THE STUDY ON SELECTED INDUSTRIAL PRODUCT DEVELOPMENT IN MALAYSIA

FIRST YEAR FINAL REPORT

(SUMMARY B)

SEPTEMBER 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

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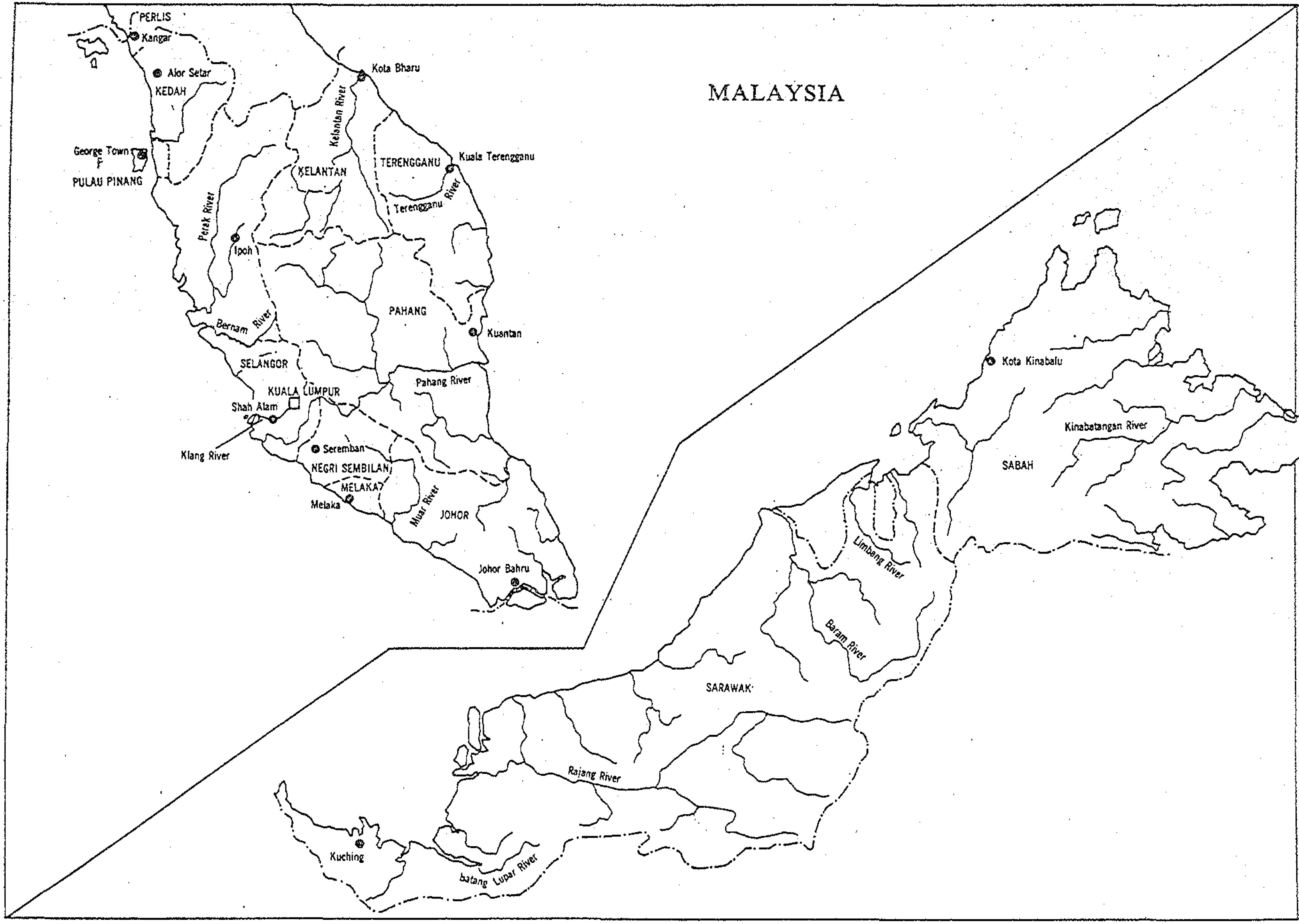

MALAYSIA
PERLIS
Kangar
Alor Setar
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George Town
PULAU PINANG
Perak River
Ipoh
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SELANGOR
KUALA LUMPUR
Shah Alam
Klang River
Kota Bharu
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TERENGGANU
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Seremban
NEGRI SEMBILAN
MELAKA
Melaka
Muar River
JOHOR
Johor Bahru
Kota Kinabalu
Kinabatangan River
SABAH
Limbang River
Baram River
SARAWAK
Rajang River
Kuching
batang Lupar River

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Summary B was compiled from necessary portions of the original report for the reference of those concerned. The original numbering of the tables and diagrams was retained for the sake of convenience in editing.

I. INDUSTRIAL AND EXPORT PROMOTION POLICIES AND FOREIGN INVESTMENT POLICIES

I. INDUSTRIAL AND EXPORT PROMOTION POLICIES AND FOREIGN INVESTMENT POLICIES

1. State of Industrialization

Malaysia established its Pioneer Investment Ordinance in 1958, soon after its independence in 1957, so as to start to build up industries to cut down on imports. This program of promotion continued through the subsequent First Malaysia Plan of 1966 to 1970, the Second, Third, and Fourth Malaysia Plans; and the current Fifth Plan. During this time, Malaysia introduced its New Economic Policy, in 1970, aimed at eradicating poverty and achieving equal distribution of income among its component racial groups. This was designated as a fundamental guideline in economic policies up to the year 1990.

In the 1970s, good performance in exports of primary products and the start of exports of crude oil, among other factors, enabled Malaysia to sustain high economic growth and led to progress in the 1970s in elimination of imports of light industrial goods, such as wood and rubber products, i.e., the "easy" or "first phase" of import-substitution industrialization.

In the 1980s, Malaysia entered the second phase of import-substitution industrialization and took up the task of industrialization in the heavy machinery and chemical fields. Toward this end, it established HICOM, the Heavy Industry Corporation of Malaysia, in 1981 and pushed forward with the Proton Saga Project, etc.

In the 1980s, however, the prices of crude oil and primary products plummeted, resulting in stagnation in exports. Further, fiscal expenditures for promotion of industrialization in the heavy machinery and chemical sectors increased. On top of this, cumulative foreign debts rose.

To deal with this situation, the Malaysian government came out with an aggressive export promotion policy and, in October 1986, announced a new foreign investment policy under which it showed a positive stance toward new foreign investment. Further, in February 1986, it released its Industrial Master Plan setting forth the direction for industrialization policies from 1986 to 1995 and announced policies for industrialization in export-oriented sectors and development plans for strategic industries. The IMP is an "indicative plan" by nature, but holds the important position of a "pillar" of the industrial policies of the Malaysian government, and indicates the future directions Malaysia will take. The IMP is a special type of industrialization plan calling for the public and private sectors to support each other in the industrialization process. Revisions are being made in it along with the state of progress. In March 1988, the Malaysian government released an Sectoral Task Force Annual Report (1986 to 1987) detailing the progress made in the IMP.

The basic industrialization strategies under the IMP are as follows:

(1) Outward looking industrialization
(2) Promotion of heavy industry
(3) Support to manufacturing operations of small- and medium-scale industries (SMIs) and promotion of ancillary industries

The Malaysian economy is structurally weak in that it lacks linkages between the large corporations, which are primarily foreign capital operations, and the local SMIs. Therefore, the government has felt the need for promotion of local SMIs and promotion of supporting industries to back up the large corporations. It is currently searching for specific promotional measures toward this end.

Industrialization Policies of Malaysia

	Industrial policies	Trends in industrial related policies	Foreign investment policies	National economic plans
1958	• Diversification of primary products • Import substitution industrialization (primary light industries	Enforcement of Pioneer Industries Ordinance		
1965		Amendment of Pioneer Industries Ordinance		1st Malaysia Plan (1966 to 1970)
1967		Establishment of FIDA	Positive *introduction*	
1968	Introdution of export-oriented industrialization	Investment Incentive Act (enforced 1971)		
1969				
1970	Stress on fiscal guidance type industrialization	Increase of Non Financial Public Enterprises	Limitation on foreign equity ratio (to ensure ratio of Bumi capital) and, simultaneously, separate treatment for export-oriented investment (due to pressing need for industrialization)	2nd Malaysia Plan (1971 to 1975)
1972	Creation of FTZ	"New Economic Policy" (NEP, 1971 to 1990)		
1975		"Industrial Coordination Act"		
1976				3rd Malaysia Plan (1976 to 1980)
1981	• Heavy industrialization (secondary import substitution), medium level technology, capital intensive	Establishment of HICOM, start of heavy industrialization project for steelmaking, petrochamicals, and automobiles	Indication of clear rates of local content in auto parts	4th Malaysia Plan (1981 to 1985)
1982	• Resource processed export type industrialization	Start of debt management Privatization of Non Financial Public Enterprises		
1983	Emphasis on consumer life			
1985		Amendment of "Industrial Coordination Act"	Loosening of obligation to obtain manufacturing license	
1986	Stronger export orientation	"Promotion of Investment Act 86"	Positive introduction, loosening of restrictions	5th Malaysia Plan (1986 to 1990) Announcement of Industrial Master Plan (1986 to 1995)

Source: JETRO Sensor, November 1987

2. State of Industrial Promotion Policies

(1) Export Promotion

At the present time, Malaysia is basing its industrial policy on its IMP. The current Fifth Malaysia Plan was also formulated along the lines of the IMP. The IMP stresses most of all promotion of exports, and it is in this area that the Malaysian government is expending much of its effort. The Ministry of Trade and Industry, the Malaysian Export Trade Centre, and other organizations have been engaged in diverse activities including the dissemination of information on overseas markets, participation in exhibitions, registration of exporters, and sponsoring of seminars. Incentives are also being provided for export promotion and preferential measures established for exports.

Further, Malaysia established the Export Promotion Council, headed by the Secretary-General of the Ministry of Trade and Industry, in 1985. This council plays an important role as a forum for the exchange of opinions on and study of recommendations on export promotion among government officials.

(2) Promotion of Direct Foreign Investment

Since the Investment Incentive Act was established in 1968, Malaysia has welcomed investment in export industries. Particularly in recent years, it has found a rising need for export-oriented industrialization and thus has more relaxed restrictions on investment and offered new incentives. The new foreign investment incentives announced in October of 1986 ease the application of restrictions on foreign investment in accordance with the export ratio of the products and the number of workers employed, enlarge the framework of employment of foreign nationals in accordance with the paid-up capital, and extend the period of the exemption on income tax for pioneer industries from the old 5 years to a maximum 10 years. Further, the licensing obligations under the Industrial Coordination Act were eased in December 1985 and further eased in October 1986 in order to make acquisition of licenses unnecessary for companies with capitals of less than M$2.5 million and fewer than 75 permanent employees.

Due in part to the easing of these restrictions, the value of approved foreign investment projects soared in 1987. In particular, the investment from Japan shot up, supported by the yen appreciation.

The Malaysian Industrial Development Authority (MIDA) plays an important role as the organization for promoting investment in Malaysia.

Looking at the state of the infrastructure, Malaysia has 101 industrial estates throughout the country. These industrial estates are managed by the State Economic Development Corporation (SEDC).

Further, Malaysia has 8 free trade zones (FTZs) for promotion of exports and has licensed manufacturing warehouses throughout the country.

(3) SMI Promotion Policies

The Malaysian economy suffers from the problem of weak supporting industries. The issue at hand is how to promote their development in the future. The Malaysian government has shown a positive stance toward the promotion of supporting industries and the promotion of SMIs enterprises, which form the backbone of these supporting industries. There are now some 9 ministries and 30 organizations involved in some way in the promotion of small and medium enterprises in Malaysia. From the standpoint of administrative efficiency, Malaysia should study the establishment of a central body corresponding to Japan's Small and Medium Enterprise Agency and more focused, one-dimensional measures.

The current incentives (investment incentives, export incentives, etc.) do not differentiate according to the the size of companies and apply equally to large and small firms alike. In financing, however, the SMIs naturally have less financial ability compared with the large corporations, so that in practice, the majority of the financial incentives are used by the large firms. It may be necessary to study some form of special incentives limited to just SMIs.

(4) Human Resource Development

Economic development is supported by human resources. This development of the same is being performed by the Ministry of Labor, Majlis Amanah Rakyat (MARA), the Ministry of Education, and the Ministry of Youth and Sports, among others. The Government has approved the establishment of a National Vocational Training Council (NVTC) based on the recommendation of the IMP so as to coordinate the labor training activities previously handled diversely by various organizations. Vocational training is also considered necessary to raise the quality of workers to meet with the needs of industry. For example, in moulds and dies, the industry has been seeking the establishment of a system to supply skilled engineers with higher level abilities. In response, MARA and the Industrial Training Institute of the Ministry of Labor are considering the start of a higher level mould and die training course.

Further, the Ministry of Labor introduced a system for double income deductions for costs of training, starting 1987, to promote in-house training programs.

Managerial training is being offered by the National Productivity Center through seminars and the like to raise levels of awareness.

(5) Scientific and Technical Promotion Policies

At the foundation of industrial promotion may be said to be strengthened abilities to absorb technology and promotion of technical transfers. The importance of scientific and technical promotion was recognized in the IMP. In particular, emphasis was placed upon the role of the government, taking cue from the experiences of Japan and South Korea. The government has established an internal Coordinating Council for Industrial Technology Transfer (CCITT) to move toward implementation of the IMP recommendations. In October 1987, the CCITT established under it a special committee for formulating a comprehensive and technical promotion policy. This committee is to complete its final report by March 1989 and submit the same to the Malaysian government.

The Standard and Industrial Research Institute of Malaysia (SIRIM) plays an important role as the government's implementing organization for promotion of science and technology. In SIRIM is MIDEC for molds and dies and the Ceramic Department for ceramics.

(6) Financial System

In terms of financial incentives, Malaysia offers institutional financing through its development banks (Malaysian Industrial Development Finance, Development Bank of Malaysia, and two other main banks) and a loan guarantee system for SMIs under the Credit Guarantee Corporation. However, the recent business slump and high interest rates and the insufficient collateral of the SMIs have resulted in slow use of the CGC. The New Investment Fund, which was started in 1985 to provide low interest loans to fund capital investment in industry will be terminated upon full utilization of its allocated funds totalling M$1.7 billion. This was done at a time when the rate of use by private manufacturing enterprises was rising. This fact alone has led to calls from the private sector for the restoration of this type of system. The Bank Negara, however, came out with a statement at the end of March 1988 asserting that it was not considering resurrection of the NIF.

One of the measures taken by Japan to divest itself of its trade surplus was the establishment of the ASEAN Japan Development Fund (AJDF), worth a total US$2 billion. The portion earmarked for Malaysia is reportedly to be administered to private businesses through the MIDF and 3 other development banks.

3. State of Export Promotion Policies

Malaysia began promoting exports with the establishment of the 1968 Investment Incentive Act. Under the act, pioneer status given to import-substitution type industries under the 1958 Pioneer Industries Ordinance was extended to cover export-oriented industries and preferential tax treatment was given without distinction as to whether the industries were founded by foreign or domestic capital.

In 1970, the Free Trade Zone (FTZ) Act was established. Based on this act, Malaysia set up FTZs in different parts of the country starting in 1972. Companies which export 80% of their production are allowed to locate in the FTZs. In these zones, no duties are assessed on the raw materials, intermediate goods, and machinery used for production. Further, the introduction of the licensed manufacturing warehouse (LMW) system enabled companies approved as LMWs to receive the same benefits as companies in the FTZs even in non-FTZ areas.

After the introduction of this system, there was active investment in Malaysia by foreign capital, primarily in textiles and electronics. Simultaneously, there was a surge in exports of Malaysian goods.

A comparison of 1970 with 1975 shows that the share of manufactured goods in total exports rose considerably from 10.5% to 21.3%. Further, the share of textiles in the exports of manufactured goods rose from 6.5% to 11.0%, and the share of electrical and electronic equipment from 2.8% to 15.4%.

However, since the FTZs and LMWs depend on imports from parent companies for the major part of their materials and intermediates, there was a decisive lack of linkage with the indigenous economy. This problem remains today.

In the mid-term review of the Fourth Malaysia Plan announced in 1984, greater stress than ever was placed on promotion of increased exports of manufactured goods. At the same time, mention was made, in regard to the manufacturing industries, of (1) infusion of maximum private sector activity, (2) stronger linkage between the FTZ industries and the indigenous economy, and (3) stimulation of resource-based industries. The directions laid down there were further clarified through the Fifth Malaysia Plan (1986 to 1990) and the IMP (1986 to 1995).

In the IMP, stress was placed on more "outward-oriented" industrialization and on stronger export competition. Reforms of the export-promotion policies were proposed, such as introduction of competition and increased access to input goods on a free trade basis.

Since 1986, Malaysia has been making improvements on its export-promotion policies. Many of the privileges actually offered were originally proposed by the IMP.

The current export incentives may be classified into 1. financial (tax) measures, 2. export financing, and 3. measures for acquisition of raw materials.

(1) Financial (tax) measures: There is the system of abatement of adjusted income for exports which allows for companies to reduce their adjusted income by 50% of their export sales, the export deductions for traders which allows deductions of 5% of export income, and the double deductions of export credit insurance premiums and specific expenses incurred for developing export markets.

(2) Export financing: There is the system of export credit refinancing (ECR) for supplying funds, at preferential interest rates, to export companies (current 4% a year). The system has been revised several times since 1985 to extend the scope of coverage of loans from just the direct exporters to indirect exporters, to increase of ceiling on financing, etc. so as to promote its use.

The system is still under review. To ease the severity of the loan conditions (overemphasis on collateral) of the commercial bank, one of the reasons for the lack of active use of the system, consideration is being made of using the Malaysian Export Credit Insurance Berhad (MECIB).

(3) Measures for acquisition of raw materials: There is the system for drawback of customs duties, whereby the entire amount of the tariffs which are applied to raw materials and intermediate goods used for production of export goods is subject to rebate. Complaints have been leveled against the system that [1] it takes too much time from application to drawback and [2] the application procedures are too difficult, but effort is being made to improve the situation. With current procedures, payment is made within 21 days of the application.

Further, companies exporting over 80% of their production may locate in the FTZs or receive designation as LMWs in order to receive comparatively easily exemption from tariffs.

Malaysia established the Malaysian Export Trade Center (MEXPO) as a unit of the International Trade Division of the Ministry of Trade and Industry.

MEXPO [1] handles trade inquiries, [2] participates in exhibitions and dispatches and assists mission, [3] offers consulting services, [4] supplies information, and [5] holds seminars, through which services it facilitates access by Malaysian companies to overseas markets, improves products, trains domestic entrepreneurs, etc.

Along with the rise in exports by Malaysia, the Export Promotion Council was established in 1985. This provides assistance in drafting policies on export promotion. It has members drawn from government agencies and organizations and serves as a forum for positive dialogues between the public and private sector. Opinions here are fed back in some form or another and have gained a favorable reputation inside the MTI as well.

The MTI has further sponsored an export achievement award system since 1987. These MTI sponsored awards are presented once a year to companies that have demonstrated outstanding export successes.

4. State of Foreign Investment Policies

Since Malaysia's independence, the government has shown a consistent stance of welcoming foreign investment. In particular, since the establishment of the 1968 Investment Incentive Act, the government has offered various incentives to export-oriented companies in an attempt to promote such investment.

The basic framework of the foreign investment policy is given by the New Economic Policy (NEP, 1971 to 1990), which aims at uniting the various racial groups of Malaysia into a single nation and at eliminating the economic gap among the racial groups and eradicating poverty. The NEP has as its goal the reconstruction of domestic capital to a ratio of 30% Bumiputra, 40% non-Bumiputra, and 30% foreign investment by 1990. This has become a basic guideline for equity ratios in foreign investments. However, the government has adopted a considerably flexible stance in regulating equity ratios, taking into consideration the export ratios, technical levels, and scale of investments. In particular, it allows up to 100% foreign ownership for companies with export ratios over 80%.

Further, companies engaged in manufacturing activities in Malaysia are obliged to obtain manufacturing licenses under the provisions of the 1975 Industrial Coordination Act (ICA), but the government currently considers companies with shareholders' capitals of less than M$2.5 million and fewer than 75 permanent employees to be exempt from this and allows them complete freedom from all restrictions, including equity ratios.

The year 1986 was an epoch-making one in terms of the foreign investment policies of Malaysia. First, the Promotion of Investment Act of 1986 was enacted to take the place of the 1968 Investment Incentive Act. The main incentives for investments were established by this law and the 1967 Income Tax Law.

The 1986 Promotion of Investment Act has as its main objectives (1) creation of employment opportunities, (2) promotion of exports, (3) regional development, (4) active use of domestic resources, and (5) development of technology and human resources. It was basically the same as the 1968 Investment Incentive Act.

However, the investment environment of Malaysia has been rapidly improved institutionally since 1986 with the relaxation of restrictions on foreign equity and employment of foreign nationals, expansion of investment incentives, and speeding-up of investment processing.

The attached table shows in brief the investment incentives of Malaysia for the manufacturing industries.

The investment-incentive system is based on various tax abatements. Companies in Malaysia are assessed a 40% corporate tax and 5% development tax. In the past, there was an additional excess profits tax of 3%, but this was abolished from the 1988 fiscal year.

The Malaysian Industrial Development Authority (MIDA) is the central organization for investment promotion. MIDA is in charge of authorization of manufacturing licenses and examination of eligibility for incentives and is therefore the organization which investors first contact.

MIDA has 9 local offices and 12 overseas offices. It holds seminars, supplies investment related information, and engages in other promotional activities for foreign investment. It also acts as overall coordinator for the promotion of domestic industrial estates.

The State Economic Development Corporations (SEDC) are engaged in actual development and management of industrial estates. Activities are slightly different in each state. Some states are working to promote indigenous small- and medium-sized industries and are participating in various projects.

Main Incentive Systems for Manufacturing Industries

General incentives	(1) Pioneer status, 5-year exemption from corporate tax with a possible 5 year extension on a case-by-case basis	
	(2) Investment Tax Allowance (ITA) in respect of qualifying capital expenditure incurred within five years from the date of approval of the project.	Export ratio, maximum 30% deduction Added value ratio, maximum 20% deduction Local content rate, maximum 20% deduction No. of employees, maximum 15% deduction Site location, maximum 15% deduction
	Special income deduction system (3) 5 percent deduction of adjusted income for companies located in regions designated for promotion	
	(4) 5 percent deduction of adjusted income for SMIs	
	(5) 5 percent deduction of adjusted income for companies complying with new economic policies	
	(6) Accelerated deceleration system, initial 20% and annual 40%	
	(7) Reinvestment deduction system, 25%	
Export incentives	(1) Export Credit Refinancing	
	(2) Abatement of adjusted income from exports	For value of export sales, 50% For usage of domestic materials, 5%
	(3) Deduction of 5 percent of exports for trading companies	
	(4) Double deduction of export credit insurance premiums	
	(5) Double deduction for export promotion	
	(6) Industrial Building Allowance system	
Incentives for R&D	(1) Deductions for research expenses	
	(2) Deductions for research buildings, initial 10% and annual 2%	
	(3) Deductions for research plants and machinery	
Incentives for training	(1) Deductions for training buildings, initial 10% and annual 2%	
	(2) Deductions for expenses for training	

II. MOULDS & DIES

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1. Overview of the Industry

1-1 Production

Statistics on moulds and dies can not be obtained in Malaysia, because the statistics themselves are not classified in detail. Production figures of moulds and dies are included in those figures classified under industrial code number [38230] (Manufacture of Metal and Woodworking Machinery).

Concerning the Malaysian mould and die industry, there are 26 manufacturers with 695 employees and an annual output of M$12 million (M$1=¥50), according to the Malaysian Industrial Survey in 1985 compiled by the Department of Statistics, Malaysia.

The Malaysian Industrial Development Authority (MIDA) put the number of mould and die manufacturers at about 60 in its survey conducted in 1987.

Table IV.1-1 Manufacturer, Production and Employee

Manufacture of metal and woodworking machinery				
Year	No. of firms	Annual output	No. of employee	No. of employee per firm
1983	24	M$ 9.5 million	494	21
1984	24	M$ 9.9 million	493	21
1985	26	M$ 12 million	695	27

Source: Industrial Surveys '83, '84, '85.

As the annual outputs of the smaller mould and die manufacturers are not included in the statistics of the Industrial Survey, the correct total production figures of the Malaysian mould and die industry are not shown.

The total annual outputs of 60 firms are estimated to amount to M$40-50 million in 1987, based on the interviews of the 25 firms surveyed. The output figures of the in-house production of the home electric appliance industry and the automobile industry are not included because they are not available. Outputs are expected to increase 30% in 1988 and 1989 respectively, as demand is rising, owing to the recovery of the Malaysian economy in the latter part of 1987.

1-2 Manufacturers

Malaysian independent mould and die manufacturers serving the needs of other industries on a job order basis are estimated at a total of 60 firms. However, actually more than half of them are manufacturing not only mould and die parts and toolings but also metal stamped parts and plastic parts in addition to moulds and dies.

By district, more than 60% of the mould and die manufacturers are situated in Kuala Lumpur and its environs which is the center of the electric appliances and electronics industry and the automotive industry. The remaining manufacturers are in Penang State. This situation will not change because they are situated near the users of moulds and dies.

Most manufacturers (80% of them) are operated on a small scale basis with an average employment of 20-30 workers. Their paid-up capital is rather small, less than M$1.6 million, and annual sales of the smaller manufacturers vary from M$8.36 million to M$0.1 million.

Table IV.1-2 Location of Manufactures by District

Disctrict	No. of firms
Kuala Lumpur and its environs	37
Penang and its environs	19
Ipoh and its environs	4

Source: MIDA

1-3 Main industries supplied

<u>Supply to the electronic and electric industries</u>

Mould and die manufacturers which supply the electric and electronic industries have developed as a response to requests from export-oriented semiconductor plants which are located in the Free Trade Zones.

At present there are 22 firms which mainly produce moulds and dies for IC production, manufacture mould and die parts and undertake mould and die repairs. With the exception of 3 rather large firms, they each have less than 20 employees and their annual turnover is in the region of M$40,000 to M$50,000.

Locally produced moulds and dies supplied to the electric and electronic industries are worth between M$20 million to M$30 million per annum. This constitutes 20% of the total supply to the electronic industries which is worth M$150 million.

Supply to the plastic moulding industry

Mould and die firms which work as subcontractors to the plastic moulding industry are mostly small in scale. Their moulds and dies are used for the production of products which are made for the domestic market and they are simple and of relatively low level precision. However, some of them do export products to neighboring countries.

There are 4 types of moulds; namely, the injection mould, blow mould, compression mould, and extrusion mould. These moulds are used in the production of electric goods, home appliances, medical instruments and articles for construction.

There are 21 mould and die manufacturers which are associated with the plastic moulding industry, but there are also quite a few moulding and product manufacturers which undertake their own in-house production.

Firms which specialize in moulds and dies are small in size and have work forces of between 10 and 20 employees. Local mould and die manufacturers supply between 20 and 25% of the needs of the plastic moulding industry which is worth a total of M$50 million per annum.

According to the Federation of Malaysian Foundries and Engineering Industry Association (FOMFEIA), mould and die production in Kuala Lumpur and its environs was worth a total of M$14 million in 1985.

Supply to the metal working industry

Moulds and dies required by the metal working industry are those which are used for the production of stamped parts such as parts for electric machinery and appliances, automobiles, and home appliances. Although the manufacturers of press dies for goods such as these are still not very advanced, the progress made by local manufacturers in producing automobile parts, electronic parts for industrial use, and good quality home appliances has led to the growth of the press die industry.

In addition to the in-house production carried out by aluminum extrusion plants and press parts manufacturers today, there are 11 specialized manufacturers. While there are no accurate figures for the output of this industry, the industry source has put the figure at somewhere less than M$10 million per annum.

As for die casting, although there are presently 11 die cast manufacturers which produce automobile parts, cable terminal boxes, and parts for fans, etc., imports are relied upon for all of the dies which are used for such die casting.

Supply to the rubber processing industry

With the exception of moulds for tyres, there are few manufacturers of moulds for rubber so there is a heavy reliance on imports.for these.

1-4 Summary of Manufacturers Surveyed

25 mould and die manufactures, including one in-house manufacturer, have been surveyed and can be summarized as follows:

1-4-1 First Group

The first group is composed of two foreign affiliated firms: Micro Machining Sdn. Bhd. of National Semiconductor Corp. of America and Mattel Tools Sdn. Bhd. of Mattel Inc. (a toy maker) of America.

Micro Machining is the biggest mould and die manufacturer in Southeast Asia with 190 employees and M$8.38 million in annual sales. It has the capacity to produce dies for lead frames of micron order and is equipped with first class CNC EDM and CNC Machining Centres.

Mattel Tools is the manufacturer of plastic moulds for toys. They have 100 employees and M$4 million in annual sales. They also have the capacity to produce plastic moulds to micron precision, although with less accuracy for plastic toys.

Both manufacturers supply all of their products to related companies in Malaysia and overseas. Mattel has closed its factories in Taiwan and the Philippines and is planning to centralize its facilities in the Penang factory.

Both companies have excellent technical levels, good OJT training systems, and well organized pay scale systems clearly classified by job grades. They are superior to other firms in respect to company size and technology.

The Malaysian Government is expecting to invite more of this kind of establishment and technical transfer.

1-4-2 Second Group

The second group is composed of two Japanese joint venture companies, Matsushita Electric Co. (Malaysia) Bhd. and Topla Engineering (Malaysia) Sdn. Bhd.

Matsushita Electric, the manufacturer of home electric appliances in Shah Alam, a suburb of Kuala Lumpur, has started in-house production of moulds and dies and has imported other moulds and dies from Japan and Singapore which could not be supplied by in-house production.

From January of 1987, it has started to supply products to Matsushita group factories in Malaysia and Singapore for the purpose of fully utilizing its facilities and is now selling 40% of its moulds and dies to them. It has 40 employees supervised by one Japanese senior engineer with M$1.4 million in annual sales.

Topla Engineering was established in Ipoh City, midway between Kuala Lumpur and Penang, aiming at both markets. Since its establishment five years ago, it is expanding its business step by step as one of the best independent mould and die manufacturers.

One Japanese senior engineer supervises the local staff for OJT training and technical transfer by introducing a Japanese production system. The firm supplies its products mainly to Japanese affiliated companies in Malaysia. As it has had many orders for hardened moulds and dies from this year, it has invested in new machinery and equipment whose depreciation is rather heavy.

The technical level of both companies is excellent, having precision to the micron order, as well as being able to meet the requirements of Japanese users. They have firm management policies to pursue localization by transferring technology and fostering local staff. They are good examples of future joint ventures and technical tie-ups.

1-4-3 Third Group

The third group is composed of well-organized medium-sized local firms such as ENG Hardware Engineering Sdn. Bhd. in Penang. This company has more than 100 employees and M$4.3 million in annual sales and produces high-precision moulds and dies and jigs with the most advanced CNC machinery and equipment. It even produces progressive dies of its own design as well as tie bar cut dies.

Hup Lee Engineering Works, a plastic mould manufacturer in Kuala Lumpur, is also in this group, having about 50 employees. For a medium scale company, it has a high level of technology.

Loh Kim Teow Engineering, another firm in Penang, has 100 employees and M$4 million in annual sales. It also has a high level of technology.

Another company with some high level technology is Sun Tong Seng Mould-Tech Sdn. Bhd. in Bangi, a southern suburb of Kuala Lumpur, with 30 employees. Its annual sales were M$1.2 million and are expected to increase 30% in 1988. As they are lacking in skilled workers, its handling of machinery is rather rough. Their level would be improved if it were ready to accept experts' advice and try harder.

1-4-4 Fourth Group

The fourth group is composed of nearly 50 small-sized firms having less than 30 employees (mostly 10 to 20 employees). They have the technical level to produce moulds and dies with precision to 0.1mm.

Spurred by the recent brisk demand for moulds and dies, those firms plan to purchase the most advanced sophisticated machinery and equipment. Actually, they were going to install EDM and Machining Centres. It is possible to raise accuracy by introducing high-precision machinery and equipment. However, they are only part way toward getting precise accuracy because they neglect the basic skills of metal cutting, grinding, and polishing and also they are lacking in skilled workers including design engineers. Some of them are still using older machinery and equipment because they have limited assets to pledge as collateral for bank loans.

The Malaysian Government firmly recognizes that the mould and die industry is a most basic supporting industry and a very important one. It has already designated the mould and die industry as a high priority item in the Industrial Master Plan (IMP) which is the basis of Malaysian industrial policy, and has already reviewed the plan to start developing the industry. One of the biggest themes for fostering and developing the mould and die industry should be to raise its technical level by fostering skilled and ordinary workers in the fourth group of firms.

1-5 Malaysian Import Trend

Malaysia imports 80% of plastic moulds and dies heavier than 3-4 tons from Japan, Taiwan and Singapore. The work size of the rest of the machine tools of almost all mould and die manufacturers is less than 1,000 mm x1,000 mm with some exceptions.

Also, it has to import moulds and dies with accuracy of a micron order. It can produce and supply locally moulds and dies for parts of home electric appliances and automotive parts in addition to those for simple sundry goods (tolerance level 0.1mm). On average, the users of mould and dies import more than 70% of their total requirements.

Almost all metal materials are imported from overseas. As prices of imported metal materials are rather expensive, the material ratio of production cost is rather high. Local supply of metal materials is not likely since consumption of such materials is very low. So, these materials continue to be imported for the time being. It would be better to give some incentives to manufacturers by supplying imported materials at low cost.

Table IV.1-3 Import of Moduls and Dies Excluding Ingot Moulds

(Unit: M$ 1,000)

Countries	1985	1986	1987
Australia	2,069	714	823
West Germany	2,925	4,903	6,281
Hong Kong	5,620	9,270	8,693
Italy	3,295	970	1,435
Japan	22,177	28,665	37,960
Republic of Korea	1,666	863	3,288
Singapore	9,573	10,660	12,095
Taiwan	9,782	10,787	13,337
United Kingdom	2,683	1,319	2,872
U.S.A	3,730	5,988	6,800
Others	6,543	5,845	11.099
Total	69,961	79985	104,683

Source: Malaysian Annual Statistics of External Trade

Imports of moulds and dies (No. 749-910-00) are set out in Table IV. 1-3.

It is to be noted that these import values do not include those supplied to the Free Trade Zone (FTZ) and the Licensed Manufacturing Warehouses (LMW) in the country or the values of moulds and dies which are imported together with other machinery or as machinery parts recorded in different import codes. Accordingly, the actual total imports are higher than values shown in the table, but actual values are not available.

In terms of value, one-third of the imports are from Japan, but those from NIES, especially Hong Kong in addition to Taiwan and Singapore, are increasing. It is expected that imports from NIES will increase in the future owing to the strong yen.

1-6 Malaysian Export Trend

It is recognized in Malaysia that supplies to the Free Trade Zone (FTZ) mean exports. Accordingly, the values of exports from the mould and die industry are very large in this area. Some firms are said to export more than 80% of their total products to the Free Trade Zone (FTZ). On average, those ratios are 40-50%.

Table IV.1-4 Exports of Moulds and Dies Excluding Ingot Moulds

(Unit: M$ 1,000)

Countries	1985	1986	1987
Hong Kong	637	378	821
Indonesia	453	499	347
Japan	1,155	1,051	1,279
Singapore	5,760	4,973	13,950
Thailand	1,866	11,956	3,495
U.S.A.	505	349	102
Others	879	1,467	5,496
Total	11,255	10,674	25,489

Source: Malaysian Annual Statistics of External Trade

Exports of moulds and dies (No.749-910-000) excluding exports to the Free Trade Zone (FTZ) are set out in Table IV. 1-4. Total export values increased 2.5 times in 1987 because of a sharp increase in exports to Singapore.

Singapore is the largest buyer of Malaysian moulds and dies, and next is Thailand. In both cases they purchase simple ones. Several companies we interviewed mentioned that they export to Indonesia.

Japan is the future market. For instance, the technical level of Malaysian plastic moulds have advanced to some extent (to the Japanese level of 10 years ago). Some Japanese manufacturers could import some unfinished items and finish them in Japan. Further, it is expected that mould and die exports will become main stream as the overseas investment of Japanese firms is increasing drastically, including that in the mould and die industry, owing to the strong yen.

2. Existing Status of Manufacturing Establishment

2-1 Production Process

2-1-1 Designing Process

With some exceptions, mould and die parts design drawings are not prepared in medium and smaller manufacturers belonging to the fourth group. In most cases, product sample drawings are supplied by their customers, but many of them are making moulds and dies only by production samples without even their own drawings.

It is a serious problem to start machining without the drawings. As even simple moulds and dies are one assemblage of metal components and parts, the total accuracy of the moulds and dies depends upon the accuracy of each component and part. In many cases, the accumulated knowledge of experienced engineers (mostly the owners in the case of smaller manufacturers) are respected and their oral instructions are conveyed to machinists to make the moulds and dies. Without their instructions, there would be some trouble on the production line. A more serious matter is that without design drawings the past accumulated technologies and experience are not collected systematically.

The fact that nothing can be done without experienced engineers is a grave matter. If those experienced engineers who are not the owners were to quit , the firms would be on the verge of bankruptcy.

The owners should be expected to make experienced engineers hand over at least hand-written design drawings to machinists for on-the-job training.

In some firms, the correct instructions are conveyed to machinists by hand-written three dimensional drawings, and there are also well organized firms in which machining operations are not allowed until after machinists read and understand the design drawings. There are very few firms that have good on-the-job training systems to foster design engineers from the start.

In designing, basically, a very wide knowledge of production processes, products, accuracy requirements, and the capabilities of each machine installed in each factory is necessary. For instance, the firms need sophisticated machine tools capable of making precise components and parts if they have excellent drawings. And they must know the capabilities of their metalworking technology, otherwise their intentions will not be realized. Finally, placing importance on designing will determine the direction of the firm's future standardization. Theoretically, good designing is expected to generate all information such as production lead-time, delivery time, and cost of the product at the time that a drawing is completed, but this level has not yet been accomplished even in Japan. The expectation for good design is partly achieved by the establishment of CAD (computer aided design) systems, but actually complete software for CAD systems is not ready even in Japan.

As mentioned before in relation to designing, accumulated experience is a decisive point because wide knowledge of every production process is required. In Malaysia, the average experience is 3-5 years depending on the firm. In fact, Malaysian design engineers with 10 years experience have a level of training which equals only 5 years of experience in Japanese technical levels.

Without design drawings, pre-checking on how to improve and add new ideas, or to reduce costs, or to accomplish easier assembling in mould and die making is found to be inadequate and incomplete. More technology transfer and information should be constantly provided to the industry from the outside.

Because of the lack of experience, most of the firms depend heavily on drawings supplied by their customers. It is supposed that only 10% of the firms have their own design and component drawings, and the firms with hand-written drawings make up 20% of all firms. The remaining firms make moulds and dies from experience, with information other than drawings.

During the survey, almost all owners mentioned the lack of experienced design engineers. All of them recognized the importance of designing and said fostering or quickly employing experienced design engineers is vital for the future development of their firms. To supply more design engineers to alleviate increasing demand is another important requirement. Generally speaking, one design engineer should be assigned to 7 to 8 workers, while ideally one design engineer should be assigned to 4 to 5 workers. Introducing a CAD system is one alternative way to resolve the problem of design engineers. But it becomes meaningless if basic preparations and standardization have not been firmly established.

The more sophisticated the moulds and dies become, the more important designing will become. Subsequently, the cost of designing would also come to occupy a large part in the total cost of production. Under the current situation in which the number of orders from their customers is increasing rapidly, how quickly and accurately design engineers can prepare drawings is one of the most important factors for the development of the industry.

Designing is fundamentally concerned with the level of education. Basic skills, such as reading and writing, drawing, calculations, accurate machining, drawing methods, and designing methods are basically determined by the level of education offered by individual educational and training institutions.

In this respect, expansion of the mould and die training courses and establishment of mould and die classes at ITI, SIRIM MIDEC, and Polytechnics (Industrial high school) are urgently needed.

One problem arising here is that the graduates from these kinds of educational and training institutions do not have practical skills which are directly applicable in real work. So, it is suggested that further training is necessary to meet the different needs at each individual firm.

If each firm were to provide this basic education, it would be a heavy burden for them in terms of time and money. It would be much easier and more time efficient to educate and train newcomers entering the mould and die industry after they have completed the basic education.

Generally, it would take more time, at least 4-5 years longer, to foster design engineers than to foster ordinary skilled machinists. So, all necessary measures should be immediately taken.

Shown below for reference is a graphic ratio of attainments in Malaysian mould and die designing compared with Japanese standard designing levels in medium- and small-scale industries in Japan as 100%.

*** Graphic chart of designing ***

	Attainment Ratio (0% — 50% — 100%)
Product drawings	(60%)
Mould and die drawings	(20～30%)
Mould and die components drawings	(10～20%)
Hand-written drawings	(30～40%)
Skill level	(40～50%)
No. of designers	(10～20%)

2-1-2 Machining Process

Analysis of the machining process was conducted from two different points of view: Hardware (machines and facilities) and software (skill of workers, metalworking methods). It is rather difficult to pinpoint an average level for hardware because the level of hardware varies greatly from firm to firm. It was, however, made clear that all firms are equipped with at least the lowest line of machine facilities. These are the ordinary machine tools necessary to make moulds and dies such as lathes, milling machines, jig milling machines, shapers, drilling machines, radial drilling machines, surface grinding machines, engraving machine sinkers and EDMs (Electric Discharge Machine), etc. They are rather old and unreliable because they are not well maintained.

Many Taiwanese machine tools have been introduced into Malaysia. More than half of the machine tools of the firms surveyed are Taiwanese. The main reason is their cheap price, half that of Japanese machine tools, plus the fact that it is also easy to depreciate them. In the case of general purpose machine tools, extreme accuracy is not required if some level of skill is attained.

Many American jig milling machines are installed in the firms together with Taiwanese machines. Well organized firms are equipped with first class overseas machinery and equipment which is new and well maintained. But, most firms operate machines very roughly and over their capacity.

Operation ratios (total working total ÷ hours machine operating hours) were said to be 80% at the interviews with firms surveyed, but actually are thought to be 30-60%, although there is no actual data. According to Japanese data, ratios are 20-50% in the case of general purpose machine tools and 70-80% in the case of NC machine tools.

On the other hand, both well organized and medium-size firms are equipped with CNC and NC machine tools such as CNC Machining Centres, CNC EDMs and CNC Wire-Cut EDMs, etc. Most of them are of Japanese and European make, but machine tools such as those made by joint-venture firms between Japan and Singapore have also been imported because of their cheap prices. These high-priced machine tools are operated efficiently and correctly even on two or three shifts. As the impetus for equipment investment is increasing owing to Malaysian economic recovery, most firms are ordering or ready to order the newly advanced machinery and equipment in the near future. Modernization of factories through installation of advanced machines would contribute to improved accuracy as well as machining speed.

From the standpoint of software, its development is still very slow, stemming from the lack of experienced workers in the field compared to the excellent facilities. This was proven from the fact that even firms equipped with the latest machining facilities did not pay so much attention to the basic machining skills. Some software problems were observed as follows.

a) How to shape the edges of drills, grind the degree of edges and center drill centers. Drills more than 8mm in diameter should be ground by drill-grinders.

b) In many cases, the grinding wheels seemed to be so hard that the surface of drill edges might be rough.

c) Inadequate theory between cutting speeds and cutting revolutions.

d) Wrong sequences of cutting works for six surfaces.

e) Inadequate degree of cutting tools, bites for lathes, and shapers.

f) How to use End Mills and Disposable Cutters when using milling machines.

g) How to use Cemented Carbide tips, and grind them with diamond wheels.

h) What is the cutting limit capacity for the machines? Problems of overload often occur.

i) How to use surface grinders by wet or dry type. The balance and dressing of grinding-wheels are wrong.

j) How to set the Electrode with the aid of one-touch accessories for EDMs to reduce setting times.

k) The reason why work tanks are filled with oil (danger of fire).

l) The maintenance systems of machines, annual precision checks.

m) How to use levelling-blocks under machines to keep them accurate.

n) How to use measuring equipment, for example, calipers, dial gauges, squares, height gauges, etc. (in particular, height gauges with sight-allowances).

o) Management of high-accuracy accessories for machines which are seldom used.

The above mentioned problems are commonly observed in most firms. These problems could be solved by in-house-training, especially on-the-job training, but they should really be taught in the basic educational institutions. Another big problem found though the interviews is the lack of skilled workers. Human factors are vital for making moulds and dies and future development depends solely on workers' higher level of skill. One firm that can not secure skilled workers plans to close its mould and die division.

Taking into consideration the fact that workers in Malaysia are diligent and are eager to acquire advanced skills through work experience, it is supposed that a worker can obtain a certain level of skill in a relatively short period, such as 2 to 4 years, through practical advice and systematic educational and training programmes.

Cases of domestic firms with systematic training programmes have also been observed, and these have achieved substantial results. Further, workers employed by foreign-affiliated firms or Japanese joint venture firms have acquired a high level of skill through in-house job training, especially OJT.

A graphic representation of the ratio of local firms' metalworking productivity attainments is shown below. Medium and smaller firms are selected, excluding first class firms from the sample, and they are compared with Japanese counterparts of the same size.

*** Graphic chart of metalworking ***

	Attainment Ratio (0% – 50% – 100%)	
Machine operation hours	→	(30 ~ 50%)
NC machine operation hours	→	(40 ~ 60%)
Skill level	→	(30 ~ 40%)
Level of metalworking	→	(20 ~ 50%)
Level of measuring	→	(20 ~ 30%)

2-1-3 Assembling Process

The assembling process is further subdivided into two processes. One is to assemble pieces into one mould or die; the other is to adjust the assembled moulds or dies through trial use.

The first process, assembling pieces into one mould or die, mainly depends on how accurately each piece is machined, and if each piece is accurate enough, the assembly does not take a long time. On the other hand, each piece has its own tolerance of accuracy. So, if each piece is inaccurate, tolerances accumulate when they are assembled, and this immediately affects product accuracy. Accumulated tolerances are barely on the order of 0.1mm in most cases judging from the poor accuracy of finished components.

Many firms do not have any systematic troubleshooting measures to deal with inaccuracy troubles. Workers in the field just judge for themselves if inferior components should be modified or completely remade without considering the overall situation.

Any worker can easily judge how to do orderly assembly and where more accuracy is needed if he has the daily training which enables him to see which parts of moulds and dies are more important in terms of accuracy. In doing so, modification can be quite easy in the case of re-assembling. Usually, Malaysian workers are not trained to reduce problems and think that the assembling process means just assembling the components and parts without any modifications or adjustments. Consequently, they put unmodified or unadjusted moulds and dies on trial.

The next process is the adjustment of the assembled moulds and dies. This final process is a must and should not be neglected, particularly in the case of high precision moulds and dies.

In the case of press moulds and dies, inferior parts should be modified and adjusted by sight checking or using measuring instruments. After a trial of the assembled moulds and dies, adjusting the progressive die completely to produce satisfactory final products takes a great deal of time and labour. But actually these accumulated experiences become the know-how of the firm.

The situation is the same in moulds and dies for plastic forming. Usually, second and third trials are necessary for adjustment. Even the most advanced plastic mould manufacturers in Japan need an average trial of 1.8 times. But, if they require more than a third trial, they would lose money in Japan.

In Malaysia, adjustment of assembled moulds and dies is virtually neglected except for a few cases where critical defects in products are found. In addition to the unavailability of trial machines, more than half of Malaysian mould and die manufacturers do not have a system of feedback from their customers for adjustment. This lack of a feedback system creates a big technical problem for Malaysian manufacturers preventing improved levels of technology or reductions in cost.

At present, the situation in Malaysia is such that the quality of products can not be guaranteed because they are fully occupied with ever increasing new demands. A few firms have trial machines and make the necessary adjustments (trial-adjustment-delivery), but that number is very limited. Since adjustment is inevitable for every instance of mould and die production, mould and die manufacturers must realize that establishment of an adjustment system is the key area for the accumulation of their production know-how and for their future development.

Based on the same criteria with the previous section, the technological level of Malaysian manufacturers in the assembling process is illustrated below.

*** Graphic chart of the technological level in assembling process ***

	Attainment Ratio (0% — 50% — 100%)	
Components completion	→	(40 ~ 50%)
Assembling skill	→	(30 ~ 40%)
Worker's skill	→	(30 ~ 50%)
Troubleshooting measures	→	(20 ~ 30%)
Adjustment trial	→	(10 ~ 30%)

2-2 Technical Level

2-2-1 Moulds and Dies for Plastic Forming

The technology level in this field is relatively high, with the accuracy tolerance achieved by general purpose machine tools such as laths or milling machines falling within 0.01mm. Some firms have already been achieved even micron order accuracy of tooling, which subsequently could achieve overall product tolerance within 0.1 to 0.5mm and 0.05 mm in sundry products and in precise electric components,respectively.

On the other hand, the average accuracy level of measurements is not high enough. The maintenance of vernier calipers and micrometers is somewhat loose, and consequently decreases the reliability of measurement at the factory site. Almost all firms have vernier calipers and micrometers, but some firms do not use very often high precision measuring instruments by keeping them inside of the office rooms.

In general, Malaysian plastic mould and die manufacturers are judged to have enough capability to produce moulds and dies for home electric appliances although their levels vary from firm to firm and from products to products.

In the cutting process, the basic principles which have to be observed in the process are not strictly observed. Even advanced level of firms do not process materials based on cutting theory and advanced techniques such as deep cutting method.

As for hardwares, highly advanced machines such as CNC machining centre, CNC EDM and CNC wirecut EDM are already installed in some firms. With these modernized machines, remarkable progress has been made both in operation shortening hours and in increasing accuracy of micron order. Because as the price of these automation machines are very expensive (average 20 to 60 million yen/machine) the percentage share of these modernized machines to the total equipment is very low at 5 to 10%. And a considerable portion of the work are conducted using general purpose machine tools with labour intensive methods. The percentage share of labour intensive works are 100 % in ordinary local firms and more than 60% even in advanced firms.

From the nature of the products, three dimensional processing work is most suited for making moulds and dies. But this is not yet generally conducted in Malaysia and even two dimensional processing work is rarely conducted. As a result, it is said that Malaysian manufacturers could supply moulds and dies for imprecise ordinary electric and electronics parts and for home sundry goods manufacturers, but it is difficult for them

to supply for small and precise parts (for electronics, cameras and VTR etc.) or for engineering plastics manufacturers.
Neither they can supply moulds for plastic products of thermoseting resin.

When aiming at total assembling accuracy, it is impossible to modify the unbalances in the size of each cavity and that means less precise measurements. And also, the accuracy in parting lines in the moulds and dies can not be achieved to allow some burr at the parting lines. In Malaysia, inferior moulds and dies which would be rejected by Japanese standards.are accepted.

Plastic moulds should be designed considering the shrinkage which will occur in the products formed, but these considerations are not fully observed because the shrinkage ratio is different depending on the thickness of the parts of each product. And the size and shape of the runners and gates of plastic moulds can be expected to be improved by accumulated experience.

Plastic moulds of hardened materials are very rare in Malaysia. In fact, 90% of the moulds use pre-hardened steel. But one firm is saying that moulds of pre-hardened steel, which were popular until last year have been replaced by hardened moulds in this year. Accordingly the manufacturers have quickly installed the necessary facilities.

This trend has very important implications for the future development of the Malaysian plastic mould industry. As foreign investment and technical tie-ups increases, production of labour intensive products not profitable in Japan and they will be shifted to countries like Malaysia.
Eventually, hardened and durable moulds are supposed to be in great demand and the pre-hardened steel type of moulds will be less in demand because only moulds with high precision and less life spans will be demanded.

If this trend continues in the future, the trend of future equipment investment will be changed. Investment in the forming grinding machines and EDMs for machining hardened materials will be increase instead of investment in machines for machining pre-hardened steel materials. Accordingly, heat treatment has the same important factors as the press die.

As for materials, ASSAB of Sweden supplies them to Malaysian firms and these are recognized as standard materials. The supply of the kinds of materials not in demand are limited. With increasing demands for a wide variety of materials, more kinds of special steel materials will become available at prices as inexpensive as in Japan. The quality of local materials used for die-plates is very inferior.

HASCO of West Germany supplies almost all the standard parts for moulds and dies to Malaysia. Japanese standard parts are few owing to the strong yen.

These special steel materials and standard parts are delivered in a day or in several days at most.

Finally the structure of moulds and dies is weak. In the cheaply made products, mould and die parts such as die plates, guide posts and sliding posts, etc., are rather thin and fragile against external and internal pressures.

It does not cost so much to strengthen the structure, and the total costs are increased only 1% or so, even if the cost for strengthening the structure is increased 10% because the material cost occupy only 15 to 20% of the total cost. Also, strengthening of the structure would lead to stability of the products and fewer claims and also to winning a reputation for superior moulds and dies.

Totally, the technical level in some top class firms is equal to the Japanese level of seven or eight years back but most firms are not so advanced. However, their level should improve because they are planning to introduce the most advanced machinery and equipment in response to brisk demand.

The point is that training and fostering workers is more important than introducing advanced machines, as making moulds and dies is quite labour intensive in Malaysia.

Finally, the cost of making lens caps was compared both in Japan and in Malaysia to compare their technical level. Quotations were requested from the firms belonging to the second, third and fourth group (drawings attached).

The quality of lens caps is rather high, having an accuracy of 0.05mm and fine surface polishing. The purpose of the comparison of lens cap cost is to check whether the technical level is high enough to be able to make products salable in the Japanese market. The firms of the second and third group offered quotations, but the firm in the fourth group could not offer a quotation because they were unable to make the mould (cost comparisons explained in a latter part).

The Malaysian technical level of making plastic moulds could be judged if the firms can make moulds for complicated and precise products such as escutcheons for cassette players as well as the camera lens caps. If they can make such moulds, they have the possibility to penetrate the Japanese market and are thought to be able to "Take Off".

Graphic chart of the technical level of plastic moulds is shown below. The conditions are the same as before.

*** Graphic chart of technical level of plastic moulds and dies ***

	Attainment Ratio 0% 50% 100%	
Mould and die structure	→	(40 ~ 70%)
Metal work finishing	→	(50 ~ 60%)
Surface polishing	→	(60 ~ 80%)
Parting line accuracy	→	(30 ~ 50%)
Total accuracy	→	(40 ~ 60%)

2-2-2 Moulds and Dies for Metal Working

Compared to moulds and dies for plastic forming, the technical level of those for metal working is still less developed. This is considered to be due to the fact that not such a high degree of accuracy is required in Malaysian in-house die production and to the domestic low demand for the products. Due to the development of auto industries, the electronic parts industries centering in Penang and home electric industries (TV refrigerators, electric fans, air conditioners), the demand for moulds and dies for metal working is gradually expanding.

In spite of the growing demand, most manufacturers can supply only parts of a component die, and that number of firms is very limited.

The tolerance level that they could satisfy is at most on the order of 0.01mm. There are so many firms whose basic metal working level is very low. However, there are some local manufacturers that can supply precision metal parts of tungsten carbide with accuracy in the micron order for the electronic industry in Penang.

Making moulds and dies for metal working by using hardened materials would need improved processes and more working hours.

It also needs various kinds of know-how about the nature of metal, annealing, hardening, designing, metal working, grinding, assembling and stamping.

So Malaysian mould and dies industries for metal working are said to be at their dawn.

There is a wide gap in the technology level between foreign firms and domestic ones. The firms supplying moulds and dies to the electronic industries are comparatively well developed. But many other firms can not make moulds and dies on their own.

There is not only capital imbalance but also differences in skilled workers and technical information. If these imbalances are left as they are, more skilled workers and more information will gather to the big and developed firms and will not go to the small firms.

In consideration of this, collecting and disseminating technical information and starting training and fostering programmes are urgent needs. When these improvements are made, the problems of job-hopping and workers keeping technical information to themselves will be solved little by little.

The reason that the technical level of moulds and dies for metal working is still less developed is that they do not reach the level of making high precision progressive dies and compound dies for the production of motor cores.

Mould and die manufacturers would have to satisfy the product tolerance requirement of 0.02 to 0.05mm. This is the level which would enable the domestic production of motor cores. In order to achieve the above product accuracy, each part's tolerance would become on the micron-order. For this accuracy achievement, skilled workers who can operate such advanced machines as wire-cut EDM, and forming grinders would be required. By improving the training skilled workers, the technology of making high-precision moulds and dies could be obtained step by step. Japan followed such a process in the past.

Graphic chart of the technical level of moulds and dies for metal working is shown below.

*** Graphic chart of technical level metal working moulds and dies ***

	Attainment Ratio 0% 50% 100%	
Total accuracy	——→	(20～30%)
Progressive dies	——→	(10～20%)
Precission parts	——→	(20～30%)
Non-precision dies	————→	(50～70%)

2-3 Development of the Mould and Die Industry

For the further development of the mould and die industry, it is required that the development of the electric, electronics and automotive industries raise the demand for moulds and dies. Considering the present circumstances that foreign investments are constantly inflowing and the electronic and electronics industries are substantially expanding, the market for moulds and dies in Malaysia has bright prospects.

2-3-1 Hardware

Generally speaking, it is not difficult to upgrade machinery and equipment. Great varieties of basic machinery are available in Malaysia. The industries can also import machinery at a low price form NIES, especially from Taiwan.

For moulds and dies, specific types of expensive machines such as EDM (general-purpose EDM and CNC-EDM), wire-cut EDM, forming grinders, profile grinders, CNC machining centers, precision measuring equipment , and two and three dimensional measuring equipment are needed. In Japan, the mould and die industry has shifted from a technology industry to a process industry. Most Japanese mould and die manufacturers are small-scale firms having 20 to 30 employees. The investment in machinery and equipment amounts to more than 100 million yen per firm on average. Interest expenses and depreciation for such investment are a heavy burden for the mould and die manufacturers in Japan.

The labour cost in Japan is among the highest in the world. The mould and die industry, hence, tends to promote factory automation with the introduction of precision equipment in order to supply precision moulds and dies at a low price. Although Malaysia still has a relatively cheap labour force. Indonesia has an even cheaper labour force. It is not appropriate to consider the competitiveness of the Malaysian industry simply from the point of labour cost. Hardware should be given proper consideration from the viewpoint of upgrading.

In the mould and die industry in Malaysia, a limited number of companies have introduced excellent machinery and equipment and the precision level of their products is high. But most manufacturers can not afford expensive machinery. Their general machine tools have been used for around 10 years and their precision level has decreased. In addition, they have been used roughly.

It seems that the present production system relying on manual work could not catch up with the increase of demand when the business uptrend continues. The industry can meet the expansion of demand simply by increasing the number of machines and equipment. But, in order to pursue the take-off of the industry, it is desirable to invest in machinery for the upgrading of production technology and to realize the upgrading of precision level and the improvement of productivity.

It is obvious that the mould and die industry should invest in machinery and equipment to keep up with the increasing demand. The best consideration should be paid to the course of machinery and equipment investments for the realization of industrial development.

The introduction of CNC machines should be decided based on well-established planning. Managers point out the lack of manpower and machinery as the major problems concerning the precision level and delivery. That is partly true. But the overloaded use or inappropriate use for the improvement of precision level and productivity often becomes the major problem. New expensive machinery seems to contribute to the expansion of production, but not to the improvement of precision level and productivity.

To improve the precision level and productivity as well as to increase production and to realize horizontal international specialization are the targets of the Malaysian mould and die industry. Investments in machinery and equipment should be made in accordance with those purposes.

To achieve those targets, it is first required that the Malaysian government provide institutional supports such as the Loan Scheme for Machinery and Equipment Modernization and the Loan Scheme for Machinery and Equipment Improvement. Second, the development of substantially cheap precision machinery is needed. Even Japanese mould and die manufacturers are pressed for the depreciation of a CNC machine, which costs more than 20 million yen. The depreciation burden is larger for Malaysian manufacturers.

The precision level of existing general-purpose machine tools has deteriorated. Malaysian manufacturers need to purchase new machinery. It may be worth considering the replacement of two existing machines with one new machine which has twice the functions of an existing one.

A higher rate of investment in equipment for high precision production facilities is judged to be necessary for the ultimate "take off" of the moulds and dies industry.

* Graphic chart of machinery & equipment investment *

	Present	Three Years Later	Five Years Later
Ratio of general-purpose machine tools	90% or more	70% or less	60% or less
Ratio of precision machines	10% or less	30% or more	40% or more

2-3-2 Software

The mould and die industry in Malaysia has a lot of problems concerning their field of software. But the development of software is the key of the future development of the industry. The development of software means the development of skilled or trained workers, for one thing, and the successful transfer of technology, for another.

The development of software lags far behind the required pace of economic development. Personnel training is left to each private company partly because the public organizations provide insufficient opportunity of vocational education and training. Each company has to train its own employees how to manufacture moulds and dies from the beginning.

At present, there are some public sector facilities such as MIDEC (the Metal Industry Development Centre) established in SIRIM (the Standards and Industrial Research Institute of Malaysia), CIAST (the Centre for Instructor and Advanced Skill Training) and ITI (the Industrial Training Institute), which have educational or training programs on moulds and dies.

Talking the case of SIRIM, SIRIM has trained a considerable number of trainees with the machinery and equipment for the production of moulds and dies assisted by JICA and Japanese experts. Japanese experts left at the expiration of the contract term with JICA. Although SIRIM still continues training programs, it seems necessary to examine the education and training programs of mould and die technology carried out by Japanese experts. ITI also has education and training programs.

In addition, the vocational division of MARA is, in earnest, considering the start of educational programs of mould and die technology. The Ministry of Youth and Sports plans to establish the Advanced Training Centre in the Engineering Industries Complex, which will provide advanced-level training programs, in August 1990, with the cooperation of the Indian government.

The necessity of education and training programs on moulds and dies is fully recognized. For the development of education and training facilities, short-term and long-term measures would be needed.

As a short-term measure, the expansion of existing facilities is recommended. The shortage of technicians is an urgent problem of the Malaysian moulds and die industry. It would hinder the country's economic development. The job-hopping of technicians would increase due to intensifying recruiting activities.

The existing facilities expansion program, which is recommended as a short-term measure, would place more importance on accepting dispatched experts because large investments in hardware would not be necessary.

As a long-term measure, there must be the establishment of new training facilities. Although there are some training facilities around Kuala Lumpur, training facilities are lacking or insufficient in local areas. In the Penang area, where the electronic industry is rapidly developing, for example, the demand for trained mould and die workers is very high, and some of the firms are reportedly examining the possibility of establishing jointly a training facility. The Penang Development Corporation has the plan of establishing the Tooling Centre. From this example, it is clear that existing education and training facilities do not meet the increasing demands for trained workers which keeps pace with the economic development.

As for training programs, it is recommended to classify them into elementary courses, intermediate courses, and advanced courses. Polytechnics would provide an elementary course supplementing facilities and experts. An intermediate course is an intensive course which would give practical education and training to graduates from an elementary course. An advanced course means the course which would teach high-grade precision mould and die technology.

There is a way to teach separately curricula of which each course is composed in order that trainees can learn the course in a short period. Those courses should be properly positioned in the overall long-term program in order that trainees can finish all curricula.

Curricula should place importance on practical training of practical techniques such as designing techniques from basic punching dies to precision progressive dies, machine handling of EDM or angular mould grinding, and problem-solving techniques in the processing at workshop. It is necessary that experts examine details of those curricula before training courses start.

The courses should be open to those workers having 2 to 4 years of practical experience as well as inexperienced workers. Except for elementary courses, training programs should be intended for workers with 2 to 4 years of practical experience and graduates from primary education. The key problem is how to make a system of programs which employees of companies can attend without difficulty. The experience of CIAST shows that companies do not send workers to a program when the program period is long. This is because the shortage of skilled workers is the problem at most companies.

The other important point is "textbooks" or "manuals", which are dispensable for transferring technologies. Textbooks or manuals on press and plastic moulds and dies should be systematically prepared.

Managers have recently tended to send workers to training programs in spite of the shortage of manpower. On the other hand, requests to send experts to company have tended to increase. The government should devise a scheme to meet those requests from companies.

The development of textbooks and manuals should be examined as the theme of a project. The development of textbooks and manuals requires a fair amount of work. This is not a task which can be achieved by only an expert.

Some Japanese experts compiled some textbooks which have been used in MIDEC or CIAST. However, to prepare textbooks was a time-consuming task.

Once a wide variety of textbooks and manuals are prepared based on the general framework, experts or trainers can use them at any time. When the framework of textbooks and manuals is well-established, application manuals can be easily developed to meet specific requirements.

Textbooks printed in Japan, in-house manuals of Japanese companies, and those visual devices such as VTRs would be very helpful. The distribution of those educational materials to technicians in Malaysia should be promoted in order to improve their level of work.

Training programs should place importance on transferring practical techniques instead of on teaching bookish knowledge. Along with this principle, workshop-style training programs should be included in the overall training programs.

The development of programs mentioned above would contribute to solving the shortage of skilled labour, which causes the high frequency of job-hopping, and to the improvement of the reluctance to exchange information, which hinders industrial development.

There are some foreign companies which have manuals which regulate in-house education, employees' skills, and pay. These manuals would serve as references for the development of curricula which would meet the requirements of the Malaysian mould and die industry.

There is a program which sends Malaysian trainees overseas. This program should be enlarged.

Now is the time to establish education and training programs from the long-term standpoint because the Malaysian mould and die industry has a ten-year history. Projects to expand or create integrated education and training facilities, based on the long-term program, not only in the metropolitan area but also in local cities are required in order to make use of individual characteristics of each area. An example is the project that would establish a training centre specialized in high-grade technology with the introduction of new and high-grade machines producing precision moulds and dies for metal working and curricula in Penang in order to contribute to the development of the electronic industry. In other words, the characteristics and purposes of the training programmes should be clear.

The Directions of Recommended Software Development

① **Personnel Education**

Advanced technicians: To master multi-skills → Overseas Training → Practical applications to work → In-company practical education →

↕ From this stage, to transfer skills to other employees.

Operation technicians: To master a single skill ——→ In-company practical education → To improve the skill – Practical application to work

↑ To master other skills, if necessary

② **Transfer of Skills**

Long-term curricula → A master plan for the acquisition of multi-skills
Program period is 2 - 3 years

Short-term curricula → For the acquisition of a single skill
Program period is 1 - 6 months

③ **Institutional Development**

Objective	Measures
The expansion of existing institutions	To expand personnel and facilities
To establish the individual characteristics of new institutions	To create advanced institutions by specifying the objective of each institution
To expand the basic education system	To reinforce the capabilities of POLYTECNIC and ITI

2-4 Business Administration and Sales Strategies

The mould and die industry in Malaysia is still very young, having a history of around 10 years. Most of the managers of mould and die firms are also young. The managers interviewed in Malaysia were mostly in their thirties or forties. The average age of workers in the mould and die industry is also as young as around 30. In comparison, the average age of the workers in the mould and die industry in Japan is estimated at the late forties. Due to this short historical background, most of the firms interviewed were managed in very premature ways putting most of the efforts in both sales and production, and modernized management systems were scarcely introduced. With the development of the business volume, however, most fo these firms would soon be faced withe the necessity of introducing modern management systems.

First, the introduction of a "Quality Control" system is needed in the area of production control. Although "QC" systems and other modernized production control measures are already established in relatively large-scale firms or foreign affiliated firms, in a majority of local firms, the introduction of these production control measures is in a very primitive stage. Although there are even firms having no idea of what a "QC"is, which is not unusual at their developing stage, it is judged that Malaysian manufacturers have enough managerial base to accept the "QC" system in their production management. The extension of "QC" activities would have to be soon started through organized campaigns or PR activities. In Thailand, the spread of "QC" activities through nation-wide campaigns has had a considerable effect in recent years.

Second, the introduction of modern business administration systems is needed through the education of executives of small-and -medium size mould and die firms. Major items of modern business administration are the accurate control of direct production costs (cost accounting system), and the production flow control for accurate delivery of the products. In order to effect the introduction of these modern management systems, the invitation of foreign experts in the field or case studies of advanced firms both in Malaysia and abroad is needed. For another, it would be promoted by the active exchange of experience or information among executives in the mould and die industry. In Japan, such nation-wide industry associations as "Japan Die and Mould Manufacturers Association" or "Japan Metal Stamping Association" play an active role. Recently, the business information exchange has become active not only in the same industry group but among different industry groups aiming at the R&D of new products and new business investment chances. Further, such organizations as "Japan Junior Chamber Inc." (J.C.)

contribute largely to the development of young executives of the firms in Japan. The Malaysian Mould and Dies Manufacturers Association is not a unified industrial organization. Rather, it is nothing but a group included within the Mould & Die and Precision Engineering Group which is one part of the Federation of Malaysian Foundry & Engineering Industries Associations (FOMFEIA). There is a total of 53 companies in the group, but even including the companies outside of the mould and dies industry, the level of activity is low because some of them are located in regions outside of Kuala Lumpur and Penang. In Malaysia, also, it is considered to be essential for the development of the mould and die industry to expand the industry association and to activate the information exchange both of management and of technology.

As for sales, the demand for moulds and dies is expanding largely from foreign investors located in FTZ. From the nature of the products, the best sales strategy for mould and die manufacturers would often be to locate near their customers and give flexible services. In this view, those local firms located in the Penang area have advantages and have succeed in their sales strategies. The major problem in these firms is the delivery period, which reaches around 3 months at present, due to the rapid increase of the demand. For reference, the average delivery period in Japan is 1-2 months. In case the Malaysian manufacturers could not make the present delivery term shorter than the present 3 months through up-grading productivity, it would be very difficult for them to compete with new investors aiming at the growing demand for moulds and dies in the Penang area. Under the present environment of growing demand, sales seem to grow automatically, and sales efforts are apt to be neglected. For the purpose of increasing future competitiveness, further efforts would have to be placed on the improvement of the total capability of firms including the establishment of sales networks.

The future target of mould and die manufacturers in Malaysia would have to be directed in such a way that they could supply a stable quality of products both for the foreign investors and for the local manufacturers. At present, the tendency is often observed that the quality of products is low due to the low price offered for the products. A sales strategy which would cut down the above vicious cycle would be required. As a part of this strategy, efforts should be made that orders should be placed based on the exact drawings, and once the drawings are set, no change should be made during the stage of processing.

The following table shows the subjectively evaluated levels of local mould and die manufacturers in the field of business administration and sales capabilities.

* Graphic chart of management *

	Achievement Ratio 0% 50% 100%	
Business administration capability		(30 ~ 50%)
Introduction of modern management system		(10 ~ 40%)
Cost analysis		(50 ~ 60%)
Managers' aggressiveness		(80 ~ 100%)
Established sales system		(50 ~ 60%)

2-5 Relations with Peripheral Industries

2-5-1 Metal mould and die materials

It is the metal mould and die material industry that should be taken up first as one of the related industries. Characteristically, moulds and dies must use many kinds of special steels and have the problem of ensuring a stable supply of the materials. Fortunately, ASSAB Steels of Sweden is established as the supplier of standard materials in Malaysia. Japanese firms supply extremely limited quantities of metal mould and die materials in limited categories.

It is impossible to produce these materials in Malaysia in consideration of demand in that country, or even in Southeast Asia as a whole. It may be necessary to continue importing them over some years in the future. If demand increases, competition will occur, prices will stabilize and varieties will increase.

According to ASSAB's catalog, their products form a sort of lineup including prehardened steel, die steel and stainless steel. Materials are not divided into several kinds within one family as those in Japan are. It appears that this is attributable to the fact that limited demand makes it difficult to stock many kinds of materials.

As long as ASSAB and Japanese products are used, no problem will occur in terms of the accuracy of materials supplied (materials are usually supplied in previously-processed round and square forms in several sizes). Locally processed materials contain ones of inadequate accuracy (inaccurate in units of mm). No matter how short their lead time and how low their prices are, they are useless.

2-5-2 Metal mould and die parts

HASCO of West Germany has been the leading supplier of standard parts for moulds and dies (guideposts, guide bushes, injection pins, hot-runner systems) and Japanese products have been available only in small quantities. Malaysians feel that these standard parts are relatively expensive in consideration of the price level in that country. Many companies use in-house parts, buying important parts from outside suppliers. These standard parts are important in a certain sense and provide an effective means of standardization in the mould and die industry. If the industry expands and has to shorten the lead time, naturally they are forced to use many standard parts. Standard parts are available in abundance in advanced mould and die producing countries, their accuracy and reliability are very high. In Thailand, parts manufacturers are developing by themselves. In the near future, even in Malaysia, domestic production will pay off.

2-5-3 Heat treatment

Heat treatment is important to both metal working and plastic moulds and dies. Since there is an emerging tendency to switch to wholly-hardened moulds and dies, whether metal working or plastic, the superiority of the heat treatment division is gaining importance.

According to surveys on the present condition of heat treatment in Malaysia, there are very few heat treatment factories for moulds and dies in Malaysia. The existing factories lack reliability, and Singaporean manufacturers are commissioned to produce moulds and dies which are required to be accurate. It is presumed that perhaps they cannot handle hardening and tempering and that they do only annealing. It may be possible to install a small electric furnace and heat-treat ASSAB's XW41 (equivalent to SKK11 of JIS) which is widely used for precision parts, if they are small. However, it requires a large sum of money to install equipment to heat-treat large parts. This is not realistic. It is necessary to develop an industry specializing in heat treatment.

The quickest and easiest way is to install heat treatment equipment at training institutions and open it to the private sector. For example, MIDEC in SIRIM has sophisticated heat treatment equipment. This may serve a double purpose if outside specialists are allowed to make use of it.

2-5-4 Metal mould and die users

As mentioned earlier, major users of metal working moulds and dies in Malaysia are semiconductor manufacturers in FTZ mainly in Penang. It is said that the Malaysian semiconductor industry ranks first in world production volume. In 1986, there were 35 semiconductor manufacturers, 16 of which were located in Penang.

Table IV. 2-1 Semiconductor Manufacturers by Location

State	Operation	Non-operation	Preparing	Total
Penang	16	1	–	17
Selangor	11	–	2	13
Negri Sembilan	2	2	–	4
Melaka	3	–	–	3
Kedah	1	–	2	3
Johor	1	–	2	3
Perak	1	–	1	2
Kelantan	–	1	–	1
TOTAL	35	4	7	46

Source: MIDA

The second largest user is the home electric appliance industry. Malaysia is the world's third largest exporter of room air conditioners. This is the result of Matsushita and Toshiba having shifted their production bases to Malaysia. Plastic moulds are used for manufacturing plastic frames of TV sets and plastic parts of irons.

Table IV. 2-2 General Condition of the Electric and Electronic Industry

		Firms	Production (M$1,000)	Employees
Refrigerator, air conditioners, etc.	83	11	361,183	3,705
	84	9	225,873	2,355
	85	10	218,269	2,566
	86	12	349,493	3,367
TVs, radio audio products	83	16	594,086	9,693
	84	18	698,415	10,811
	85	18	742,587	9,787
	86	15	792,257	11,144
Semiconductor, IC, etc.	83	57	4,299,835	68,039
	84	56	5,369,512	58,717
	85	54	4,771,037	53,354
	86	55	5,694,325	56,459

Source: Monthly Industrial Statistics

3. Cost Analysis

3-1 Comparison of Production Cost in Malaysia and Japan

3-1-1 Major Unit Costs Comparison

Here the comparison is based on the data related only to mould and die production. the exchange rate used is 1M$=J¥50. The following figures are based on field interviews. A variation of figures can be found depending on the type of industry or the location of the industries in Malaysia. In the Japanese case, there are also figure variations. In spite of these variations, average base salaries can be calculated as follows.
<Monthly Base Salary>

Monthly Base Salary

Unit M$ (1M$ = ¥50)

Major Items	Malaysia	Japan
Junior high school graduates	250- 300	N.A.
Technical high school graduates	300- 400	2,200-2,500
Graduates of university, designer	500- 800	2,700-3,000
Workers with 1-5 years experience	500- 700	3,500-4,000
Designers of with 3-10 years experience	900-1,500	4,500-5,000
Factory managers or foremen with over 10 years experience	1,500-2,800	6,000-8,000

In Malaysia, the portion of allowance fees in the salary is very large. Normal overtime allowance fee per hour is 1.5 times the base salary per hour. The Sunday work allowance fee is 2 times, and that of holiday work is 3 times.

These allowance fees in Malaysia are considerably high compared to those of Japan, where the overtime allowance fee, for example, is from 1.25 to 1.5 times the base salary.

The salary totaled with overtime fees in Malaysia can easily reach twice the level of the base salary. In addition, because of the continuous good performance in the mould and die industry in Malaysia, the base salary in this industry has a tendency to rise further. Taking a certain company as an example, the monthly base salary has already increased from M$800 to M$1,300. At a factory of another company, the average monthly salary reaches M$2,000. Therefore, the estimated average monthly salaries could actually be from 1.3 to 1.6 times the monthly base salaries mentioned for each major item shown above. For skilled workers however, their salary seems to have already reached a high enough level so that it will increase no more. as a result, in a production programme, a strict policy must be established to avoid overtime work. In Japan also, the system of salaries in the mould and die industry differs greatly according to types and locations of companies and overtime work is often seen.

Recently, a movement to change the salary system from a system based on seniority to a system based on efficiency and performance can be frequently seen. This movement is concerned especially with the introduction of high quality machining equipment. There appears to be a tendency to replace highly paid aged workers by younger workers who are capable of using their knowledge in software, enabling them to use efficiently the precise metal working machinery.

Judging from the above figures, if simply compared, the salary in Malaysia ranges from 0.16 to 0.3 times and averages 0.25 times that of Japan.

The personnel cost in the Malaysian mould and die industry plays an important role because it is very high compared to the production cost. In personnel cost, an important factor is the inflation rate in Malaysia, which, however, is said to be at a low level at present at about 5% per year. The problem of personnel cost might be worsened by the job-hopping trends which would accompany the recovery of economy. The high increase of wages of skilled workers is especially feared.

Under the circumstances of the present expansion of market, the supply of skilled workers seems not sufficient to catch up with the demand. This would be the reason that the creation of a personnel development programme is urgently required.

<Comparison of Hourly Charge for Major Machine Tools>

In the field survey, most of the companies seemed not to have calculated this cost and were unable to provide the data. Therefore, the following figures are assumed mostly based on the data drawn from Japanese affiliated companies in Malaysia.

<Comparison of Hourly Charge for Major Machine Tools>

Comparison of Hourly Charge for Major Machine Tools

Major items	Malaysia	Japan
Multipurpose machine tools	M$10-20/h	M$80-90/h
EDM	30-36	100
CNC wire cutting EDM	40-45	120
CNC machining center	40-50	120

The comparison simply shows that the Malaysian cost is considerably cheap at less than half of the Japanese cost. But these figures do not have much importance because of the difference in the types of machining equipment between Japanese firms and Malaysian. Many Malaysian firms use machine tools imported from Taiwan.

As to high-quality machines used in Malaysia such as CNC machine tools, those are made in Japan, Europe and the Unite States of America, and the purchase price is very high. Naturally, the depreciation cost of the machine tools also becomes high. Consequently the cost of machine tools is at a relatively high level in relation to the wages in Malaysia. For this reason, in Malaysia, the machine tools imported from Taiwan or Japanese joint venture companies in Singapore are used in order to reduce the initial costs. Their machine tools are either without convenient attachments or are simple NC machine tools and not CNC machine tools.

But according to the demand projections, a 30 to 40% increase of demand is expected. High quality machines would be increasingly used, and high precision and low-priced machines are appearing in the market. The age of continuous 24 hour operation of machine tools to yield cost savings will soon arrive. Because of the lack of skilled workers, dependence on high quality machine tools will surely and rapidly increase. Regarding this point, the cost of machine tools will bear a significant importance. Therefore, it is urgently required to establish the calculation of machine tool cost according to each genre of the machines. The operation rate of the machines in relation to the cost calculation is also important.

In Japan, the increase of personnel cost has induced the introduction of high priced machines for the purpose of cost reduction. Profits can not be expected without an increase of the machinery working rate of high priced and high quality machines. In the case of high priced CNC machine tools, the break-even point would be attainable only at the operation rate of the machine over 80%.

<Comparison of Cost Composition>

Comparison of Cost Composition

Major items	Malaysia		Japan
Materials	15-25%		15-25%
Personnel	20-55		45-50
Administration & design	10-25	(estimate)	15-20
Depreciation	5-30		10-20
Profit	10-20	(estimate)	8-10

The structure of costs in Malaysia were compared to those in Japan based on the results of interviews as per one unit of mould based on the results of the interviews. Sales value is assumed as 100%.

Not much difference can been seen in the composition of the cost in both countries. However, the accelerated depreciation cost of the machines on a company basis differs largely according whether the companies possess high quality machine tools or not.

In Malaysia, 4 year depreciation of high quality machines could be probable instead of the actual 10 year depreciation. This probability may make the profit appear to be lowered for short periods of time. But the profit in reality would be more than it appears.

In Malaysian companies, personnel cost occupies the main portion of the administration cost. Meanwhile in Japanese companies, software costs such as designing, computers, office automation, etc., occupy the main portion of the administration cost. The administration cost is assumed from the level of salary and the personnel structure of the Malaysian industries.

The rate of profit would be judged to be rather on the conservative side. The exact data for judgement was not obtained in the field survey. There is a difficulty of calculation due to the difference in the manner of depreciation and technology between Malaysia and Japan.

Though not shown in this table, there are other rates such as the attrition rate of tools, the yield rate, the rate of frequency of final trial and arrangement which would affect the comparison. These rates could not be clarified unless more detailed analysis of cost structure were be achieved.

These rates are not less important in relation to the rate of profit. In reality, problems with these elements could sometimes lead to no profitability. But in order to solve the problems, quality control systems and improved technology are required though not easily achieved, but remain to be solved in the future.

The variation in personnel costs is related to the problems of automation and efficiency. Personnel costs are low-rated when the efficiency dominates due to NC or other high quality machine tools.

Thus, the rate of personnel cost will be a decisive factor for the rate of profit.

<Sales Value Per Man>

Sales values based on the field survey of Malaysian companies of each group in 1987 are as follows. figures vary according to each company. Thus annual sales value per man is assumed to be M$38,000 (¥1.9 million). There is quite a difference between the best sales value (M$58,000=¥2.9 million) and the worst one (M$15,000=¥750 thousand).

This seems to be due to the difference in mechanization and technology. It is also noted that there is a difference of sales value per unit mould and die raging from M$5,000 to M$20,000.

Sales Value per Man

Unit M$

Company	Number of Employees	Sales value in 1987
A Company	20 men	1,000 thousands
B Company	9 men	450 thousands
C Company	9 men	250 thousands
D Company	10 men	150 thousands
E Company	33 men	800 thousands
F Company	30 men	1,200 thousands
G Company	17 men	1,000 thousands

Sorce: Field survey of representative companies belonging to 2nd and 4th group.

Annual sales value per man in Japanese companies is said to be from about M$240,000 (¥12 million) to M$400,000 (¥20 million) per annum and the break even point is about M$200,000(¥10 million) per annum. In other words, if the precessing value (sales value minus cost of materials, subcontracted orders, and consumables) is under ¥6 million per annum, it could be assumed to be under the break-even point. In this comparison, the rate of sales value of Malaysian companies is about one fifth (1/5) that of Japanese companies. That sales value per one unit mould and die will inevitably increase, so the mould and die should be of a value-added type in the future.

In 1988, sales value is expected to increase by 30% or 40% compared to that of 1987.

It seems impossible to increase workers so rapidly and it is necessary to use existent workers to cope with the problem of productivity. At present, the delivery term is about 3 months, but if the delivery term should deteriorate further because of the weak productivity, the whole industry would be affected badly.

To alleviate this problem, there will be no other alternative but to increase the productivity.

From the above points, it could be said that it is necessary to increase the annual sales value of Malaysia to the value ranging from M$20,000 (¥1 million) to M$70,000 (¥3.5 million) which is equivalent to one fourth (1/4) of that of Japan.

<Material Cost>

In Malaysia, standard material is that of ASSAB. The prices of the representative materials are compared as follows.

Material Cost

	Malaysia	Japan
ASSAB 760 (Equiv: JIS S50C):	M$4.6 – 5.5/kg	M$5.0 ± 10%
ASSAB 718 (PD555):	8.8 – 10.8/kg	26.0 ± 10%
ASSAB XW – 41 (SKD11):	15.5 – 18.3/kg	12.0 ± 10%
ASSAB STABAX(SUS53B):	13.3 – 16.4/kg	30.0 ± 10%

In Japan the price of materials of ASSAB is 15% higher than Japanese materials. However the materials of SS50OC or SKD11 which are popular in Japan are relatively cheap in the Japanese market. In the Japanese market, prices will differ in each area and in different channels of the sales route. Sometimes the price is double that in other areas.

The price of materials in Malaysia could be said to be about half the Japanese price if some exceptions are neglected.

3-1-2 Comparison of Production Cost of Moulds and Dies

In this paragraph, we tried to take a sampling of plastic moulds as the object for the comparison. For this purpose, we have chosen 3 kinds of lens caps and knobs. These products require quality in precision in which the precision of grade goes as far as to 0.05mm. The reason we have chosen a precision-required product is that, for the development of the Malaysian mould and die industry, it is necessary to secure the Japanese market for sales. Thus, high quality products would be required and Malaysia should be up to the challenges of achieving this.

For the sampling survey, a request was made to a total of 3 companies belonging to the 2nd, the 3rd and the 4th groups respectively. The request was made for a cost estimate of the lens caps and its breakdown. Only the 2nd and the 3rd group companies could reply to our request and the 4th group company refused it because of their lack of confidence in their quality in precision. The 3rd group did not answer the request for the cost breakdown,

The comparison of the estimate prices compared to that of a Japanese plastic mould manufacturer (employee about 30) is shown in Table. The design drawings attached to this report is for reference. Malaysian makers use the hot uner system mould, while Japanese makers use the pin-gate-type mould to which they are accustomed. Pin-gate-type mould is cost saving but requires a certain level of processing technology to achieve good results in the moulding. But any type could be used so long as the request meets the requirement. The Japanese maker was requested to proceed according exactly to the instruction indicated in the design drawings.

Cavities in the lens caps were assumed at 2 and cavities in the knob were assumed at 4.

Unit M$

	2nd group	3rd group	Japanese maker	%
Lens caps 58 mm dia:	22,800	16,800	36,000	0.63 — 0.46
Lens caps 67 mm dia:	25,600	19,800	38,000	0.67 — 0.52
Lens caps 77 mm dia:	29,200	18,000	40,000	0.73 — 0.45
Knob :	20,000	16,000	35,000	0.57 — 0.46

There is an average price difference of 65% in the 2nd group and 47% in the 3rd group compared to the price of the Japanese maker. As these are estimated prices, actual prices might be lower than this but the rates are not so unreasonable. Estimate purchase costs of the moulds to make the products in other Japanese makers were surveyed. The result showed that the cost differences were within ±10%.

However a certain Japanese maker replied that they can manufacture at the same price as the Malaysian 2nd group. This means that when Japanese maker comes to compete in price to obtain the order, they may reduce the cost.

If they manufacture the moulds using an extremely high quality system like CAD or CAM, lens caps of 58mm could be made at M$30,000 (¥1.5 million). In addition, some local Japanese makers are said to be capable of making the caps at M$18,000 (¥0.9 million). This shows that Malaysian moulding cost is not necessarily lower than the cost in Japan. In order for Malaysian manufacturers to be competitive enough against the Japanese, at the current exchange rate, Malaysian manufacturers have to maintain their costs in the range of 35 to 40% difference compared to the Japanese.

In Japan, until the first half of last year (1987), Japanese makers suffered a scarcity of orders combined with hard competition in sales price. Thus the sales prices have lowered extremely, in some cases, to half of the price at the beginning of the year.

They have lowered the price to a losing point to obtain orders for the sake of plant operation. But as demand has increased recently, the prices have regained to their tendency to rise by an average of 5 to 6% per year.

Now the Malaysian mould and die makers have come to the point where they have to renew their equipment to increase their design capacity and complete the personnel development programme in the search for improving high technology in order to compete with Japanese makers in the international scale.

The following are the cost structures of the manufacturing moulds indicated by The 2nd group.

Unit: M$

	Materials	Processing	Design	Others
Lens caps 58 mm dia:	2,800	15,000	1,000	4,000
	(12.3%)	(65.8%)	(4.3%)	(17.5%)
Lens caps 67 mm dia:	3,100	16,500	1,000	5,000
	(12.1%)	(64.4%)	(3.9%)	(19.5%)
Lens caps 77 mm dia:	4,200	18,000	1,000	6,000
	(14.4%)	(61.6%)	(3.4%)	(20.5%)
Knob :	1,650	15,000	1,000	2,350
	(8.2%)	(75.0%)	(5.0%)	(11.7%)

Compared to the average Japanese cost of materials, Malaysian costs are most reasonable but the processing cost is high. The reduction of the cost of the processing cost should be pointed out to increase profit. In Japan, because of the high design cost, the introduction of CAD is being considered.

3-1-3 Cost of Plastic Moulding

A survey was conducted to find out the estimated cost in Malaysia of plastic moulding using the mould for the lens cap studied in the preceding paragraph. The estimate obtained from a company in the vicinity of Kuala Lumpur is compared with the Japanese cost. This comparison is based on a minimum quantity of 10,000 pieces per order.

Comparison was made on the assumption that the product made by using the Malaysian mould would be exported to Japan, because it would be better for Malaysia to gain added-value than exporting the mould itself to produce the same products.

The result shows a difference of only 14 to 26% in the cost comparison.

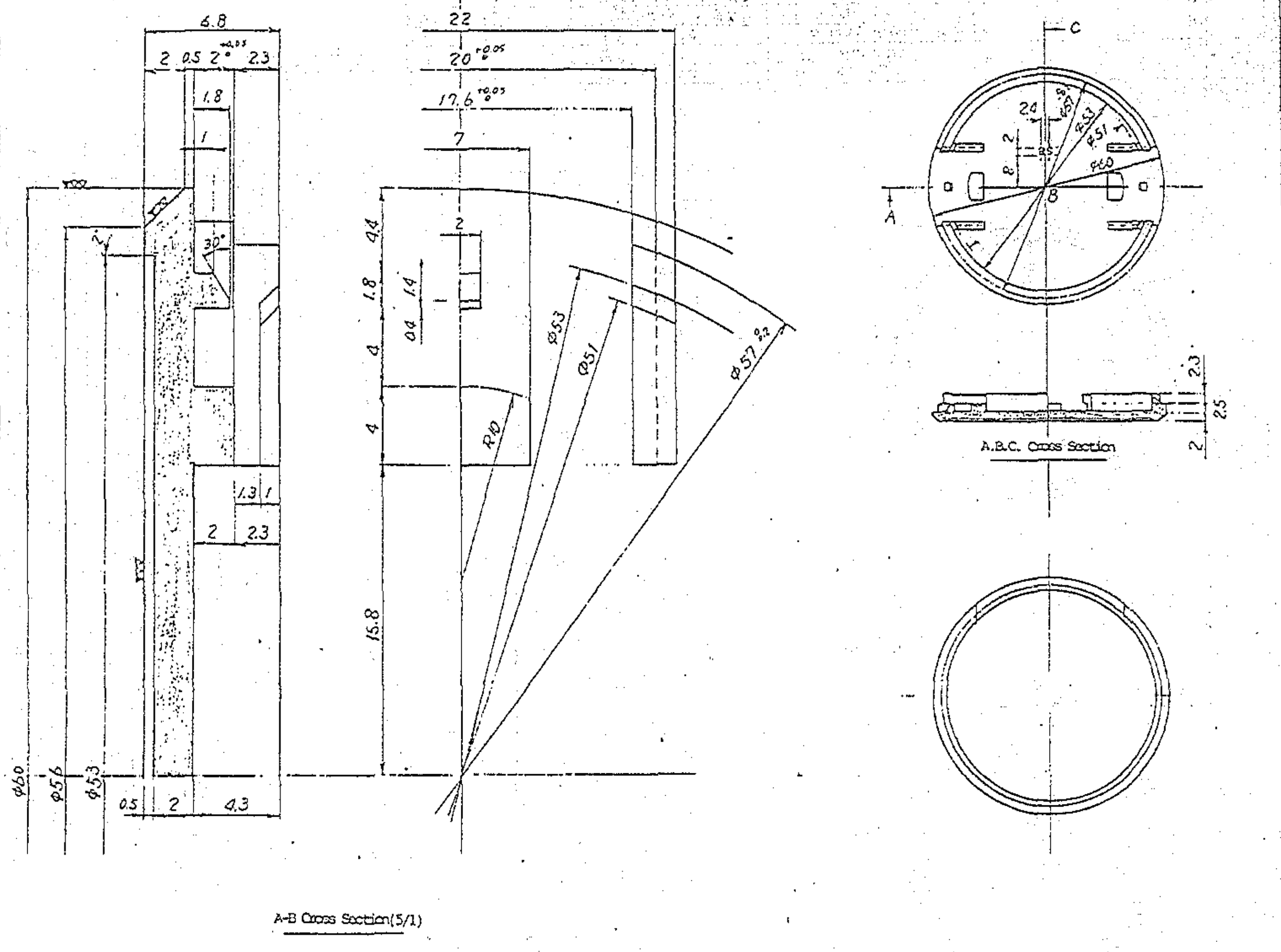
While Malaysian moulds are clearly 30 to 40% lower in price compared to those of Japan, Malaysian products imported to Japan, do not show much advantage in terms of cost, because of the additional cost of transportation costs. In the general view, it comes to a question of the moulds in the two countries.

Therefore in order to reduce the total cost of Malaysian plastic products, the cost of the mould should be reduced. Since the export of the Malaysian products to Japan is expected to increase, both the cost of the mould and the plastic moulding (or punching) should have enough competitiveness.

Comparison of Moulding Prices

Unit M$ (1M$ = ¥50)

Iten	Caps moulding Unit Price	Unit Price of Knob	Transpor-tation	Total	Purchase cost in Japan	Rate
58 mm dia	0.22	0.40	0.042	0.662	0.794	1:0.91
67 mm di.	0.26	0.40	0.042	0.702	0.814	1:0.94
77 mm dia	0.26	0.40	0.042	0.722	0.98	1:0.81



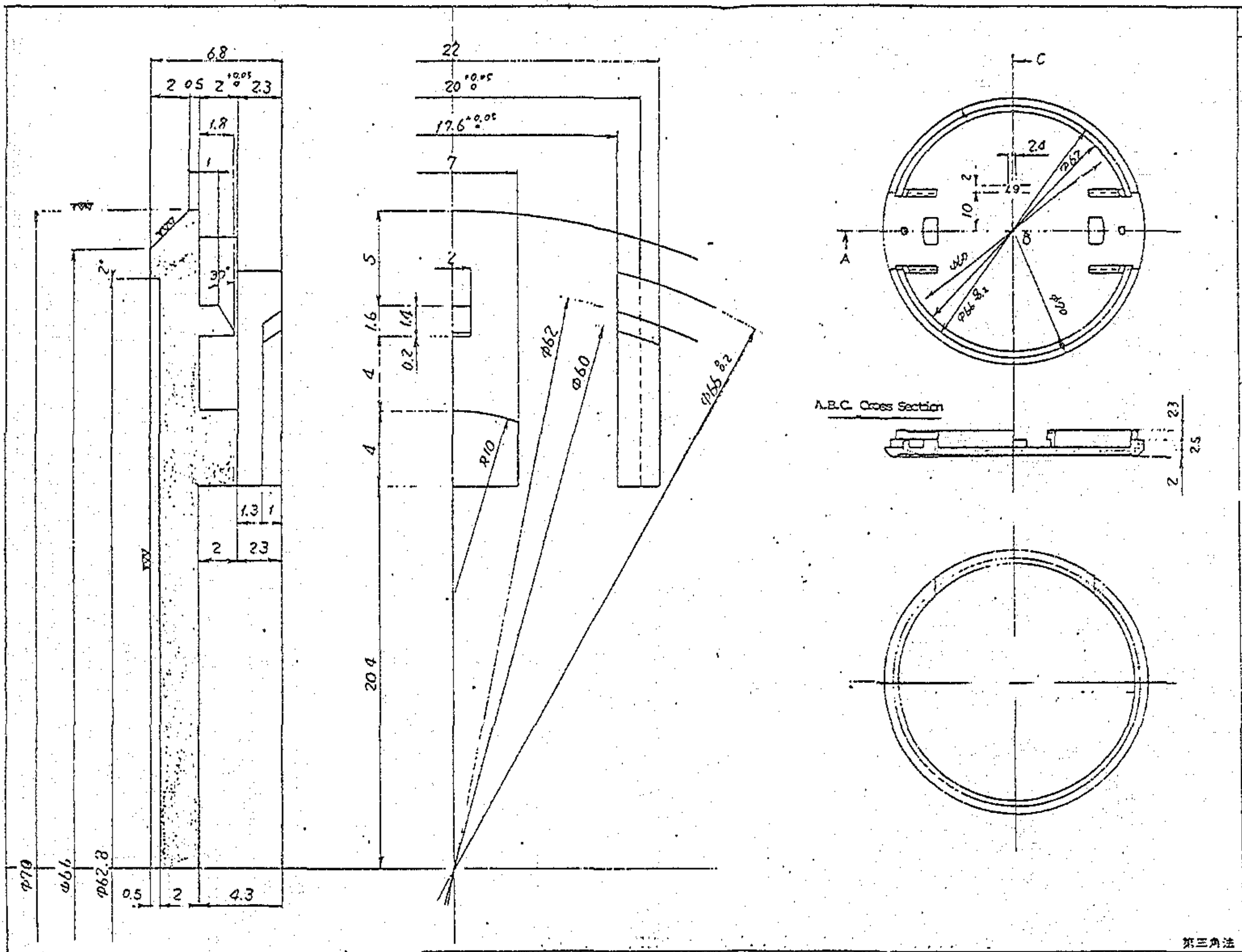
A-B Cross Section(5/1)

1. Appearances to be clean without scratches, thermal deflections, cutting remains
2. Gates to be made inside in the centre and cut clean
3. ▽▽▽ parts to be mirror lapped
4. "58" Letter inside
   (a) Font MLF No.9
   (b) Height 0.25
   (c) Line width 0.4

第三角法

◯ . .	C	◯ . .	C	材料 Material Black ABS		処理	尺度 ／
◯ . .	C	◯ . .	C				
◯ . .	C	◯ . .	C	Accuracy Average 特別		承認	検図
◯ . .	C	① 63·4·5	新規設計	Length	±0.1		写図
◯ . .	C	記号 年月日	設変事項	Angle	±30'		設計

名称: LENS CAP 58



1. Appearances to be clean without scratches, thermal deflections, cutting remains
2. Gates to be made inside in the centre and cut clean
3. ∇∇∇ parts to be mirror lapped
4. "67" Letter inside
   (a) Font MLF No.9
   (b) Height 0.25
   (c) Line width 0.4

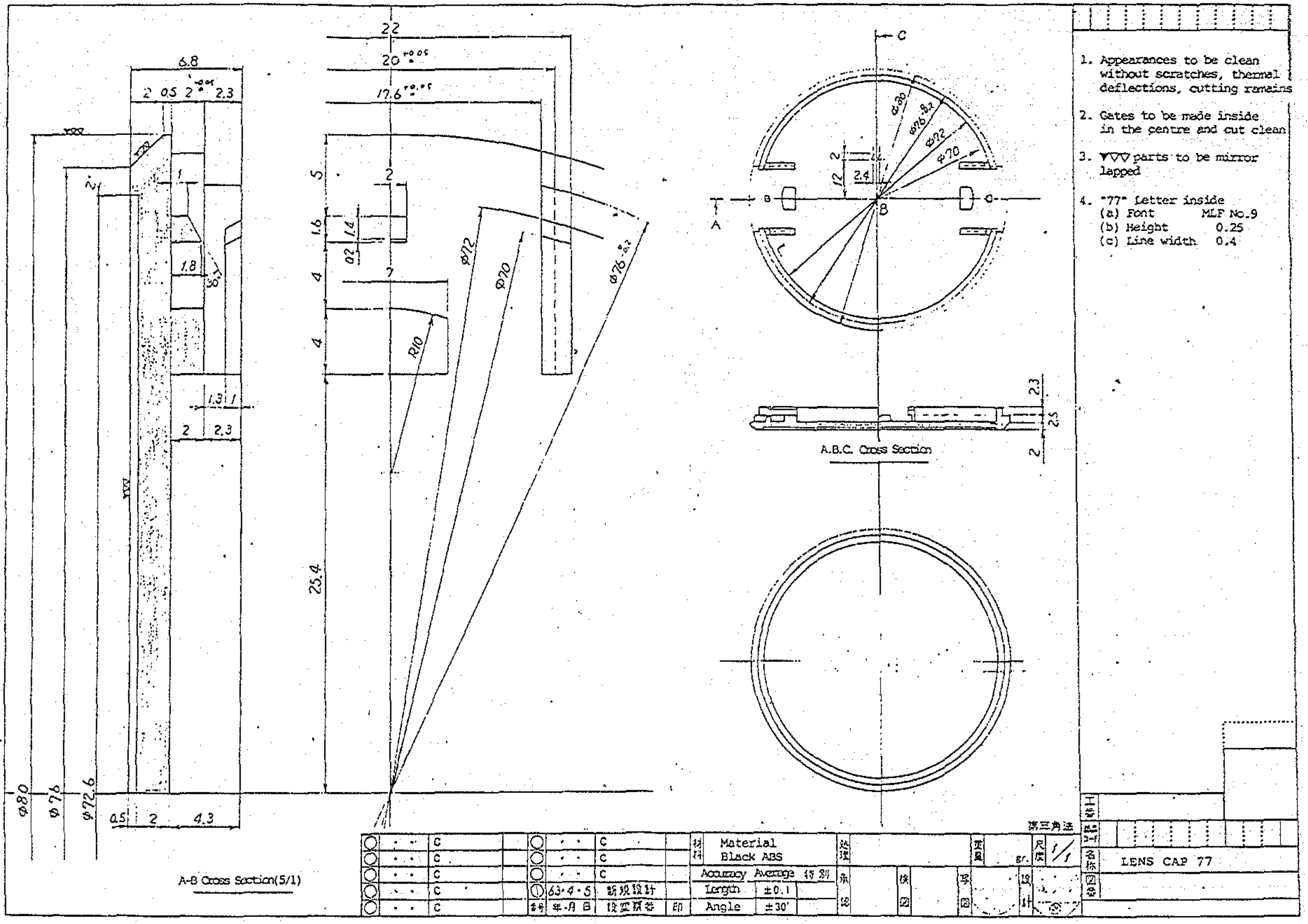
第三角法

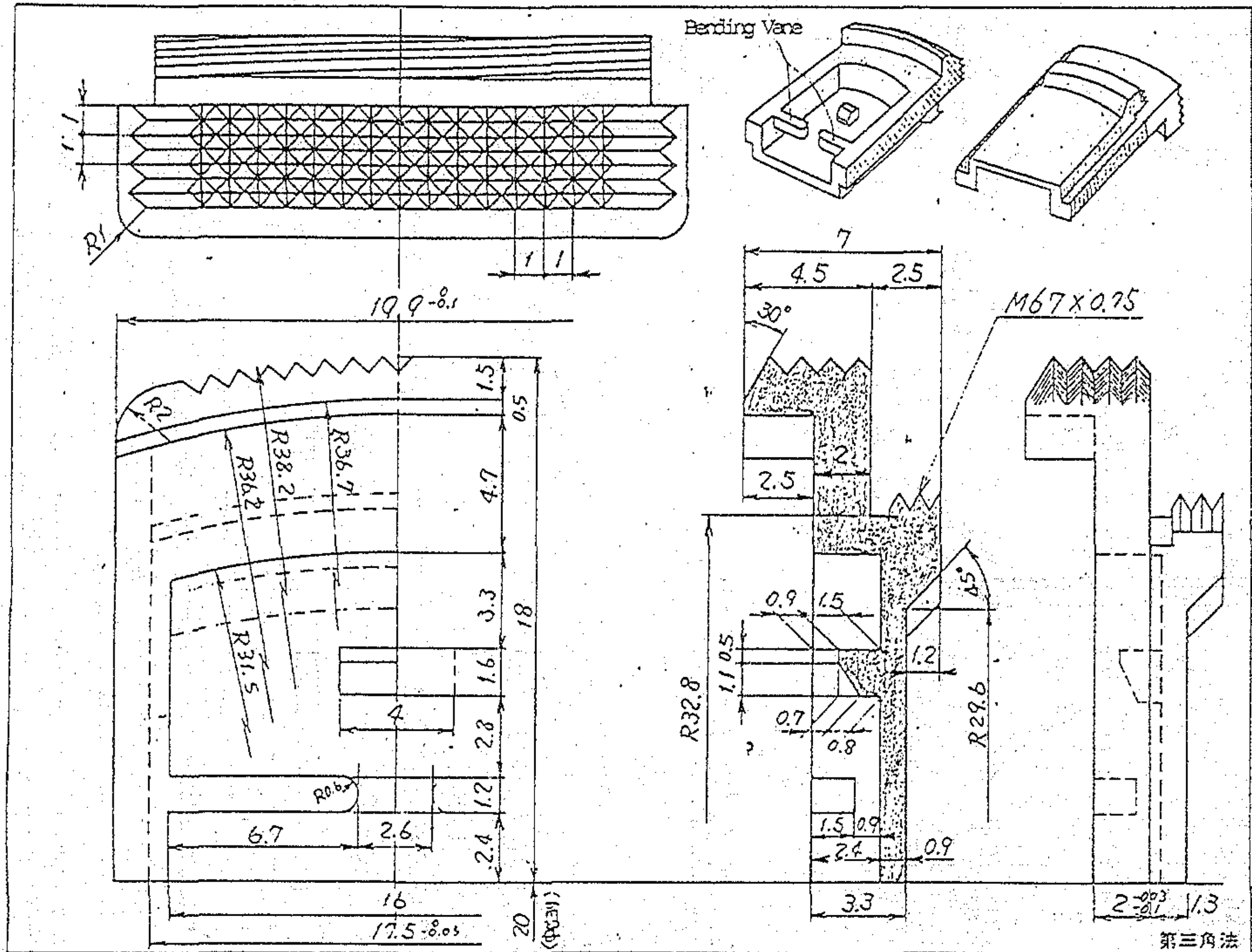
Material: Black ABS

Accuracy	Average	特別
Length	±0.1	
Angle	±30'	

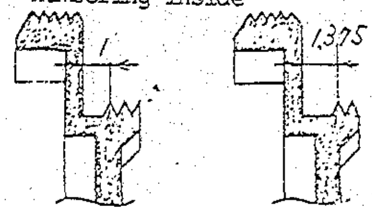
①63-4-6 新規設計

LENS CAP 67


1. Appearances to be clean without scratches, thermal deflections, cutting remains
2. Gates to be made inside in the centre and cut clean
3. ▼▽▽ parts to be mirror lapped
4. "77" Letter inside
(a) Font MLF No.9
(b) Height 0.25
(c) Line width 0.4
A-B Cross Section(5/1)
A.B.C. Cross Section
第三角法
Material
Black ABS
Accuracy Average
Length ±0.1
Angle ±30'
63・4・5 新規設計
LENS CAP 77



1. Appearances to be clean
2. Sliding parts indicated by slant lines to be flat
3. Gates to be made inside in the centre
4. M67x0.75 screw parts to be made under-mentioned and to be distinguished by numbering inside



5. Vending vene(width 1.21 =6.7,two parts)not to be blow-holed and cracked

◯	· ·	C	◯	· ·	C	
◯	· ·	C	◯	· ·	C	
◯	· ·	C	◯	· ·	C	
◯	· ·	C	①	63·4·4	新規設計	
◯	· ·	C	記号	年月日	設変緊番	印

材料	Material Black POM		
Accuracy	普通	特別	
Length	±0.1		
Angle	±30′		

処理	
承認	
検図	
重量	gr.
尺度	5/1
写図	
設計	
工番	
部品コード	
名称	LENS CAP KNOB
図番	