METALS INDUSTRY RESEARCH AND DEVELOPMENT CENTER AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Mid-Term Impact Assessment of the Upgrading Project for Plastic Molding Tool Technology

Final Report
July 31, 2000

Conducted by
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Project to be Evaluated

The Metals Industry Research and Development Center (MIRDC) and Japan International Cooperation Agency (JICA) commissioned PSR Consulting, Inc. to conduct an independent mid-term impact assessment of the "Upgrading Project for Plastic Molding Tool Technology." The Project, a joint undertaking of MIRDC and JICA, was launched on September 1, 1997 and shall run until August 31, 2002.

Purpose of the Evaluation

The goals of the mid-term evaluation are: a) to assess the impact of the Project activities on the identified beneficiaries, and b) to determine what other technology products and services the Project could provide in the future to meet the needs of its beneficiaries. The independent evaluation primarily focused on the following Project activities:

1. Training programs and courses
2. Consultancy services
3. Short-series experimental production (SSEP)

The evaluation addresses the following concerns:

1. An assessment of the impact of the Project activities to target beneficiaries: did the Project benefit the target participants? To what extent?

2. An assessment of additional technical assistance that target beneficiaries might need in the future: did the participants want the Project extended and enhanced with specific new benefits in mind?

3. Ways of addressing additional technical assistance needs: did the participants suggest new Project delivery methodologies to improve the achievement of benefits in the future?

Project Background

The Philippine metal fabrication industry performs a range of metal processes to transform metals into products to support the material, equipment or fabrication parts requirements of the manufacturing and industrial industries. It is considered one of the country's most important support industries that serve as one of the bedrocks of the country's nascent industrial development. While total direct exports of leading metal products are of minimal volume, a number of metal fabrication companies have become suppliers to major companies operating in foreign markets as specialists in certain products. Other companies have gained recognition as joint venture partners of international firms. These are some indications of the metal fabrication industry's potential role for serving as a model of competitiveness for the whole economy.[1]

The Philippine metalworking industry is characterized by a large number of SMEs, mostly using conventional and used machineries and larger companies using state-of-the-art technologies. In this industry, technology plays an essential role of achieving higher productivity and competitive growth. Among the metal product groups identified in a 1995 study conducted by PSR Consulting on the international competitiveness of the metal fabrication industry, tool and die had been considered as "having a strong potential of becoming an export winner" mainly through technology development and transfer[2].

Companies achieve productivity in tool and die making by adding new machines and improving work procedures. They need to upgrade equipment due to the fast rate of product and machinery obsolescence. The PSR Consulting study reported that companies serving the requirements of semiconductor manufacturers use the latest technologies. Those serving other sectors use conventional and obsolete technology and consequently their manpower had lower levels of technological competencies. More than half of the capacity of the identified tool and die

[1] "Assessment of the Metal Fabrication Industry," a study prepared by PSR Consulting, Inc. UNDP-DOST, *Achieving International Competitiveness Through Technology Development and Transfer Assessment Reports Module I: Export Winners*, 1995.
[2] Ibid; pp. 241 – 242; 249 – 250.

making shops in the local industry made products for the plastic manufacturing and glass-making companies.

There is a clear market demand for technically skilled and qualified personnel to improve tool and die fabrication to world-class standards. The industry suffers from a lack of workers that are skilled in modern production techniques. This setback was found to be caused partly by the lack of training centers with advanced technological facilities and capacity to accept transfer of technology.

To advance the industry's competence in plastic molding tool technology to international standards, the government requested assistance from JICA. Earlier, from 1980 to 1986, JICA aided in uplifting the metalworking industry through its technical assistance in introducing modern foundry technology. In September 1997, MIRDC signed a five-year technical cooperation agreement with JICA to jointly undertake an "Upgrading Project for Plastic Molding Tool Technology." JICA established a US$5 million fund to finance the project while MIRDC provided counterpart facilities and personnel.

The overall goal of the Project when it was started was to enhance the international competitiveness of Philippine tool and die products. It was then envisioned that the Project could help build up a critical mass of skilled workers in plastic mold designing, processing and assembly and maintenance in order to directly benefit small and medium enterprises (SMEs). The other prospective beneficiaries of the Project were the workers themselves who would upgrade their skills and knowledge. Other beneficiaries were the other industries that use the outputs of the metalworking industry. JICA would assist MIRDC in upgrading its capability to: a) train engineers and technicians on the latest technology in plastic molding, and b) systematically give other forms of technical support to the tool and die industry.

MIRDC enhanced the Precision Tool and Die Center (PTDC) through the assistance of JICA, which provided the hardware components. The PTDC was set up to provide advanced dedicated training facilities and programs necessary to continuously supply the various manufacturing industries with highly skilled, qualified and properly motivated human resources in the design and making of tool and die. The MIRDC counterpart personnel (C/Ps), composed of seven engineers and 15 technicians, administering the PTDC are undergoing training to enable them to transfer the latest technology on plastic molding production to the local industry. Besides

granting foreign training grants to some of the C/Ps, JICA also dispatched to PTDC five long-term and seven short-term Japanese experts to assist in their continuing training.

Methodology

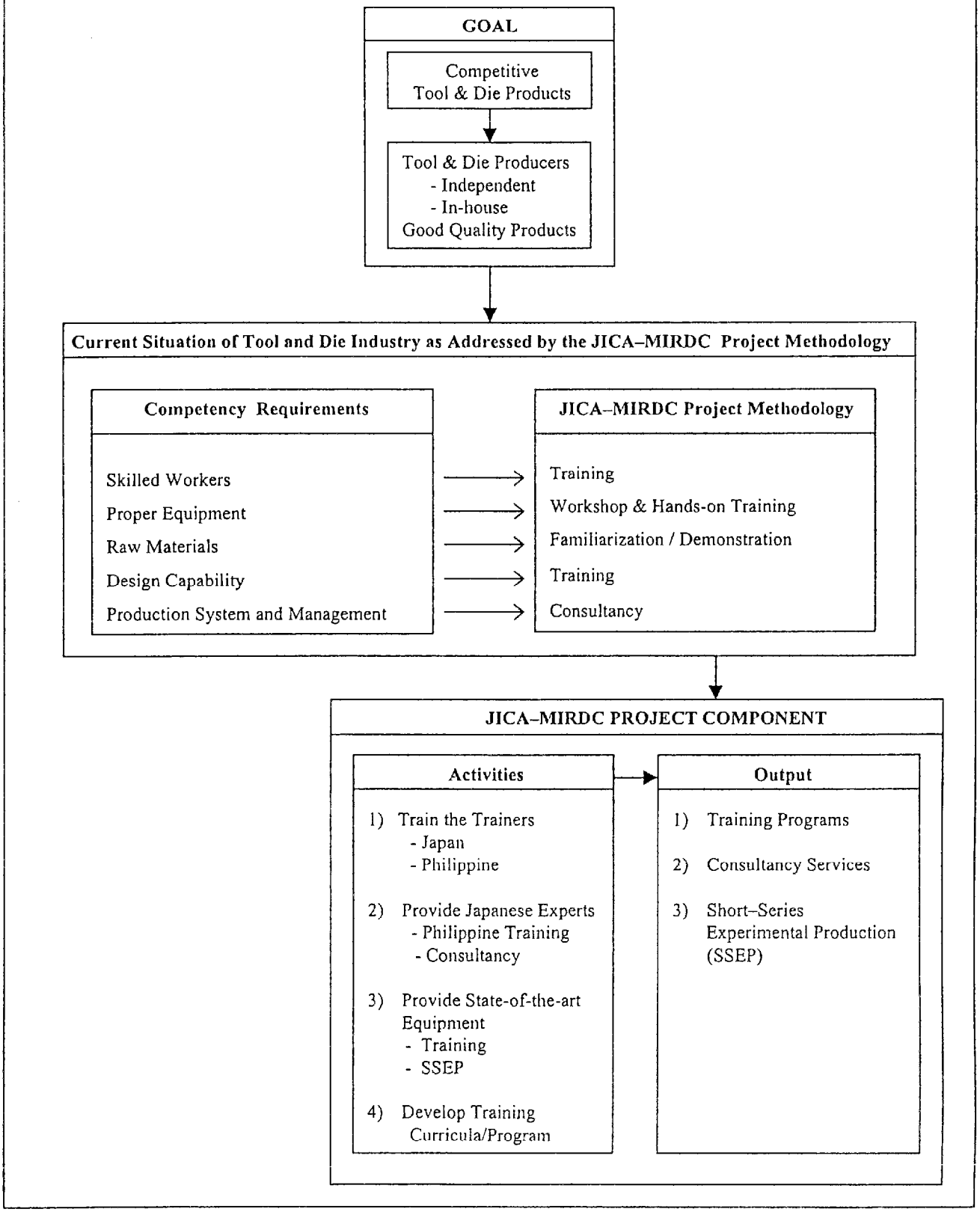
The Project designed three activities to transfer the latest technological developments related to plastic molding tool designing, assembling, and maintenance. These were: a) conduct of training courses, b) extension of consultancy services and c) performance of short-series experimental production. Figure 1 in the next page shows the schematic representation of the various Project components and activities while the detailed Project status report is shown in Annex 1.

The equipment housed at PTDC was intended to be utilized as common facilities for the hands-on training and short-series experimental production (SSEP). The Japanese experts and the C/Ps assigned as classroom instructors conduct the training courses. The hands-on trainings are to be assisted by the other C/Ps assigned as workshop instructors and demonstrators. The Japanese experts also continued to supervise the technological training of the C/Ps at PTDC.

To assess the impact of the Project goal, the PSR Consulting Research Team conducted a face-to-face interview survey using a survey questionnaire. PSR Consulting designed the questionnaire in consultation with MIRDC and JICA. It is divided into three parts: . Module A assesses the impact of the training courses to the target companies and the trainees, Module B assesses the impact of the consultancy and Module C assesses the SSEP's impact. A complete set of the questionnaire is shown in Annex 2.

PSR Consulting organized two sub-teams to implement the two key activities, namely: setting of interview appointments and conduct of interviews. The first team, composed of full-time staff, took charge of setting interview appointments, reproduction of interview questionnaires and other materials and tracking of the actual conduct of interviews. The respondent companies were randomly drawn from a list of MIRDC clients that availed of the services of the JICA-assisted Project. The second team conducted the interviews of the senior officers and training participants of respondent companies. Actual research and fieldwork were conducted during the two-month period of June and July 2000.

Figure 1: Upgrading Project for Plastic Molding Tool Technology



Mid-term Impact Assessment of the
Upgrading Project for Plastic Molding Tool Technology

Key Survey Results

A total of 63 respondents were interviewed. The respondents consisted of companies that are mainly in the fabrication of molds for plastic-based products and individual training participants. The respondents gave their responses only for specific Project activities where they participated. Overall, there were 32 company respondents for Module A (Training Program); 38 individual respondents for Module A.1 (Trainees that attended Training Programs) including 10 C/Ps; 11 company respondents for Module B (Consultancy); and 2 company respondents for Module C (SSEP).

The list of respondents is shown in Annex 3.

Profile of Respondent Companies

The respondent companies were composed of 29 manufacturing firms, three equipment distributors, three trading companies and three educational institutions. Ten MIRDC C/Ps were also interviewed. Respondent companies reported annual sales revenues ranging from P10 million to P3.2 billion and annual income ranging from P1 million to P400 million. The manufacturing companies fabricated dies and molds for plastic-based products. Some 17 companies manufactured solely for their company's in-house requirements, 11 companies produced for job orders, and five companies produced for both in-house and job order requirements. Among the major product applications reported by the respondent companies were: plastic components of electronic products – 18 respondent companies; 14 for plastic components of parts for automobile and 13 for appliances, 11 for general commodities, six for communication, and 14 for other product types. Table 1 below shows the other characteristics of the respondent companies.

Further analysis of the profile of the respondent companies showed that the majority of the companies that accept plastic mold orders were Filipino-owned and had assets of less than P40 million. Two Japanese-owned companies mainly into plastic mold jobbing had assets of over P40 million.

Table 1. Profile of the Respondent Companies

	Number	Percent
Type of Ownership		
Single proprietorship	3	7.9
Partnership	2	5.3
Corporation	32	84.2
Publicly listed	1	2.6
Total	**38**	**100.0**
Nationality of Ownership		
Filipino	23	60.5
Japanese	6	15.8
Chinese	3	7.9
American	1	2.6
German	1	2.6
Others	4	10.5
Total	**38**	**100.0**
Size of Corporate Assets		
Less than P10 million	7	18.4
P10 million – P40 million	5	13.2
Over P40 million	26	68.4
Total	**38**	**100.0**

Technical jobs have been a traditional enclave of male workers as shown among respondent companies where male workers comprised the majority of the technical force. Women workers have started to join the industry's technical workforce. As shown in Table 2, a growing number of female workers have attained the qualifications to handle technical work such as mold designing (2), machining (3), assembly (1), tool crib (3), and maintenance (3). The largest numbers of female workers are found in quality control (7) and administrative work (8). Most of these workers completed high school and vocational courses.

Table 2. Profile of Personnel
(Number)

Job Description	Male	Female
1. Design	5	2
2. Machining	17	3
3. Assembly	8	1
4. Tool Crib	9	3
5. Quality Control	5	7
6. Plant Maintenance	8	3
7. Administrative	7	8

Most of the respondent companies own conventional equipment and some reportedly own computer-aided facilities such as CNC lathe, CNC milling, vertical machining center, EDM wire cut, EDM sinker and CAD/CAM computer systems. The profile of the equipment and machineries owned by the respondent companies is shown in Table 3. The list of the CAD/CAM systems used and the capacity of the plastic injection machine by the respondent companies is shown in Annex 4.

Table 3. List of Equipment and Machinery Used by Respondent Companies

	Number of Companies
Conventional Equipment	
Milling machine	33
Lathe machine	32
Measuring equipment	32
Drilling machine	31
Grinding machine	30
Boring machine	17
Jig grinding	8
Jig boring	8
Copy lathe	7
Copy milling	7
Computer-aided Equipment	
CAD/CAM Systems	20
CNC Milling machine	19
EDM Sinker machine	19
CNC lathe machine	14
Plastic injection machine	14
EDM wire cut machine	11
Vertical machining center	11

Table 4 shows the problems encountered by respondent companies and their frequency. All companies reported that they need technical support. Generally, large companies are supported by their parent companies and suppliers of software and machineries. In contrast, SMEs rely on the assistance provided by industry associations and MIRDC to upgrade their technical know-how. Likewise, all companies would like to have access to a pool of skilled workers from where they could recruit their manpower requirement. Generally, large companies have the capacity to train their personnel on the use of modern technology. Employees of SMEs, on the other hand, lagged in technical know-how since their companies still use conventional technology.

Most respondent companies could readily source their raw material requirements and bring their products to the market. Companies involved in mass production of tool and dies use

mold bases provided by their clients. Most of these clients have long-term relationships and are satisfied with service quality of respondent companies. Companies that fabricated tool and dies on job order basis also readily sourced their metal base needs. One respondent company that was the sole precision tool supplier of a semiconductor company commented that other semiconductor companies are the ones who come to them for fabrication of their tooling requirements.

Table 4. Problems Encountered and Their Frequency (Number of Respondent Companies)

Type of Problem Encountered by Company Asset Size	Frequency of Problem			
	Often	Seldom	Never	Weighted Ave. Rating
Technical Support				
Less than P10 million	2	5	0	Seldom
P10 million – P40 million	1	4	0	Seldom
More than P40 million	2	20	4	Seldom
Total	**5**	**29**	**4**	
Labor/Manpower				
Less than P10 million	2	4	1	Seldom
P10 million – P40 million	0	3	2	Seldom
More than P40 million	3	18	5	Seldom
Total	**5**	**25**	**8**	
Sourcing of New Materials				
Less than P10 million	2	3	2	Seldom
P10 million – P40 million	0	3	2	Seldom
More than P40 million	5	10	11	Seldom
Total	**7**	**16**	**15**	
Marketing				
Less than P10 million	1	3	3	Never
P10 million – P40 million	0	3	2	Never
More than P40 million	0	9	17	Never
Total	**1**	**15**	**22**	
Utilities				
Less than P10 million	2	3	2	Seldom
P10 million – P40 million	1	3	1	Seldom
More than P40 million	2	11	13	Seldom
Total	**5**	**17**	**16**	
Government Rules				
Less than P10 million	3	2	2	Seldom
P10 million – P40 million	1	3	1	Seldom
More than P40 million	2	11	13	Seldom
Total	**6**	**16**	**16**	

Except for occasional problems in electric power fluctuations that could damage equipment and machineries, respondent companies seldom had problems about getting adequate water and power. Larger respondent companies are registered with BOI and were able to avail of investment incentives. SMEs often had problems complying with various permits and licenses required by the local government units and the reporting requirements of the Bureau of Internal Revenue and the Social Security System because they only have a few administrative employees.

The training courses were conducted earlier than planned because the private companies wanted to accelerate the transfer of updated plastic molding tool technology. As of 1999, 16 training programs were conducted by the local counterparts with participation of 253 engineers, technicians and craftsmen employed by 59 SMEs and some large companies. As of the first quarter of 2000, 49 companies availed of consultancy services and were visited by the Japanese experts together with the MIRDC C/Ps.

The profile of the Project services availed by the respondent companies is shown in Table 5. Most of the respondent companies took part in the training programs (61 percent). Eighteen percent took advantage of consultancy services and 16 percent in both training program and consultancy services. Two companies availed of all three services offered under the Project.

Table 5. Types of Services/Support Received Under JICA-MIRDC Project

Types of Service(s) Received	No. of Respondent Companies	Percent
Training Program	23	60.5
Consultancy	7	18.4
Training Program and Consultancy	6	15.8
Training Program, Consultancy and SSEP	2	5.3
Total	38	100.0

Training Program

The respondents' overall evaluation of training courses they attended is shown in Table 6.

Table 6: Respondent Companies' Overall Training Course Evaluation (Number of Respondent Companies)

Training Program	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Overall Weighted Average	
					Score	Rating
Application of CAD/CAM	1	3	1	0	4.0	Very Good
CAD/CAM Technology	0	1	0	0	4.0	Very Good
Production Management System	0	5	0	0	4.0	Very Good
Vertical Machining Center Programming and Operation	0	1	0	0	4.0	Very Good
New Product Management System for Mold	2	3	1	1	3.9	Very Good
Basic Mold Design for Plastic Injection Mold	2	2	1	1	3.8	Very Good
Latest Technology for Plastic Mold Making	1	7	2	1	3.7	Very Good
Trends of Mold Materials	1	4	2	1	3.6	Very Good
Nondestructive Testing	1	0	0	1	3.5	Very Good
CNC EDM Wire Cut Operation and Programming	0	1	1	0	3.5	Very Good
Plastic Injection Molding	0	2	1	1	3.3	Good
Appreciation Course in CNC Digitizer	0	0	1	0	3.0	Good
Technology on Mold Polish	0	2	1	2	3.0	Good
Seminar Workshop on CNC EDM	0	0	1	0	3.0	Good

The respondent companies sent an average of four employees to various training programs. The three most popular courses among the respondent companies that sponsored their employees are as follows: a) "Latest Technology of Plastic Mold Making," b) "Trends of Mold Materials" and c) "New Product Management System for Mold."

Overall, the respondent companies were highly satisfied (Average rating of "Very Good" to "Good") with the training courses their employees attended although they have different levels of training requirements. The training courses were perceived to be effective in providing relevant technical information to participants and their companies as shown in Table 7.

Table 7. Level of Satisfaction of Respondent Companies on Training Courses
(Number of Responding Companies)

Impact of Project by Company Asset Size	Level of Satisfaction					
	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Overall Weighted Average	
					Score	Rating
Overall Impact of Training						
Less than P10 million	0	5	0	0	4.0	Very Good
P10 million – P40 million	2	2	1	0	4.0	Very Good
More than P40 million	3	10	5	2	3.7	Very Good
Total	5	17	6	2	3.8	
Improved Skills						
Less than P10 million	0	3	1	0	3.8	Very Good
P10 million – P40 million	1	1	3	0	3.6	Very Good
More than P40 million	2	5	10	2	3.4	Good
Total	3	9	14	2	3.5	
Improved Working Methods						
Less than P10 million	0	1	3	0	3.3	Good
P10 million – P40 million	1	1	3	0	3.6	Very Good
More than P40 million	0	12	6	1	3.6	Very Good
Total	1	14	12	1	3.5	
Increased Productivity						
Less than P10 million	0	2	2	0	3.5	Very Good
P10 million – P40 million	1	1	3	0	3.6	Very Good
More than P40 million	1	9	9	0	3.6	Very Good
Total	2	12	14	0	3.6	
Increased Creativity						
Less than P10 million	2	2	0	0	4.5	Excellent
P10 million – P40 million	0	2	3	0	3.4	Good
More than P40 million	1	9	8	1	3.5	Very Good
Total	3	13	11	1	3.6	

The respondent companies reported that the training courses on the various aspects of the plastic molding tool technology were particularly useful as their employees were able to update their technological knowledge. Overall, the respondents gave highly satisfactory rating for the program (Average rating of "Very Good"). Impact was higher for smaller than in larger companies as seen in the higher weighted average satisfaction level for SMEs. Employers noted that employees who attended the training courses show marked improvement in their skills and working methods and increase in their productivity and creativity.

Training Course

Feedback gathered from the field survey indicated that the participants of training programs have different levels of training requirements. Some companies reported that the training courses where they sent participants were not matched to the training levels that they required. Some participants from larger companies wanted to learn more advanced technologies while those coming from SMEs wanted information on basic technology. For example, at one of the training courses a participant commented that the training was "designed for beginners and could not create experts since the course was too general." There were also cases when technological information provided by training courses could not be applied by SME participants after the seminar because their companies did not have the required state-of-the-art equipment.

Employees of large companies with state-of-the-art facilities already had extensive training on latest technology either through in-house training, from their parent companies overseas or from suppliers of equipment and software. Multinational companies such as Matsushita Electric Philippines Corporation, Fujitsu Die-Tech Corporation of the Philippines and LG Collins Electric Manila Company have technological support from their foreign counterparts.

Future training programs

Most of the respondent companies indicated that the duration of short-term and long-term trainings run by MIRDC was adequate (see Table 8). Among the course offerings, the most popular among the respondent companies are the short-term training courses on "Plastic Injection Mold Design" and "CAD/CAM Technology" and the long-term training course on "Mold Design." Some respondents observed that the time allotted to plastic injection mold design (40 hours) appeared too short.

Future training programs on stamping, die casting, and heat treatment were perceived to be relevant and would particularly be beneficial to SMEs. Among the other technical areas that SMEs wanted training on are: plastic decoration (painting), allocation of resources, quality control on metal composition, software design developments, tempering of materials, precision grinding, machine maintenance and mold preventive maintenance, and technical supervisory skills. Other than technical trainings, some respondent mentioned the relevance of values formation and work ethics training to improve the motivation of workers and leadership training.

Table 8: Duration of Short-term and Long-term Courses Run by MIRDC

Future Training Program	Duration				Recommend	
	Short	Adequate	Long	Average	Yes	No
Plastic Injection Design	8	14	1	Adequate	20	2
CAD/CAM Technology	5	14	0	Adequate	16	2
Mold Design	1	18	1	Adequate	13	4
Injection Molding Process & Operation	3	14	0	Adequate	12	3
CNC EDM Wire Cut Programming & Operation	7	9	0	Adequate	11	2
CNC EDM Sinker Prog. & Operation	6	9	0	Adequate	8	3
Vertical Machining Center Prog. & Operation	3	13	0	Adequate	8	3
Mold Processing	1	13	2	Adequate	8	4
Assembly Maintenance & Trial Shot	1	12	2	Adequate	8	4
CNC Digitizing	3	10	0	Adequate	5	4
CNC Surface Grinding Prog. & Operation	2	11	0	Adequate	5	4
Other Programs Needed						
Stamping					10	11
Die Casting					4	12
Heat Treatment					14	7

Training Facilities

The participants particularly those from smaller companies that used conventional facilities found the training facilities at PTDC sufficient for their requirements. From the responses, it was evident that PTDC successfully provided participants from SMEs the opportunity to experience and appreciate the latest technological developments. The experience enabled them to acquire an understanding of the latest developments in the industry. An example was a company manufacturing plastic packaging materials that had limited capacity for mold fabrication. After attending the training course, the participating employees became aware of the importance of the properties of mold base and had started to advice their clients on which mold base material to use to maximize its service life.

Resource Persons

All training participants rated the Japanese resource persons as technically capable and knowledgeable. Participants noted that the Japanese resource persons' superior expertise were especially demonstrated in the question-and-answer portions of the courses. However, participants have difficulty comprehending certain aspects of lectures due to difficulties by some Japanese resource persons in expressing themselves in the English language. For a more efficient transfer of technology, some participants suggested the need for more MIRDC C/Ps to be proficient in state-of-the-art technology. They suggested that MIRDC should ensure that the C/Ps possess technological knowledge that is "one step ahead of the industry." Some participants suggested that resource persons team up with C/Ps to use a combination of English and Pilipino as a medium of instruction to ensure better communication with participants. They considered this especially necessary in training programs conducted for machine operators.

Support/Secretariat

All training participants rated the support/secretariat services extended by MIRDC at the various training programs as adequate. However, there was a reported case of one company being unable to send participants to a training program because it was not properly informed in advance.

Impact on Trainees

Module A.1 Training Program (Trainees) was designed to gauge the impact of the training courses on the trainees. Most of the training participants were sponsored by their corresponding companies. Their overall training course evaluation is shown in Table 9.

On average, the trainee respondents rated the training highly successful (Average rating of "Very Good") in terms of its relevance to their job and the applicability of the new knowledge, techniques and skills they learned. Likewise, they also gave high ratings to MIRDC secretariat/support and the training facilities – shop, rooms/site and equipment/accessories. The Japanese resource persons were rated highly in terms of their knowledge of the subject matter (Average rating of "Very Good") but were found to need improvement in their communication and presentation skills (Average rating of "Good"). While most of participants from SMEs

indicated that they acquired adequate levels of information and skills, those coming from large companies indicated that they were already familiar with the technology.

Table 9. Participants' Overall Training Course Evaluation

Aspects of Training Project	Level of Impact on Participants						
	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)	Overall Impact	
						Weighted Score	Rating
By Attributes							
Knowledge of the subject matter	13	16	9	0	0	4.1	Very Good
Room/site	9	17	10	2	0	3.9	Very Good
Secretariat/support	6	22	9	1	0	3.9	Very Good
Relevance to my job	11	14	9	4	0	3.8	Very Good
Equipment/accessories	5	21	10	1	1	3.7	Very Good
Shop facilities	5	18	11	3	1	3.6	Very Good
Application of new knowledge	5	16	11	6	0	3.5	Very Good
Presentation skills	3	11	19	5	0	3.3	Good
Communication skills	2	9	17	9	1	3.1	Good
By Benefits							
Improve skills	3	19	14	2	0	3.6	Very Good
Increase productivity	2	18	18	0	0	3.6	Very Good
Increase creativity	3	19	15	1	0	3.6	Very Good
Improve working methods	1	19	17	1	0	3.5	Very Good
Promotion/salary increase	0	2	5	7	0	2.6	Good

Ten MIRDC C/Ps, composed of four engineers and six technicians, were interviewed to assess the impact of their training. All respondent engineers including one respondent technician were sent abroad (Japan and Malaysia) for technological training on plastic molding tool technology. The rest of the C/P respondents attended training courses conducted by the Japanese experts at PTDC.

Most of them reported that their technological training resulted to improvements on their skills, working methods, productivity and creativity. Some reported that they need to improve on their confidence and communication skills to be able to impart the knowledge they gain from the Japanese experts to the local industry. While some technicians had previous expertise on computer-aided machine, the others want more hands-on experience to improve on their capability to use the updated molding facilities.

Some respondents commented that the Japanese experts needed to develop a well-designed course curriculum based on pre-set teaching goals in order to systematically transfer the

latest technology. They noted that due to lack of coordination, the Japanese experts occasionally discussed topics that were not related to the training, causing some participants to lose focus. These respondents suggested that Japanese technicians prepare lesson plans based on the objectives of the course.

The respondents expected that their future training would focus on more advanced technology.

Consultancy

The effort to upgrade the plastic molding tool technology used by the local industry included not only training programs at PTDC but also consultancy services by the Japanese experts and the C/Ps to private companies. They visited some companies to render consultancy services on improvement of production methods and product quality.

Most of the SMEs visited by the JICA-MIRDC consultants rated the service as relevant and adequate. The benefits of the technical consultancy were greatly appreciated among smaller respondent companies that wanted consultancy services, particularly by the Japanese experts, to be regularly conducted in the future. Most larger companies had a more organized production system and an "efficiency culture" conducive to adopting technological improvement at par with those being introduced at JICA-MIRDC.

Most respondents who availed of the consultancy services were highly satisfied (Average rating of "Very Good) and reported resulting improvements in the quality of their products and production methods and systems. They also found the recommendations of the JICA-MIRDC consultants suitable for practical applications (see Table 10). One respondent would like to see the MIRDC C/Ps extend credible technical assistance to the companies. However, he commented that to do this, C/Ps needed to acquire technological expertise that is "one step ahead of the current players in the industry."

Table 10. Participants' Evaluation of Technical Consultancy Services

Aspects of Training Project	Level of Impact on Participants					
	Excellent	Very Good	Good	Fair	Poor	Overall Weighted Average Rating
By Attributes						
Practicality of recommendations	2	5	4	0	0	Very Good
Costs/expenses involved	1	3	7	0	0	Good
Research methodology	0	3	7	1	0	Good
Time of implementation	1	3	5	1	1	Good
	Very Significant	Significant				
By Benefits						
Improve product quality	6	1				
Improve methods & system	5	3				
Increase capacity utilization	3	1				
Reduce production expense	3	2				
Increase productivity	2	2				
Decrease rejection rate	2	1				
Improve product design	1	3				

Short-Series Experimental Production (SSEP)

The SSEP Program of the JICA-MIRDC Project was envisaged to provide a facility where the metalworking industry could test run their new products and new processes or acquire additional production capacity to service additional job orders. The program was designed for SMEs who could benefit from the availability of common service facilities which would enable them to fabricate the product requirement using state-of-the art technologies at lower costs. Generally, large companies are already capable of conducting product experimentation because they have complete facilities.

In line with the "hands-on" training program of the MIRDC C/Ps to implement the SSEP Program, the local industry provided them with plastic mold design projects to support them. Two companies requested assistance in the production of new products and introduction/testing of new processes. Ultimately when the C/Ps completed their training, PTDC could accept more projects under this program. In this sense, among the services availed by the respondent companies under the JICA-MIRDC Project, SSEP had the least number of participants.

The participating companies wanted MIRDC to provide faster production turnaround and not be hampered by change of manpower. Some companies expressed interest in supporting this service.

Table 11. Participants' Evaluation of SSEP Services

Aspects of Training Project	Level of Impact			
	Very Good	Good	Fair	Weighted Average
By Attributes				
Production facilities	1	0	1	Good
Costs	1	0	1	Good
Delivery time	0	1	1	Good
Product quality	0	1	1	Good
Design capability	0	0	2	Fair
Manpower capability	0	0	2	Fair
	Very Significant	**Significant**		
By Benefits				
Introduce/test new product	1	1		
Introduce/test new process	1	1		
Implement product quality measures	0	2		
Generate add'l production capacity	0	1		
Reduce production expenses	0	2		

Recommendations

The analysis of the survey results showed that the JICA-MIRDC Project had a positive impact to the plastic industry in general and a similar significant positive impact to training program participants. The mid-term assessment revealed that the three major activities of the Project – training, consultancy and SSEP - are the suitable vehicles or media for transferring the technology to the local industry. Even though these activities were conducted ahead of the Project timetable, the positive results showed the dire need for these services in the industry.

In this Section, PSR Consulting presents recommendations based on the survey findings. These recommendations are grouped into two - one group is based on the suggestions of the survey respondents and the other group is based on recommendation of PSR Consulting based on knowledge of the capacity of MIRDC, the requirements of the metalworking industry, and field interviews. These recommendations are grouped according to the three major Project activities.

Recommendations of Survey Respondents

Training

Training Courses and Offerings

The training courses are classified into three areas, namely : appreciation, short-term and long-term courses. Appreciation courses are usually one-day courses given to the industry and students to introduce them to the latest technological developments. Those interested to learn more could attend the short-term or long-term courses. Advance appreciation courses on new trends conducted by Japanese experts were found to be suitable for large companies. The short-term courses are suitable for employees of companies in the industry while the long-term courses are suitable for the new graduates or out-of-school youths who are interested to pursue this type of vocation.

Survey respondents suggested that target companies should be given enough time and information to enable them to determine suitability of course program to their manpower

development requirement. Due to limited resources, SMEs need to schedule in advance when to send their employees to the relevant training courses.

Participants noted that SMEs need assistance on basic skills training for their employees while most of the large companies provide their own basic training. On the other hand, large companies require seminars on new trends in plastic materials, processes and plastic equipment. Training course descriptions need to be improved and distributed to the appropriate companies that stand to benefit from them. In this way, each training course in the future could achieve a better match to the level of technical know-how of participants.

Training Schedule

It would be advantageous if the Project can prepare a one-year program for all the training courses it would undertake. In this way, companies that want to send their employees to training courses could program their attendance without disrupting their operations.

Other Training Requirements

In addition to the technical training, respondent companies requested for MIRDC to continue its training on value formation and work ethics.

Mold and die companies wanted to have a training courses designed and conducted for metal stamping and heat treatment.

Consultancy

JICA-MIRDC experts and counterpart staff should continue the consultancy visits to various companies. These visits would be a good venue for exchange of industry practices and hands-on knowledge which the trainors can also impart to the training participants.

SSEP

Due to the economic slowdown, the industry is not currently utilizing this program of the JICA-MIRDC project. However, participants noted that JICA-MIRDC should gear up for a

future surge of demand. With the current trend of globalization, manufacturing companies would require fast turnaround for product sample and process in order to give competitive pricing and quotation.

Recommendations of PSR Consulting

The Precision Tool and Die Center is envisioned to be the facility that would provide the manufacturing industries with a continuous supply of highly-skilled personnel in the design and making of tool, die and mold. The launching of the MIRDC-JICA Project wherein the latest equipment and metalworking experts would be provided is an essential step in this direction. Although the training and some equipment are for plastic technology, the basic training and other equipment can generally be used to meet the requirements of the tool and die making company. In this respect, the curricula of any future training can be broken up into basic training for general tool, die and mold making and special training for plastic molding tool making. In this way, introduction of other specialized tool and die technology like metal stamping would be easy and smooth.

The basic training in design, processing and assembly, maintenance and trial shot should include theoretical aspects so that the trainees would be knowledgeable on the principles that govern such activities. The combination of the theory and practical aspects would enable the trainees to adapt to any brand of equipment available in his present or future workplace.

Technical training requires certain aptitude and JICA-MIRDC should consider conducting a screening and aptitude tests for participants, particularly on long-term courses so that the program integrity can be maintained.

PSR Consulting would like to stress the need for proper scheduling of the training program and the dissemination of the course description and schedule not only to human resources department but also the production department of the target companies. In the Survey, PSR Consulting found training participants who are willing to spend their own money to attend the short-term courses if their companies will not send them officially sponsor their attendance.

JICA-MIRDC should also consider the "dual-tech" method of training for new vocational or college graduates and out-of-school youths who have the aptitude for this type of skills. In the

Survey, PSR Consulting found some companies that are willing to participate as sponsors of this program.

Based on their own assessment, the MIRDC C/Ps considered their aptitude for plastic molding tool technology as still in the basic skills level. Some rated their technological know-how as below 50 percent. To have knowledge "one-step" ahead of industry, the C/Ps have a lot of catching up to do which they hoped to do in the next phase of their training. To enhance the training of the C/Ps, PSR Consulting recommends that the Project management should the following:

1) Continue the company visits and consultancy work to upgrade the training capacities of C/Ps. Through constant dialogue and exposures to the local industry, tool and die practitioners would enable the C/Ps to gain knowledge on some industry practices. The C/Ps could then document these methodology by putting these into written and flow-chart forms and imparted to the training participants.
2) Add more projects under a right scheduling. Alternatively, the Project management can ask the industry players for projects to be used under SSEP. However, this should be undertaken based on proper and competitive costing and timetable. In this way, the C/Ps could experience the constraints felt by local companies which had to deliver the desired products ordered by the clients on time and at the least cost.
3) New trends on plastic materials and processes can only be learned through proper laboratory research, disciplined internet and library search, liaison with equipment suppliers and participative visits in local and international equipment exhibits and conferences. PSR Consulting recommends that Project management budget for these costs in succeeding phases of the training programs.
4) To be sustainable, the Project should charge a reasonable fee for the conduct of training, consultancy visits and SSEP. In this way, the industry participants shall appreciate the value of the use of equipment. Also, the funds can be used to properly maintain the common service facilities at the SSEPs.

Annex 1

STATUS REPORT OF PROJECT COMPONENTS
As of March 30, 2000

1. Technical training of MIRDC counterpart personnel (C/Ps)

Twelve MIRDC C/Ps were granted foreign grants for following training abroad:

Training Course	Name of MIRDC C/P	Inclusive date
Computer Management	Leah Padiernos	March 23 - July 9, 1999
Project Management	Rolando T. Viloria	Nov. 11 - 24, 1998 March 26 - 31, 1999
	Eduardo R. Lacbay	March 15-28, 1998
	Eric P. Duquez	March 26 - 31, 1999
	Fred P. Liza	Nov. 16 – Dec. 2, 1999
Mold Design	Rogelito B. Aquino	Oct. 1997 - March 1998
	Ernesto Adraneda	Sept. 1 – Nov. 20, 1998
	Crisanto H. dela Cruz	July 24 – Oct. 16, 1999
Mold Processing	Feliciano H. Japitana	Sept. 1 to Nov. 20, 1998
Mold Assembly	Augusto S. Atanacio	Sept. 1 to Nov. 20, 1998
	Benjamin C. Logica	July 24 – Oct. 16, 1999
Monbu-Sho Scholarship University of Electro-Communications	Feliciano H. Japitana	Oct. 1, 1999- Mar 20, 2002

The Japanese experts conducted the following training courses locally for the C/Ps and companies in the private sector:

Training Course	Lecturer	Date
High Speed Machining	Dr. T. Matsuoka	March 11, 1998
Rapid Prototyping	Dr. T. Nakagawa	Nov. 24, 1998
Fundamentals of Steel Materials	Dr. Toshio Okuno	Aug. 25, 1999
Tool Steels for Injection Mold Application	Dr. Toshio Okuno	Aug. 25, 1999
Die Materials & Heat Treatment	Dr. Toshio Okuno	Aug. 26, 1999
Die Materials & Heat Treatment	Dr. Toshio Okuno	Aug. 30, 1999
Introduction to Troubleshooting in Plastic Injection Molding / Consulting Method	Mr. Michio Komatsu	Nov. 09, 1999
Heat Treatment Process	Mr. Michio Komatsu	Nov. 12, 1999
Consultancy Services	Mr. Michio Komatsu	Nov. 12, 1999

MIRDC C/Ps produced the following prototype finished products C/Ps as part of the training: calling card box, letter opener, soap box, plastic catch, pen holder, paper and clip holder, organizer, flower pot, turn lens, clamp and holder.

2. Dispatch of Japanese experts for the technological training at MIRDC-PTDC and consultancy services

Japanese long-term experts:

1. Dr. Yasuhiko Kondo	Chief Adviser
2. Mr. Kaname Kojima	Mold Design Expert
3. Mr. Shusuke Doi	Mold Processing Expert
4. Mr. Masaki Ide	Mold Assembly & Trial Shot
5. Mr. Kazuki Ishida	Administrative Coordinator

Japanese short-term experts:

1. Dr. Toshitaka Matsuoka	High Speed Machining	March 11-14, 1998
2. Mr. Atsuhiko Hatakeyama	Installation & Adjustment	July 12-25 1998
3. Mr. Joji Fujisawa	Installation & Adjustment	July 12-25 1998
4. Mr. Fuminaga Hanyu	Installation & Adjustment	July 12-25 1998
5. Mr. Minoru Hata	DNC Operation	Oct. 25-Nov. 2, 1998
6. Dr. Takeo Nakagawa	Rapid Prototyping	Nov. 24, 1998
7. Mr. Minoru Hata	Installation & CAD/CAM Network Operation	March 15-26, 1999
8. Mr. Michio Komatsu	Mold Design & Molding Technique	March 22-26, 1999
9. Mr. Joji Fujisawa	CAD/CAM Operation	July 7-23, 1999
10. Mr. Minoru Hata	DNC Operation	July 7-23, 1999
11. Dr. Toshio Okuno	Mold Materials	Aug. 24-31, 1999
12. Mr. Michio Komatsu	Consulting Method & Consultancy Services	Nov. 08-13, 1999
13. Mr. Mitsuo Tamura	Production Management	Feb. 21-26, 2000
14. Mr, Yanagisawa	Mold Polishing Technique	March 15-23, 2000

3. Provision of state-of-the-art machinery and equipment

Machinery and Equipment	Brand	Capacity
1. 10 units 2D CAD 5 units 2.5D CAM 1 unit 3D CAM	I-CAD Twin/Simple CAD/CEUS	2000 Mhz x 2 Memory: 64MB Disk (Array Disk): 8 GB
2. CNC Wirecut EDM	Sodick A 500W	500 X 380 X 350mm Taper ± 15°
3. CNC EDM Sinker	Sodick A50	500 x 380 x 350 mm Max. wt. of workpiece: 1000 kgs.
4. CNC Vertical Machining Center	Mazak FJV-25	1020 x 510 x 410 mm
5. Universal Milling Machine	Niigata	870 x 370 x 50 to 450 mm
6. Surface Grinder	Kuroda	550 x 200 mm Table Travel 680 x 240 mm
7. Drill Grinding Machine	Fujita	--
8. Plastic Injection Machine ⇒ 350T ⇒ 150T ⇒ 80T	Sumitomo	 Size of Platten: 1030 x 1030 (Mold opening/closing stroke: 610 mm) Size of Platten: 750 x 750 mm (Mold opening/closing stroke: 450 mm) Size of Platten: 545 x 540 mm (Mold opening/closing stroke: 550 mm)
9. Van	Mitsubishi L-300	--
10. Mold Polishing Machine	Minimo	
11. Mold Welder	Japan Techno Engineering	UH 8365
12. Drafting Kit	Rotring	--
13. Audio/Visual Equipment	Sony	--
14. Others (Accessories, Cutting Tools, etc.)	--	--
15. Measuring Instruments	Mitutoyo (Digital Caliper)	0.25 mm/0.001 accuracy
16. OHP accessories, Opaque Projector, etc.	--	--

4. Development of training curricula and program

Three long-term and eight short-term curricula/ training materials were developed as follows:

	Training Courses	Duration
	Long-term Courses:	
1.	Mold Design	6 Months
2.	Mold Processing	6 Months
3.	Assembly, Maintenance & Trial Shot	6 Months
	Short-term Courses	
1.	Plastic Injection Mold Design	40 hours
2.	CNC EDM Wire Cut Programming & Operation	40 hours
3.	CNC EDM Sinker Programming and Operation	40 hours
4.	CNC Digitizing	24 hours
5.	CAD/CAM Technology	40 hours
6.	Vertical Machining Center Programming & Operation	40 hours
7.	CNC Surface Grinding Programming & Operation	40 hours
8.	Injection Molding Processes & Trial Shot Operation	40 hours

5. Training and seminars conducted by the MIRDC C/Ps

As of 1999, 16 training programs were conducted by the local counterparts and participated by 253 engineers, technicians and craftsmen employed by 59 SMEs and some large companies.

6. Consultancy services/plant visits

As of the first quarter of 2000, 49 companies were visited by the Japanese Experts together with the MIRDC local counterparts for the conduct of consultancy services.

UPGRADING PROJECT FOR PLASTIC MOLDING TOOL TECHNOLOGY

MID-TERM IMPACT ASSESSMENT

RESPONDENT DATA

Person Interviewed: _____

Position: _____

Company Name: _____

Office Address: _____

Tel No.: _____ Fax No.: _____ E-mail: _____

Plant Address: _____

Tel No.: _____ Fax No.: _____ E-mail: _____

Year Started Operation: _____ Plant Capacity: _____

Product Line/Service Offered:

_____

_____

_____

_____

_____

_____

In what areas you received support from JICA-MIRDC.

- ❑ Training Program (go to Module A)
- ❑ Consultancy (go to Module B)
- ❑ Short-series Experimental Production (go to Module C)

MODULE A. TRAINING PROGRAM

1. Total number of employees sent to the program _____

2. Kindly indicate the programs attended.

Name of Training Program	Date	No. of Employees

3. Training Feedback. On a scale of 1 – 5, please indicate the rating by your personnel on the following aspects of the training courses: (where 5 - excellent, 4 – very good, 3 – good, 2 – fair, 1 – poor)

Attributes	Rating	Remarks
a. Training Course		
b. Training Facilities		
c. Resource Person		
d. Support/Secretariat		

4. Trainee Evaluation. On a Scale of 1 – 5, please evaluate your employees who have undergone the training. On the following attributes (where 5 - excellent, 4 – very good, 3 – good, 2 – fair, 1 – poor)

Attributes	Rating	Remarks
a. Improve Skills		
b. New Skills		
c. Productivity		
d. Efficiency		
e. Work Attitude		

5. Did the trainee conduct training of other employees in your company?

   Yes _____ No _____ If Yes, how many? _____

6. This is a list of training programs to be conducted by JICA-MIRDC (show card ___), do you consider the duration of the program too short? Just right? Too long?

7. Will you recommend any of the training courses to your other (co-) employees? (Yes/No)? Which program?

Programs	Duration	Question No.6			Question No. 7	
		Short	Adequate	Long	Yes	No
Short-Term Courses						
1. Plastic Injection Mold Design	*40 hours*					
2. CNC EDM Wire Cut Programming & Operation	*40 hours*					
3. CNC EDM Sinker Programming & Operation	*40 hours*					
4. CNC Digitizing	*24 hours*					
5. CAD/CAM Technology	*40 hours*					
6. Vertical Machining Center Programming & Operation	*40 hours*					
7. CNC Surface Grinding Programming & Operation	*40 hours*					
8. Injection Molding Processes & Operation	*40 hours*					
Long-term Courses						
1. Mold design	*6 months*					
2. Mold Processing	*6 months*					
3. Assembly Maintenance & Trial Shot	*6 months*					

8. Aside from plastic molding related seminars, what other programs does your company need? (e.g. stamping, die casting, heat treatment, etc.)

Programs	Yes	No
1. Stamping		
2. Die Casting		
3. Heat treatment		
4. Other _____		
_____		

MODULE A.1 TRAINING PROGRAM (Trainees).

1. Trainee's Name: _____ Position: _____

2. Sponsor: Individual _____; Company _____; Others _____

3. Trainings Attended

Training Program	*Duration*	*Date(s)*

4. Training Feedback. On a scale of 1 – 5 please rate the following training attributes (where 5 – excellent, 4 – very good, 3 – good, 2 – fair, 1 – poor).

Attributes	*Rating*	*Remarks*
a. Training Course		
1. Relevance of program to my job		
2. Applications of new knowledge, techniques, skills to my job		
b. Training Facilities		
1. Shop Facilities		
2. Rooms/Site		
3. Equipment/Accessories		
c. Resource Persons		
1. Communication Skills		
2. Knowledge of the Subject Matter		
3. Presentation Skills		
d. Secretariat/Support		

5. Training Impact. How did the training benefit you in your job? On a scale of 1 – 5 please evaluate the effect of the training to you personally (where 5 – excellent; 4 – very good; 3 – good; 2 – fair; 1 – poor).

Benefits	Rating	Remarks
1. Improve skills		
2. Improve working methods		
3. Increase productivity		
4. Increase creativity		
5. Promotion/salary increase		
6. Others (pls. specify) _____		

6. Will you recommend that your fellow employee attend the JICA-MIRDC Training Program? Yes _____ No _____

7. Here is the list of MIRDC's Short-term and Long-term Courses (show card). What other courses would you like to attend? Will you attend these courses if you will not be sponsored by your company?

Courses	Yes	Sponsor	
		Company	Individual
Short-term Courses			
1. Plastic Injection Mold Design			
2. CNC EDM Wire Cut Programming & Operation			
3. CNC EDM Sinker Programming & Operation			
4. CNC Digitizing			
5. CAD/CAM Technology			
6. Vertical Machining Center Programming & Operation			
7. CNC Surface Grinding Programming & Operation			
8. Injection Molding Processes & Trial Shot Operation			
Long-term Courses			
1. Mold Design			
2. Mold Processing			
3. Assembly Maintenance & Trail Shot			

8. What other training programs do you or your company need aside from plastic molding services? (stamping, die casting, heat treatment, etc.)

MODULE B. CONSULTANCY

1. Specify the consultancy service you availed from JICA-MIRDC?

Nature of Consultancy Service	Date(s)

2. What aspect(s) in the production process did the consultancy services provide? Kindly indicate the significance of its contributions.

Aspects	YES (✓)	Significance: Very Significant	Significant	Not Significant
• Increase in Productivity				
• Increase in Capacity Utilization				
• Improvement in Product Design				
• Decrease in Rejection Rate				
• Improvement in Methods & System				
• Improvement in Product Quality				
• Reduction in Production Expense				

3. Assessment of Consultancy Service. Using a scale of 1 – 5, how do you rate the consultancy provided (where 5 – excellent, 4 – very good, 3 – good, 2 – fair, 5 – poor).

Attributes	Rating	Remarks
1. Research Methodology		
2. Practicality of Recommendations		
3. Time of Implementation		
4. Costs/Expenses involved		
5. Others (pls. specify) _____		
_____		

4. Other than plastic molding, what are the other present and future consultancy needs of your company? (e.g. stamping, die casting, heat treatment, etc.)

5. Comments/suggestions to improve future consultancy service.

MODULE C. SHORT-SERIES EXPERIMENTAL PRODUCTION

1. Specify the short-series experimental production (SSEP) assistance that you availed from JICA-MIRDC?

Nature of SSEP	Date(s)

2. What benefits did the SSEP provide?

Aspects	Significance		
	Very Significant	Significant	Not Significant
1. *Introduction/testing of new Product*			
2. *Introduction/testing of new Process*			
3. *Implementation of product quality measures*			
4. *Additional production capacity generated*			
5. *Reduction in Production Expense*			
6. *Others (pls. specify)* _____			
_____			

3. Please evaluate using a scale of 1 – 5 the SSEP program of JICA-MIRDC (where 5 – excellent, 4 – very good, 3 – good, 2 – fair, 1 – poor).

Attributes	Rating	Remarks
1. *Design Capability*		
2. *Production Facilities*		
3. *Delivery Time*		
4. *Product Quality*		
5. *Manpower Capability*		
6. *Cost*		
7. *Others (pls. specify)* _____		
_____		

4. Please give comments and suggestions on how to improve the SSEP series.

MODULE D. COMPANY PROFILE

1. Annual Sales: _____
2. Average Annual Income: _____
3. Business Type: Mass Production _____ Jobbing _____
4. Nature of Trade: Local Market ____(%)____ Foreign Market __(%)___
5. Major Product Application:
   1. Automobile
   2. Appliances
   3. Electronic Equipment
   4. Communication
   5. General Commodities
   6. Others pls. Specify _____
6. Type of Ownership:
   1. Single proprietorship
   2. Partnership
   3. Corporation
   4. Listed
   5. Private
   6. Government Agency
7. Nationality (%):
   1. Filipino _____
   2. American _____
   3. Taiwanese _____
   4. Chinese _____
   5. Japan _____
   6. German _____
   7. Other _____
8. Company Size (Total Assets):
   1. < P100,000
   2. P100,000 – P1,000,000
   3. P1,000,000 – P10,000,000
   4. P10,000,000 – P40,000,000
   5. > P40,000,000
9. Human Resource Profile

Particular	*No of Personnel*		
	Male	*Female*	*Total*
A. Technical			
Design	_____	_____	_____
Machining	_____	_____	_____
Assembly/Maintenance	_____	_____	_____
Tool Crib	_____	_____	_____
Quality Control	_____	_____	_____
Plant Maintenance	_____	_____	_____
B. Administrative	_____	_____	_____
C. Education			
- High School / Vocational	_____	_____	_____
- College / University	_____	_____	_____

10. Available Equipment
(Please check appropriate box)

❑ Lathe Machine	❑ Copy Lathe	❑ CNC Milling	❑ EDM Sinker
❑ Milling Machine	❑ CNC Lathe	❑ VMC	❑ Jig Grinding
❑ Boring Machine	❑ Copy Milling	❑ EDM Wire Cut	❑ Jig Boring
❑ Grinding Machine	❑ Drilling Machine	❑ Measuring Equipment	
❑ CAD/CAM Systems	(Pls. specify software)	_____	
❑ Injection Machines	(Pls. specify capacity)	_____	

11. Problems Encountered
(Please check box based on the following levels: 1 = often, 2 = seldom, 3 = never. State your reason/s on the space provided. Use separate sheet if necessary.)

A. Technical Support ❑ 1 ❑ 2 ❑ 3
Please explain.

_____

_____

_____

B. Labor/Manpower ❑ 1 ❑ 2 ❑ 3
Please explain.

_____

_____

_____

C. Sourcing of Raw Materials ❑ 1 ❑ 2 ❑ 3
Please explain.

_____

_____

_____

_____

D. Marketing ❑ 1 ❑ 2 ❑ 3
Please explain.

_____

_____

_____

E. Utilities ❑ 1 ❑ 2 ❑ 3
Please explain.

_____

_____

_____

F. Gov't. Rules & Regulations ❑ 1 ❑ 2 ❑ 3
Please explain.

_____

_____

_____

List of Respondent Companies

1	Anglamar Tool Makers Industries, Co.	*E. Tepaurel Compound, Km. 28 National Road, Putatan, Muntinlupa City*
2	Aries Machine Shop & Engineering	*111 G. Araneta Avenue, Quezon City*
3	Asian Transmission Corporation	*Carmelray Industrial Park, Canlubang, Calamba, Laguna*
4	Atlanta Industries, Inc.	*A. Mabini St., Bo. Manggahan, Pasig City*
5	Carparts Manufacturing, Inc.	*Airstrip, Canlubang Industrial Estate, Canlubang, Calamba, Laguna*
6	De La Salle University	*Taft Avenue, Manila*
7	Dualtech Training Center	*Carmelray Industrial Park, Canlubang, Calamba, Laguna*
8	Dynamicro Corporation	*Suites 306-308 Ramagi Bldg., 1081 P. Gil, Paco, Manila*
9	Eastern Int'l. Plastic Packaging Corporation	*18 Perfecto Drive, Bagumbayan, Taguig*
10	EVAPIA Precision Tooling Co.	*15 C. Raymundo Ave., Maybunga, Pasig City*
11	Fujitsu Die-Tech Corporation of the Philippines	*113 East Science Avenue, SEPZ Laguna Technopark, Binan, Laguna*
12	Intertool Precision Group	*MIRDC Compound, Gen. Santos Ave., Bicutan, Taguig*
13	LG Collins Electronics Manila Inc.	*15 Francisco Legaspi St., Maybunga, Pasig City*
14	Macorley Tooling Industries	*658 VRL Compound, Bo. Nueva, National Highway, San Pedro, Laguna*
15	Manly Plastics, Inc.	*404 M. H. del Pilar St., Maysilo, Malabon*
16	Matsushita Electric Phil. Corporation	*Ortigas Avenue Ext., Pasig City*
✓17	Maximetal Industries	*No. 9 T. Arellano St., Caloocan City*
18	McKinley Machinery Phils., Inc.	*F. P. Felix Avenue, Cainta, Rizal*
19	Meralco Foundation, Inc.	*Ortigas Avenue Ext., Pasig City*
20	MESCO, Inc.	*MESCO Building, Reliance St., Pasig City*
21	Metroplas Packaging Products Corporation	*858 Champaca Rd. Ext., UPS IV, Sucat, Paranaque*
22	Mikado Phils., Corporation	*Cavite Export Processing Zone, Rosario, Cavite*
23	Moriroku Philippines, Inc.	*115 North Science Avenue, Laguna Technopark, Binan, Laguna*
24	Octagon Chemicals Manufacturing Corporation	*7B Manalac Ave., Bagumbayan, Taguig*
25	Optitech Machines Tools	*Platinum St., Goldendale II, Tenejeros, Malabon*
26	OVIMCO-Armel Plastics Co., Inc.	*No. 48 2nd Avenue Industrial Estate, Bagumbayan, Taguig*
✓27	Philippine Die Casting Manufacturing Corporation	*Km. 14 Edison St., West Service Road, Paranaque City*
✓28	Plastmann Industrial Corporation	*Carmelray Industrial Estate, Canlubang, Laguna*
29	Plastic and Tools, Inc.	*15 RMT Industrial Complex, Tunasan, Muntinlupa City*
30	Plastic City Corporation	*10 T. Santiago St., Canumay, Valenzuela City*
31	Plastimer Industrial Corporation	*25 T. Santiago St., Bo. Canumay, Valenzuela City*
32	Saarstahl Philippines, Inc.	*109 P. Florentino St. corner G. Araneta Ave., Quezon City*
33	Sagara Metro Plastic Industrial Corporation	*Brgy. Paciano Rizal, Calamba, Laguna*
34	San Miguel Packaging Products	*631 Tomas Claudio St., Pandacan, Manila*
35	Swedish Match Phils.	*F. Manalo St., Punta Sta. Ana, Manila*
36	TEK Corporation	*2/F Tektrade House, 8463 Trabajo St., Makati City*
✓37	TML Gasket Industries, Inc.	*5165 Sucat Road, Paranaque City*
38	TNC Chemical Phils., Inc.	*Brgy. Turbina, Calamba, Laguna*

	Company	CAD/CAM System	Injection Machine Capacity (Max.)
1	Anglamar Tool Makers Industries, Co.	PDPF (Personal Designer 8.7)	None
2	Aries Machine Shop & Engineering	MASTERCAM	None
3	Asian Transmission Corporation	CAD/CAM version 2000	None
4	Atlanta Industries, Inc.	None	60 oz.
5	Carparts Manufacturing, Inc.	DELCAM and SOLIDWORK 1997	250 tons
6	De La Salle University	None	None
7	Dualtech Training Center	AUTOCAD version 14	None
8	Dynamicro Corporation	None	None
9	Eastern Int'l. Plastic Packaging Corporation	None	70 tons
10	EVAPIA Precision Tooling Co.	(Confidential)	None
11	Fujitsu Die-Tech Corporation of the Philippines	ICAD MX, MYPAC System & UNIGRAPHICS	100 tons
12	Intertool Precision Group	PERSONAL DESIGNER	None
13	LG Collins Electronics Manila Inc.	PROE, AUTOCAD version 13	None
14	Macorley Tooling Industries	AUTOCAD	None
15	Manly Plastics, Inc.	AUTOCAD, PROE 2000, POWERMILL	50 tons
16	Matsushita Electric Phil. Corporation	POWERSHAPE	16,000 tons
17	Maximetal Industries	MASTERCAM 7.2	250 tons
18	McKinley Machinery Phils., Inc.	AUTOCAD & CADKEY	150 tons
19	Meralco Foundation, Inc.	MASTERCAM version 6 and 7	None
20	MESCO, Inc.	CAMWARE	None
22	Metroplas Packaging Products, Inc.	AUTOCAD & CADKEY	150 tons
23	Mikado Phils., Corporation	None	None
24	Moriroku Philippines, Inc.	CATIA	650 tons
25	Octagon Chemicals Manufacturing Corporation	CAMWARE	25 oz.
26	Optitech Machines Tools	DELCAM	None
27	OVIMCO-Armel Plastics Co., Inc.	PROE release 18	2 tons
28	Phil. Die Casting Manufacturing Corporation	PROE version 14	None
29	Plastmann Industrial Corporation	AUTOCAD	850 tons
30	Plastic and Tools, Inc.	AUTOCAD 2000 & AUTOCAD release 14	300 tons
31	Plastic City Corporation	Not available	200 oz.
32	Plastimer Industrial Corporation	SURFCAM	1,600 tons
33	Saarstahl Philippines, Inc.	None	None
34	Sagara Metro Plastic Industrial Corporation	AUTOCAD MECHANICAL DESKTOP	350 tons
35	San Miguel Packaging Products	AMPRO	1,000 tons
36	Swedish Match Phils.	AUTOCAD	200 tons
37	TEK Corporation	None	None
38	TML Gasket Industries, Inc.	AUTOCAD	None
39	TNC Chemical Phils., Inc.	None	None