, while companies having decreased gross sales are related to the IT industry. In particular, many press die companies are related to semiconductor industry. The recent steady growth in the Korean automotive industry and the depression of the IT industry seem to strongly affected the die and mold industry.

Figure 15 shows that the dependence on domestic markets of plastic mold manufacturing companies, — five companies having decreased show 80~100% domestic market dependence. This indicates that the development of new overseas markets is also a substantial influence in the die and mold industry. Also, in the case of press die manufacturing companies, a larger number of companies having high dependency on domestic market experience decreased gross sales.

On the whole, the Korean die and mold industry has grown in these two years. Moreover, companies which have been succeeding in acquisition of new customers (especially in overseas markets) through improved competitiveness in quality and delivery time due to technical improvements have achieved increased gross sales. The

Fig. 14 Markets of Press Dies for the View-Point of Increased/Decreased Gross Sales

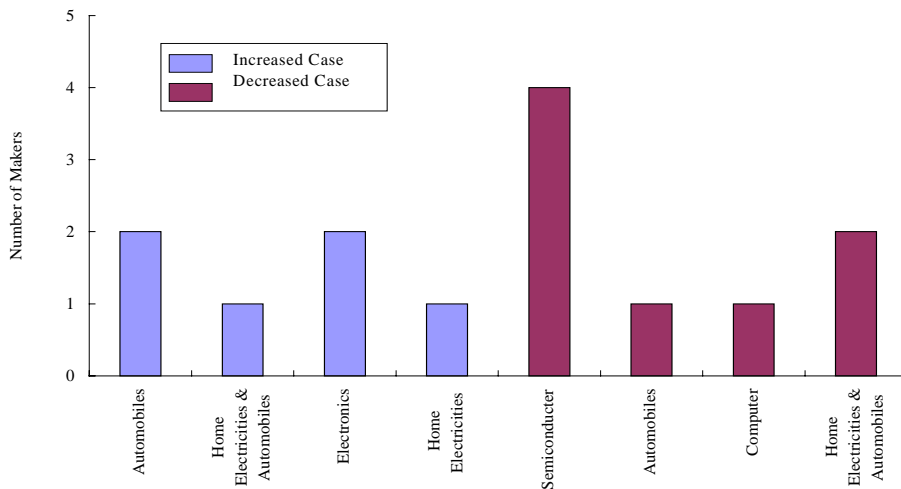


Fig. 15 Dependency on Domestic Markets in Case of Plastic Molds

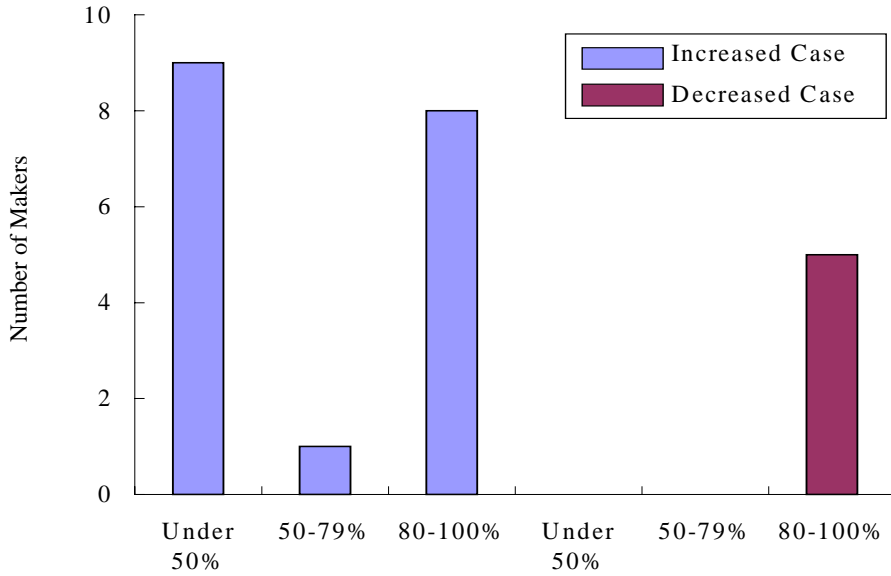


Fig. 16 Dependency on Domestic Markets in Case of Press Dies

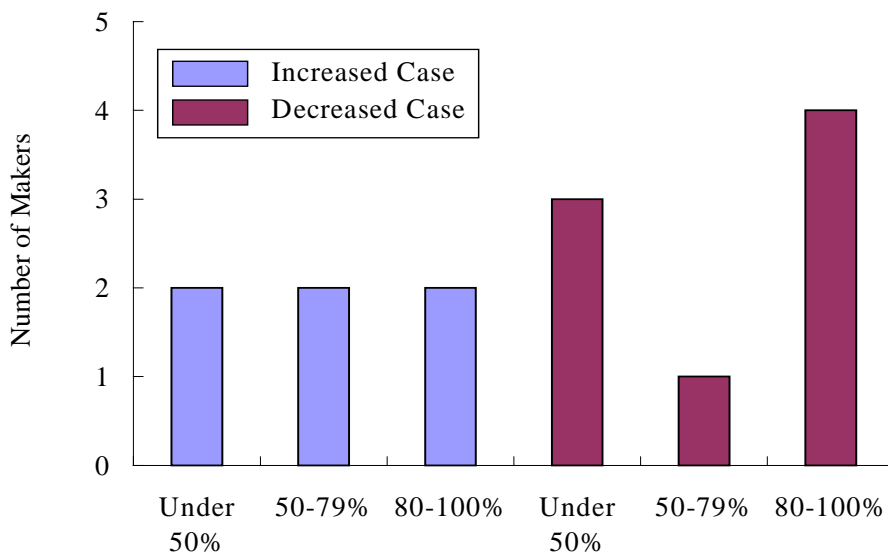


Fig. 17 Changes of Quality and Accuracy-Compared with 1999

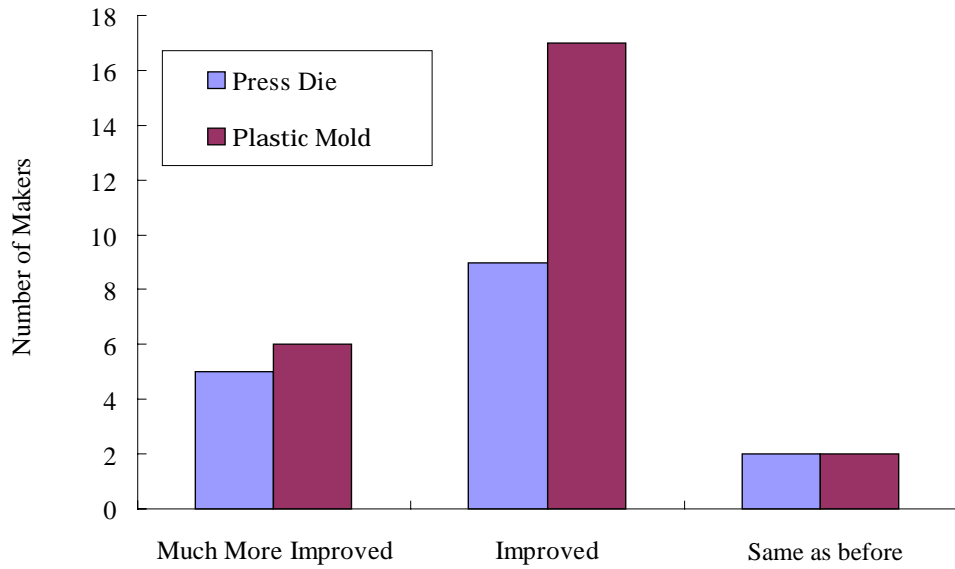
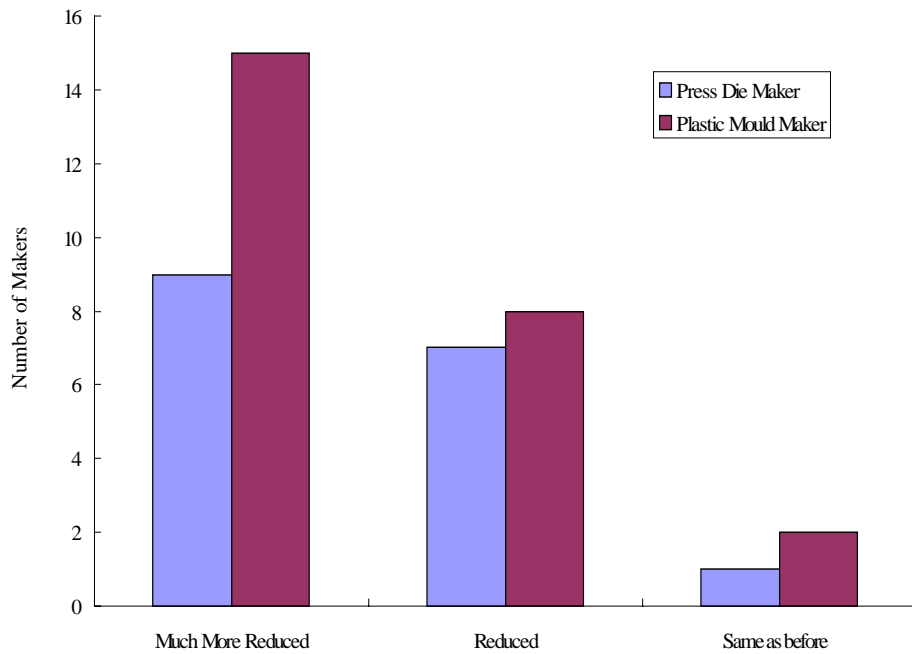


Fig. 18 Changes of Delivery-Compared with 1999



economic trends of the IT and automotive industries particularly affected gross sales within the die and mold industry.

Improvements in die and mold technology are reflected in the questionnaire replies concerning delivery time, quality and accuracy over the past two years. As shown in Figures 17 and 18, quality and accuracy were improved in most companies and delivery time also was reduced significantly. It can be concluded that improvements in manufacturing technologies have been achieved, becoming a main factor for increased gross sales.

2.2 Present status of employees and countermeasures for employment

It is well-known that die and mold process require expert skills and experience, and the employment trends can be very helpful in observing changes in the die and mold industry in several aspects. The results are summarized as follows.

First, the changes in employment compared with two years ago (1999) are summarized in Table 4. The numerical values in the table indicate the number of companies that replied to each item.

On the whole, majority of responding companies indicated that there have been no

Table 4 Employment Change

	Increase		No Change		Decrease	
	Plastic Mold Maker	Press Die Maker	Plastic Mold Maker	Press Die Maker	Plastic Mold Maker	Press Die Maker
a) Young worker	10	7	10	6	4	3
b) Elder Worker	6	2	10	14	7	0
c) College graduates are increasing	7	10	14	3	3	3
d) Dispatching labors	1	1	11	12	2	1
e) Labors based contract	4	4	10	8	1	2
f) Part-timer, temporary posts	1	1	11	12	3	1

significant changes in employment. Moreover, the number of companies that increased the size of their workforce is larger than those having decreased their workforce size. In particular, the number of employed young workers and college graduates increased. Hiring temporary employees such as dispatching laborers, contract-based laborers, and part-timer laborers did not increase. These statistics show that the die and mold industry need high skilled labors, and also that the Korean labor market is lacks flexibility.

Table 5 shows employment changes in manufacturing field. The numerical values represent the number of companies replied to each item.

The data presented here show that employment in CAD, CAM and CNC machine processing has increased and it also reflects the recent trend of introducing IT technology.

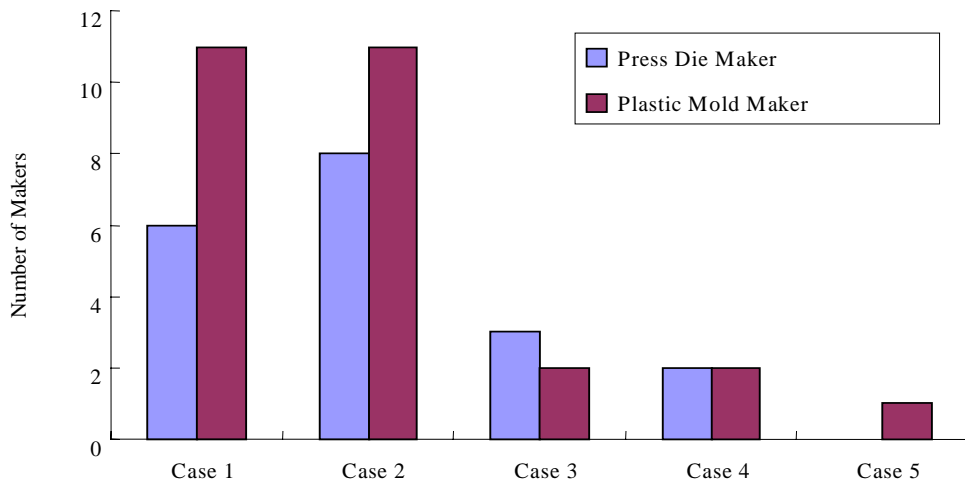
Figure 19 shows the corresponding plans for meeting changes in the industry such as IT technology. Many companies are employing new engineers recently graduated from college or are dispatching old members to professional training schools rather than having inner study group meetings or education programs.

On the contrary, most companies are utilizing OJT (On the Job Training) under the skilled workers. This is the same as the previous (i.e. OJT) as a training method for novices. This means that they are relying highly on outside factors for new technologies such as CAD/CAM/CAE, while there are very few inside training programs for novices (refer to Figure 20).

Table 5 Employment Changes in each Process

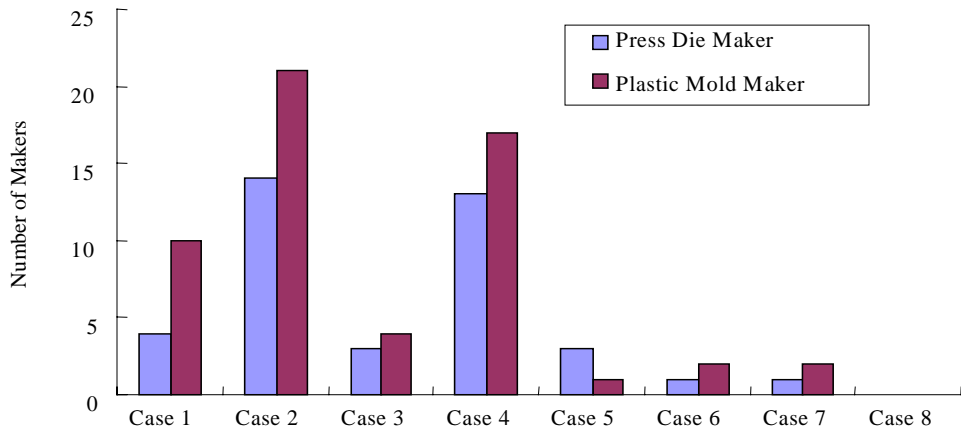
	Increase		No Change		Decrease		Out Sourcing	
	Plastic	Press	Plastic	Press	Plastic	Press	Plastic	Press
	Mold	Die	Mold	Die	Mold	Die	Mold	Die
	Maker	Maker	Maker	Maker	Maker	Maker	Maker	Maker
a) Products Design	7	2	5	6	4	4	6	3
b) Model Prototyping	0	0	3	5	4	3	11	6
c)Die/mold Design	13	5	6	6	4	4	0	0
CAD part	13	5	6	7	5	3	0	1
CAM part	14	2	6	7	2	2	0	4
d) Die/Mold Manufacture	10	3	7	3	5	8	0	1
CNC Machinery	12	5	9	6	1	3	0	2
General Purpose Mechine Tool	4	2	12	7	5	7	1	0
e) Grinding Assembly	7	1	12	9	5	6	0	1
Try out Mold	6	2	12	8	2	4	2	1
f) Inspection	9	5	13	8	0	3	1	0

Fig 19 Counter-Plan to New Technology such as CAD/CAM



- Case 1: Employing college graduates
- Case 2: Dispatch core members to professional training schools
- Case 3: Training high school graduates inside the company
- Case 4: Inside study group meetings using texts
- Case 5: Others

Fig. 20 Training Methods for Novices



- Case 1: Dispatch to learn theories through lectures
- Case 2: On the job training under skilled workers
- Case 3: OJT by programmed schedule
- Case 4: Learn from senior workers
- Case 5: Inside Training school
- Case 6: Professional training school
- Case 7: Employ only skilled workers
- Case 8: Others

2.3 Manufacturing condition and cost down strategy

The results about obtained from the questions for manufacturing condition and cost reduction strategies are as follows.

First, gross output per each worker is shown in Figure 21.

The group of 1.0~1.5 hundred millions Won per individual is the largest; this represent an improved result compared with previous gross output as shown in figure 9. However, further improvement is needed because this output is still low compared to that of industrially developed countries.

Sales dependence on the domestic market is shown in Figure 22. The die and mold industry can be said to have taken. A progressive attitude toward exports indicated by both that more than 30% of die and mold products are exported, and export-oriented companies with exports accounting for more than 50% of gross sales reached 36%.

Second, changes in gross sales are investigated in detail, as shown in Figure 23.

In general, the majority of plastic mold companies shows increased gross sales, and some companies achieved 120~129% improvement in gross sales. However, in the press die industry, companies with decreased gross sales out numbered those with increased gross sales. Overall, There is a kind of polarized tendency, as many companies had decreased gross sales below 80% while on the cotrast some companies achieved a 140% increase in gross sales. The change of unit prices shows a decreasing tend, as shown in Figure 24, and profit rates before taxes are also decreased, as shown in Figure 25. These trends reflect the recent deteriorating business environment.

The strategy for cost reduction in production management to cope with this difficult company environment are shown as follows.

Most of all, it is remarkable that the introduction of CAD/CAM and reinforcement of outsourcing are generally adopted strategies in manufacturing management. More than 80% companies chose the introduction of CAD/CAM as a cost reduction strategy in the plastic mold industry(refer to Figure 26). The introduction of CIM as well as using network system are not yet significant factors, but they begun to be introduced as aspects of IT technology utilization. Figure 27 represents the utilization of IT technologies in manufacturing processes. About 80% of companies take advantage of the exchange of CAD data using IT technology, and about 40% of companies utilize IT technologies in various areas such as making homepage, collecting information for customers and introducing internet order systems.

Also, dependency on CAD Data in ordering system is very high and most of plastic mold companies make use of 3D CAD Data, as shown in Figure 28.

Fig. 21 Gross Output per each Worker

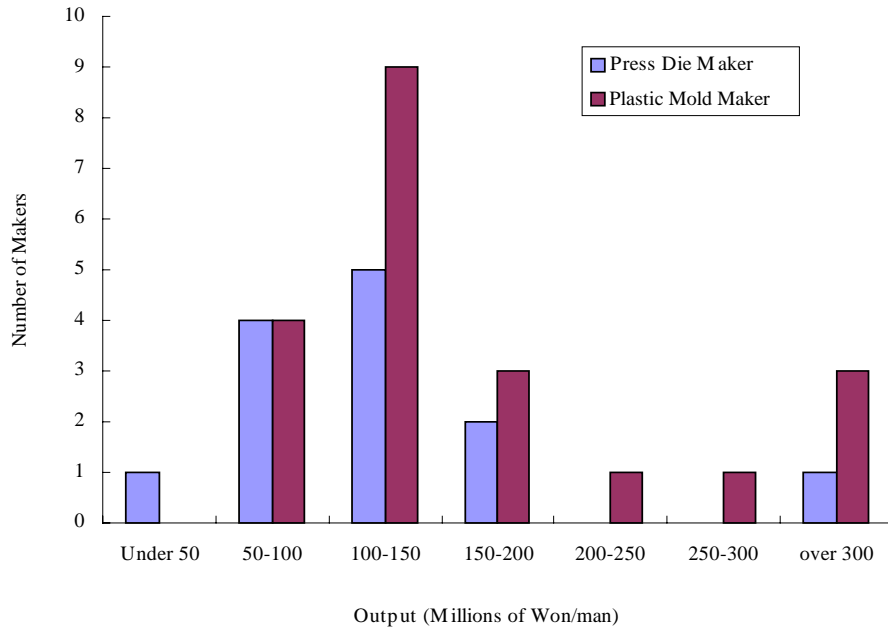


Fig. 22 Sales Dependency on Domestic Markets

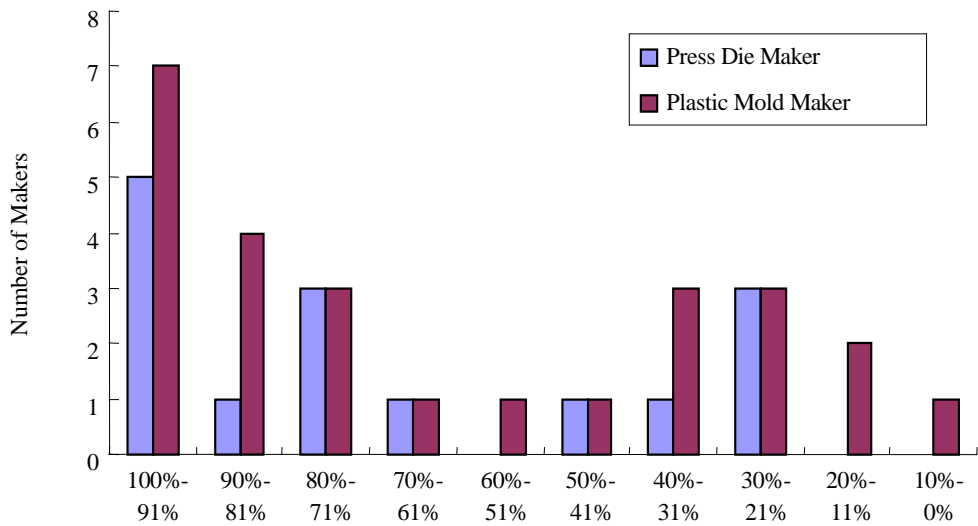


Fig. 23 Changes of Gross Sales - Compare with 1999

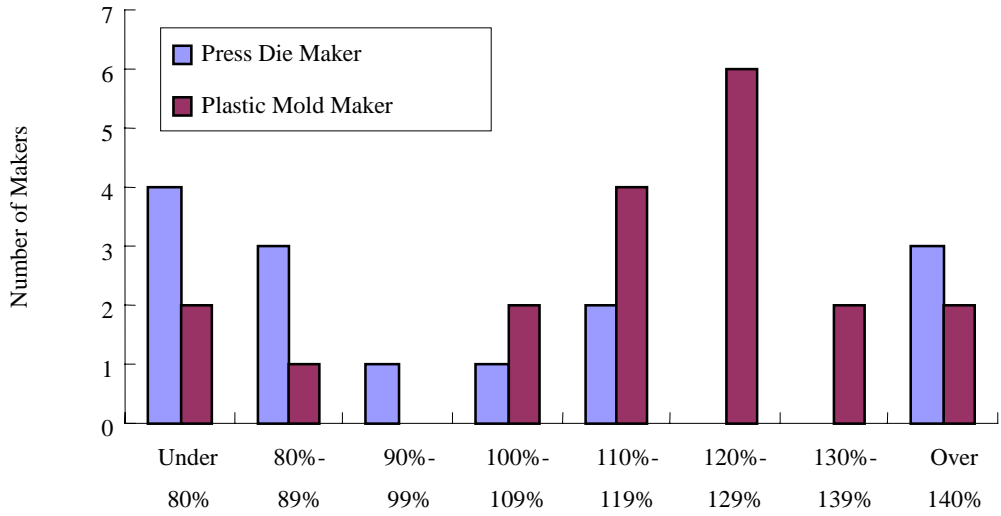


Fig. 24 Changes of Unit Prices

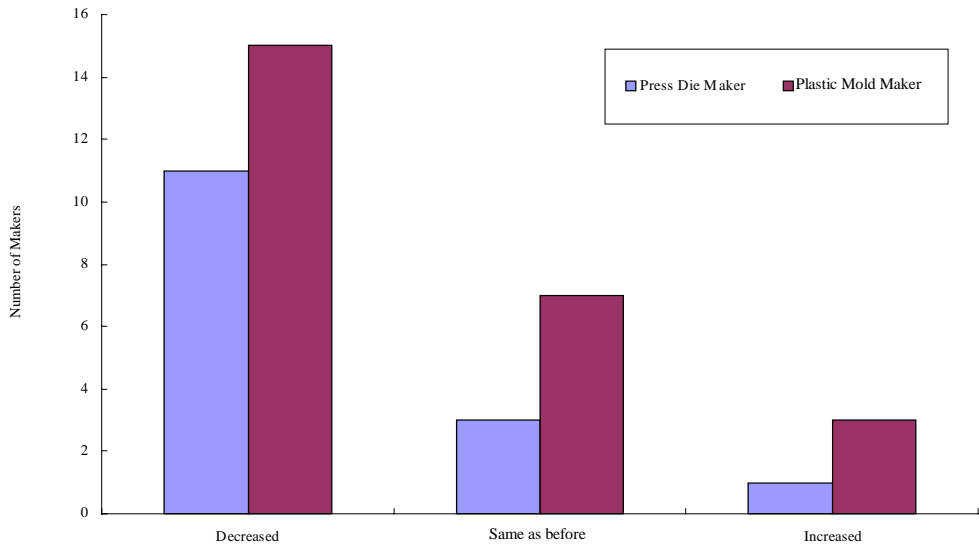


Fig. 25 Changes of Profit Rates before Taxes

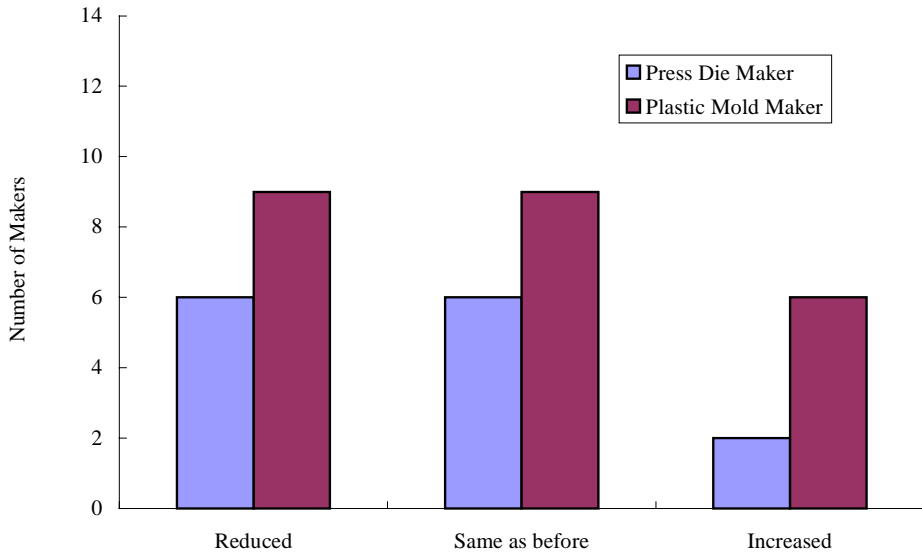
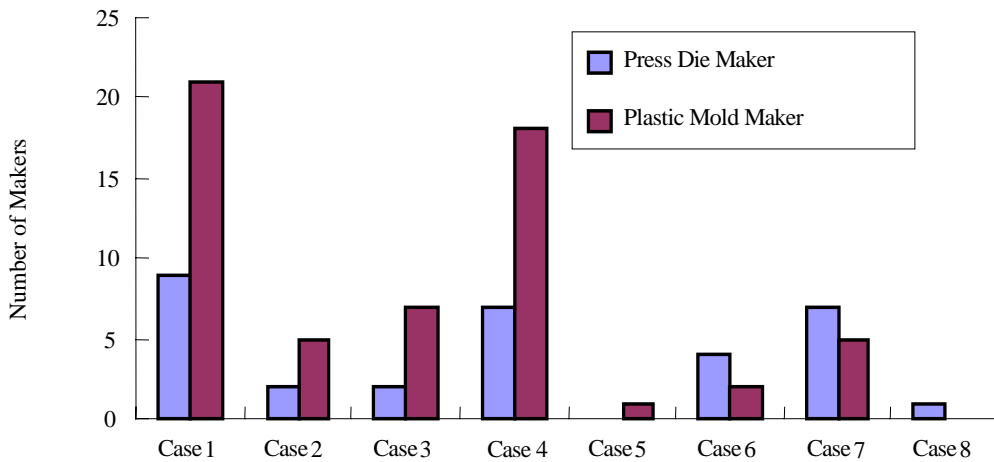
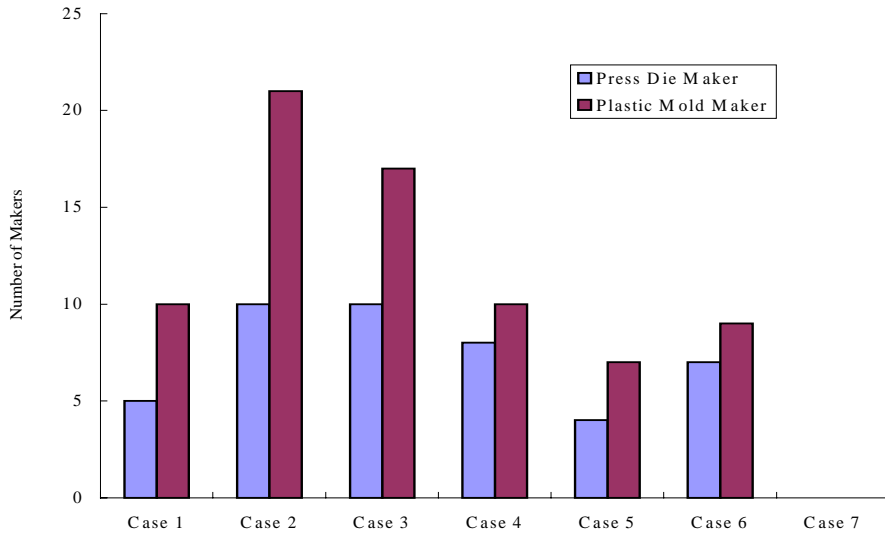


Fig. 26 Solutions of Cost Reduction in Product Process Management



- Case 1: Reinforce CAD/CAM process
- Case 2: Introducing CIM or MES
- Case 3: Introducing supply chain management system
- Case 4: Reinforce out sourcing
- Case 5: Supply parts from abroad
- Case 6: Introducing module system
- Case 7: Bench marking with competing company
- Case 8: Others

Fig. 27 Processes of Introducing IT Technologies



- Case 1: Introducing inter-net oder system
- Case 2: Applying inter-net CAD data exchanging system
- Case 3: Building homepage
- Case 4: Collecting informations for customers
- Case 5: Collecting informations for subcontractors
- Case 6: Collecting informations for R&D
- Case 7: Others

Fig. 28 Data Communication Methods with Customers

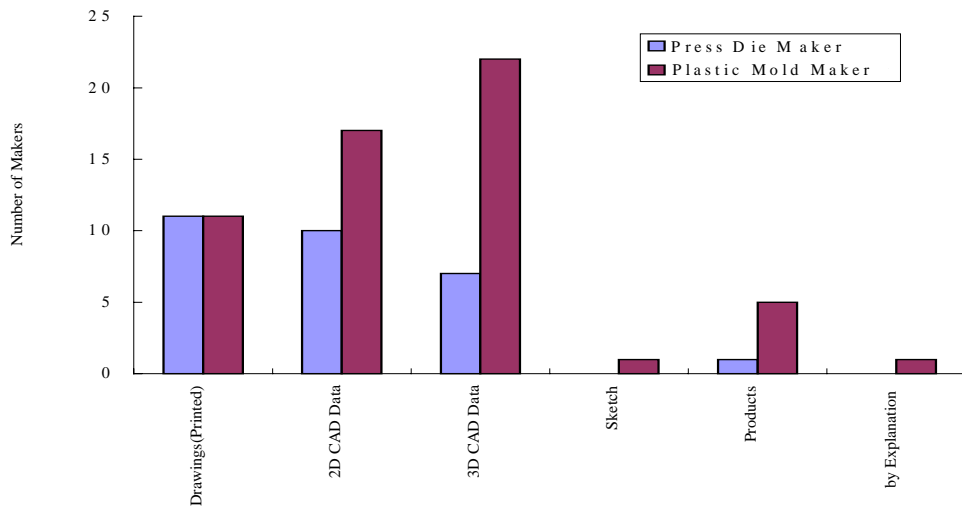
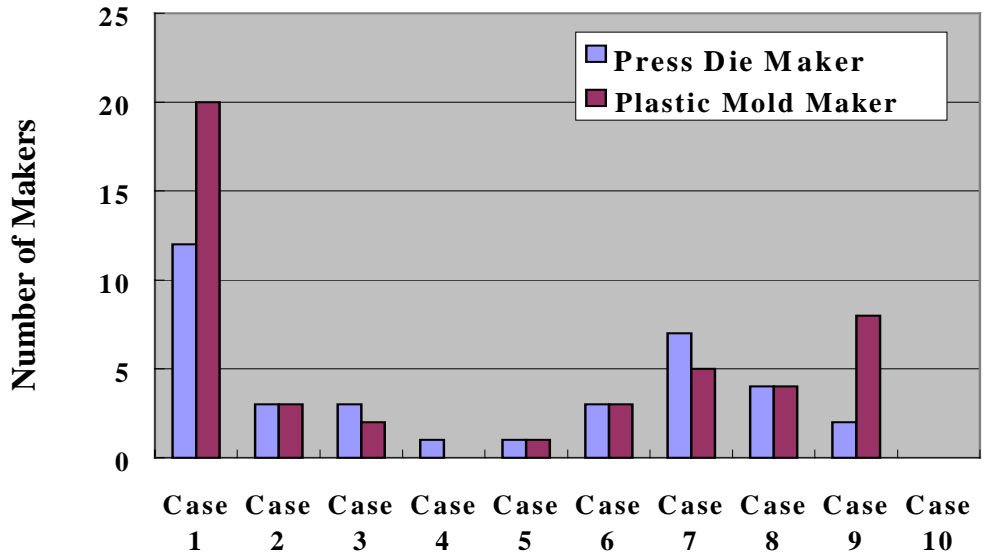


Fig. 29 The Solutions of Cost Down in Labour Management System



- Case 1: Reinforcing productivity depending system
- Case 2: Reducing labour cost
- Case 3: Increasing part timers
- Case 4: Increasing dispatched labours
- Case 5: Increasing foreign labours
- Case 6: Increasing contract based labours
- Case 7: Decreasing number of labours
- Case 8: Rebuilding salary system
- Case 9: Introducing annual salary system
- Case 10: Others

Table 6 Number of Makers Using Imported Parts

	Press Die Maker				Plastic Mold Maker			
	Japan	USA	Germany	Ohters	Japan	USA	Germany	Ohters
Imported From								
Materials	7	2		3	16	1	2	5
Cutting Tool	9	1	2		16	2		1
Jig & Fixture	7		1		10		1	
Parts of Die & Mold	10			2	11	2	1	1

As a solution to reducing labor costs, many companies were inclined to adopt ability-based annual salary system. However, a few companies downsized the number of workers or increased contract-based workers, as shown in Figure 29. This reflects the fact that employment in the die and mold industry requires high skills and the lack of flexibility in the Korean labor market as discussed previously.

Materials, cutting tools, jigs and fixtures, and other imported parts for die and mold manufacturing are summarized in Table 6. The dependency on imports in this area is not high, and most items are imported from industrially advanced nations, including Japan. The purpose for imports in this area is not cost reduction, but rather to resolve quality and technical problem.

2.4 The future prospects of die and mold industry

Most die and mold makers list order decreases caused by domestic economic difficulties and abroad production of customers as the biggest confronted management problems, and too much equipment investment as a secondary problem. Lack of personnel resources and overseas removal are relatively insignificant, as shown in Figure 30.

Moreover, the majority of makers (73.2%) predict that future prospects in the Korean

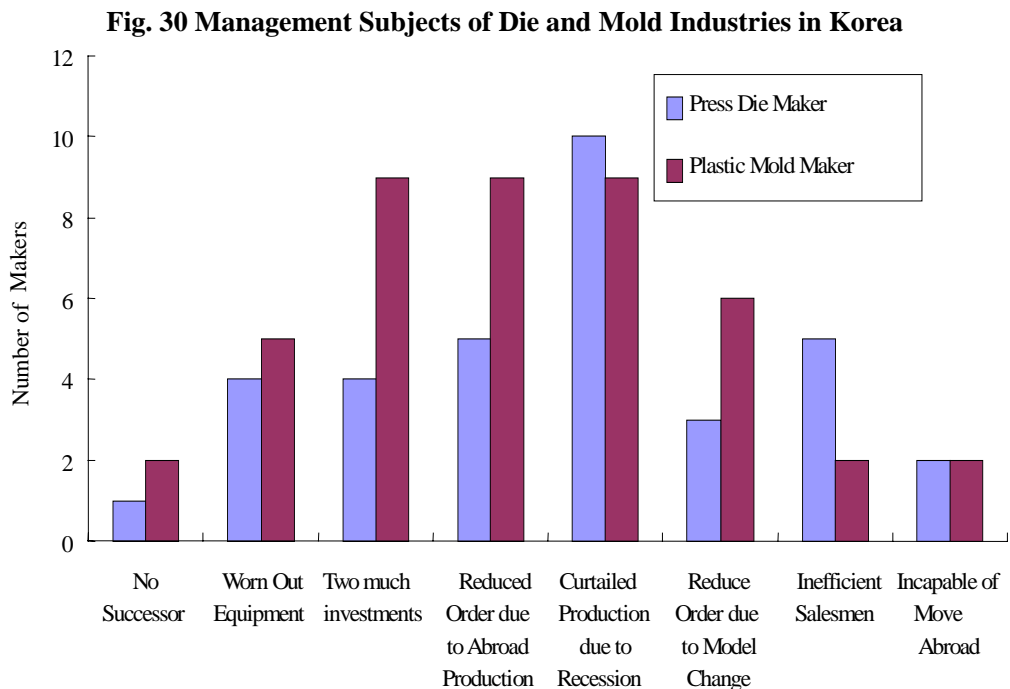
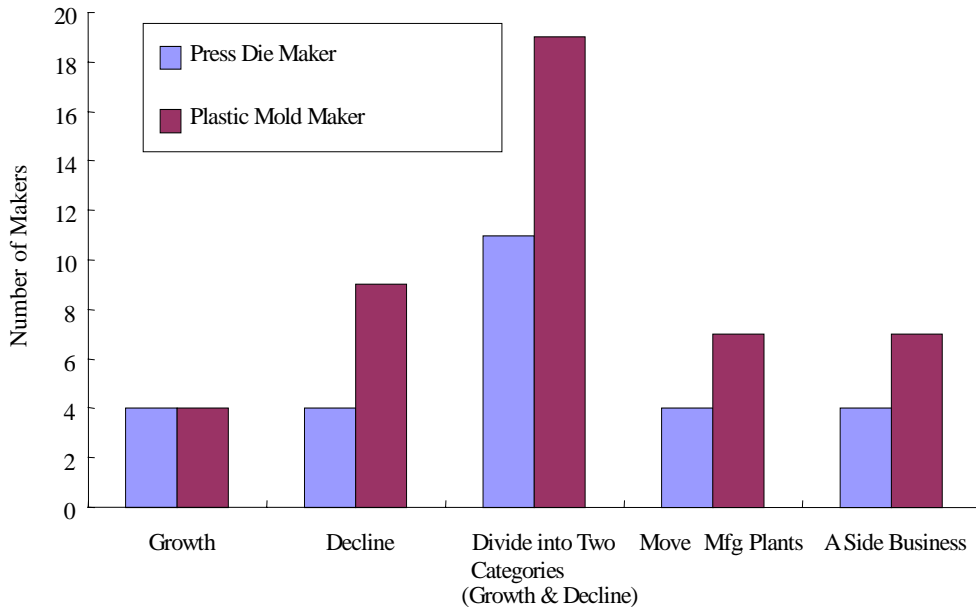


Fig. 31 Future Prospects of Korean Die and Mold Industries



die and mold industries will be divided into two categories (growth & decline), as shown in Figure 31. Companies in growth maintain market competitiveness by improving their design and manufacturing technologies, and companies in decline will lose competitiveness because of delayed renovations. 31.7% of makers are forecast a decline in the Korean die and mold industries, and only 19.5% expect growth. Thus, makers are more anxious about the future situation of Korean die and mold industry than the statistical data represents. As a result, between the industrially developed countries who already have technological superiority and the developing countries such as China, the future of Korean die and mold industry depends on whether it can maintain international competitiveness through continuous technical developments and equipment innovations.

2.5 Business strategies of Korean die and mold industry

Finally, business strategies for quality, production and technology were investigated and the results are as follows.

First, as we can see in Figure 32, the majority of companies (58.3%) choose a policy of concentrating on their strong fields as a technological strategy. 25.0% of makers choose general technological strategy and 16.7% of makers select a particular technological strategy in a unique field that other firms do not penetrate. Both plastic

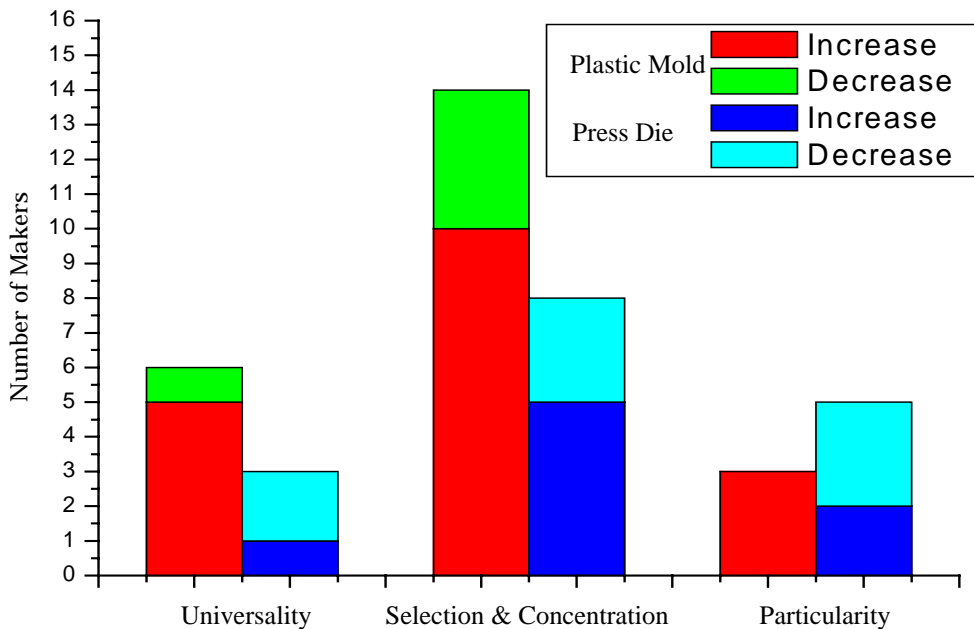


Fig. 32 Technical Strategies of Korean Die and Mold Industries

mold and press die companies show a similar tendency. There is no significant difference in technological strategies between the two groups of companies having increased or decreased gross sales. This indicates that recent increases or decreases in gross sales do not seem to be affected by the technological strategies between two groups.

Second, plastic mold makers adopt high, medium and low price strategies, relatively in terms of priority, while press die makers employ medium, high and low price strategies sequentially as cost strategies, as shown in Figure 33. It can be recognized from this figure that many press die makers are avoiding low price products with consideration of developing countries such as China, and in the case of high price products they are less competitive than industrially developed countries. There is not a large difference of cost strategies between the two groups of companies having increased or decreased gross sales. Therefore, the difference of cost strategies doesn't seem to have an influence on recent increases or decreases in gross sales.

As for quality strategy, plastic mold companies are divided into two categories as shown in Figure 34; one is concentrating on high value-added strategies and the other is employing general strategies focusing on standardized goods. The press die makers show

an even distribution in all of three strategies. There is also not a big difference in quality

Fig. 33 Cost Strategies of Korean Die and Mold Industries

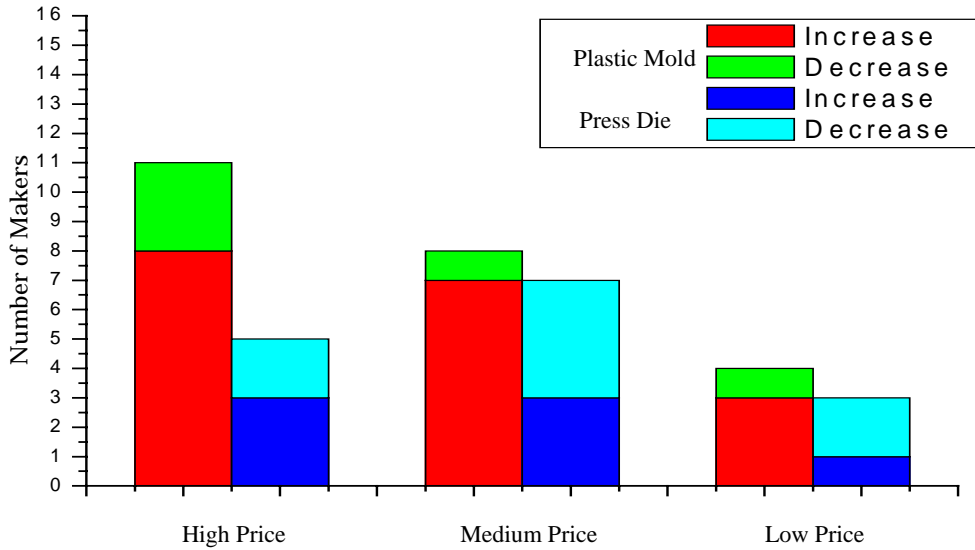


Fig. 34 Quality Strategies of Korean Die and Mold Industries

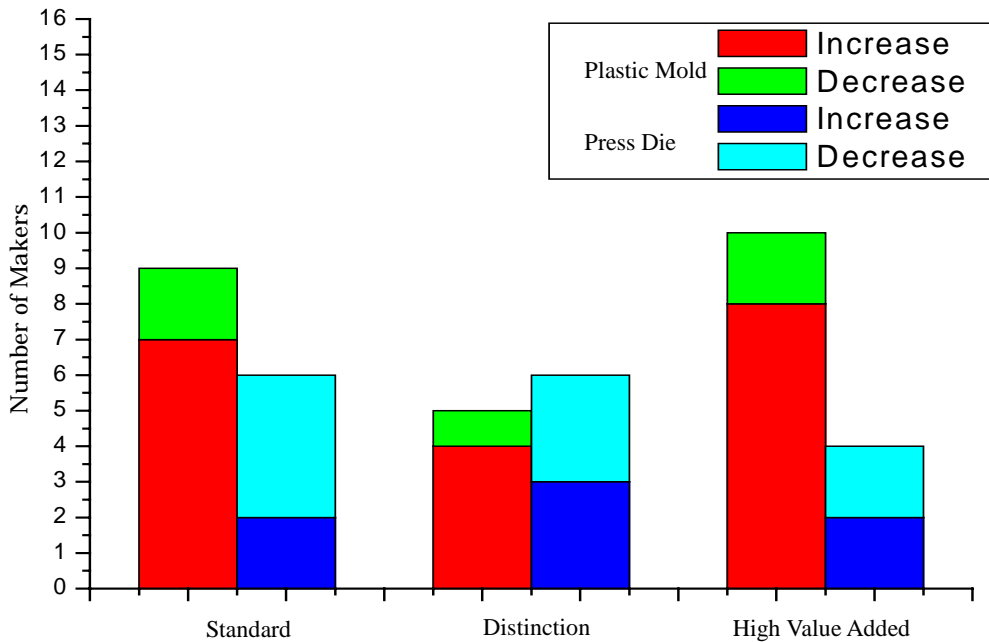


Fig. 35 Manufacturing Systems of Korean Die and Mold Industries

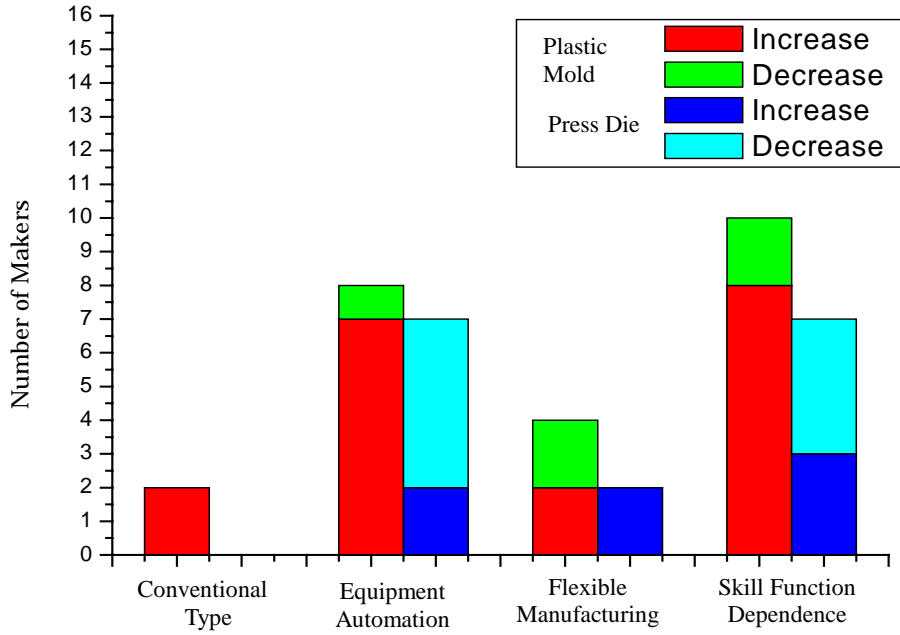
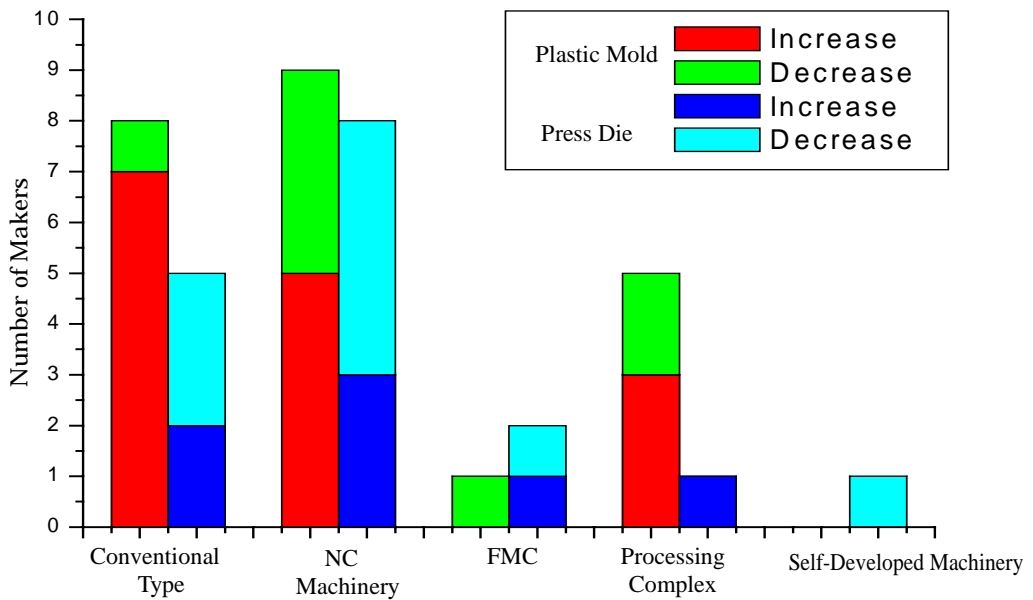


Fig. 36 Core Manufacturing Facilities



strategies between the two the groups of companies with increased or decreased gross sales.

In manufacturing strategies, companies are classified into two groups; one choosing an equipment automation strategy and the other choosing a skill dependence strategy. There are also a few companies that choose flexible automation systems. Both plastic mold and press die makers show a similar tendency, as shown in Figure 35.

For the question about core manufacturing facilities, many makers answered that they have stand-alone NC machinery, but almost the same number of companies still keep conventional batch processing machines as core manufacturing facilities (refer to Figure 36). Since the recent die and mold industry is changing to a facility dependence type combined with CAD/CAM technology, many companies need to modernize their equipment to improve value-added per worker and increase competitiveness. There is also not a large big difference between the two groups of companies with increased or decreased gross sales.

As shown in Figure 37, assembly drawing and part drawing are regarded as the most important processes in design, and concept drawing and original drawing are next. The fact that assembly drawing and part drawing are regarded as the most important part of the design process means many companies are not interested in creative and original designs. Companies still rely highly on imitation and modification design. This is one of the technical problems that the Korean die and mold industry must overcome.

Generally, plastic mold companies are using 3D CAD system and press die companies are using 2D CAD system as design tools. This appears to be a difference of product specialty rather than a technical gap, as shown in Figure 38. The fact that no companies use old type drafter as core design tools represents that IT technology in the Korean die and mold industry is in a state of rapid progress.

Management strategies for human resources are as follows.

First of all, productivity-based salary system dominate, as shown in Figure 39. This coincides with general trends shown since financial crisis that occurred at the end of 1997 in Korea.

Especially, the most needed experts in plastic mold companies are design engineers, CAD/CAM experts, system engineers in that order (refer to Figure 40), but CAD/CAM experts and system engineers are the most needed for the press die companies. This result also shows that improvement of the die and mold design technology is one of most important issues for the Korean die and mold industry.

The investigation of average age of employees shows that the 30~34 years old group make up two-thirds of the investigation, as shown in Figure 41. Young employees

Fig. 37 Most Important Process in Design

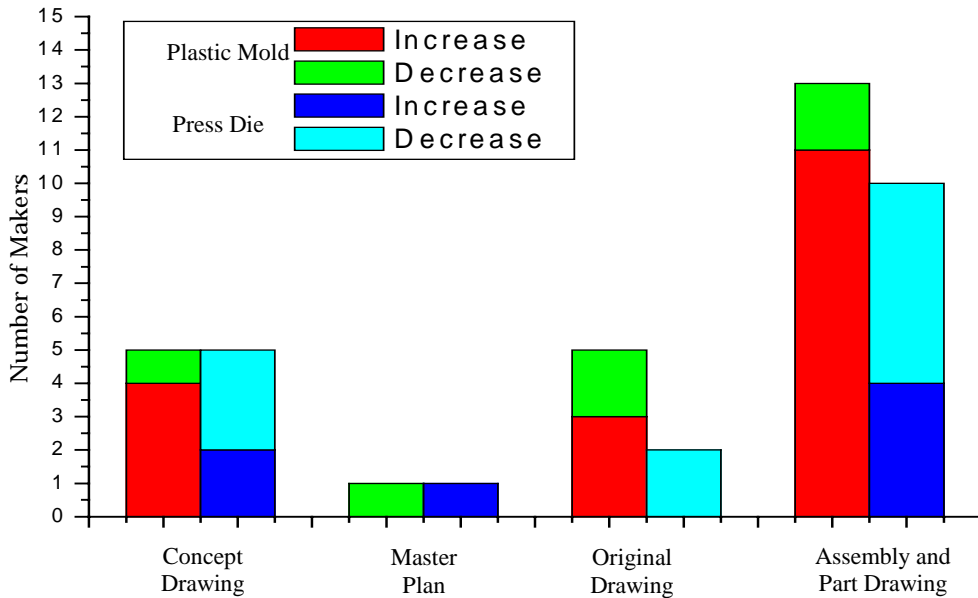


Fig. 38 Design Tools

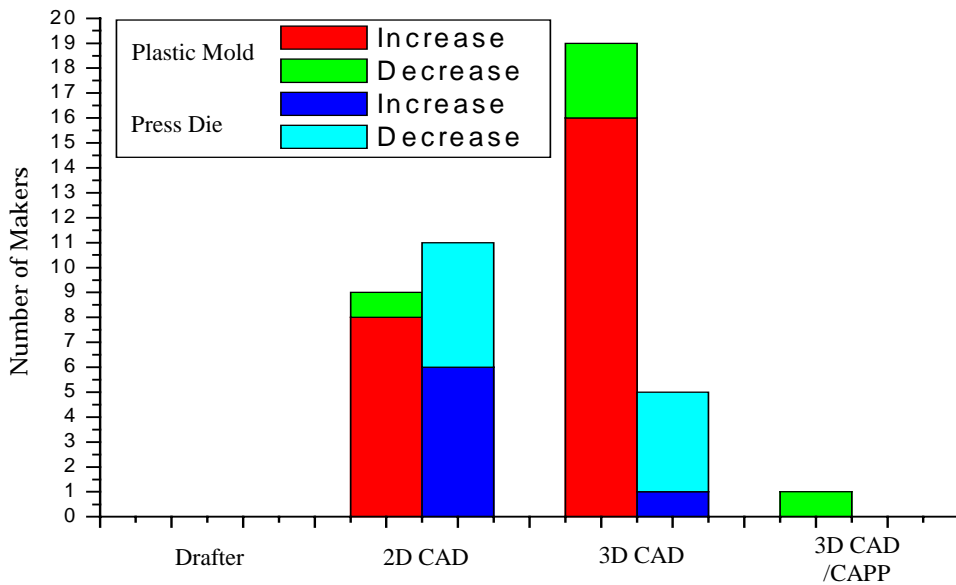


Fig. 39 Adopted Salary System

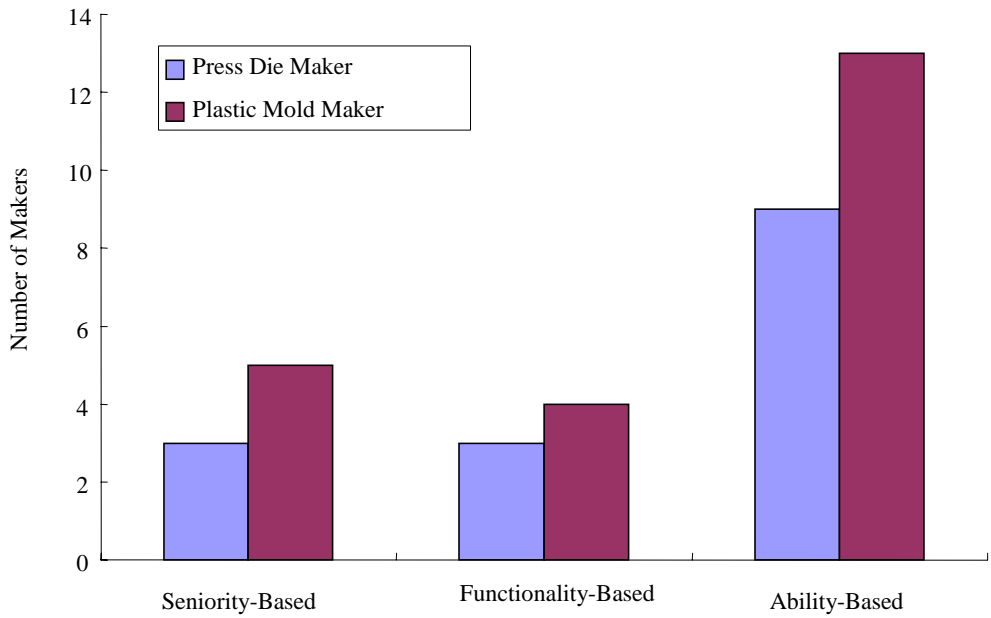


Fig. 40 Most Needed Experts

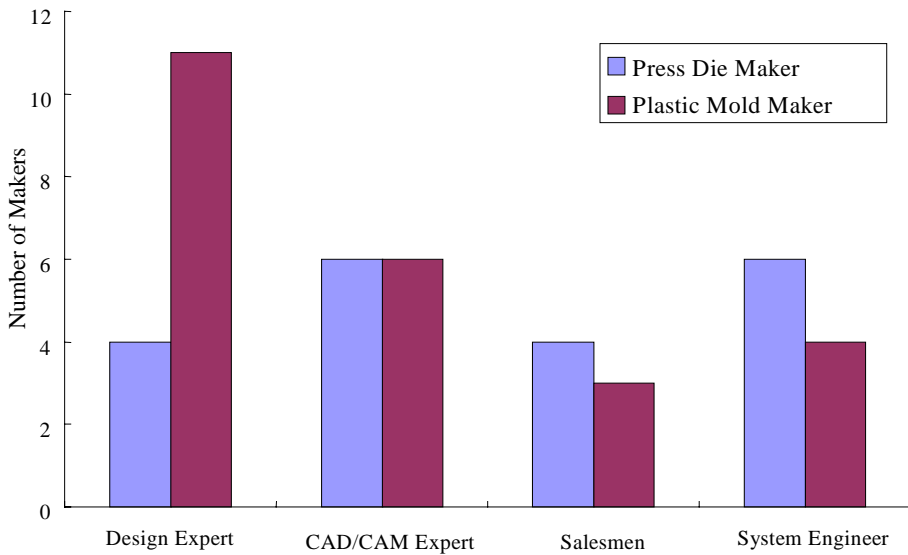
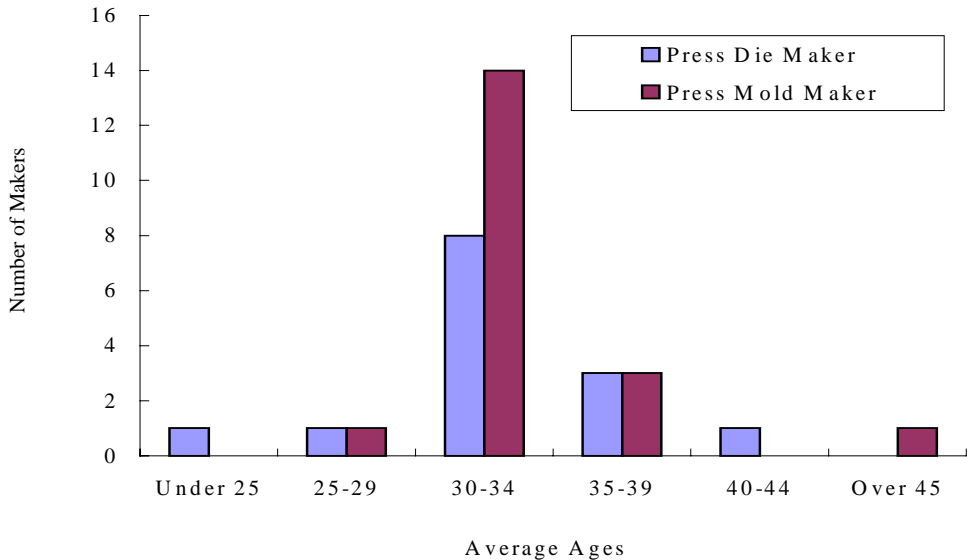


Fig. 41 Average Age of Workers in Die and Mold Manufacturing Process



have an advantage of easily adapting to IT technologies such as CAD/CAM, but they have insufficient skills and experience in die and mold technologies.

2.6 Strategies for international division of labors with Asian countries

Recently, Korean companies have extended their business to Asian countries, mainly in electronics and automotive industries. International division of labors with Asian countries can be a solution for expanding overseas market or cost reduction methods. Investigation was also carried out about the strategies for international division of labors.

As a result, it was found that none of the die and mold companies have overseas factories at present, but some companies are considering overseas business in China over interest in its immense market.

About the question for international division of labor among Asian countries, as shown in Figure 42, only 22.0% of companies show a positive attitude and 39.0% of companies consider the cooperation if they get on offering from customers. This implies that Korean die and mold companies still have a comparatively passive attitude for international division of labor with Asian countries.

As for the methods of division of labor with Asian countries, 19.5% of companies choose the vertical division of labor in which domestic companies take charge of development and design and overseas companies care for manufacturing. 17.1% of

Fig. 42 International Division of Labor & Tech. Transfer in Asian Enterprises

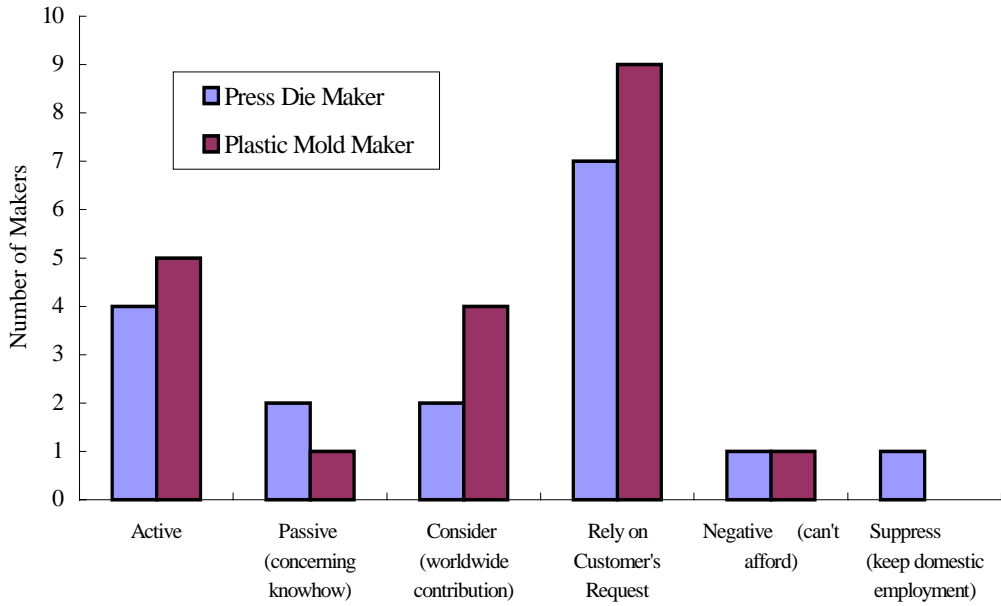
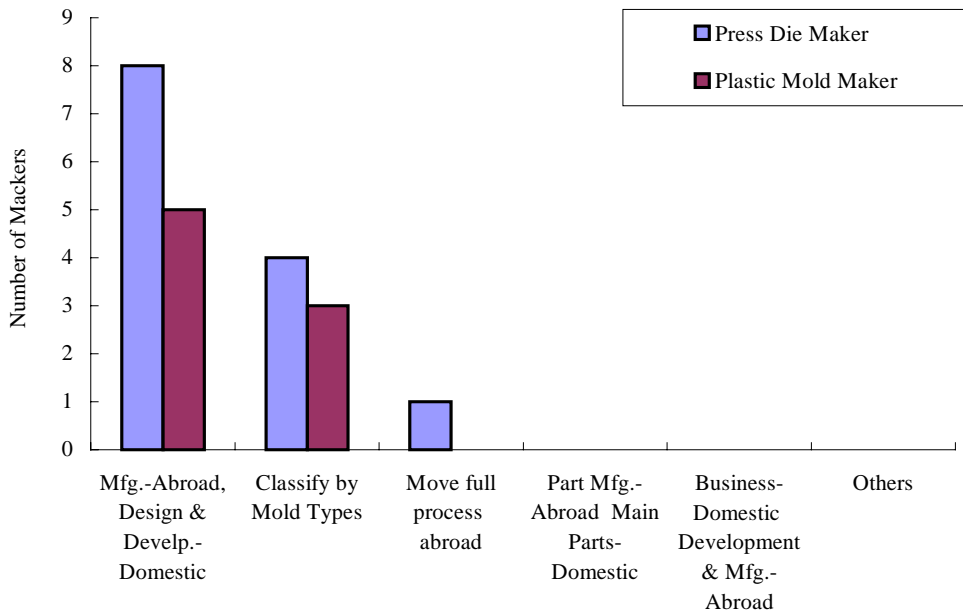


Fig. 43 International Division of Labors



companies choose a horizontal division of labor in which division was classified by die and mold methods. Entrusting only overseas manufacturing of parts followed as shown in Figure 43.

Most companies believe that the benefit of overseas division is exploration of new markets as a sales strategy rather than a cost reduction method. This implies that overseas division of labor might be quite limited, even if it is achieved.

While a majority of companies stated that they previously has business relationships with Asian countries, only a few companies had experience of technical training from overseas or receiving trainees or student apprentices from abroad.

In summary, the Korean die and mold industry has frequent trade relations with Asian companies, but it still has a passive attitude for overseas production in Asian countries and only considers them in terms of business relationships.