Chapter 6

Waste Minimization Pilot Project

6 Waste Minimization Pilot Project

6.1 Background and Objectives of the Pilot Project

6.1.1 Background of the Pilot Project

IEM consists of implementation of pollution control measures and establishment of a system to manage the measures such as EMS. There are various fields in IEM; major measures are focused on minimization of pollutants in emissions and effluent and solid wastes, so called "waste" that is generated from production processes. Waste minimization indicates efficiency of production per input resources; it means maximization of production per input resources as well as minimization of input materials and disposal costs of unused resources. That is, waste minimization is an effort to reduce production costs.

Waste minimization is sometimes called as "Cleaner Production," "Pollution Prevention," or "Green Productivity." These approaches tackle waste minimization as a part of productivity improvement, which is exactly an essential issue in business management.

In the Philippines, the IEMP project, which was carried out by EMB/DENR from 1992 to 1998 with support from USAID, tackled waste minimization. It has been remained as a big step, however its accomplishments have not been fully utilized for further development of waste minimization until the present.

IEM has been discussed with putting establishment of EMS at its center; however, EMS itself does not realize waste minimization. EMS deals with an institutional aspect of IEM but never becomes an action for waste minimization. While it is very much desirable for a company to establish EMS to effectively pursue waste minimization, it is necessary to understand that the objective of IEM should be to minimize wastes, not to establish EMS.

After completion of the IEMP project, several activities for CP promotion have been attempted, but they were not organized in a comprehensive way, which makes it difficult to appeal importance of waste minimization. Because under such situation past accomplishments would have little impact on development of new efforts to minimize waste, it was judged important to increase practical examples of waste minimization, disseminate such efforts within members of industry associations, and encourage other companies to minimize waste.

For future development of IEM, how many business owners and top management recognize that waste minimization would bring about productivity improvement has been still a key

factor. Especially business owners' recognition of benefits of waste minimization is necessary.

Although waste minimization means CP, the term, CP, is not used in the EMPOWER project. It is difficult to image resource productivity improvement from the term, CP. Since waste minimization represents elimination of wasted resources, it is more proper to use in the EMPOWER project.

6.1.2 Objectives of the Pilot Project

The waste minimization pilot project aims to, through waste assessment and implementation of waste minimization measures by model companies, demonstrate achieving productivity improvement and waste minimization at the same time, upgrade IEM activities of the model companies, and provide companies in the same sector as the model companies and other sectors with information about the results of model companies' waste minimization for their reference.

6.2 Structure of Pilot Project Implementation

6.2.1 Parties Involved in Pilot Project Implementation

PBE, ITDI/DOST, BOI/DTI are selected as the implementing body of the waste minimization pilot project at the 5th EMPOWER Steering Committee meeting. PBE has been involved in environmental enhancement projects, education and awareness, promotion of CP and sound environmental management, and intermediation between communities, business and government in environmental issues. It is PBE that coordinated Philippine business to prepare Business Agenda 21, which is a consolidated plan of action developed by the business sector consistent with and supportive of national efforts to promote sustainable development. EMB/DENR and relevant industry associations are assisting PBE, ITDI, and BOI to implement the pilot project. Financial and technical assistance for the project is provided by EMPOWER.

6.2.2 Roles of Relevant Parties

Roles of relevant parties for implementing the waste minimization pilot project are shown in Table 6.2.1.

Table 6.2.1 Roles of Relevant Parties

Party	Role
PBE **ITDI/DOST** **BOI/DTI**	➢ Overall coordination and management ➢ Establishment of waste minimization steering committee comprised of relevant parties to manage the pilot project such as selection of model companies and preparation of sector-wide/industry-wide waste minimization plans with planning period of three years ➢ Planning and implementation of the workshops ➢ Preparation of a guidebook on waste minimization targeting business executives ➢ Monitoring and evaluation ➢ Preparation of a plan for next steps
BOI/DTI	➢ Awareness raising of industries for the participation in the pilot projects ➢ Management of policy dialogue with industries/industry associations on IEM promotion ➢ Establishment of the award system and announcement of the award system at relevant seminars ➢ IEM promotion using the guidebook
Model Companies	➢ Establishment of an internal waste minimization committee to manage the pilot project ➢ Providing information for waste assessment ➢ Preparation of an action plan on waste minimization ➢ Implementation of measures identified during the assessment ➢ Evaluation of implementation of measures ➢ Sharing its experiences with other companies
Participating Companies	➢ Providing information for waste assessment ➢ Evaluation of the proposal by CEO ➢ Preparation of the action plan to implement measures in the proposal
EMB/DENR	➢ Advice on selection of model companies and measures to minimize waste
LLDA	➢ Advice on selection of model companies and measures to minimize waste
PEZA	➢ Advice on selection of model companies and measures to minimize waste
Industry Associations	➢ Input to preparation of waste minimization pilot project plans ➢ Advice on selection of model companies ➢ Coordination of sector-wide action plan on waste minimization ➢ Assistance for preparation of the company-wide an action plan on waste minimization ➢ Cooperation for information campaign
EMPOWER Project	➢ Dispatch of Japanese and local experts for waste assessment and preparation of proposals on waste minimization ➢ Identification of results achieved and problems encountered during the past waste minimization projects ➢ Financial and technical support for publishing the guidebook and holding the workshops and meetings with industries
Steering Committee	➢ Confirmation of overall planning of the pilot project ➢ Monitoring and evaluation

6.2.3 Establishment and Management of the Steering Committee

The steering committee was established to plan and monitor activities and evaluate outputs of the waste minimization pilot project; it is composed of the members listed in 6.2.2. Since pulp and paper, chemical, foundry, and food sectors were selected as target industry, representatives of the relevant industry associations were invited to be the steering committee member.

Table 6.2.2 Member of the Waste Minimization Pilot Project Steering Committee

	Organization	Name of Representatives
1	BOI (Implementing body)	Ms. Raquel B. Echague
2	ITDI-DOST (Implementing body)	Dr. Christopher M. Silverio
3	PBE (Implementing body)	Ms. Lisa C. Antonio
4	PBE (Implementing body)	Ms. Lloly de Jesus
5	PBE (Implementing body)	Ms. Wini Y. Villanueva
6	Philippine Metalcasting Association, Inc. (PMAI)	Mr. Hermes D. Bautista, Jr. & Mr. Napoleon J. Tanganco
7	Philippine Exporters Confederation, Inc. (PHILEXPORT)	Ms. Leonor D. Abella (representing also is Ms. Ma. Flordeliza C. Leong)
8	Pulp and Paper Manufacturers Association, Inc. (PULPAPEL)	Mr. Victor Pascual (representing also is Mr. Reynaldo A. Gomez)
9	Chemical Industries Association of the Philippines/SPIK	Ms. Teresita B. Corpuz
10	JICA Study Team Member	Mr. Tad Tanaka

6.3 Purpose, Activities and Schedule of the Pilot Project

6.3.1 Purpose and Outputs of the Pilot Project

The following purpose and outputs are set for the waste minimization pilot project:

Purpose

1. Company CEOs / senior managers' recognition of value of waste minimization is increased.
2. Waste minimization activities are institutionalized through active involvement of industry associations.

Outputs

1. Many business executives / owner – entrepreneurs from Manila and Cebu are oriented to waste minimization approaches and benefits.
2. At least twenty (20) additional business executives of Philippine companies strongly support waste minimization for productivity improvement.

3. Four industry organizations develop industry-wide waste minimization action plans and their role to sustain waste minimization program is strengthened.
4. Four model companies have implemented successful waste minimization programs as shown by reduction of waste volumes and economic savings in operations.
5. Waste minimization guidebooks based on the experiences of the pilot project are published (1,000 copies) and disseminated to owners of Philippines companies.
6. Establishment of the government award system for companies that conducted IEM rigorously is discussed.

6.3.2 Summery of Pilot Project Activities

The waste minimization pilot project has the following components:

(1) Identification of results achieved and problems encountered during the past waste minimization projects
(2) Policy dialogue between BOI/its institutional partners and industry associations on IEM promotion
(3) Preparation of sector-wide/industry-wide waste minimization plan by target industry sectors
(4) Workshop on steps to plan and implement waste minimization activities
(5) On-site assessment and proposal preparation for waste minimization at 20 volunteer companies by experts
(6) Implementation of measures identified as feasible and effective to minimize wastes by at least four (4) model companies
(7) Evaluation of results of the measures at the model companies
(8) Preparation of the guidebook on promotion of waste minimization targeting company decision-makers
(9) IEM promotion by BOI through the dissemination of the guidebook
(10) Workshop on the experiences of the model companies
(11) Discussions on the award system for the companies rigorously conducting IEM

Food processing, chemical, pulp and paper, and foundry sectors are selected as target industries.

6.3.3 Implementation Schedule

The waste minimization pilot project was carried out from November 2002 to August 2003 as shown in Table 6.3.1. The waste minimization pilot project steering committee was held as shown in Table 6.3.2 (see Annex 6.1 for details of the discussions).

Table 6.3.1 Waste Minimization Pilot Project Implementation Schedule

	Waste Minimization at Volunteer and Model Companies	Awareness Raising/ Information Dissemination
Nov. 2002	➢ Establishment of a waste minimization steering committee under PBE ➢ Selection of potential volunteer companies ➢ Discussion on waste minimization between model companies and experts	
Dec. 2002	➢ Pre-waste assessment for 11 potential volunteer companies	➢ Planning on preparation of a guidebook on waste minimization
Jan. 2003	➢ The First Workshop ➢ Exchange of an agreement on confidentiality and disclosure of information among volunteer and model companies, PBE, and EMPOWER project team	
Feb. 2003	➢ Waste assessment for 20 volunteer companies ➢ Preparation of a proposal on waste minimization for volunteer companies by experts ➢ Selection of model companies ➢ Preparation of a company-wide action plan on waste minimization for model companies by experts	➢ Discussion on the outline of the draft guidebook ➢ Discussion on the award system
Mar. 2003	➢ Implementation of the action plans by model companies and its monitoring by ITDI (continue to July 2003) ➢ Preparation of sector-wide/ industry-wide waste minimization plans (planning period: three years)	➢ Preparation of the draft guidebook
Apr. 2003	➢ Evaluation of the action plan implementation (model companies) ➢ Preparation of a plan for next steps for model companies ➢ Feedback to relevant industry organizations ➢ Review of the industry-wide waste minimization plan	➢ Discussion on the first draft guidebook ➢ Discussion on the award system
May 2003	➢ Continuation of waste minimization by participating companies	➢ Revision of the draft guidebook
Jun. 2003	➢ The Second Workshop ➢ Exhibition/presentation of achievements of the waste minimization pilot project at the Environment Exhibit on June 9 - 10.	➢ Revision of the draft guidebook
Jul. 2003	➢ Finalization of industry-wide waste minimization action plans	
Aug. 2003	➢ Project evaluation and final report preparation	➢ Finalization of the guidebook
Sep. 2003		➢ Printing and dissemination of the guidebook

Table 6.3.2 Summary of the Steering Committee Activities

	Date	Activity
1	Nov. 21, 2002	➢ Establishment of the steering committee ➢ Confirmation of pilot project activities ➢ Selection of partner industry associations ➢ Identification of participating companies
2	Feb. 7, 2003	➢ Review of the progress of the pilot project ➢ Selection of model companies ➢ Discussion on industry-wide waste minimization action plans and waste minimization guidebook
3	Apr. 2, 2003	➢ Presentation on the first draft guidebook ➢ Presentation of the WM Assessment Consolidated Report ➢ Discussion on the Industry Award System
5	May 8, 2003	➢ Review of progress of implementing the waste minimization action plan by model companies ➢ Revision of the WM Assessment Consolidated Report ➢ Revision of the draft guidebook ➢ Presentation of the draft industry-wide waste minimization action plans ➢ Planning on the closing workshop ➢ Planning on the presentation at the Environment Exhibit
6	Jun. 10, 2003	➢ Review of progress of implementing the waste minimization action plan by model companies ➢ Presentation of the draft industry-wide waste minimization action plans ➢ Confirmation of the program of the closing workshop ➢ Discussion on the revised PDM
7	Aug. 12, 2003	➢ Finalization of the guidebook ➢ Evaluation of the pilot project

6.4 Outputs of the Pilot Project

6.4.1 Summary of the Project Components

The pilot project components are summarized as the following:

1. Assessment for Waste Minimization
2. Selection of Model Companies and Implementation of Assessment for Waste Minimization
3. Assessment for Productivity Improvement
4. Preparation of Waste Minimization Action Plans by Industrial Associations
5. Preparation Waste Minimization Guidebook
6. Holding of Workshops

7. Commitment on Iimplementing of Waste Minimization by Business Owners

8. Discussion on Establishment of an Award System

6.4.2 Waste Minimization Assessment

(1) Nomination of Volunteer Companies

The steering committee asked the four industry associations to nominate companies that would like to participate in the WM Pilot Project, in which local and Japanese experts conduct WM assessment. The following 20 companies were nominated: 15 companies from Metro Manila District and 5 from Cebu City (see Table 6.4.1).

Table 6.4.1 List of Volunteer Companies for WM Pilot Project

Sector	Name of Company	Location
Chemical (6)	Kemwerke, Inc.	Metro Manila
	Int'l Chemical Industries	Metro Manila
	LMG Chemical Corp.	Metro Manila
	Mabuhay Vinyl	Metro Manila
	Phil Resins Industries, Inc.	Metro Manila
	United Coconut Chemicals, Inc.	Metro Manila
Pulp and Paper (3)	Aclem Paper Mills, Inc.	Metro Manila
	Container Corp. of the Phils.	Metro Manila
	Noah's Paper Mills, Inc.	Metro Manila
Food Processing (7)	Basic Fruits Corp.	Metro Manila
	Eldon Industrial Corp. (Bounty Foods Division)	Metro Manila
	Jo-na's International Phils., Inc.	Metro Manila
	TSB Enterprises, Inc.	Metro Manila
	FMC Marine Colloids Phils., Inc.	Cebu
	Central Seafood Inc.	Cebu
	Cebu Legacy Marketing Corp.	Cebu
Foundry (4)	Acetech Metal Industries Corp.	Metro Manila
	Metal Engineering Resources Corp.	Metro Manila
	Cebu Iron Foundry Corp.	Cebu
	San Gabriel Enterprise	Cebu

(2) Implementing Method

1) Assessment Team

A majority of the assessment team is consisted with ITDI Members and a JICA specialist is joined in each industrial sector to support them.

2) Preliminary WM Assessment

Prior to the confirmation of the volunteer companies, a pre-assessment was conducted from December 2-6, 2002 to 11 potential volunteer companies to explain the objective of

the WM assessment, identify the current status of IEM practices in the target industries, and solicit relevant information in advance.

3) Workshops on WM

During the startup workshop (Manila: Jan. 8-10, Cebu: Jan. 22-24, 2003), top decision makers of the companies belonging to the four target industry sectors were informed about benefit of WM, and in-house staffs were trained on steps to implement WM at their companies.

4) Commitment of Corporate Management

Commitments from management were secured during the startup workshops. The volunteer companies signed a Letter of Commitment to adopt waste minimization as an effective management approach.

5) Collection of Basic Information

The WM Assessment team tried to collect basic company information before the conduct of the assessment. Baseline Data Worksheet was given to all companies. However, this result showed that some information were incomplete due to low level of data controlling in the enterprises.

6) Establishing of Assessment Team in each enterprise

Each enterprise was required to establish the Waste Minimization Assessment Team to conduct the Project.

7) Conducting of the Assessment for Waste Minimization

The Assessment Team conducted the following works at each enterprise.

- Explained to top management and staff about the method of the Waste Minimization Assessment.
- Reviewed about condition of the implementation by visiting each plant.
- Discussing between the Assessment Team and Corporate management about results and problems that were obtained at assessment of the plant.
- Specify problems and study about implementing measures on the assessment on the Waste Minimization.
- Propose top management in the enterprises with these exact solutions.

(3) Result of Assessment

1) Summery of Assessment Result

The following items are identified as the result of Waste Minimization Assessment (see Annex 6.4 for results of individual companies).

- All have management that are strongly committed to pollution prevention and continual improvement
- Some companies have established environmental management system like Phil Resins. But most have no environmental policy and has no established system for environmental management
- Volunteer companies from the food-processing sector are basically SMEs. The productions are usually in batches – they operate only when they have enough order or when there is demand. Their wastewater effluents have relatively high BOD.
- Pulp and paper companies are large industries and manufacture a wide range of paper products – cardboard liner, office paper, newsprint, recycled wrapping paper, and tissue paper. Their basic problems are lower demand for their products due to the current dragging economy and stiff competition with China, which sells paper products at lower price.
- Volunteer companies from the Foundry sector are SMEs and have difficulty operating continuously due to the sluggish market. A common environmental issue is slag disposal.
- Except for Kemwerke, all other volunteer companies from the Chemical processing sector are large companies. Common environmental issue is the management of toxic chemicals and hazardous wastes.

Waste minimization related activities that were recommended to all volunteer companies include:

- Establishment or strengthening of WM team
- Information dissemination on waste minimization effort to all employees
- Training employees on waste minimization and environmental management
- Benchmarking
- Monitoring of effluent and emission and impacts of waste minimization

2) Details Result on the Waste Minimization Assessment on each enterprise

The WM results for each volunteer company including lists of WM focus area, recommended WM options, and the evaluation of each option are summarized in Table 6.4.2.

Table 6.4.2 WM Options Recommended for the 20 Volunteer Companies

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
Pulp and Paper Mills			
Aclem Paper Mills Product: Tissue Paper	Leaks/spillage from water valves	To conduct regular monitoring and maintenance of water valves and other water sources	Low cost option that has potential for water savings
	Large consumption of electricity	Put on machine one at a time to reduce consumption	May have impact on the continuity of operation.
	Lack of measuring equipment for steam consumption	Install measuring equipment for the machine being used most of the time, test run for 1 to 2 hours then install it on other machines to test and measure steam consumption	Low cost option that has potential for energy and water savings
	Wastewater treatment facility does not have aeration and settling tanks	Include in its future plan the installation of aeration and settling tanks	May entail high capital investment. Should be implemented once waste minimization options are fully assessed and implemented
Container Corp. of the Phils. Product: Paper	Solid waste generation	Enforce stricter inspection and quality monitoring of incoming local wastepaper	Low cost option that can have significant impact in reducing solid wastes
	Fiber loss	Set-up retention aid for paper machine Balance white water system to prevent overflows	Retention aid chemical reduces TSS concentration and increases paper recovery
		Install saveall system at paper machine 3 for fiber recovery	May entail high investment cost but the potential for reducing waste water generation and fiber recovery is high
	Starch quality	Use automatic jet cooker for temperature control during starch preparation	This will improve starch preparation and storage
	Baling of local wastepaper	Purchase of additional baling machine	Maximize good baling of local wastepaper
Noah's Paper Mills, Inc. Product: Printing and writing grades	Water consumption and wastewater generation	Install measuring gauges in every section of production	Low cost option that has high potential for water savings
		Install catch basin for process waters and re-use water back in process	Low cost option that can prevent spills and washdowns in paper manufacturing process, thereby reducing wastewater generation
		Conduct regular monitoring and maintenance of valves, pipes and other sources of water generation	Low cost option that has high potential for water savings

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
	Housekeeping practices	Observe good housekeeping practices like preventing oil spillage and ensuring immediate collection of spilled oil, and providing catch basins or pits to all operations that have potential for spillage.	Low cost option that can have significant impact.
	Sludge	Improve several operations and re-use fibers in paper manufacturing to lower sludge production	May entail further study on the feasibility of reusing the finer fibers
		To be disposed in landfill or used as construction material	May entail additional study
Chemical Processing			
Mabuhay Vinyl Corporation Product: Hypocloride	Leaks and spills	Establish a leak detection program for all valves, pipes, pumps and seals.	To avoid chemical spills and fugitive emissions of toxic and hazardous gases
	Raw materials	Eliminate the use of precoat materials (diatomaceous earth and fiber) in the filtration process, instead use a filter membrane	Improve the production process.
	WTP efficiency	Cover the sludge pond with net	To prevent dry leaves and other dirt to come in the system.
	Hazardous wastes	Provide designated storage area for other chemicals and tanks. It should have a band walls and provisions to contain chemical spills.	Compliance to DAO 29
Phil Resins Industries, Inc Product: PVC	Hazardous wastes	Enapsulate the process equipments and piping system to prevent any accidental or inadvertent discharges of toxic VCM while ensuring safety of workers and improving process efficiency	Reduce discharge of hazardous wastes
		Lined raw material containers with plastic material so that it can be rinsed and recycled. Hazardous raw material should be placed into plastic bag first before in a rigid container. If possible return the containers to the supplier for proper disposal.	Reduce generation of hazardous wastes

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
		Reuse the treated water in the process.	Wastewater collected in the system is easy to handle because it does not contain much pollutants (see water quality monitoring data) and upon further treatment it can be recycled in the system.
United Coconut Chemicals, Inc. Product: Oleo chemicals	Oil Spills	Provide a catchments (emergency) in the storage tank to avoid spillage in case of leakage	
	Water leaks	Schedule frequent preventive maintenance Immediately repair the damaged area using any temporary measures	
Int'l Chemical Industries Product: Basic chemicals	Ambient dust	Cover/enclose the conveyor system to avoid escape of fine particles of K_2SO_4 Install a high capacity/efficiency bag filter Improve the bagging system even manually operated by installing a coupling in the feeder spout wherein the bag can be tighten/enclosed to the spout. This can prevent formation of air particulates.	Low cost option that has potential for recovering K_2SO_4 as well as protect the health of employees
	HCL Production	Replace the final tower with $CaCO_3$ packing materials instead of H20.	HCL gas emission sometimes reaches up to 100 ppm or less. This option will lessen the concentration of HCl gas emitted because the Cl will react with $CaCO_3$ and can produce another product of $CaCl_2$.
Kemwerke, Inc. Product: Alkyd Resin	Accumulated amount of paper bags with liner (chemical bags)	Negotiate with the supplier to pack the chemicals first in the plastic before it is packed in paper bag instead of having a paper bag lined with plastic material and try to coordinate with paper industry who can recycle the paper bag.	Reduce generation of hazardous wastes

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
	Chemical spills and leaks	Establish spill and leak control policy to include frequent scheduling of inspection and maintenance of equipment, pumps and pipelines, and providing emergency responses and cleanup procedures in the event of accidental spills or leaks.	To avoid accidental or inadvertent releases of chemicals resulting to material losses and exposure of workers to hazard. Ensure proper management of hazardous wastes
	Raw materials usage	Employ mechanical devices such as rubber wiper in the reaction kettles	To provide a mechanism for recovering and ultimately reusing residual resin inside the tank Improve production efficiency
		Maximize the usage of the reactor to specific type of product or provide a reactor kettle that is dedicated to a certain product	Avoid regular cleaning of the kettle resulting to clean-up cost reduction
		Recover and recycle nitrogen tank spray water Use treated wastewater as spray water	Savings on the consumption of water
	VOC emissions	Regular monitoring of volatile organic compounds emission specially xylene emission in the workplace	To ensure safety of the workers and monitor material losses
		Provide general ventilation and conservation vents in the production, bulk storage and filling stations	Provide safe workplace and lessen the possibility of direct inhalation of workers to solvent fumes
	Hazardous wastes	Improving or reorganizing existing storage area of raw materials by separating the hazardous to non-hazardous materials.	Avoid contamination of other materials Ensure compliance to DAO 29
LMG Chemicals, Corp. Product: Basic Chemicals	Raw sulfur spillage around the melting pit	Improve the loading/charging system if possible place a catchments for the spillage so that it can directly return to the melting pit without any treatment (filtering) Enhance housekeeping practices	Low cost option that has high potential for savings on raw materials
	Leak of molten sulfur in the pipeline going to the furnace	Replace the gasket by using a tylon lined or tylon material gasket or any more durable gasket Schedule more frequent preventive maintenance	Low cost option that has high potential for savings on raw materials and prevent land contamination

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
	Generated bulk volume of solid waste in the treatment of spent acid	Develop a systematic and quantitative way of adding exact amount of line; store the spent acid in properly labeled tank and look for potential use of this type of waste	Can be used by other companies for adjusting wastewater pH)
	Accumulated amount of spent catalyst	Investigate appropriate method to recover the vanadium metal catalyst Improve the storage procedure to comply with RA6969	Has high potential to generate additional revenue at the same eliminates accumulation of hazardous wastes
	Hazardous wastes (empty containers, spent acid)	Strict compliance to DAO 29 requirement for temporary storage of hazardous waste Should have a designated area with provisions to contain spills; properly labeled date of disposal, type of waste	The current practice is not in compliance to DAO 29 requirements.
	Oil Spill	Relocate the day tank or cover the canal and provide catchments for oil spills	The diesel day tank is located on top of an open canal; traces of spills is evident around the area
Food Processing			
Eldon Industrial Corp. (Bounty Foods Div.) Product: Canned products	Solid wastes e.g. cartons, plastics (from raw meat), vegetable peelings, tin cans (rejects), paper (labels)	Disinfect; chlorinate; re-use as garbage bag	Reduce solid waste generation
	Waste water	Use of chemical treatment (polymer, afflouclating agent – type of coagulant) and settling tank; aeration system; sand filtration	Not a waste minimization option
	Boiler emissions (visual monitoring emissions only)	Conduct stack sampling to establish emission level so proper waste management can be implemented	For benchmarking
TSB Enterprises, Inc. Product: Cut Vegetables, Fruits, Nata de Coco, Cakes, Preservatives, Puree	High BOD load of the wastewater (during mango depulping, during washing/cleaning of equipment)	Mix rinsing water from depulping with water from washing	Low cost option that can reduce BOD level
	Water usage and wastewater generation	Install water meters	Low cost option that has high potential for water savings
	Same quality of waster used for process and domestic	Do cost-benefit analysis and explore alternative domestic piping	

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
Basic Fruits Corp. Product: Banana Chips	Housekeeping Some containers are unlabeled in the sorting area, banana chips are left/dropped on the floor	Ensure that the working and storage areas are clean and well organized Keep all containers properly labeled	Currently, some containers are unlabeled in the sorting area, banana chips are left/dropped on the floor
	Solids along the liquid waste streams	Install screens or strainers to filter out solids before it goes to the WWTF	Currently, the influent in the WWTF is high in solids and highly concentrated
	Wasted syrup	Proper scheduling of frying will ensure continuous use of the syrup	Currently, sugar syrup are disposed at the end of each batch operation
	High volume of wastewater being directed to the WWTF	Reduce consumption of water by employing pressurized water in cleaning the equipment	Low cost option that has high potential for reducing water consumption and wastewater generation
	Effluent quality	Review efficiency of existing WWTF; conduct treatability study (lab-scale) on the WWTF systems Redesign WWTF if necessary Establish a laboratory that is capable of testing critical parameters in wastewater	Not a waste minimization option
	Unnecessary treatment systems in the existing WWTF	Put DAF directly after equalization tank and omit the use of another holding tank (refer to the revised flow sheet – WWTF)	Not a waste minimization option
	Accumulated sludge	Conduct R&D activities for its utilization such as: fertilizer, animal feeds, soil conditioner	Need further study
Jo-na's Int'l Phils* Product: Nata de Coco, Mango Juice	Raw materials usage	Utilize the thin slices of nata de coco from the slabbing process for candies or confectioneries. Study also its utilization for medical purposes.	Waste utilization eliminates waste. Additional income can be generated by producing saleable by-products.
		Study the utilization of spilled and rejected nata de coco for animal feed	Waste utilization eliminates waste and additional income can be generated from saleable by-products
		Determine the optimum time for the centrifuge of nata de coco	Energy can be saved if equipment are operated at the shortest possible time but still attain the required product quality.
	Energy conservation	Study the energy consumed in each process/operation. Make an energy audit.	Energy audit can determine where savings on power/fuel can be made

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
		Install heaters to pre-heat the fuel for boilers and furnaces and reduce fuel feeding	Pre-heating of fuel will save energy.
	Water conservation	Improve or change the jet washing equipment. Increase the size of the catch basin. Increase the number of times the recycling of water.	The jet washing equipment keeps on running but the output is very small (inefficient). Plenty of water is also spilled because the catch basin for water is small.
Cebu Legacy Marketing Corp. Product: Dried Mango	Wastewater generation	Implement a system to allow continuous use of the syrup, instead of one time use.	Although the spent syrup is being sold, maximizing its service life can reduce time, labor and materials in preparing the syrup
		Use of conveyor sprinkling system of washing the mango	This would significantly reduce water consumption and wastewater generation
		Recycle wash water: use of countercurrent washing	This would significantly reduce water consumption and wastewater generation. However, the quality of recycled water must be monitored to prevent bacteria growth
		Recycle water used in the spreading of trays	This would significantly reduce water consumption and wastewater generation. However, the quality of recycled water must be monitored to prevent bacteria growth
	Solid waste management	Use of mango peels as compose material	This will eliminate the current practice of dumping the waste in the backyard causing emission of odor. However, this may take substantial investment.
		Type up with DOST to conduct R&D for the potential use of mango seed (pit	Aside from eliminating the current practice of dumping the waste in the backyard causing emission of odor, action has potential to generate additional revenues. This needs further study.
		Collaborate with the piggeries and other livestock companies within the area for possible use of mango peels as livestock feeds	Aside from eliminating the current practice of dumping the waste in the backyard causing emission of odor, action has potential to generate additional revenues. This needs further study
		Encourage immediate collection of spilled mango parts to prevent them from mixing with water thereby adding to the organic load of the wastewater	This will reduce organic load to their septic tank. This may require employee training and constant supervision

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
	Solid wastes	Improve the screening system of the canal – series of screens with decreasing mesh size going the septic tank.	Reduce solid waste generation Reduce organic load of the wastewater
		Encourage immediate collection of spilled mango parts to prevent them from mixing with water thereby adding to the organic load of the wastewater	Reduce solid waste generation Reduce organic load of the wastewater
	Raw materials conservation	Segregate chlorinated water and, channel it to the empty tank beside the septic tanks.	May entail significant cost Reduce usage of chlorinated water
Central Seafood Inc. Product: Frozen seafoods octopus, abalone, cuttlefish, scallop	Water consumption and wastewater generation	Use of high pressure low volume washer	A low cost option that can reduce water consumption and wastewater generation
		Use of sprinkler system in the washing and cooling operation	A low cost option that can reduce water consumption and wastewater generation
		Recycle spent pasteurizing water (either as boiler feed water)	This will reduce water consumption and wastewater generation. This may entail capital investment for the holding tank, pipe, and pump. However, there is significant potential savings in water and avoidance of fines and penalties for eliminating thermal pollution
	Water consumption and wastewater generation	Recycle spent cooling water.	The spent cooling water is relatively clean, except for some meat that adhered to the cans. This will also entail investment in the construction of cooling tower. However, the savings in water may offset the investment.
	Solid waste generation	Install series of screens along the drainage canal to effectively remove the solids from the liquid streams	A low cost option that can significantly reduce organic load of the wastewater. This will also improve solid waste collection
		Coordinate with livestock association for the potential use of the collected waste seafood meat as food for the livestock	A low cost option that can reduce the accumulated organic solid wastes within the plant. This may also result in additional revenues.
FMC Marine Colloids Phils., Inc. Product: Seaweed Products	Energy conservation	Installation of preheater in the LPG line and reduction of LPG flow	Preheating gas usually reduces fuel consumption
	Production efficiency	Monitor and determine the optimum temperature and retention time in the modification process and maintain these conditions.	Energy can be saved if the optimum operating conditions are maintained.

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
	Dusts	Study the enclosure of areas or equipment, which generates dust.	Enclosure of some areas/equipment prevents the spread of dust to other parts of the plant and reduces the dust collector required to control the dust particles because the collection will be required in smaller areas only.
	Water use and wastewater generation	Maximize the collection of rainwater; collect the rainwater from the roofs of other buildings of the company. This option may require additional water tanks and piping.	Rainwater can be used in the various processes in plant and supplement the water supply from the city.
		Study more thoroughly the characterization of wastewater and identify more appropriate wastewater treatment. High cost option.	Although the company can comply with the regulations imposed by DENR, the effluent still looks black, highly polluted, and very dirty and its disposal to the creek/Mactan Channel, which is not acceptable to the community. It does not give a good public image. Thus, the management of wastewater still needs improvement.
	WTP efficiency	Reduce air pumped to the wastewater treatment system.	Monitoring records show there was excessive aeration in the WWTF. Sometimes DO reaches 10-11 mg/L but aeration data shows that even if DO ranges from 3-4 mg/L only the corresponding BOD of the effluent can already comply with the Standards.
		Adjust the dosing of chemical for neutralization based on monitoring data. Reduce the amount of HCl used for neutralization. No cost option	Adjustment of the flow of neutralization chemicals was not done based on monitoring data. Operation is not in optimum condition. Use of excessive chemicals for neutralization is waste. Savings in chemicals can be realized if the pH of wastewater is neutralized down to about pH 7.5 only instead of sometimes 6.3.
	Raw materials conservation	Study the utilization of spent liquor from the modification process first and later on the wash water for fertilizer and/or the recovery of potassium from the spent liquor.	High cost option The waste liquor still contains potassium, which may be utilized as fertilizer, or the potassium can be recovered and reused. Zero discharge from the modification process and wash tanks could be the best management practice and should strive to attain this. Very

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
			big savings can be derived if study is successful and implemented by the company.
Foundry			
Acetech Metal Industries Corp. Product: Cast Irons	Air emission	Conduct initial air quality monitoring through other government and private laboratories	No emission testing has been conducted yet to verify the efficiency of the dry type air pollution control device
		Used of coal and other fuels to minimize air pollution instead of coal	Current fuel in heating the cupola is coke. Need to establish first whether the use of coke is ccompatble with the existing furnace.
		Give preference to the use of induction furnace	This may entail significant investment
	Solid wastes	Conduct study and coordinate with public and private sector in utilizing the following solid wastes: slag, fly ash, fine sand , and rejects	Currently, these solid wastes are used as filled materials, thereby causing land contamination.
		Use first in first out policy by marking the purchase date of each container	There is no accurate recording of raw material usage as such some new materials are used instead of the old ones
Metal Engineering Resources Corp. Product: Cast Irons	Noise pollution in production area	Schedule operations so that noise pollution can be within only a specific limit of time in a day	Reduce air pollution
	Hazardous wastes	Provide additional racks for these metal parts to avoid contamination	Reduce hazardous wastes generation
	Solid wastes	Landfill sand recovery methods have to be investigated; heavy metals in sand require further treatment before disposal; collected and landfilled	Reduce solid wastes generation
San Gabriel Enterprise Metal Casting Product: Furniture accessories	Solid waste generation	Optimize recycling of wax	The current 80% recycling can still be improved by improving the collection system
		Properly segregate and venture into recycling opportunities for the following solid wastes: • Spilled sand • Slag • Ceramic shells • Ceramic duct • Spent sandpaper • Damaged packaging materials • Used steel brush • Used plastic brush • Used scrubbing pads	These solid wastes are currently accumulated within the site. Other like the ceramic shells and dust are used as filled materials. Exploring the opportunity fir reselling has potential for additional revenue that may be used as positive reinforcement for the team the help implements WM in the plant.

Name of Company	Potential Subject in WM	Action to be Taken	Comments & Remarks
	Hazardous wastes	Optimize the use of finishing chemical solutions by regularly monitoring its quality and extending its bath life.	The finishing chemical solutions are directly discharge to the drainage canal. Optimizing its, if possible zero draining can reduce chemical consumption and more importantly eliminates the discharge of hazardous wastes into the environment, thereby improving compliance
	Waste steam	Reuse/recycle waste steam from the dewaxing process either as boiler feed water or input material to the wax recycling process	Need to check was steam qualify if can be accepted as boiler feed water. May result to significant water and energy savings and eliminate thermal pollution
		Recover heat from the dewaxing process to: • Pre heat the boiler • Pre heat the caustic soda cooking	May entail investment for piping. May entail investment for the heat exchanger
Cebu Iron Foundry Corp. Product: Cast Iron	Air emission	Monitor the quality of coke. Use better quality of fuel	Low quality fuel emits more pollutants. By purchasing better quality coke, emissions of air pollutants may be reduced.
		Study the effectivity of scrubber in controlling air pollution and make the necessary improvements	Te current use of water curtain to abate air pollution may have been rendered ineffective by the strong air blowers
		Experiment using lower air pressure at the start of firing	
	Water use	Tap other sources of water (like rain water) for putting off embers at the end of daily production	At present precious drinking quality water is used for putting off embers. This process does not require high quality water.
	Solid wastes	Evaluate the substitution of some low quality materials with better quality materials. The higher cost of better quality materials must be weighed versus the costs for re-working/re-melting	The higher cost of better quality materials must be weighed versus the costs for re-working/re-melting, and time delay Minimize metal spills and products with defects, re-melting/re-working to save on costs.
		Collaborate with other industries for the utilization of other solid waste materials. Slag can be utilized as materials for cement while waste sand, fly ash, and bentonite can be utilized by the pottery industry, which exists in this area.	Eliminate waste. This has potential revenue from waste materials

3) Issues for Implementing the Waste Minimization Measures

All representatives of the volunteer companies showed strong desire to pursue WM as an effective tool in waste management as follows.

- Savings in raw material, manufacturing costs, and waste treatment/disposal costs
- Better waste management that may pave the way for environmental compliance
- Improve image in the community and from employees
- Potential reduction in liabilities for environmental problems and for worker safety

Despite the strong beliefs in the WM benefits, the company representatives are somehow restricted in fully implementing WM.

- Lack of benchmark information for the implementable options.
- No monitoring of basic information such as electricity consumption, man-hours utilized for specific projects or departments, wastewater generation, pollutant, loading, generation of air emissions, etc.
- Limited information on waste minimization opportunities
- Employees' outlook to WM activities as a "project" rather than as a continuing effort.
- Limited financial resources

6.4.3 Waste Minimization Activities by Model Companies

(1) Selection of Model Companies

1) Setting Selection Criteria and Preliminary Selection of Model Companies

The following criteria were set for selecting model companies from the 20 volunteer companies:

- Strong management commitment (e.g. environment-policy),
- Willingness to share and showcase their experience,
- Willingness to be visited by a team of WM experts from JICA and DOST,
- Preferably, but not only, Filipino-owned SMEs, and
- Manufacturing sector.

2) Final Selection of Model Companies

Based upon the results of the WM Assessment and identification of possible WM measures and recommendations by the DOST and Japanese experts as well as willingness of

candidates, the WM pilot project Steering Committee authorized the following companies as the Model Company in each target sector.

Sector	Model Company
1. Chemical Industry	Kemwerke, Inc.
2. Pulp and Paper Industry	Noah's Paper Mills, Inc.
3. Food Processing Industry	TSB Enterprises, Inc.
4. Foundry Industry	Acetech Metal Industries Corp.

2) －1 Kemwerke, Inc. (KWI)

This company was chosen to represent the *Chemical Processing* sector. Kemwerke, Inc. can be a good model company to showcase WM success. Its management is fully committed to implement and sustain WM. There were a number of WM opportunities identified at this company. Of all the volunteer chemical processing companies, Kemwerke is the only one belonging to SMEs, which is the focus of this project.

2) －2 Acetech Metal Industries Corp. (AMIC)

AMIC was selected to represent the *Foundry* sector. AMIC has demonstrated commitment to adopt and sustain waste minimization. It belongs to the SMEs and has a number of potential WM opportunities. Its WM cause champion is an active member of the industry association and has the leverage to showcase its WM experience to other member companies.

2) －3 TSB Enterprises, Inc. (TSB)

TSB was chosen to represent the *Food Processing* sector. TSB is an SME and has a strong need for the technical assistance that this project can provide. Its management has demonstrated strong commitment to implement and sustain WM endeavors.

2) －4 Noah's Paper Mills, Inc. (Noah's)

This company was selected to represent the *Pulp and Paper* sector. The unique qualification that Noah's has over the other Pulp and paper companies is that it has the most need of WMPP technical assistance. Like the other companies, the top management of Noah's has shown strong desire to implement waste minimization. It is also willing to showcase their experience and share them to other companies.

(2) Model Company Profile

This section presents summary of model company profile. Detailed descriptions are integrated in the WM assessment report in Annex.

1) Kemwerke, Inc. (KWI)

1) －1 General Information

Establishment	1983 incorporated
Capital (Paid-in)	Not disclosed
Sales	Not disclosed
No. of Employees	16
Main Product	Alkyd Resin (Cocoalkyd Resin) for the paint industry Coco Methyl Ester (CME), Coco Diethanol Amide (CDEA), Coco Mono Ethanol Amide (CMEA) for the soap, shampoo and detergent industry No-bake Furan Resin for the metal casting/foundry industry
Raw Materials	Coconut oil, alcohol, acid
Production Capacity	
ISO Certification	Certified 9002 in 2001

1) －2 Production Process

Coconut alkyd resin is an environment-friendly synthetic polymer resin based on coconut oil and is combined with an alcohol and acid basically used in alkyd paints. Varying percentage of this resin in paint gives excellent film properties, durable exterior oil paint or varnish, usually in gloss, which are easy to brush. They are fast drying and have good weather and abrasion resistance, as well as low permeability to water vapor.

The cocoalkyd resin is produced in batch reactor at 200-240 ºC for about 10 to12 hr reaction time. Manufacturing process consists of the following steps.

1. Polyol, polybasic acid, solvent, and catalyst are charged in an insulated universal reaction kettle.
2. Coconut oil is co-reacted with the polyhydric alcohol to extract the remaining water.
3. An inert gas such as nitrogen is introduced by bubbling it up through the mixture.
4. After cooking the completed alkyd is transferred to a thin-down tank where it is mixed with aliphatic solvents.
5. Waste solvents are steam-distilled for recovery.
6. The resin is then passed in a final filtering process to removed unwanted by-product.
7. The resultant polymer solution is filled into steel drums for storage and shipment.

1) －3 Waste Stream

Solid Waste: Raw material containers
Waste paper bags (1,000 kg/month)

Liquid Waste: Equipment cleaning water (468m^3/year)

Gaseous Waste: Volatile organic compounds

1) －4 Current Waste Management Practices

Kemwerke demonstrates a commitment in caring the environment by identifying, minimizing, reusing and treating all waste streams generated in the plant.

- Evaporated solvent in the reactor is collected, recovered and recycled as cleaning solvent.
- Fume scrubbers are installed near the universal reactor tank to protect the workers for any possible exposure to air emissions.
- Solid waste generated is segregated and recycled.
- Wastewater treatment facility is installed, but not operated to address the liquid waste generated by the plant.

2) Noah's Paper Mills, Inc. (NPMI)

2) －1 General Information

Establishment	1989: Purchased from Eastern Paper Mills 1996: Registered Corporation and started production
Capital (Paid-in)	Not disclosed
No. of Employees	86
Main Product	Writing Paper, Printing Paper, Wrapping Paper
Raw Materials	Recycled paper (50% domestic, 50% imported)
Production Capacity	Machine Capacity: 23,000 ton/year Performed in 2001: 15,917 ton/year
Operation	3 shifts /24 hours, 260 days/year (may be shut down depending on a market condition)
ISO Certification	None

2) －2 Production Process

The following are the basic process operations at NPMI:

- Pulping - Wastepaper goes to the pulper wherein the breakdown of waste paper into individual fibers and the separation of ink from fibers take place.
- Screening - Wastepaper goes through 3 types of screening namely: coarse screening, pre-screening, and fine screening. In screening, the contaminants are separated primarily on the basis of size as it passes through the screen perforations or holes/slot.
- Cleaning - The contaminants are separated mainly based on specific gravity/density difference with respect to fiber and water.
- Flotation - Air is utilized to separate ink particles from a pulp suspension through a chemical washing process. A slusher turns the old paper into pulp and the detergent dissolves and removes the ink.

- Thickening - The stock suspension is converted to higher consistency and white water is recovered and reused as dilution water for the next operation. By dispersion, contaminants are reduced in size and homogenously distributed so as to render them invisible to the naked eye.
- Washing - Excess chemicals/anionic trash as well as dispersed contaminants are removed while recovered water is loaded in the wastewater treatment facility

2) －3 Wastes Stream

Solid Waste: Wastewater Sludge (35~40 ton/day, 50% moisture)
Pulp Sludge (10 ton/day)
Liquid Waste: Wastewater (504 m^3/day, 8.26 ton/product-ton)
Quality of Effluent
* COD: 86.56 ppm (Effluent standard: 70ppm)
* BOD: 29.69 ppm (Effluent standard: 50ppm)
* TSS: 56.25 ppm (Effluent standard: 70ppm)

2) －4 Current Waste Management Practices

The company presently observes the following waste management practices in its manufacturing processes:

- Use white water to dilute rejects in tank in the first step of cleaning to reduce water consumption. Replace leaking valves, pumps and seals.
- Increase scraping times in air floating tank to remove ink on paper.
- Use recycled water to clean chests.
- Add cationic starch to increase retention of fines and fillers and to reduce solids content in white water.
- Backfeed water from vacuum pump and vacuum coach pump back to white water tank directly. Increase height of mixing tank to reduce overflow of pulp slurry. Improve efficiency of decker and reduce fiber losses.
- Add polymer and improve efficiency of air floatation.
- Use high-pressure water to wash wire and reduce water consumption.
- Make an efficient schedule of production and reduce repeated starts and stops.
- Install savealls for fiber recovery.
- Minimize unplanned or non-routine discharges of wastewater caused by equipment failures, human error and faulty maintenance procedures by training operators and establishing good operating practices
- Utilize scrubber for boiler sulfur emissions
- Utilize boiler mixed with bunker fuel to recover energy
- Use minimum amount of chlorine in the bleaching process
- Use only a small amount of defoamers to minimize the potential to form dioxin as additives are exposed to chlorine.

Most of the listed waste minimization practices performed by NPMI are focused on reducing wastewater generation. NPMI identified the accumulation of sludge as the specific public concern that requires immediate attention.

3) TSB Enterprise Inc.

3) －1 General Information

Establishment	Started in 1976 under Romualdo Enterprises and incorporated in May 1984. Actually operated June, 1990 Established Purae Corp. as marketing company in 1991
Capital	1,000,000 Pesos
Total Sales	Gross 30,000,000 Pesos /year
No. of Employees	Regular: 33, contractual (during on season): 50
Main Products	Processed Fruits, Nuts, Bakery Products, Processed Eggs, Sauces, Gravies
Raw Materials	Mango, Wobe, Strawberry, Banana, Pineapple, Peanuts
Production Capacity	6 to 7 ton/day
Operation	1 shift, 7 hours/day, 312 days/year

3) －2 Production Process

Basic production process at TSB Enterprises, Inc. is shown in Figure 6.4.1.

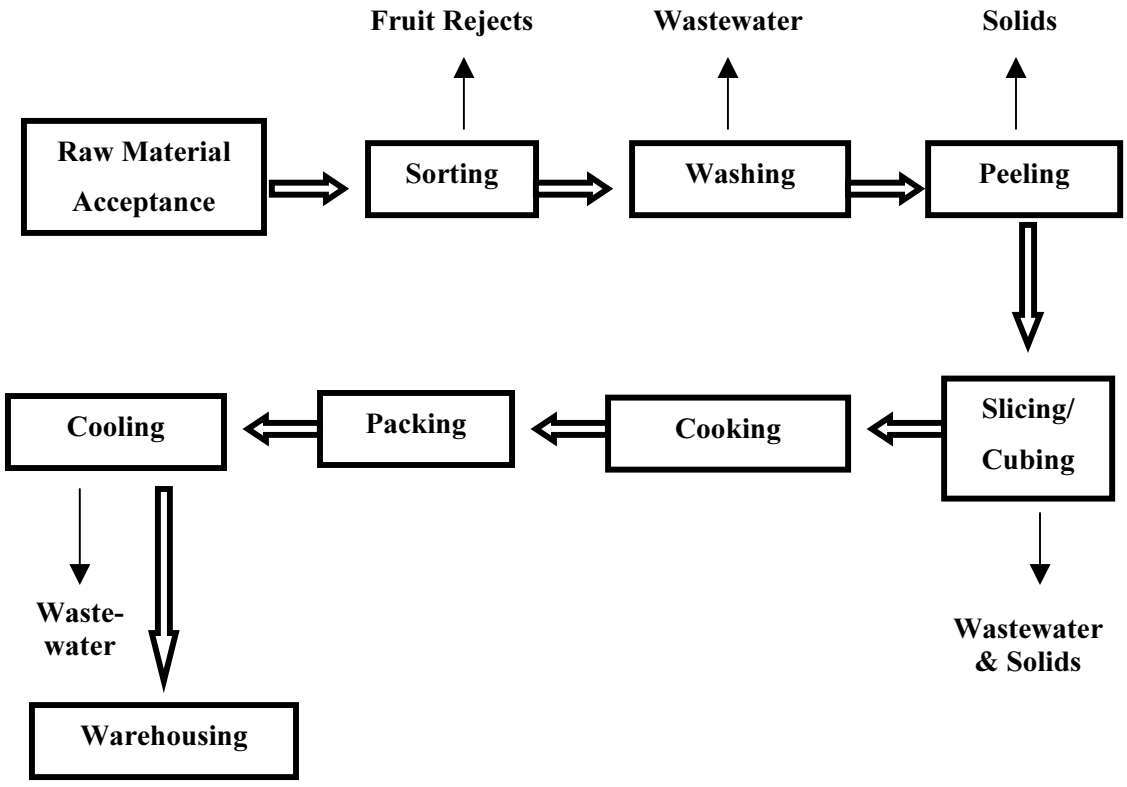


Figure 6.4.1 Basic Process Flow at TSB Enterprises, Inc.

As an example, Figure 6.4.2 shows production process of banana slice.

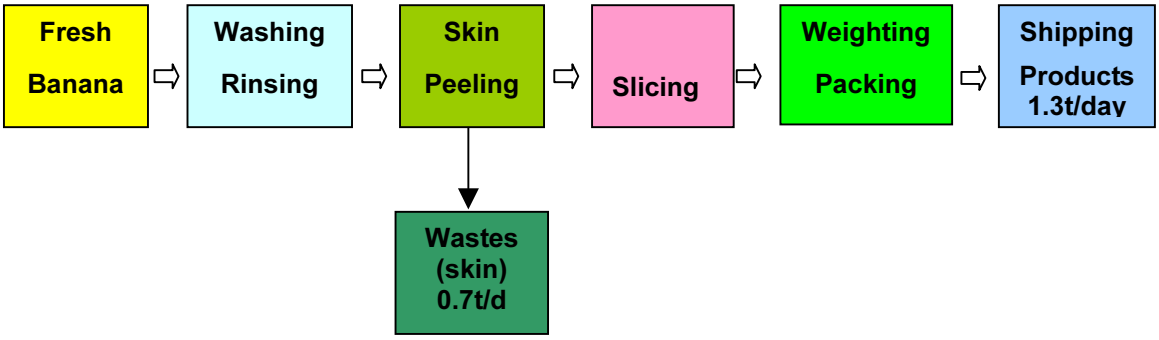


Figure 6.4.2 Banana Slice Production Process

3) －3 Waste Stream

Solid Waste:	Jackfruit peels (off-season: 52kg/day, in-season: 300kg/day)
	Banana peels (75kg/day)
	Mango seeds and peels (4.2ton/10hrs pulping operation)
	Wooden and plastic crates
Liquid Waste:	Wastewater (14,794m3/year)

3) －4 Current Waste Management Practices

TSB Enterprises through its Environmental Policy is committed to the protection of the environment and provide safe and healthful working environment for its employees and the surrounding community. Because of its policy, the company has embarked some waste management activities.

- The plant was adopting a solid waste segregation program. Its segregated wastes were collected by a private contractor and transported into a controlled dumpsite.
- In the factory, workers were required to remove spilled solids from the floor before washing it with water to reduce water consumption.
- Plan to practice water re-use and recycling.

In addition, some of the good housekeeping practices that were observed during the assessment period:

- All the workers were required to wear proper suit during process operation. It minimizes food contamination.
- The working areas were kept clean and well organized.
- Equipment were properly in placed and well secured
- Fruits in crates were properly arranged in the storage area after delivery.
- Cleaning and washing of fruits were done properly to prevent spills and leaks.

- Proper transport of food product to various process stations.
- Practice preventive maintenance on their equipment.

4) Acetech Metal Industries Corp. (AMIC)

4) －1 General Information

Establishment	incorporated in 1998 and started production in July 2002
Capital (Paid-in)	Not disclosed
Sales	Not disclosed
No. of Employees	16
Main Products	Gray Cast Iron: Pump Casing, Brake Drum, Manhole Cover Ductile Cast Iron: Cramp Carbon Steel: Machine Parts Low Alloy Steel: Machine Parts High Alloy Steel: 18-8 Stainless Steel Pump Impeller
Raw Materials	Scrap steel, Sand, Coke
Production Capacity	18 to 20 ton/month
Operation	1 shift, 8 hours/day, 300 days/year
ISO Certification	Not Planning

4) －2 Production Process

Main facilities of a foundry are a mold making machine and a cupola melting furnace. ACETECH operates the cupola that can charge materials of 16 kg of coke, 1 kg of Fe-Si and 8 kg of limestone in order to melt 140 kg of scrap irons for 20 times per day. Basic casting process is shown in Figure 6.4.3.

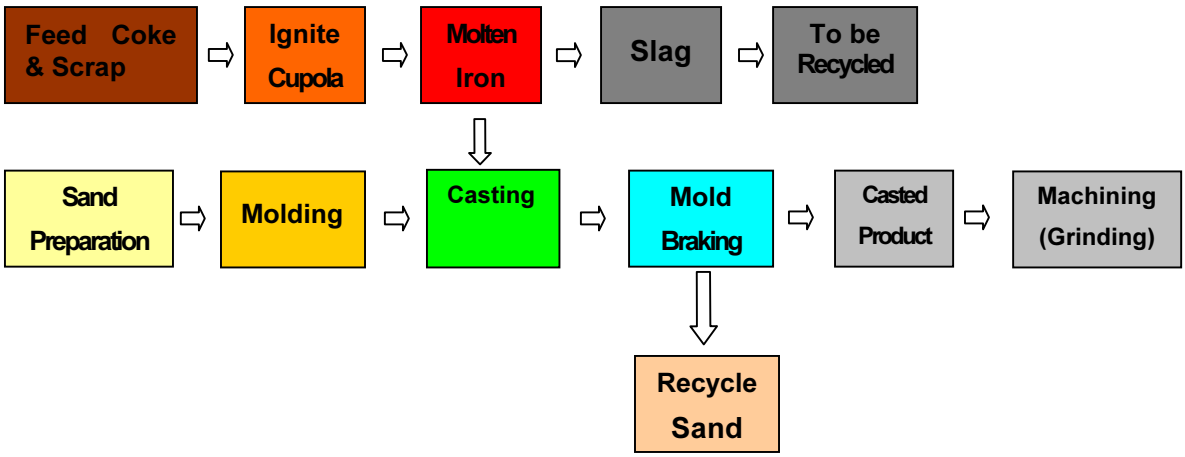


Figure 6.4.3 Basic Casting Process

Process of making mold is shown in Figure 6.4.4.

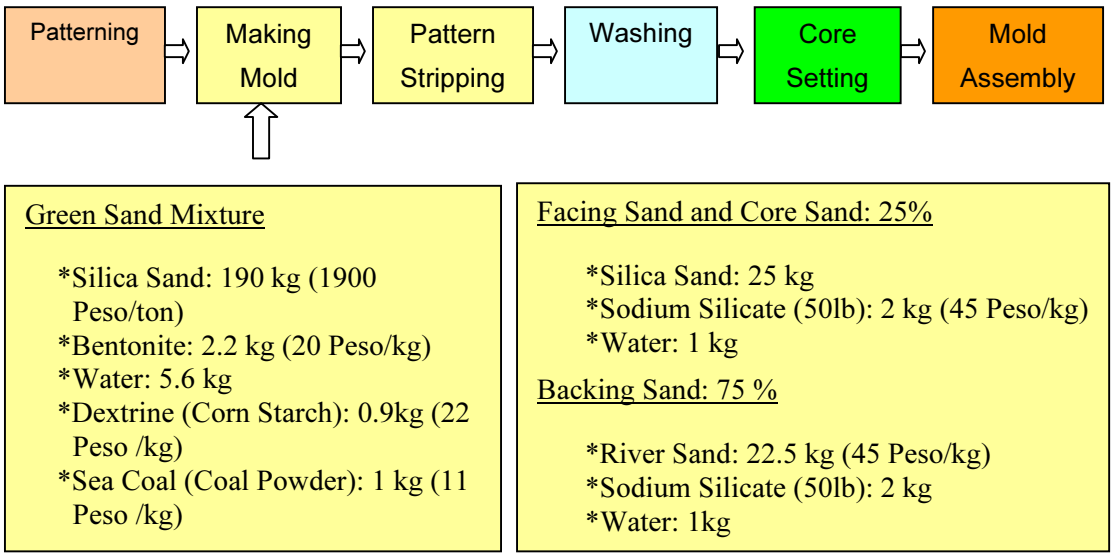


Figure 6.4.4 Process of Making Mold

4) －3 Waste Stream

Solid Waste: Slag (21.6 ton/year)
Fly ash (10.8 ton/year)
Used molding sands (can be recycled as backing sands)

4) －4 Current Waste Management Practices

In order to reduce the waste, the company undertook some waste management activities such as:

- Saw dust and planner chips is mixed with sand for molding purposes.
- Fine sand is added to molding sand at regulated amount to reduce operational cost.
- Slag is transported to landfill for disposal. In addition, they are also looking at the possibility of using it for sandblasting in the shipyard.
- Fly ash recovered from cyclone is being used as tapping compound.

Except in the molding area, the facility as a whole is kept clean and well organized. During the onsite rapid assessment, the team observed good housekeeping practices such as:

- Use of dedicated process equipment to reduce cleaning frequency and waste generation
- Utilization of dry cleanup method in cleaning the facility thereby minimizing the use of cleaning materials and water
- Provision of good ventilation in the working place

(3) Preparation of Company-wide WM Action Plan by Model Company

The four model companies prepared a company-wide WM action plan according to the steps that in-house staffs of the model companies learned during the startup workshop with the help of ITDI experts and PBE. The basic steps are summarized as follows:

1. Obtain strong management commitment
2. Establish WM program
   - 2-1 Organize a planning/implementing team
   - 2-2 Develop employee awareness
   - 2-3 Set program goals
   - 2-4 Write ideas of WM
   - 2-5 Conduct waste assessment/audit
   - 2-6 Characterize unit processes
   - 2-7 Develop process flow diagrams
   - 2-8 Perform materials balance
   - 2-9 Identify and address potential obstacles
   - 2-10 Develop schedule
   - 2-11 Identify WM options
   - 2-12 Propose options
   - 2-13 Screen options
3. Evaluate technical and economic feasibility and environmental impacts
   - 3-1 Evaluate technical feasibility
   - 3-2 Evaluate environmental impacts
   - 3-3 Evaluate economic feasibility
   - 3-4 Determine full cost of waste
   - 3-5 Establish cost allocation system
4. Select and implement WM options
   - 4-1 Select options for implementation
   - 4-2 Implement selected options

Tables 6.4.3 through 6.4.6 summarize company-wide WM action plans of the model companies.

Table 6.4.3 Kemwerke, Inc. Waste Minimization Action Plan

ACTIVITY	ACTION TO BE TAKEN	DOERS	TIME FRAME
Obtain strong management commitment	Formulate strategies Incorporate environmental protection goal in corporate policy	Waste Minimization (WM) Team	January 2003
Establishment of waste minimization program Organization of planning/implementing team Development of employee awareness Setting of program goals Writing of Waste Minimization Plan	 Organize a planning team Assign duties and responsibilities Conduct information, education, communication (IEC) and training program Set targets (compliance, waste and cost reduction, ISO certification) Plan includes: Statement of support Team structure Organizational guidelines Methods for fostering participation of all employees Company's general WM goals Provisions of employee training	 Waste Minimization (WM) Team	 March 5, 2003 March 25, 2003 March 2003
Waste assessment/audit	Develop process flow diagram Develop material balance	Waste Minimization (WM) Team with the involvement of section heads/supervisors	January 2003 to June 4, 2003
Identification of waste minimization options	Screen options	Waste Minimization (WM) Team and Empower Experts	March 2003
Evaluation of Economic and Technical Feasibility and environmental impact	Identify whether option is: No cost no risk Low cost no risk Low cost low risk Low cost high risk High cost low risk	Waste Minimization (WM) Team and Empower Experts	April 2003 to June 4, 2003
Selection and implementation of options	Select options that are technically and economically feasible Implement options that are technically and economically feasible.	Waste Minimization (WM) Team and Empower Experts	April 2003 to June 4, 2003
Evaluation of waste minimization program and projects	Measure waste reduction Measure economic results Evaluate program elements	Waste Minimization (WM) Team and management	June 4, 2003
Maintain program momentum	Rotate assignments of WM team Provide refresher training course on WM Publicize success stories Re-establish management support Re-evaluate goals	Waste Minimization Team in consultation with the management	Continuing activity

Table 6.4.4 Noah's Paper Mills, Inc. Waste Minimization Action Plan

ACTIVITY	ACTION TO BE TAKEN	DOERS	TIME FRAME
▪ Obtain strong management commitment	▪ Formulate strategies ▪ Incorporate environmental protection goal in corporate policy	Waste Minimization (WM) Team	January 2003
▪ Establishment of waste minimization program			
o Organization of planning/ implementing team	▪ Organize a planning team ▪ Assign duties and responsibilities		March 5, 2003
o Development of employee awareness	▪ Conduct information, education, communication (IEC) and training program		March 24, 2003
o Setting of program goals	▪ Set targets (compliance, waste and cost reduction, ISO certification)	Waste Minimization (WM)Team	
o Writing of Waste Minimization Plan	▪ Plan includes: o Statement of support o Team structure o Organizational guidelines o Methods for fostering participation of all employees o Company's general WM goals o Provisions of employee training		March 2003
▪ Waste assessment/audit	▪ Develop process flow diagram ▪ Develop material balance	Waste Minimization (WM) Team with the involvement of section heads/supervisors	January to June 2003
▪ Identification of waste minimization options	▪ Screen options	Waste Minimization (WM) Team and Empower Experts	March 2003
▪ Evaluation of Economic and Technical Feasibility and environmental impact	▪ Identify whether option is: o No cost no risk o Low cost no risk o Low cost low risk o Low cost high risk o High cost low risk	Waste Minimization (WM) Team and Empower Experts	April to June 2003
▪ Selection and implementation of options	▪ Select options that are technically. and economically feasible ▪ Implement options that are technically and economically feasible.	Waste Minimization (WM) Team and Empower Experts	April to June 2003
▪ Evaluation of waste minimization program and projects	▪ Measure waste reduction ▪ Measure economic results ▪ Evaluate program elements	Waste Minimization (WM) Team and management	April to June 2003

ACTIVITY	ACTION TO BE TAKEN	DOERS	TIME FRAME
▪ Maintain program momentum	▪ Rotate assignments of WM team ▪ Provide refresher training course on WM ▪ Publicize success stories ▪ Re-establish management support ▪ Re-evaluate goals	Waste Minimization Team in consultation with the management	Continuing

Table 6.4.5 TSB Enterprises Waste Minimization Action Plan

ACTIVITY	ACTION TO BE TAKEN	DOERS	TIME FRAME
▪ Obtain strong management commitment	▪ Formulate strategies ▪ Incorporate environmental protection goal in corporate policy	▪ Waste Minimization (WM) Team	January 2003
▪ Establishment of waste minimization program			
o Organization of planning/ implementing team	▪ Organize a planning team ▪ Assign duties and responsibilities		March 5, 2003
o Development of employee awareness	▪ Conduct information, education, communication (IEC) and training program		March 24, 2003
o Setting of program goals	▪ Set targets (compliance, waste and cost reduction, ISO certification)	Waste Minimization (WM)Team	
o Writing of Waste Minimization Plan	▪ Plan includes: o Statement of support o Team structure o Organizational guidelines o Methods for fostering participation of all employees o Company's general WM goals o Provisions of employee training		March 2003
▪ Waste assessment/audit	▪ Develop process flow diagram ▪ Develop material balance	Waste Minimization (WM) Team with the involvement of section heads and supervisors	January-June 2003
▪ Identification of waste minimization options	▪ Screen options	Waste Minimization (WM) Team and Empower Experts	March 2003

ACTIVITY	ACTION TO BE TAKEN	DOERS	TIME FRAME
▪ Evaluation of Economic and Technical Feasibility and environmental impact	▪ Identify whether option is: o No cost no risk o Low cost no risk o Low cost low risk o Low cost high risk o High cost low risk	Waste Minimization (WM) Team and Empower Experts	April-June 2003
▪ Selection and implementation of options	▪ Select options that are technically. and economically feasible ▪ Implement options that are technically and economically feasible.	Waste Minimization (WM) Team and Empower Experts	April-June 2003
▪ Evaluation of waste minimization program and projects	▪ Measure waste reduction ▪ Measure economic results ▪ Evaluate program elements	Waste Minimization (WM) Team and management	June 2003
▪ Maintain program momentum	▪ Rotate assignments of WM team ▪ Provide refresher training course on WM ▪ Publicize success stories ▪ Re-establish management support ▪ Re-evaluate goals	Waste Minimization Team in consultation with the management	Continuing

Table 6.4.6 Acetech Metal Industries Corporation Waste Minimization Action Plan

Activity	Specific Tasks	Doers	Expected Output
1.0 Provide WM training	Conducted a seminar and workshop for the WM Team of Acetech and Philippine Metals Association Consultant	Empower WM team	Trained WM Team
2.0 Formulate and Implement WM options			
2.1 Improving Housekeeping Practices			
2.1.1 Practice preventive maintenance	Conduct periodic inspections	In-house WM Team with the involvement of personnel from various production sections	Reduced breakdowns
	Regular scheduling of cleaning and maintenance		-ditto-
	Immediate repair of malfunctioning equipment		Repaired equipment
2.1.2 Materials and chemical supplies should be stored properly	Enclosure of materials such as sand in cubicles		Enclosed and segregated materials

Activity	Specific Tasks	Doers	Expected Output
2.1.3 Just-in-time purchasing practices should be implemented	Improve scheduling of purchases/ deliveries and inventory of materials		Improved schedule and inventory – materials are available when needed
2.1.4 Keep the workplace free of clutter. A staff should be assigned to supervise the general tidiness of the facility from time to time	Assign a staff or supervisors to maintain tidiness in their respective sections		Clean and tidy plant
2.2 Minimizing Metal Spillage			
2.2.1 Minimize metal spillage during transfer	Training of workers to avoid spillage		Reduced spillage
2.3 Recovery of Casting Sand			
2.3.1 Separate sand and shot blast dust, recover sand and mix old and new sand for molding	Segregation of sand and shot blast dust and reuse sand		Recovered sand
2.3.2 Improve metal recovery from sand	Recover metals mixed with sand by magnet and recycle the metal and sand		Recovered metals and sand
2.3.3 Reuse sand for construction if possible	Dispose sand which cannot be used in the plant by selling to construction companies or use for land filling		Off-site reuse of sand
2.4 Bag house dust and scrubber of dust contaminated with lead, zinc and cadmium			
2.4.1 Identify the source of contaminants (e.g., coatings on scrap) and work with suppliers to find raw materials that contain low contaminants	Collaborate with suppliers of materials to reduce or eliminate contaminants		Better quality materials
2.4.2 Install induction furnaces	Installation and test operation of induction furnaces		Installed / operational induction furnaces
2.5 Reduce Product Rejects			
2.5.1 Improve material testing procedures	Develop and practice quality control procedures		Developed quality control procedures
2.5.2 Recycle product rejects	Recycle product rejects		Recycled product rejects
2.6 Reduction/Utilization of Solid Wastes			

Activity	Specific Tasks	Doers	Expected Output
2.6.1 Waste slag and fly ash can be sold to construction materials processor	Collaborate with construction materials processors		
2.6.2 Experiment on improvement of melting facilities/equipment	Change refractory brick lining of cupola furnace Test and determine the optimum pH of the slag		Improved melting and reduction of waste slag
2.6.3 Separation of waste sand and metal	Separate metals from waste sand by magnet and recycle separated materials.		Separated sand and metals.
2.7 Utilization of Waste Heat			
2.7.1 Utilize waste heat from the furnaces for heating air for the furnaces	Wrap exhaust pipes with insulating materials to conserve heat and utilize the heat for heating air for the furnace		Wrapped the exhaust pipes and recycled the heated air
2.7.2 Utilize exhaust gases from the furnace for pre-heating the next batch of materials to be melted	Tap exhaust heat from the furnace to preheat the next batch of materials to be melted		Waste heat from furnace is utilized for pre-heating the next batch of materials to be melted.

(4) Results of Implementation of WM Measures by Model Companies

The four model companies have been implementing WM measures; the DOST-ITDI staffs have conducted periodical monitoring for the past 3 months. Based on the monitoring, their achievements are summarized below (see Tables 6.4.7 through 6.4.10). Detailed activities are described in the monitoring reports of each model company in Annex 6.7.

Table 6.4.7 Achievement in Waste Minimizations by Kemwerke, Inc.

Activity	Achievement
Attempt to rework or convert raw materials packaging to recyclable materials or look for potential user of waste paper.	The waste paper bags were collected and recycled by Trans-National Paper Inc.. About P1,500.00 per month hauling fee of waste was saved by the company .
Establish spill and leak control policy such as frequent scheduling of inspection and maintenance of equipment, pumps, and pipelines and provide emergency responses and cleanup procedures in the event of spills and leaks.	The In-house team conducted regular inspection and preventive maintenance of equipment, pumps and other accessories. The plant was able to prevent material losses during production and about same amount on last month savings amounting to P1,650.00 per day was realized.
Maximize the usage of the reactor to specific type of product or provide a reactor dedicated to a certain product.	The schedule of production for the month of June was forecasted based on the client regular orders. The water consumption was reduced and about P143.95 per month was saved.

Activity	Achievement
Improve or reorganize existing storage area of raw materials by separating the hazardous to non-hazardous.	The company arranged the storage area and was able to prevent misbatching in the production. Approximately about P49,228 per batch was saved.
Recover and recycle carbon dioxide spray water.	Recovered water amounting to P34.50 per Batch Operation was gained.
Provide general ventilation and conservation vents in the bulk storage and filling stations.	The bulk storage was well organized providing safe workplace to the employees.
Regular monitoring of wastewater and volatile organic compounds emission such as xylene in the workplace.	Sampling and analysis of wastewater was conducted. Results were presented to the company to properly handle and take necessary actions in the operation of the waste treatment facility.

Table 6.4.8 Achievements in Waste Minimization by Noah's Paper Mills, Inc.

Activity	Achievement
Enlargement of daytank for drum sorter	Reduced water consumption and estimated savings of P30,000/yr is attained
Addition of return line along primary slot screen	No overflow thus resulting in recycling of water and estimated savings of P9,000/overflow
Repair of worn out gasket for pneumatic valve liquid cyclone	High fiber recovery is attained resulting in estimated savings of P10,000/month and P120,000/year if repair is done once a month
Installation of water meters for chemical lines	Volume of water consumption quantified ; thus resulting in water conservation measures
Recovery of adhering fibers on rejects thru efficient drum sorter operation	Higher fiber recovery is achieved resulting in estimated savings of P2000 per day at 100MT input = P40,000/month = P480,000/year
Regular equipment monitoring and maintenance	Better equipment operation and improved quality of product
Change of the motor of the sump pit pump at collecting pit to higher speed	Improved production performance of motor pump thus resulting in better product quality and estimated savings of P6,000/yr
Installation of a manhole to remove easily any material that will clog up the pump and improve further its performance.	Savings on cost for manpower services was achieved; approximately P24,000/yr savings in case clogging occurs once a month
Installation of a submersible pump at drum sorter directing to daytank	High fiber recovery achieved resulting in estimated savings of P5,000/year
Conversion of needle shower to oscillating shower	Improved performance of gravity table
Periodic inspection of all water lines/connection	Increased water pressure of shower and improved performance efficiency of machines resulting to estimated savings of P10,000/month = P120,000/year
Regular inspection and repair of all leaking pumps	Reduced water costs and improved performance of pumps

Table 6.4.9 Achievements in Waste Minimization by TSB Enterprises, Inc.

Activity	Achievement
Utilization of fruit peels as substrate for green charcoal making	About P52,400.00 yearly savings will be realized by TSB on hauling and disposal.
Washing of the floors and cleaning of the equipment using high pressure water nozzle spray.	About 5.29 m3 of water is saved daily (P18,924.00 is saved yearly by TSB)
Re-use of water with anti-bacteria from 2nd rinsing of raw materials in cleaning working areas	About 2.81 m3 of water is saved daily from this undertaking
Re-use of water from 2nd rinsing of raw material for cleaning of another batch of raw material	About 1.85 m3 of water is saved daily from this option.
Maintain cleanliness of cooling water and tub to minimize frequency of discharge by rinsing of pails before placing in cooling tub, enclosure of the cooling section, installation of filter cloth and removal of floating material using nylon net	Frequency of discharged will be reduced once a week instead of 3 times a week. 0.42 m3 of water is saved every day on cleaning the cooling tub.
Implement correct pail washing procedure by: o Using the existing rinsing (banlaw) drum for first and second washing. o The drums shall be reduced by half a size to lessen the amount of water use inside. o The sanitized tub water will be used for the 1st and 2nd banlaw and water shall not be discharged but be used for the next day. o Sanitized tub water shall also be used in cleaning the washing area.	Implementing this option, 1.33 m^3 of water is saved daily.
Conduct sampling and analysis of wastewater	Samples of wastewater was determined by SGS for BOD, COD, total solids, total dissolved solids and alkalinity. The followings are the results of the analysis: o Alkalinity: 144 mg/l o COD: 1,779 mg/l o BOD: 278 mg/l o TDS: 648 mg/l o TSS: 272 mg/l
Installation of spray gun on water hoses in the cleaning of floors and washing of equipment	About 3.24 m^3 of water is saved daily (P12,864.00 is saved yearly by TSB)
Implementation of the options on water consumption on the various processing sections.	A total of 15 m3 of water is saved daily (P54,000.00 is saved yearly for water consumption).

Table 6.4.10 Achievements in Waste Minimization by Acetech Metal Industries Corp.

Activity	Achievement
Organization of the WM Team of Acetech	Organized the WM Team of Acetech
Training of WM Team	Trained the WM Team through seminar and workshop
Formulation of additional options for Acetech	Formulated the following additional WM options: change of refractory lining, recycling of waste heat from furnace, testing of the slag to improve the quality of the melt, and separation of metals from waste sand by magnet.
Change the refractory brick lining of the cupola furnace	Completed the change in refractory bricks. 42 pieces @ P140.00/piece of bricks were used and costs a total of P5,880.00. The change in refractory bricks reduced the amount of waste slag generated during melting from an average of 575 kg to 475 kg (100 kg/melting) or 18% waste slag reduction.
Recovery and reuse of sand spilled from conveyors	Recovered 60 kg of sand spilled from conveyors per cycle Savings = 60 kg sand/cycle x 75 cycles/year x P1.90/kg = P 8,550.00/year
Recovery of sand from shot blast machine	Recovered 50 kg sand per week Savings = 50 kg/week x 50 weeks/year x P1.90/kg = P 4,750.00/year
Recovery of sand before sand blasting	Recovered and reused 1.5 tons sand/cycle Savings = 1,500 kg/cycle x 75 cycles/year x P1.90/kg = P 213,750.00/year
Metal recovery from sand	Cost for purchase of magnet = P4,800.00 Recovered 30 kg metal/4-day cycle Savings = 30 kg metal/cycle x 75 cycles/year x P8.00/kg metal = P 18,000.00/year
Improve melting quality	Tested the pH of the black and greenish colored slag to determine the changes in material charge. The greenish colored slag indicates a better quality melt. Results of pH tests: Black slag = pH 9.6 Greenish slag = pH 8.8

Activity	Achievement
	Based on the results of the pH test, the amount of limestone charge was reduced by one (1) kg/charge to shift the pH towards the greenish slag. The flow of the metal and slag improved. Savings = 1 kg/charge x 35 charges/cycle x 75 cycles/year x P 0.80/kg limestone = P 2,100.00/year
Remelting of off specification products	Saved materials by 60 kg/cycle. Savings = 60 kg/cycle x 75 cycles/year x P8.00/kg = P 36,000.00/year
Improved the preparation of scrap materials by breaking the scrap into smaller sizes	Prepared the materials into the correct sizes. Reduced the melting time by one (1) hour/cycle. Saved on coke fuel consumption by 7 charges/hour. Savings = 7 charges/hour x 14 kg/charge x 75 cycles /year x P13.00/kg coke = P 95,550.00
Conducted stack emission test	Results of Stack emission test (numbers in parenthesis indicate DENR standards): TSP concentration (mg/Ncm): 9.0 (150) SO_2 concentration (mg/Ncm): Nil (1500) NOx concentration (mg/Ncm): 96.5 (2000) CO_2 (%) by Orsat Analysis: 1.0 CO_2 (%) by Combustion Analyzer: 1.3 O_2 (%) by Orsat Analysis: 19.7 O_2 (%) by Combustion Analyzer: 19.5 CO (mg/Ncm): 11.45 (500) Emission Opacity - Shade No. 1 Ringelman Chart

6.4.4 Productivity Assessment

(1) Objective of Productivity Assessment

In addition to the waste minimization assessment by experts of the Philippines and Japan, productivity assessment was conducted for the four model companies in order to improve their productivity and consequently environmental performance.

(2) Viewpoints of Productivity Assessment

Improvement of productivity contributes to reduction in environmental impacts of corporate activities. Saving energy, reusing and recycling materials, selling byproducts, and reducing waste generated at source are some of the ways to improve resource productivity, which also minimizes wastes. In addition to the WM assessment by the Philippines and Japanese

experts, productivity assessment was carried out for the four model companies in order to find other options that can improve resource productivity and consequently environmental performance. The JICA Study Team member in charge of productivity improvement tried to find the following possibilities for resource productivity improvement:

- **Reduction in industrial waste by improving yield rate**

  Reducing wastes generated from processing raw materials such as disqualified products, trashes and dusts as well as waste generated from maintenance of production facilities such as waste oils, wastewater, emissions, which are also an important subject for cost reduction.

- **Reduction in defective products and elimination of adjustment works**

  Improving capacity to produce final products by single operation at a production line, which contributes to elimination of losses of production time and adjustment works

- **Reduction in other management losses**

  Reducing of deteriorated products kept in storage for a long time, handling losses by damaged products, and treatment costs.

(3) Findings and Recommendations from Productivity Assessment

Recommendations on better productivity for each model company are summarized below (details are shown in Annex 6.6).

1) Kemwerke, Inc.

Recommended Actions to be Taken

- Drummed Raw Materials Area is located at a quite far area from the production plant. It should be re-located closer to the production plant.
- Direction of the entrance of Finish Product Warehouse should be closer and faced on to the production area.
- The area of Empty Drum Storage occupies nearly a half of the plant area. Those empty drums should be reduced or organized to reduce the space of them.
- Drums containing any sludge from the production should be segregated from this category.
- 5 S promotion should be implemented properly.

Recommended Production Layout

The existing plant layout is shown in Figure 6.4.5 and the arrow shows material handling between the stockyards and the production facility. Figure 6.4.6 shows recommended production layout.

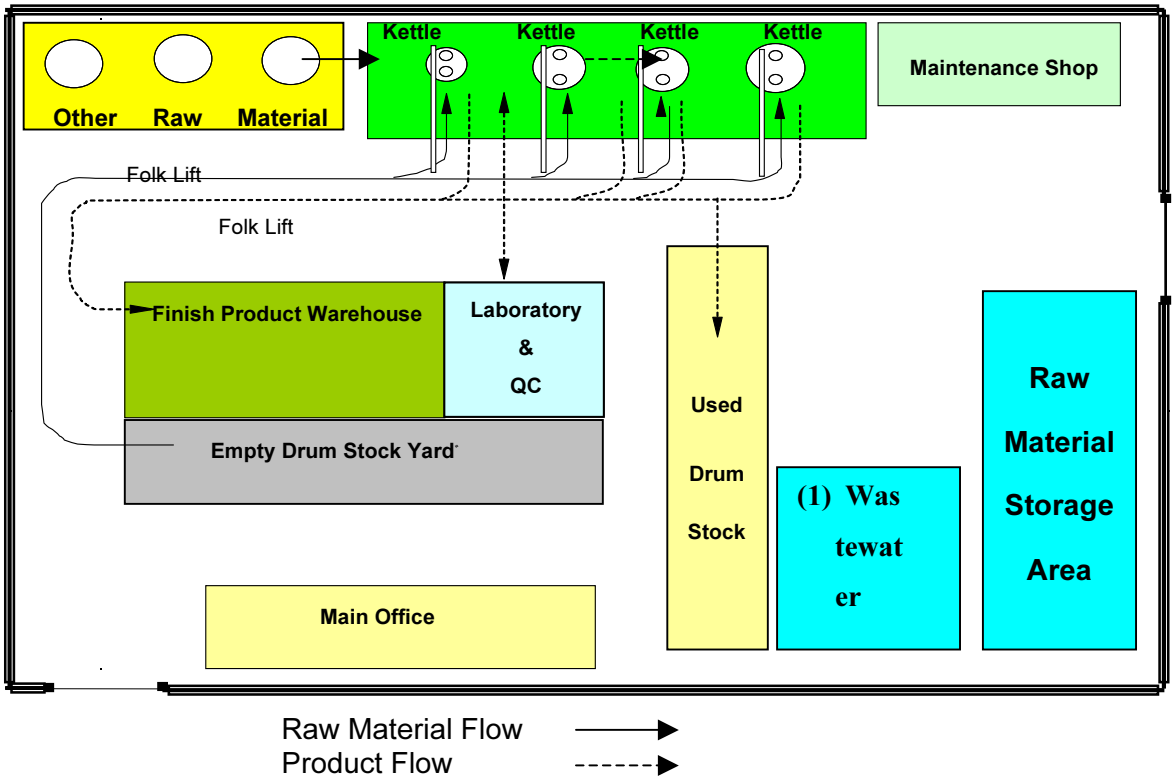


Figure 6.4.5 Existing Production Layout at Kemwerke

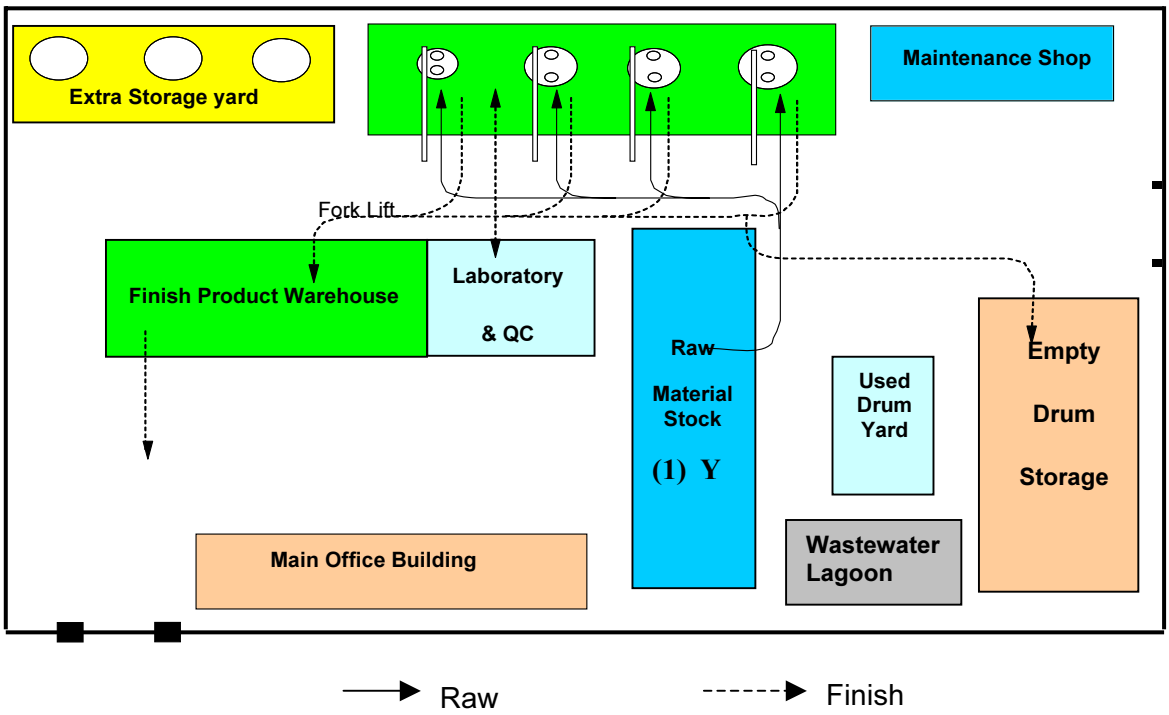


Figure 6.4.6 Recommended Production Layout

2) Noah's Paper Mills, Inc.

Recommended Actions to be Taken

- While the waste papers are stored at the storage area, uses of pallets and /or special baggage are recommended prior to feed onto conveyer systems.
- Sludge should be covered to avoid diffusing with dusts into the air, when stored at sludge yard.
- Worker at sludge area should be reduced from currently 6 to be minimized.
- Inventory amount of cutting paper products should be minimized, which can save costs as well as space.

3) TSB Enterprises, Inc.

Recommended Actions to be Taken

- The table sizes and spaces between those should meet various to process types of materials.
- Alignment of the working tables should be adjustable depending upon amount of production volumes and complexity of cooking processes.
- Handling of raw materials should meet changing of materials as well as the amounts.
- Material handling should be minimized by installing of gravity and/or powered conveyers if production volumes are increased
- Working and washing spaces should be kept the maximum to satisfy with sudden requirements of various amount and types of materials.
- The wastes should be properly handled in total handling process.
- Feeding of Raw Material and Finish Product Storage Area
- An inlet of the raw materials and outlet of finish products should be separated, and each handling route should not be crossed
- Sanitary Control

- A manual washing system should be equipped with a hose reel to minimize working time and keep good sanitary condition.
- The total area of the plant should be kept best sanitary condition; "5S" promotion may meet this requirement.

Recommended Production Layout

The existing production layout is shown in Figure 6.4.7. The recommended production layout is shown in Figure 6.4.8.

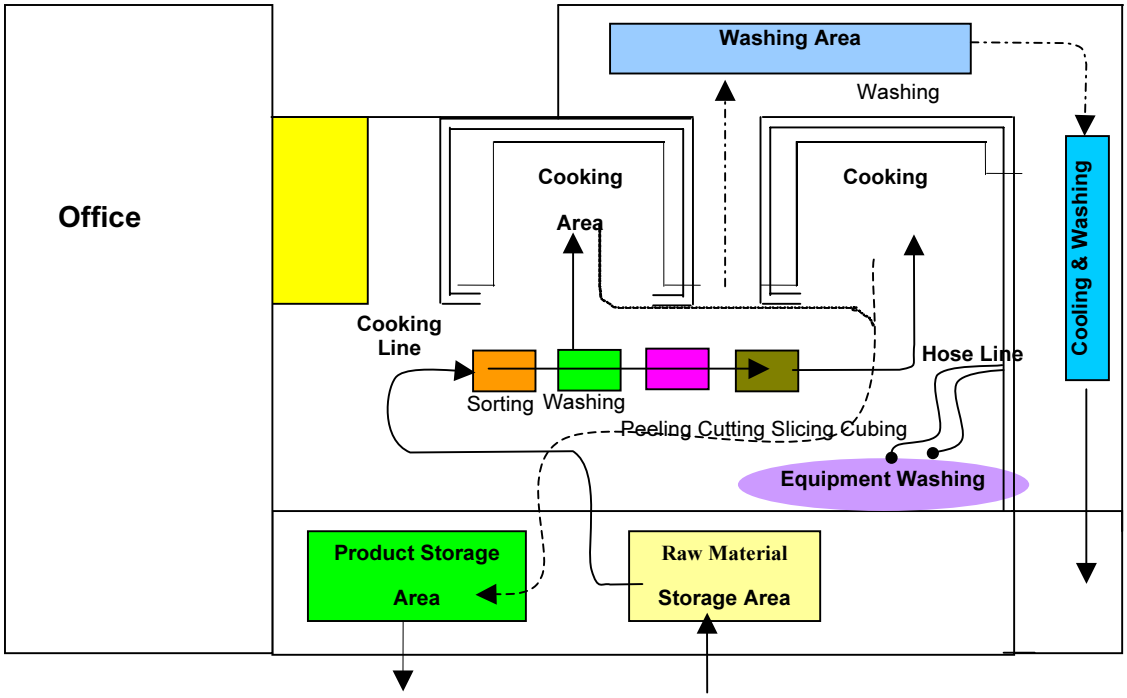


Figure 6.4.7 Existing Production Layout at TSB Enterprises

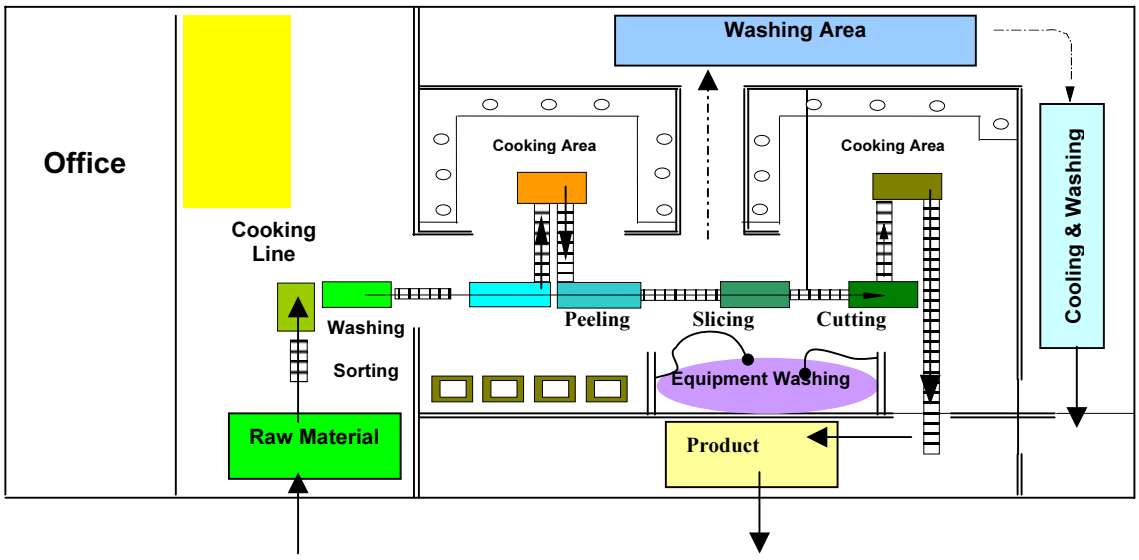


Figure 6.4.8 Recommended Production Layout at TSB Enterprises

4) Acetech Metal Casting Industries Corp.

Recommended Actions to be Taken

- A categorized scrap preparation yard should be arranged at the cupola area.
- Iron scraps should be segregated by type, grade, figure and carbon content.
- The scraps should be broken down into adequately small sizes then stocked at the categorized scrap preparation yard.
- The cupola should be relocated at outside of the existing plant facility and install along side of the facility wall.
- It should be installed as much as possible in straight position, especially outlet position of the cupola.
- The straight chimney can provide with better suction head pressure so that the flue gases are effectively and strongly aspirated.
- Consequently the cupola can provide with complete combustion, then it can reduce a load of the dust collector as well as provide with effective emission gases.
- Stop the Melting Pot to carry by hands
- Special designed melting pot, a small bogie and rails should be installed between the cupola and molding area.
- So that the casting metal (molten) can be transferred without by hands as well as avoid of spilling.
- Pouring of molten metal can be done by using of existing overhead traveling crane.
- The molding and casting area should be standardized to enable smooth molding and casting.

Recommended Production Layout

The existing production layout is shown in Figure 6.4.9. The recommended production layout is shown in Figure 6.4.10

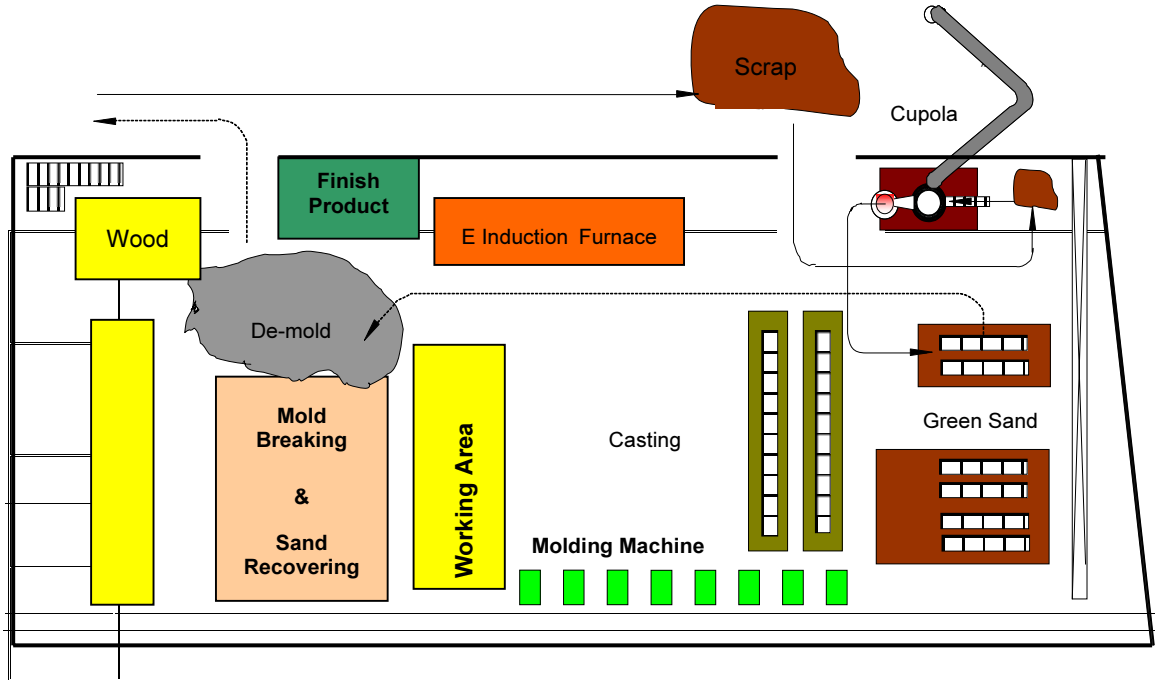


Figure 6.4.9 Existing Production Layout at Acetech Metal Casting

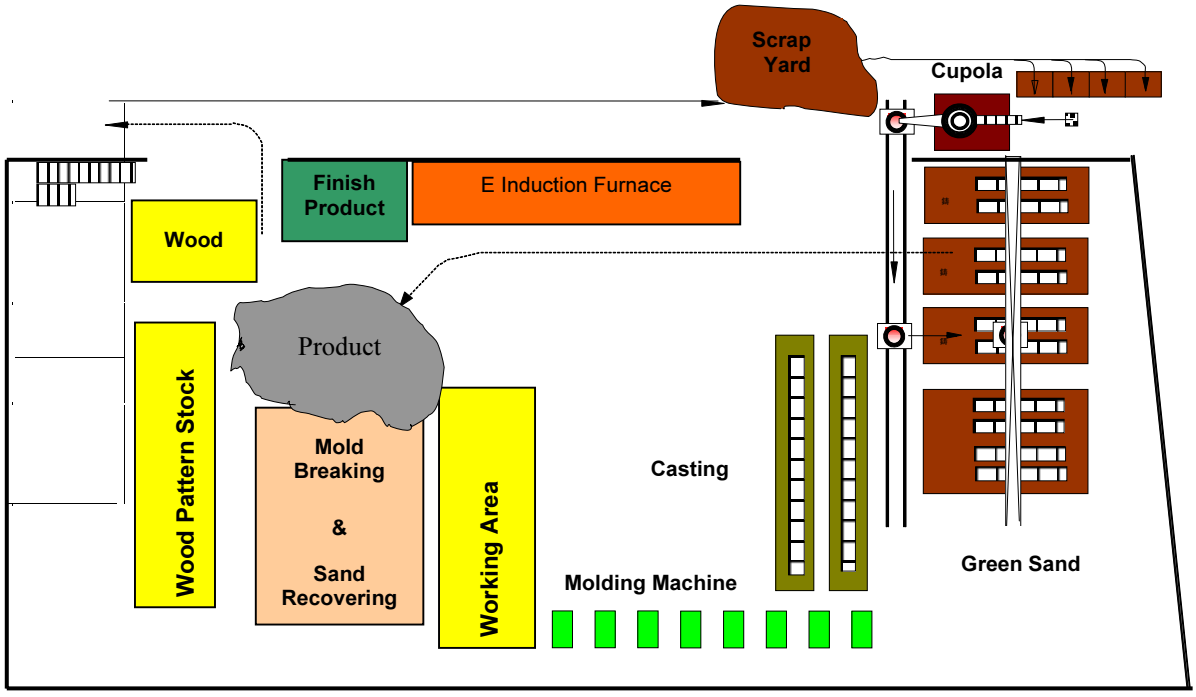


Figure 6.4.10 Recommended Production Layout at Acetech Metal Casting

6.4.5 Preparation of WM Guidebook

(1) Objective of Preparation of WM Guidebook

A guidebook on waste minimization is prepared to encourage Philippine companies to start their actions. The guidebook is based on the experiences of the model companies, but its use is not limited to the target four industries (chemical, pulp and paper, food, foundry); it

also serves as a general guidance on waste minimization to other related industries such as coconut oil milling and refining, cement, fish canning and beverage. Owners and top management of SMEs are assumed as main readers of the guidebook. PBE, the implementing body of the waste minimization pilot project, prepared a draft guidebook with technical inputs from DOST-ITDI and information provision from the model companies, and the pilot project Steering Committee discussed the contents of the guidebook.

(2) Outline of WM Guidebook

The guidebook provides an overview of generation of industrial wastes in the production, methods of waste minimization such as cleaner production and productivity improvement. The guidebook will have the following contents:

1. Introduction
   1.1 Overview of WM History
   1.2 Waste Minimization and Cleaner Production
   1.3 Background of Guidebook
2. Waste Minimization Concept
   2.1 Waste minimization Hierarchy
   2.2 Waste minimization Program
      2.2.1 WM Program Elements
   2.3 Incentives of Waste Minimization
   2.4 Barriers to Waste Minimization
   2.5 Waste Assessment
3. Waste Minimization and Productivity Improvement Techniques
   3.1 WM Techniques Overview
      3.1.1 Source Reduction Techniques
      3.1.2 Recycling, Reuse and Reclamation
   3.2 Productivity Improvement
   3.3 Small Group Activity as an Effective Tool to Increase Workers' Sensitivity
      3.3.1 What Is the Small Group Activity?
      3.3.2 Organization Arrangement to Promote the Small Group Activity
      3.3.3 Steps to Conduct the Small Group Activity
      3.3.4 Types of Problems and Steps on How to Solve problems
      3.3.5 Measures to Vitalize the Small group Activity
      3.3.6 Tips to Motivate Workers/Staff Reluctant to Engage in the Small group Activity
      3.3.7 Other Resources
   3.4 WM Techniques for the Food (Fruit) Processing Sector
      3.4.1 Industry Profile of the Food Processing Sector

3.4.2 Typical Process Description
3.4.3 Environmental Concerns
3.4.4 Waste Minimization Options
3.5 WM Techniques for the Foundry Industry
3.5.1 Industry Profile of the Foundry Sector
3.5.2 Typical Process Description
3.5.3 Environmental Concerns
3.5.4 Waste Minimization Options
3.6 WM Techniques for the Chemical Processing Industry
3.6.1 Industry Profile of the Chemical Processing Industry
3.6.2 Typical Process Description
3.6.3 Environmental Concerns
3.6.4 Waste Minimization Options
3.7 WM Techniques for the Pulp and Paper Industry
3.7.1 Industry Profile of the Pulp and Paper Sector
3.7.2 Typical Process Description – Using Virgin Pulp
3.7.3 Typical Process Description – Using Recycled Paper
3.7.4 Waste Minimization Options
4. Waste Minimization Success Stories
4.1 Food Processing WM Case Study – The Experience of TSB Enterprises
4.2 Foundry Industry WM Case Study – The Experience of Acetech Metal Company
4.3 Chemical Processing Industry WM Case Study – The Experience of Kemwerke Inc.
4.4 Pulp and Paper Sector WM Case Study – The Experience of Noa's Paper Mill
5. Other Environmental Management Approaches
5.1 Environmental Cost Accounting (ECA)
5.2 Greening the Supply Chain Management (GSCM)
5.3 Environmental Management System
5.3.1 Benefits of EMS
5.3.2 EMS development Process
5.4 Life Cycle Analysis
5.5 Ecolabelling

(3) Distribution of WM Guidebook

Total 1000 copies of the guidebook are printed and distributed to owners and top management of SMEs in the four target sectors, through the corresponding industry associations, and other related industries. Upon the distribution of the guidebook, a reader feedback form is included in order to evaluate the effectiveness of the guidebook. The feedback form may include the following items:

- Owner/top management's support for waste minimization
- If they do not support, their reasons
- If they support, what kind of assistance they need
- Evaluation of the contents
- Evaluation of the presentation
- Comments on the guidebook

6.4.6 Preparation of Industry-wide WM Action Plans

(1) Objectives of Preparation of Industry-wide WM Action Plans

With an aim to strengthen industry associations' role to sustain SMEs' WM activities, industry-wide WM action plans were prepared. Since the model company was selected for each of the four target industry sectors, the industry-wide WM action plan is expected to work as a tool to expand the model company's experiences to other member companies of the industry associations.

(2) Process of Preparation

During the startup workshop in January 2003, participants from the target industry sectors conducted a group work to identify waste minimization issues and possible measures by industry sector. The outputs of the group work were used as inputs to the industry-wide WM action plans. PBE indicated a framework of the WM action plan as follows:

- Association profile
- Local industry profile
- Environmental concerns of the industry
- Environmental policies of the association/sector
- Previous and ongoing environmental programs of the sector
- Waste minimization action plan (advocacy level, technology transfer, information, education and training)

The target industry associations (SPIK, PULPAPEL, PHILEXPORT, PMAI) held consultative meetings with their member companies and drafted their action plans. In addition to the four target industry associations, Philippine Confederation of Exporters (PHILEXPORT) Cebu voluntarily prepared the waste minimization advocacy plan. They also presented the draft plans at several WM pilot project Steering Committee meetings and obtained comments from the members of the Steering Committee. The industry-wide action plans were presented with their commitment at the second (closing) workshop (see Annex 6.9 for their action plans).

Each of the industry associations will organize a group to monitor implementation of their action plans.

6.4.7 Conduct of Waste Minimization Workshops

(1) Objectives of the Workshops

The workshops on waste minimization aims to increase the feasibility of the industry-wide action plans on waste minimization through awareness-raising of top decision makers of the companies belonging to the target industry sectors, and capacity development of in-house staff of the companies regarding organizational development and planning and implementation of the waste minimization measures. Two workshops were held during the EMPOWER project. One is before the WM assessment, and the other is after the implementation of waste minimization measures by the model companies.

(2) The First Workshop (Startup Workshop)

1) Objective

The objectives of the startup workshop are to:

- Increase awareness of industry participants on waste minimization concepts, practices and benefits;
- Motivate CEOs and senior company executives to strongly support the adoption of waste minimization in their companies; and
- Guide company/plant managers and environment officers to identify waste minimization options and prepare waste minimization plans.

2) Date and Venue

The startup workshop was held for three days in two venues (Manila and Cebu).

Manila: January 8 to 10, 2003, Astoria Hotel in Pasig City

Cebu: January 22-24, 2003, Sarrosa Hotel in Cebu City

3) Program

The startup workshop was held for three consecutive days. The first day was dedicated to presentations to increase awareness of the participants towards waste minimization concepts, practices and benefits as well as waste minimization efforts by the four target industry sectors. The lectures on how to plan and implement waste minimization program at plant level were given on the second day, and the group work was conducted to prepare sectoral waste minimization action plan as group activity on the third day. Detailed program is shown in Annex 6.10.

4) Participants

Total 104 representatives (62 in Manila, 42 in Cebu) from 63 companies participated in the start up workshop; names of the participants are listed in Annex.

(3) The Second Workshop (Closing Workshop)

1) Objective

Objectives of the second workshop are to:

- Share experiences in waste minimization by the model companies;
- Confirm benefits of waste minimization; and

- Present industry-wide waste minimization action plans by the four target industry associations.

2) Date and Venue

The closing workshop was held for one day in two venues (Manila and Cebu).

Cebu: June 11, 2003, Sorrosa Hotel in Cebu City

Manila: June 18, 2003, Astoria Hotel in Pasig City

Closing Workshop in Manila

3) Program

The programs of the workshops in Cebu and Manila are slightly different because all the model companies are located in the Metro Manila area. Japanese experiences in waste minimization and accomplishments of the WM pilot project were presented at the both venue. In Cebu, FMC Marine Colloides Phils, Inc., one of the volunteer companies under the WM pilot project, presented specific WM experiences, and PHILEXPORT Cebu Chapter expressed their commitment in waste minimization by presenting their Business Agenda and Future Environmental Management / Waste Minimization Advocacy Plan. In Manila, the target four industry associations showed their commitment to promote waste minimization efforts by presenting their industry-wide WM action plans, and the model companies (Kemwerk, Noah's, TSB and Acetech) shared their strategies planned, measures implemented, and benefits gained in waste minimization with the participants. Detailed program is shown in Annex 6.11.

4) Participants

Total 53 representatives (21 in Cebu, 32 in Manila) from the volunteer and model companies and the target industry associations participated in the closing workshop; names of the participants are listed in Annex.

6.4.8 Commitment to Waste Minimization by Owners and Top Management of SMEs

During the first workshops, 22 companies signed the declaration commitment to adopt the waste minimization strategy as an effective environmental management. After the first workshops, additional 13 companies signed the declaration; the total 35 Philippine companies strongly support waste minimization.

6.4.9 Discussion on Award System

(1) Discussion on an Award System to Encourage Companies to Promote IEM

One of the waste minimization pilot project components is establishment and management of an award system to encourage companies to promote IEM. The three (3) Consultation meetings / Roundtables conducted by BOI with the assistance of the JICA Study Team (05, 12 & 21 February 2003) with various stakeholders that include government agencies, industry, NGOs and academe emphasized the need to recognize industry efforts on industrial environmental management either through issuance of incentives or an awards system. In one of the meetings with the industry representative, there was a suggestion to incorporate the environmental award system into the existing awards given by government, e.g. the DTI's Philippine Quality Award (PQA) being administered by Center for Industrial Competitiveness (CIC).

At the waste minimization steering committee meeting held on April 2, 2003, an award system was discussed, and the following issues were identified:

1. A BOI-administered environment award system may not be possible under the present government structure wherein the implementation of environmental programs is lodged with the DENR. However, BOI may initiate such awards within its own area of jurisdiction like the BOI-registered firms; but, environmental compliance will still have to be endorsed by DENR, it being the primary agency responsible for the evaluation of compliance of industries with environmental laws and regulations. Hence, such an award may not be considered a BOI-led or administered award due to the aforementioned constraint.

2. Another constraint in establishing such an award is time, notwithstanding human resources and budget. It needs proper planning and commitment from the implementing agency and other partners. Since the EMPOWER Project will be concluded by June 2003 or barely three (3) months, setting up the whole award system may not be possible.

3. Incorporating a special category or citation e.g. exemplary performance on IEM by

SMEs, under the present PQA will require congressional acts or amendments since the PQA is already governed by R.A. 9013 with procedures and standards based on Malcolm Baldridge award system.

(2) Decision on an Award System

Considering the above issues, the EMPOWER steering committee decided to include an activity to establish an award system in the National IEM Action Plan at the EMPOWER Steering Committee meeting held on May 20, 2003. After the meeting, however, DENR Administrative Order was issued to create the Philippine Environment Partnership Program (PEPP) to support industry self-regulation towards improved environmental performance, under which an award system for industry's environmental management is to be established. Therefore, the EMPOWER Steering Committee concluded to pursue the award system under the PEPP, which is included in the national IEM action plan.

6.5 Summary of the Waste Minimization Pilot Project

6.5.1 Empowerment of Relevant Parties through Pilot Project Implementation

The waste minimization pilot project aimed to enhance capacity of relevant parties through project implementation. Table 6.5.1 summarizes targeted parties and types of the empowerment through the project implementation (from November 2002 to August 2003).

Table 6.5.1 Empowerment of Relevant Parties through the Waste Minimization Pilot Project

Target	Type of Empowerment	Method
Four model companies	In-house staff have learned steps to plan and implement waste minimization measures.	Participation in the workshops, consultation with the experts, recommendations from the experts
	Leaders of the waste minimization teams have recognized necessary items for productivity improvement.	Consultation on the results of productivity assessment
	Top management identified cost reduction benefits from implementing waste minimization measures.	Reporting on monitoring results of implementation of waste minimization measures
Twenty participating companies	In-house staff have learned steps to plan waste minimization measures.	Participation in the workshops
	Top management have recognized general benefits of waste minimization and identified waste minimization measures at their companies.	Participation in the workshops, consultation on the results of waste assessment

Target	Type of Empowerment	Method
Four industry associations	Established a framework to promote waste minimization efforts by their member companies	Preparation of industry-wide waste minimization action plans, establishment of an institutional structure to monitor the plan implementation
ITDI staff	Have increased understanding of production processes of the target industries and experiences in identifying problems in wastewater, exhaust gas, and solid waste management and formulating measures.	On-site factory visits, comments from JICA Study Team
PBE	Have learned how to promote waste minimization efforts of individual companies through industry associations being at the center of activities.	Project implementation

6.5.1 Evaluation of the Pilot Project

(1) Results of the Pilot Project

The Waste Minimization Pilot Project was managed using PDM. In August 2003, when the pilot project was almost completed, achievement level of the pilot project was identified using the indicators listed in the PDM at the Waste Minimization Pilot Project Steering Committee meeting. Although the waste minimization guidebook is finalized and published in September 2003, almost all the planned outputs have been realized (see Table 6.5.2).

Table 6.5.2 Results of Waste Minimization Pilot Project

Narrative Summary	Objective Verifiable Indicators	Results	Important Assumption	Status of Assumption
Overall Goal • Philippine companies that conduct waste minimization and consequently improve productivity are increased in the target sectors.	• Productivity (energy consumption, water consumption, raw material inputs per output) is increased in the target industry sectors.	Impossible to identify at this point	World economy does not plunge into recession	Not world-wide severe recession
Project Purpose 1. Company CEOs / senior managers' recognition of value of waste minimization is increased. 2. Waste minimization activities are institutionalized through active involvement of industry associations.	1. More than 50% of the company CEOs / senior managers who attended the workshops committed and/or recognized value of waste minimization in their companies is increased. 2. Implementation of the industry-wide waste minimization action plans is monitored by the industry associations by January 2004.	1. 35 companies declared their commitment on waste minimization. 2. Monitoring plan has been developed by August 2003.	There exist measures that can reduce waste and production costs.	Measures exist for the target sectors.

Narrative Summary	Objective Verifiable Indicators	Results	Important Assumption	Status of Assumption
Outputs 1. Sixty (60) to eighty (80) business executives / owner – entrepreneurs from Manila and Cebu are oriented to waste minimization approaches and benefits. 2. At least twenty (20) additional business executives of Philippine companies strongly supports waste minimization for productivity improvement. 3. At least two business association / organization's role to sustain waste minimization program is strengthened. 4. At least four model companies have implemented successful waste minimization programs as shown by reduction of waste volumes and economic savings in operations. 5. Waste minimization guidebooks based on the experiences of the pilot project are published (1,000 copies) and disseminated to owners of Philippines companies. 6. Establishment of the government award system for companies that conducted IEM rigorously is included in the national IEM Action Plan.	1. Sixty (60) to eighty (80) business executives / owner – entrepreneurs from Manila and Cebu recognized WM approaches and benefits at the waste minimization workshops. 2. At least twenty (20) additional Philippine companies establish company wide waste minimization teams by June 2003. 3. At least two industry associations prepare an industry wide waste minimization action plan by June 2003. 4. At least four model companies have implemented successful waste minimization programs as shown by reduction of waste volumes and economic savings in operations by June 2003. 5. One thousand copies of the guidebooks are published by July 2003, and 500 copies are disseminated to owners of Philippines companies by Aug. 2003. 6. Establishment of the award system is integrated into the national IEM Action Plan.	1. Fourteen CEOs participated in the closing workshop. 2. Four model companies and four participating companies established company wide waste minimizatio n teams. 3. Four industry associations developed industry-wide WM Action Plans. 4. Four model companies implemented WM measures and reduced production costs. 5. The guidebooks are to be printed and distributed in September 2003. 6. It will be incorporated into an award system under PEPP.	Top management of Philippine companies read the WM guidebook.	The guidebook has not been distributed as of August 2003.

(2) Summary of Project Evaluation

Based on the PDM prepared during the pilot project, the JICA Study Team evaluated the pilot project as follows.（see Annex 5 for PDM）.

Table 6.5.3 Evaluation of Waste Minimization Pilot Project

Evaluation Item	Evaluation Results	Basis for Evaluation
Efficiency	Slightly low	• Input of human resources for technical support in the field of production management and productivity improvement was not sufficient. • The study team members assigned for waste minimization dispatched to the Philippines do not necessarily have knowledge suitable to the Philippines companies. • Top management participation in the workshops was not sufficient. • Only four model companies and four participating companies established company-wide waste minimizations teams. • Target industry associations prepared industry-wide waste minimization action plans. • Four model companies showed actual reduction in waste volume and production costs. • Although the WM guidebook has not been published, it will be distributed to business owners in September 2003.
Effectiveness	Most achieved	• Thirty-five Philippine companies showed their commitment for waste minimization. • Industry-wide organizational structure has been established for tackling waste minimization.
Impact	Positive impact	• Four participating companies (FMC Marine Collids Phils. Basic Fruit Corp., Inc., International Chemicals, LMG Chemical Corp.) other than the model companies have implemented part of the waste minimization measures proposed during the waste minimization assessment. • PMAI (Philippine Metalcasting Association, Inc.) is discussing establishment of an industry-wide waste minimization team.
Relevance	High	• Waste minimization at companies leads to productivity improvement, which in conformity with basic government policy of development of SMEs.
Sustainability	Slightly low	• Institutional set-up has not been established for providing technical assistance in waste minimization and productivity improvement to companies in the sectors other than targeted ones only by ITDI staff (number of the ITDI staff with sufficient knowledge and experience is small). • Factory workers have not fully understood objective of waste minimization and importance of their full participation in tackling the waste minimization. • The system to financially support individual companies to have technical assistance has not been established. • The framework to disseminate model company's experience to other members of the industry association has been established through the development of industry-wide waste minimization action plans. • The coordination among PBE coordinating the industry, ITDI providing technical support, and BOI taking policy initiative has been developed.

(3) Conclusion

Although the model companies implemented waste minimization measures and achieved reduction in waste generation and production costs, the JICA study team evaluated efficiency of the pilot project as slightly low because achievement level of other outputs was not sufficient. The insufficient achievement of the other outputs is attributed to several factors; 1) input of human resources in the filed of production management was not sufficient because the timing that the JICA study team came to recognize importance of production improvement was late, 2) the JICA study team could not dispatch Japanese experts with techniques and knowledge suitable to characteristics of the Philippine industry because the time to look for experts was very limited, and 3) waste minimization activities of the participating companies other than the model companies were not promoted because the JICA study team could not fully follow up the their activities after the waste assessment due to time limitation. In addition, the JICA study team also evaluated sustainability of the pilot project as slightly low; it was physically impossible to enhance capacity of ITDI to be able to provide technical support for waste minimization due to limited time. Enhancement of ITDI capacity should be implemented under the training listed in the national IEM Action Plan.

"Top management read the waste minimization guidebook" was listed as important assumption to achieve project purpose with the outputs of the pilot project, but it revealed inappropriate because top management deepened their understanding of waste minimization through presentations at the workshops and declared their commitment for waste minimization.

6.5.2 Recommendations

(1) Establishment of Coordination Network with Experts in Production Management

Waste minimization should have been promoted from the viewpoints of not only reduction in environmental load but also productivity improvement, but the timing that JICA study team came to recognize importance of production improvement. This resulted in insufficient input of experts in that field, which consequently led to insufficient guidance in production management at the model companies and contents of production management in the WM guidebook. Especially, although all the staff (top management and floor workers)'s understanding objective of waste minimization and tackling with its activities is more important than adopting individual waste minimization techniques, importance of establishing an institutional structure for tackling waste minimization within a company was not shared within all the participating companies. As mentioned in Chapter 3, it is important to integrate production management component into a waste minimization project

because strengthening management basis through improvement of resource productivity is effective to increase top management commitment on waste minimization at SMEs and because production management is the basis of environmental management. It is desirable for future waste minimization projects to introduce basic policy of production management, steps to establish an internal structure for waste minimization, and ways to promote small group activity at workshops so that the participants understand the basis of environmental management. The future waste minimization projects are expected to be implemented by PBE, ITDI and BOI, the implementing body of this pilot project in coordination with production management experts groups such as organizations in charge of productivity improvement (Development Academy of the Philippines: DAP).

(2) Acquisition of practical experiences

The environment section of ITDI has been mainly conducting research on wastewater treatment; they are expected to acquire knowledge and practical experiences in the field of solid waste treatment, air pollutants management, and productivity improvement. Since there is a limited number of ITDI staff with rich experience in providing advices at factories, their active participation in trainings on CP held by JICA and other organizations is expected. In addition, it is important for ITDI to keep the staff who has acquired practical experiences.

(3) Presentation on costs and benefits of waste minimization measures to top management

Under the waste minimization pilot project, waste minimization measures were proposed as a part of waste assessment, but the JICA study team could not present estimated costs of implementation of the measures and reduction in production costs due to limited time. Although four participating companies other than the model companies implemented some of the proposed waste minimization measures, the more measures would have been implemented if estimated costs of implementation of the measures and reduction in production costs had been presented. It would be effective to provide information directly related to business management such as reduction in production costs in order to have commitment of top management.

(4) Introduction of fee contingent on success in technical support for waste minimization

In the Philippines, opportunities for SMEs to have technical support for waste minimization are limited to projects funded by aid organizations and dispatch of experts from private consulting firms and ITDI with fee payment. The former opportunities do not always exist and limited to specific industry sectors or companies. In the latter opportunities, there exist

a lack of financial resources to implement the technical advise and ambiguity of expected reduction in production costs. To encourage SMEs to actively tackle waste minimization as an opportunity to reduce production costs, introduction of a payment scheme for technical service that the amount of payment is determined according to actual reduction in production costs (waste minimization version of ESCO[1] project). That is, a certain portion of production costs reduced by implementation of waste minimization measures proposed by private consultants or experts dispatched from ITDI is paid to those who provide technical service as fee contingent on success. It is expected to consider expansion of ESCO project to the field of waste minimization.

(5) Firm implementation of industry-wide waste minimization action plans

Implementation of the industry-wide waste minimization action plans prepared during this pilot project depends on participation of member companies. Member companies' participation in the process of the action plan preparation was not intensive because waste minimization was listed as planned action in the BA 21 and because preparation time was short (representatives of industry associations prepared draft action plans and presented to their member companies). The industry associations are expected to fully discus contents of the action plans with their member companies and implement the plans.

(6) Sharing experience in project implementation

Experience in waste minimization acquired through implementation of this pilot project is integrated into the WM guidebook, which is to be distributed to top management of Philippine companies. It is desirable to disseminate the contents of the WM guidebook by uploading them on the IEM information website (see Chapter 7). The model companies shared their experience in waste minimization with participants of the closing workshop held under this pilot project; they are expected to disseminate their experience to companies in other industry sectors as resource persons at future seminars and workshops.

6.5.3 Lessons Learned

The waste minimization pilot project was implemented mainly by PBE, BOI, and ITDI, and the JICA study team provided technical support. Since the JICA study team's duration of stay in the Philippines was fixed, it had no other choice than communicating with the implementing body of the pilot project by email and telephone while the study team was not in the Philippines. Therefore, opportunities in which the implementing body of the pilot

[1] ESCO: Energy Saving Company

project and the JICA study team discuss waste minimization measures proposed by ITDI and conduct monitoring of waste minimization activities at the model companies were very limited; technical support from the JICA study team was not sufficient. Such situation was partly caused by the fact that the pilot project could not be implemented as scheduled (preparation took time, and schedule coordination was difficult among the relevant parties). It is desirable that experts who can stay in a longer term conduct technical transfer so that they can easily adjust to schedule change and provide proper advices through comprehensive monitoring of the project activities.

Chapter 7

IEM Information System Pilot Project

7 IEM Information System Pilot Project

7.1 Background and Objectives of the Pilot Project

7.1.1 Background of the Pilot Project

Information plays an important role when companies take actions for IEM. Those companies without knowledge about technologies and methods for waste minimization may refer practices of other companies in the same sector or hire outside consultants to identify current conditions and prepare measures. However, they would not be able to start the waste minimization activity if they do not have information about the technologies, the methods or the consultants. Moreover, after waste minimization measures are identified, when companies cannot finance process changes and introduction of new facilities by themselves, they need to borrow money from financial institutions. If they do not have information about low-interest loans applied to environmental projects, they would not be able to take advantage of such loans.

There exist in various forms (report, manual, CD-ROM, etc.) information useful to promote IEM such as technologies/methods identified or developed to minimize wastes, and IEM promotion tools such as environmental accounting, environmental reporting, and LCA. In addition, several sources are providing information about low interest loans and seminars and trainings related to IEM. There also exist lists of names and contact addresses of laboratories certified by DENR, environmental equipment manufactures, and environmental experts/consulting firms although they are not available from one source. The information can be found in hard copies stored in libraries and on various Internet sites. If the information is consolidated and arranged in a manner that one can easily search and obtain specific information, and if the information matches users needs and is credible, it would be helpful for Philippine companies to promote IEM.

PBE has bee playing a center role in providing information useful to promote IEM. It has been managing Environmental Technology Referral Scheme developed with assistance from USAID and providing companies with requested information from the technology database for waste minimization and end-of-pipe measures. In addition, it handles the industrial waste exchange program developed under the PRIME projected supported by UNDP; it manages information that makes it possible to industrial by-products are utilized among companies. Moreover, it administers the library specialized in IEM as the center of IEM information.

Considering above conditions, establishment of a framework to continuously improve quality of and access to IEM information and development of a website that enables user to search IEM information were adopted as a pilot project under EMPOWER.

7.1.2 Objectives of the Pilot Project

The integrated IEM information system pilot project aims to 1) create opportunities for those who are suppliers and users of information useful to promote IEM to assess and improve quality and accessibility of information, and 2) increase accessibility to information through establishment of an integrated IEM information system such as an IEM information clearinghouse. The integrated IEM information system shall support the promotion of IEM through timely provision and packaging of appropriate information for:

(1) Awareness Raising among Stakeholders
(2) Training of IEM Practitioners
(3) Technical Assistance to Industry, especially SMEs
(4) Policy Making in Government and Business

In this pilot project, a framework to continuously improve quality of and access to IEM information is established, and as one tool to provide IEM information in a convenient manner, a website is developed so that one can search existing information by IEM topic. The pilot project also aims to enhance PBE's function as a center to provide useful information to promote IEM.

7.2 Structure of Pilot Project Implementation

7.2.1 Parties Involved in Pilot Project Implementation

PBE and BOI/DTI are selected as the implementing body of the IEM Information pilot project at the 5th EMPOWER Steering Committee meeting. PBE has been acting as an environmental information center for business and industry through publication of Business and Environment magazine, planning and holding seminars and management of Industrial Waste Exchange Program. BOI/DTI is in charge of coordinating establishment of a partnership with ESPs for providing information and services useful to promote IEM. BOI's institutional partners such as EMB/DENR, ITDI/DOST, LLDA, and PEZA are assisting PBE and BOI for implementation of the pilot project. Financial and technical assistance for the project is provided by EMPOWER.

7.2.2 Roles of Relevant Parties

Roles of relevant parties for implementing the IEM information system pilot project are shown in Table 7.2.1.

Table 7.2.1 Roles of Relevant Parties for the IEM Information System Pilot Project

Party	Role
PBE	➢ Overall coordination and management ➢ Establishment and management of the IEM information steering committee comprised of relevant parties to manage the pilot project ➢ Preparation of contents for the integrated IEM information website including the development of IEM information database ➢ Announcement of the integrated IEM information website at relevant seminars
BOI/DTI	➢ Establishment and management of a working group on technologies/methods and tools to promote IEM, seminars/workshops and trainings on IEM, and environmental service providers
EMB/DENR	➢ Support to BOI in managing the working group ➢ Provision of information about existing technologies and other information useful to promote IEM
ITDI/DOST	➢ Support to BOI in managing the working group ➢ Provision of information and expertise about existing technologies and other information useful to promote IEM
LLDA	➢ Support to BOI in managing the working group ➢ Provision of information useful to promote IEM
PEZA	➢ Support to BOI in managing the working group ➢ Provision of information useful to promote IEM
EMPOWER Project	➢ Financial and technical support for preparation of policies on coordination and improvement of information useful to promote IEM ➢ Technical and financial support for collection and arrangement of existing information ➢ Financial support to establish an integrated IEM information website ➢ Technical support to develop institutional and financial arrangement to support the integrated IEM information system
Steering Committee	➢ Confirmation of overall planning and management of the pilot project ➢ Discussion on the integrated IEM information system ➢ Monitoring and evaluation

7.2.3 Establishment of Steering Committee

The steering committee was established to plan and monitor activities and evaluate outputs of the IEM information system pilot project; it is composed of the members listed in Table 7.2.2. Since UNDP has been implementing a project to promote IEM through information campaign, representatives of the project management organization (PMO) were invited to the steering committee for coordinating both activities.

Table 7.2.2 Member of the IEM Information System Pilot Project Steering Committee

	Organization	Name of Representatives
1	BOI-DTI (Implementing body)	Raquel Echague
2	PBE (Implementing body)	Lisa Antonio
3	PBE (Implementing body)	Mila Antofina
4	Clean & Green Foundation	Imelda Sarmiento
5	ITDI-DOST (Assisting organization)	Christopher Silverio
6.	DOST-ITDI/IPCT	Reynaldo Esguerra
7	PCAPI (ESP)	Jeffrey Mijares

	Organization	Name of Representatives
8	PSDN	Zeny Ugat
9	PAEAP (ESP)	Francisco Arellano
10	EPIC (UNDP project)-PMO	Georgina Sison
11	EPIC-PMO	Aloisa Santos
12	EMB-DENR	Leah Texson
13	JICA Study Team	Kaoru Oka
14	JICA Study Team	Precy Rubio

Besides the steering committee, a working group was established to discuss coordination and improvement of information on technologies/methods and tools to promote IEM, seminars/workshops and trainings on IEM, and environmental service providers; it is composed of the members listed in Table 7.2.3. The steering committee members are also the members of the working group.

Table 7.2.3 Member of the IEM Information System Pilot Project Working Group

	Organization	Name of Representatives
1	EMB-DENR (Assisting organization)	Elen Basug
2	LLDA (Assisting organization)	Dolora Nepomuceno
3	PEZA (Assisting organization)	Tonylyn Lim
4	PICPA (ESP)	Fatima Reyes
5	Land Bank of the Philippines (ESP)	Rey Peñalba
6	Development Bank of the Philippines (ESP)	Mar Enecio
7	Philippine Exporters' Confederation, Inc (Information user)	Leonor Abella

7.3 Purpose, Activities, and Schedule of the Pilot Project

7.3.1 Purpose and Outputs of the Pilot Project

The IEM information system pilot project set the following purposes and outputs:

Purposes

(1) Activities to coordinate and improve information useful to promote IEM are initiated.
(2) Information useful to promote IEM is provided in more understandable and applicable manner to Philippine companies with low technical expertise.

Outputs

(1) Framework of an integrated IEM information system (institutional and financial arrangement to support the maintenance as well as continuous improvement and updating of the information useful to promote IEM) is prepared for an input to the national IEM Action Plan.
(2) An integrated IEM information web site is developed and its service is commenced.
(3) Partnership between BOI and ESPs is initiated.

7.3.2 Outline of the Pilot Project

The IEM information system pilot project has the following components:

(1) Establishment of an IEM information steering committee to manage the project
(2) Preparation of framework of an integrated IEM information system (coordination and improvement of information on technologies/methods and tools to promote IEM, seminars/workshops and trainings on IEM, and environmental service providers)
(3) Mobilization of available resources to secure personnel and financial resources for the maintenance as well as continuous improvement and updating of the IEM information system
(4) Information collection and creation of IEM information database
(5) Development and commencement of the service of an integrated IEM information website
(6) Policy dialogues between BOI and IEM information providers through the working group

7.3.3 Pilot Project Implementation Schedule

The IEM information system pilot project was carried out from Novemebr 2002 to August 2003 as shown in Table 7.3.1. Activities of the steering committee are summarized in Table 7.3.2 (see minutes of the meetings in Annex 7.1 for details of the discussions).

Table 7.3.1 IEM Pilot Project Implementation Schedule

Month	Project Activity
Nov. 2002	➢ Establishment of the IEM information steering committee and discussion on useful integrated IEM information system (Nov. 28, 2003) ➢ Establishment of a working group to discuss coordination and improvement of IEM information (Nov. 28, 2003) ➢ Identification of IEM information users and providers' needs and issues ➢ Discussion on the structure and contents of the IEM information website
Dec. 2002	➢ Survey on IEM information users and providers' issues and needs ➢ Selection of database service provider ➢ Collection of information to be included in the integrated databases
Jan. 2003	➢ Consolidation of the databases from different agencies
Feb. 2003	➢ Identification of IEM information users and providers' needs and issues ➢ Discussion on the draft structure and contents of the IEM information website ➢ Development of website structure and contents
Mar. 2003	➢ Development of the draft IEM information website ➢ Discussion on the integrated IEM information system
Apr. 2003	➢ Upload of the draft IEM information website contents and internal commenting ➢ Discussion on the integrated IEM information system
May 2003	➢ Revision and development of the draft IEM information website contents ➢ Acquisition of the domain name (www.iem.net.ph) ➢ Finalization of the framework of the integrated IEM information system
Jun. 2003	➢ Announcement of the IEM information website at the EMPOWER seminar (partial launching of the IEM information website) ➢ Revision and development of the IEM information website contents
Jul. 2003	➢ Finalization of the institutional and financial arrangement for the integrated IEM information system ➢ Maintenance and updating of the IEM information website (continues

Month	Project Activity
	hereafter)
Aug. 2003	➢ Establishment of Editorial Committee to supervise the IEM information website ➢ Full launching of the IEM information website ➢ IEM information seminar ➢ Evaluation of the pilot project

Table 7.3.2 Summary of the Steering Committee Activities

	Date	**Activity**
1	Nov. 28, 2002	➢ Establishment of the steering committee ➢ Selection of working group members ➢ Confirmation of pilot project activities ➢ Identification of current status of information on cleaner production and pollution prevention ➢ Discussion on IEM information users and providers' needs and issues ➢ Discussion on structure and content of the IEM website
2	Feb. 3, 2003	➢ Identification of existing IEM databases ➢ Presentation on the findings of the survey regarding IEM information users and providers' needs and issues ➢ Discussion on design and content of the IEM website ➢ Data gathering for inclusion in the IEM website
3	Mar. 5, 2003	➢ Discussion on a framework of proposed IEM information system ➢ Confirmation of contract work of the website developer ➢ Confirmation of the progress of the website development
4	Apr. 2, 2003	➢ Confirmation of the progress of the website development ➢ Discussion on the proposed IEM information network ➢ Discussion on the draft design and contents of the IEM website
5	May 13, 2003	➢ Approval of the revised framework of the IEM information network ➢ Discussion on the draft terms of reference of the Editorial Board ➢ Discussion on strategies to support/sustain the IEM Knowledge Network ➢ Discussion on the draft IEM Knowledge Network brochure
6	Jun. 5, 2003	➢ Review of the IEM.Net website and revised brochure ➢ Review of the draft project proposal for sustaining IEM Knowledge Network entitled "Industrial Environmental Extension Program" or "INDENET" ➢ Discussion on the IEM information system pilot Project Development Matrix ➢ Discussion on June 9 IEM Knowledge Network launching ➢ Planning on IEM Knowledge Network seminar ➢ Confirmation of the schedule (project evaluation in August 2003)
7	August 11, 2003	➢ Seminar on IEM Knowledge Network ➢ Policy dialogue with ESPs
8	August 12, 2003	➢ Confirmation of the results of the pilot project and evaluation

7.4 Activities of the Pilot Project

7.4.1 Framework of an Integrated IEM Information System

(1) Identification of Current Status of IEM Information

As the first step to develop comprehensive design of an integrated IEM information system, source, content, type, and form of information were identified. Sources of the IEM information include DENR (library, Undersecretary for Policy and technical Services, EMB), BOI (PRIME-UNDP), DOST-IPCT, TLRC, University of the Philippines, De la Salle University, Development Bank of the Philippines, Land Bank of the Philippines, and USAID, ADB, World Bank, Asia Pacific Roundtable for Cleaner Production, PBE, management Association of the Philippines, UNEP, USEPA, Global Environmental Initiative, GreenBiz.com, and World Resources Institute (see Annex for details). The information is mainly in hard copies, but some are in electronic files. The currently available online resources are as follows:

From Government

- DENR – EMB. Website: www.emb.gov.ph (former PRIME SME Desk)
- DOST – ITDI: Integrated Programme on Cleaner Production Technologies (IPCT). Website: http://cptech.dost.gov.ph
- DTI - BOI. Website: www.boi.gov.ph
- Development Academy of the Philippines – Productivity Development Center. Website: www.dap.edu.ph

From Non – Government

- PBE. Website: www.pbe.org.ph
- Asia Pacific Roundtable on Cleaner Production (APRCP) – Manila Chapter. Website: www.aprcp.org

Others

- National Cleaner Production Centre (NCPC) for the Philippines to be established by the United Nations Industrial Development Organization (UNIDO) with the APRCP as local host.

(2) Identification of IEM Information - related Issues

Issues and concerns of IEM information in the Philippines were discussed at the IEM information system pilot project steering committee and the working group using the matrix below (see Table 7.4.1). Comments were also solicited from stakeholders from industry, private sector / professionals, government, academe, and others who work with industry (see a summary matrix of IEM Information Users/ Providers' Needs and Recommendations in Annex).

Table 7.4.1 Identification of IEM Information

IEM Information	Current Status			Issues	Recommendations/ Actions
	Who	What info provided/ needed	How info is shared/ sought		
Technologies/methods identified or developed to minimize wastes					
EMS tools such as environmental cost accounting (ECA), environmental reporting and life cycle analysis (LCA)					
Seminars and trainings related to IEM					
Financial Instruments					
Available environmental services such as names and contact addresses of laboratories, environmental equipment, manufacturers and environmental experts/consulting firms					

Priority IEM information concerns of the stakeholders are the following:

- More sector – specific information and interventions
- More specialized information related to the management of toxic substances and hazardous waste,
- Better archiving of IEM project outcomes and reports,
- Trainings on emergency preparedness.

In addition, IEM information - related issues identified in the EMPOWER project and roundtables are:

- Limited dissemination of IEM experience and knowledge (with limited transfer of successful IEM model projects
- Awareness gap among industries (particularly for domestic – oriented industries)
- Limited capacity of Environmental Service Providers (and limited demand for their services)

(3) Identification of IEM Information Users and Providers

An Integrated IEM Information System is a vehicle for promoting IEM adoption and supporting the industry's environmental efforts. It should respond to the needs of both the ***information users and providers***, where in some cases these roles could be interchanged for an individual or entity.

Information users are those needing access to IEM information for various reasons, (whether private sector / non – business (such as non – profit organizations, consultants), government, international organizations, academe and others who work with business), e.g.

- Unable to locate the proper information, resources or technologies they need;
- Looking for guidance on how to start
- Needing help to solve a specific problem such as where to send / dispose / treat waste or where to find a consultant
- Wanting more information on something they may have heard (such as a technology or legislation)
- Wanting expert advice or alternative solutions.

Information providers are those who need to bring IEM information to the users, because they feel these can help the latter address their IEM requirements. This can range from sharing of simple announcements about seminars to a range of services from Environmental Service Providers (ESPs) that include engineering and technical assistance, training and education, consulting (e.g. for Environmental Impact Assessment study preparations and feasibility studies), laboratory testing and analysis, environmental suppliers.

(4) Objectives of an Integrated IEM Information System

Taking the current status and issues of the IEM information into account, the steering committee adopted the objectives of an Integrated IEM Information System as shown in Table 7.4.2. The first two (information and matching) are the main objectives.

Table 7.4.2 Objectives of an Integrated IEM Information System

Objective	Description
➢ To ***inform*** (Information Objective)	i.e, make general IEM information available and accessible to industry , and regularly provide and disseminate updates on environment – related developments, trends, studies and reports relevant to industry Desired result: IEM information clearinghouse contributing to increased levels of industry environmental awareness
➢ To ***link*** (Matching Objective)	i.e., encourage more intra / inter – industry collaboration, match partnership opportunities with resources, initiate partnerships along common / mutual lines of interest (such as between government and business / investors, donor organizations and industry associations); strengthen industry demand of ESPs and environmental financing Desired result: More consummated partnerships on IEM, whether one – shot or strategic / public – private sector; increased industry use of ESPs
➢ To ***promote*** (Advocacy/Promotions Objective)	i.e., campaign for and influence industry to adopt CP and environmental concepts, principles, tools (e.g. EMA), technologies, practices and codes of conduct Desired result: Increased levels of industry compliance, environmental commitment and best practices

Objective	Description
➢ To ***empower*** (Capacitating Objective)	i.e., extend assistance to firms for achieving compliance and eco – efficiency via advisory, consulting, technical assistance services (e.g. technology packaging) Desired result: Successful, documented IEM models

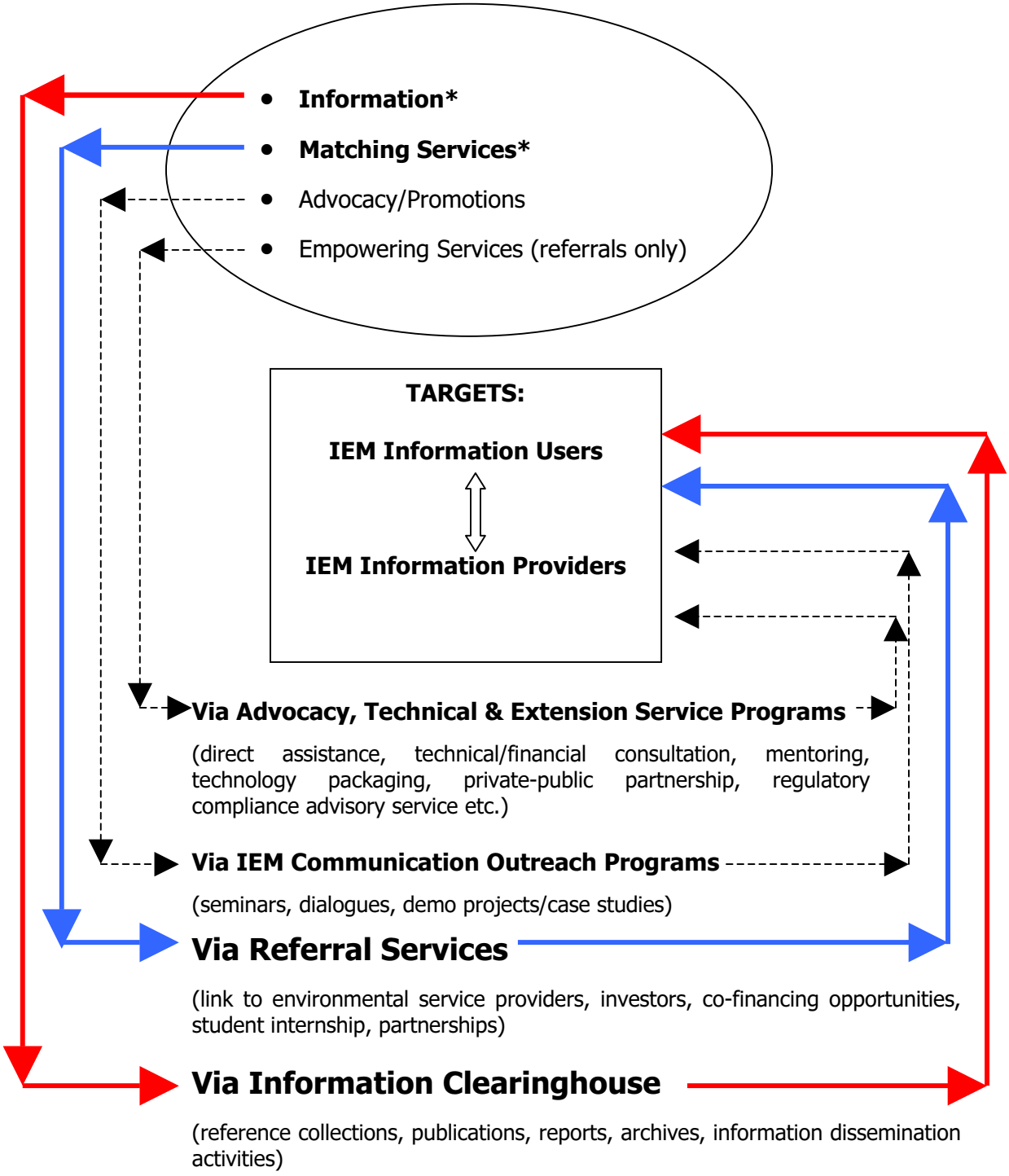
An integrated IEM information system integrates environmental information services available to industry using an "industrial extension model" which links IEM information users with information providers, and with organizations that already have active environmental outreach, trainings and technical assistance services, to achieve a multiplier effect. Graphical presentation of the objectives is shown in Figure 7.4.1.

(5) Characteristics of an Integrated IEM Information System

In addition to accomplishing the objectives, an Integrated IEM Information System should ensure the following:

- It remains relevant (i.e., it is industry – based and industry – defined; addressing the needs of its key stakeholders who are mainly the information users and providers).
- It is accessible (with due consideration for the means of access of its users).
- It is updated (particularly because the state of the art is rapidly changing with growing experience).
- It is known (and therefore needs to market itself).
- It effectively networks with complementary programs (rather than competes /excludes, reinvents or unnecessarily duplicates them).
- It is used (i.e., it is reaching its target users and they find it helpful).

What an integrated IEM information system can potentially deliver?



Note[1]: * Primary goals of the IEM Network
_ _Secondary goals
Note[2]: Quarterly review and enhancement of the IEM Information System through an Editorial Board

Figure 7.4.1 Objectives of an Integrated IEM Information System

(6) IEM Knowledge Network as a Model of an Integrated IEM Information System

The proposed Model for an Integrated IEM Information System will be named as Integrated IEM Knowledge Network and have the following characteristics:

- Will work with existing entities which are not physically located in one facility but are similarly engaged with providing industrial environmental information and assistance and who share the same vision for enhanced industry competitiveness through IEM. (These entities are independent from each other, with their own staff and specialists as well as funding source.)
- Will use an 'Industrial Extension' model which adopts from an agricultural extensions model, in which the latter uses multiplier organizations with active outreach, training and technical experiences to disseminate the latest experiences, practices and technologies to farmers, although in this case, the target will be industry.
- Will integrate the environmental information services of the Network partners via a "command center", hosted by one of the Network partners
- Scope of information assistance it will provide, will depend largely on the network membership and the range of services they are capable of

Potential service areas of the I*ntegrated IEM Knowledge Network* are:

- ***IEM Information Clearinghouse***: responding to general IEM inquiries, maintaining and updating a core collection of web – based IEM references, publications, reports, archives of IEM Projects; hyperlinks with other websites (e.g. for environmental legislation, pending bills); and with information dissemination activities that can include publications, newsletters, video and CD productions, exhibits, study tours/ facility visits
- ***IEM Outreach Program***: for IEM advocacy and promotions via seminars, dialogues, academic tie – ups, demonstration projects, case study documentations, publications, IEM proposal development and packaging
- ***IEM Matching Programs***: via referral services to environmental service providers, investors' fora, business ventures, donor matching, co - financing opportunities, student internships, public – private partnerships
- ***IEM Advisory and Technical Services***: through counseling / direct assistance to businesses for cost – effective compliance and pollution prevention, business proposal preparation and financing; availment of incentives; confidential technical consultation and on – site visits; mentoring, technology verification, technology packaging /and /or incubation

(7) Organizational Set-up for Integrated IEM Knowledge Network

The Integrated IEM Knowledge Network will have a single coordinating entity which is non – government and with the internal technical grasp and capability as well as networking and marketing skills to shepherd each program area. It will be a joint effort of several organizations / agencies with a common vision for IEM adoption and who are already involved in IEM information dissemination and assistance with the respective Heads / representatives of the organizations serving as members of the IEM information system steering committee. As its initial task, the steering committee contributes all possible IEM information resources, literature and publications to the Network, and prepares a business

plan. It meets regularly to discuss better coordination and collaboration opportunities, as well as how to improve services and review and monitor progress.

(8) Financial Arrangement for Integrated IEM Knowledge Network

Financial requirements for the Integrated IEM Knowledge Network are estimated as PHP 1,176,00 per year for manpower and direct costs that are necessary for providing services in the main areas (information and matching objectives) of an integrated IEM information system. Additional PHP 503,000 per year would enable the Network to provide services in the remaining areas (advocacy/promotion and capacitating objectives). Funding for the Network has been discussed at the steering committee and the working group of the pilot project but not concluded. It can initially be donor – sourced and subsequently come from the contributions of its members and revenues for its services. As of the end of June 2003, DBP has shown its interest in hosting the IEM Knowledge Network (website), and the following revenue generating activities has been proposed:

- Charging a fee from the IEM Knowledge Network users for some specific information/data in the network or added service requested
- Charging a fee from ESPs and/or PBE member companies for advertisement of their business on the IEM Knowledge Network

7.4.2 Establishment of the IEM Information Website (IEM Knowledge Network)

(1) Objectives of the IEM Information Website

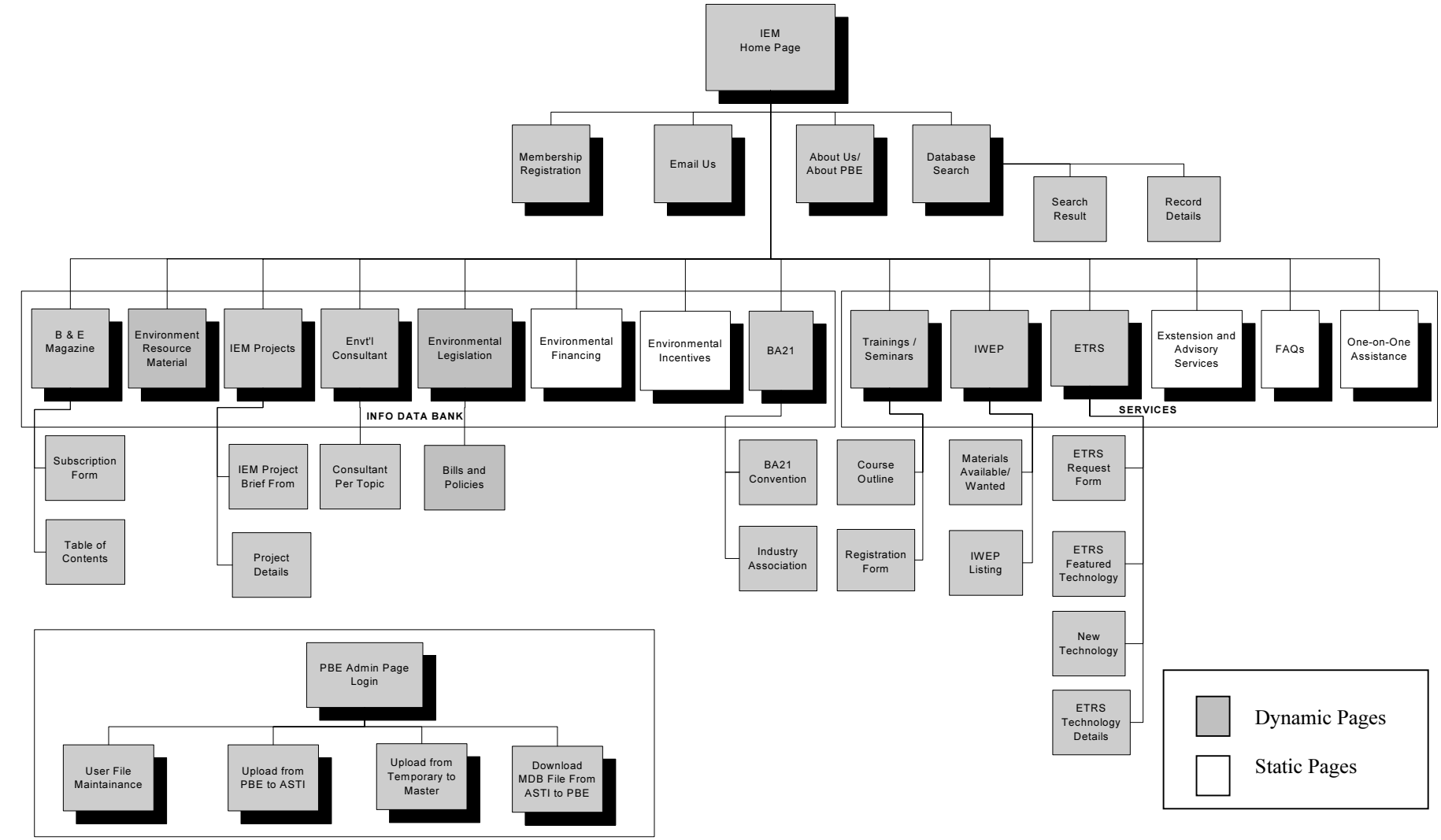
The IEM information website (IEM Knowledge Network) has been developed with the following objectives:

- To facilitate access to industrial environmental information in response to the needs of Philippine companies particularly SMEs
- To develop an IEM information clearinghouse which consolidates the databases from PBE, EMPOWER, DOST, DENR and other sources useful to IEM promotion
- To develop a mechanism that will make the IEM information website self-sustaining

(2) Structure of the IEM Information Website

The concept of an IEM information website is an interactive and self-supporting website which hosts PBE's enviromnental databases and is linked to the other related environmental website containing useful information to promote IEM. The structure of the website is shown in Figure 7.4.2.

PBE SITE MAP



Note IWEP: Industrial Waste Exchange Program
ETRS: Environmental Technology Referral Scheme

Figure 7.4.2 Structure of the IEM Information Website

(3) Contents of the IEM Information Website

1) IEM Knowledge Network Homepage

Home

This stands as window into the information, description and features contained in the IEM Knowledge Network. Text and images are clickable to get to the website's specific pages (see Figure 7.4.2).

- A brief paragraph or statement that defines the IEM Knowledge Network, its partner agencies, its goals and vision and its funding agency (JICA).
- A section of this page highlights Briefs that present a teaser listing of the latest goings-on in PBE and some environmental info. It may feature current seminars, new environmental technologies, new publications or the latest PBE-sponsored events. The information will be stored and maintained in a database.
- There is also a space on this page for companies or businesses to post commercial advertisements in the website. This feature is manually updated for changes.
- Top Menu – This area contains the links to pages that presents what agencies manages the website, its networks, its members and its supporters. It also contains its mission statement, its members (Charter and Regular) and its Board. It also contains the E-mail Us feature.
- Navigation Menu – A guide on the left portion of the page where it lists the links to all the featured items of the website.
- Date information.

Member Registration

This provides online registration for companies or organizations that wish to be part of IEM Knowledge Network. The member registration information shall be stored in a database for PBE's subsequent processing.

PBE Database Search

This shall allow interested users to look into the records of the PBE Database. The user selects a specific PBE area such as IWEP, ETRS and then enters a keyword. Then all the records found in the PBE area database that match the keyword will be listed.

At present, a clickable icon on the upper right corner holds EMPOWER logo and guides visitors to the EMPOWER homepage; this field will be used in the future for putting

advertisement of ESPs or PBE member companies for fundraising purposes. Figure features the IEM information website homepage.

2) Business and Environment Magazine

The Business and Environment Magazine page introduces the cover page and table of contents of the latest issue of the magazine. It also shows titles and prices of the back issues. For those who want to subscribe the magazine, clicking the icon enables them to place their order through the Internet.

3) Environmental Resource Materials

This lists all hardcopy information, books, resources and technologies available in the PBE library.

4) IEM Projects

The IEM projects page lists previous and on-going IEM-related projects. When one clicks the title of a project, year of implementation, funding agency, implementing agency, major accomplishment, and relevant website appear in a pop-up window.

5) Environmental Consultants

This provides a free information referral service for industry request for resource persons on topics related to business and environment. A list of available topics can be viewed and a form shall be provided for interested parties to request from PBE the speakers for specific environmental topics that they need. It links to the list of environmental laboratories recognized by DENR.

6) Environmental Legislation

This page contains list of Philippine legislations under certain categories such as environmental laws, general laws, etc. Retrieval of the details of the laws links the surfer to the EMB-DENR website.

7) Environmental Financing

This static page provides the interested organizations with information on the available financing programs from the banking sector, for their environment-related projects. This contains a short description on the list of requirements to avail of the assistance of the financing institutions that provide lower interest loans for environmental projects of the interested SME.

Figure 7.4.3 IEM Information Website Homepage

8) Business Agenda 21 (BA 21)

The Business Agenda 21 page explains the objective and features of the BA 21. When one clicks the icon, BA 21 Associations, names and contact numbers of the industry associations participated in BA 21 appear in the pop-up window.

9) Productivity Improvement

The Productivity Improvement page was specially developed for this website to introduce philosophy of productivity management, which contributes to environmental performance improvement. Practical steps to improve resource productivity through small group activity are presented, and useful tools for conducting small group activity are introduced. Relevant links are also listed. Details of the contents are shown in Annex.

10) Training/Seminars

The Training/Seminars page announces venue and schedule of upcoming trainings and seminars on IEM related issues. When one clicks the title of a training/seminar, topics covered in the program appear in the pop-up window. This site enables visitors to see s list of planned trainings/seminars and to register through the website by inputting necessary information.

11) Industrial Waste Exchange Program (IWEP)

The IWEP page presents on-going waste information exchange service that matches companies who are looking to buy, sell, trade, and recycle by-product materials. List of available and wanted materials can be seen in a pop-up window by clicking the icon, Available/wanted materials. Viewers can search listed materials using the search engine on the IEM Knowledge Network homepage. Those who have available materials or want to list their needs for materials can register by sending the listing form through the website.

12) Environmental Technology Referral Scheme (ETRS)

The ETRS page introduces the service of referring environmental technology in response to requests from those who want to identify helpful technologies. There are several environmental technologies listed on the page; when one clicks the name of a technology, description, application, benefits, manufacturer/supplier, and information source appear in a pop-up window. Those who want to use the referral service can send their request for information about environmental technologies meeting their needs through the website; they will be contacted by the site manager, PBE, for the information. Those who want to list their technologies on the website can send their registration through the website. Viewers

can search environmental technologies using the search engine on the IEM Knowledge Network homepage.

13) One-on-One Assistance

This contains the list of services that the network agencies can offer with SMEs. Unlike the MAJOR LINKS, this webpage contains the contact details of the experts that can assist the SMEs. These people have close coordination with the IEM Knowledge Network and can render services to the SME.

14) Major links to other databases

For viewers to get additional information, the following links are made on the Extension and Advisory Services page.

Table 7.4.3 List of Major Links

Category	Linked Organization
Trainings and seminars on environment	Philippine Business for the Environment National Economic and Development Authority
Technical and consultancy assistance	Department of Science and Technology Department of Environment and Natural Resources
Feasibility study and financial assistance	Development Bank of the Philippines Land Bank of the Philippines Asian Development Bank
Regulatory and other legal environmental issues	Department of Environment and Natural Resources Department of Science and Technology Laguna Lake Development Authority
International Network Assistance	World Business Council for Sustainable Development United Nations Environment Programme US Environmental Protection Agency Pollution Prevention Roundtable

15) FAQs

Frequently asked questions regarding the website and their answeres are presented.

16) About IEM

The About IEM page lists network members of the IEM Knowledge Network that promote sustainable development through the promotion of environmental information; both hard and soft technologies .

17) About PBE

PBE's history, board of Trustees, staff, and members companies are presented on "About PBE" page. Viewers can send email to PBE by clinking the icon of "Email us."

(4) Full Launching of the IEM Information Website

The address "www.iem.net.ph" has been obtained for the IEM information website, and partial launching of the website was announced as one of the opening events of the Environment Exhibit in June 2003. The IEM inforamtion website became fully operational in August 2003.

(5) Enhancement of PBE's Capacity to Maintaine Website

Through attending the following trainings under the pilot project, PBE is now capable of maintaining local area network, server/network administration, basic PC troubleshooting and maintenance, webpage design/maintenance and database management.

Table 7.4.4 Contents of Training on Website Management for PBE

Month	Contents of Training	Training Implementor
Dec. 2002	Basic Orientation Training for Microsoft Windows 2000 Server Administration	Hardex Computer Center
Jan. 2003	Basic PC/Network Troubleshooting	Hardex Computer Center
Mar. 2003	Database Management and Updating	Ayala Systems Technology, Inc. (ASTI)
Apr. 2003	Orientation Training on Webpage Design using Macromedia Dreamweaver MX	ASTI
Aug. 2003	Basic PC Networking	Computesaurus Computer Center

(6) Institutional Arrangement for Susutaining the IEM Information Website

The IEM information website (IEM Knowledge Network) is supervised by a multi-sectoral organization, Editorial Committee. Roles of the Editorial Committee are the following:

- Ensure that the website is professionally maintained and is regularly updated and remains relevant its targeted audience
- Meet quarterly to review and suggest enhancements for the website
- Develop and implement appropriate policies and guidelines for information posting on the website
- Help in the promotion of the website
- Promote support to the Network's communications activities
- Assist with the funds generation to ensure sustainability of the website

The Editorial Committee is composed of representatives from the following organizations and was established in August 2003 (see Annex 7.4 for minutes of the meeting).

- Board of Investments – Department of Trade and Industry (BOI-DTI)
- Environmental Management Bureau – Department of Environment and Natural Resource (EMB-DENR)

- Laguna Lake Development Authority (LLDA)
- Industrial Technology Development Institute – Department of Science and Technology (ITDI-DOST)
- Industry Association (Philexport)
- Philippine Business for the Environment
- Clean & Green Foundation, Inc.
- Financial Institution (Land Bank of the Philippines, Development Bank of the Philippines)
- Information Technology Agency (Ayala Systems Technology, Inc[1])
- Media (Environmental Broadcasting Corp.)

7.4.3 Promotion of IEM Information Website

(1) Dissemination of Leaflet

Leaflets shown in Annex 7.5 were prepared to promote use of the IEM information website. They were distributed to the participants of the 4th EMPOWER seminar and the closing workshop of the waste minimization pilot project and will be distributed at other seminars organized by PBE in the future.

(2) IEM Information Website Seminar

IEM information website seminar was held to explain how to use the website at BOI's audio and visual room on August 11, 2003; the seminar was focused on how to search information about environmental technologies and financial assistance scheme using the website. The program is listed in Annex 7.6.

Sixty-five participants came from industry associations, SMEs, and government organizations (see Annex 7.7). Among the 35 participants who turned in the feedback form, 30 participants answered that IEM Knowledge Network was useful information tool to themselves and/or their companies, and three participants said that it would help promoting their services to the industry. High expectation toward IEM information website was identified as a tool to get information about IEM related technologies, environmental services, and waste management (see Annex 7.8 for the results of the participants' feedback).

7.4.4 Development of Partnership between BOI and ESPs

As the first step to establish partnership between BOI and ESPs, a policy dialogue between them was held in order to identify needs and concerns of ESPs on August 11, 2003. Total of 19 representatives from technology supplier, engineering services, consultants, educators, laboratories, and financial institutions attended the dialogue and provided the following recommendations:

[1] Developer of the IEM information website.

(1) Incorporation of environmental modules e.g., eco-industrial development module of PATLEPAM (to be started next year) under EPIC or Environmental Cost Accounting in the academic curriculum;

(2) Formation of the Editorial Board of the IEM Knowledge Network with ESPs included as member;

(3) Matching of company projects/proposal with appropriate ESPs – could be for a fee;

(4) Specific information on the available loan facility (and other services) for specific type of project;

(5) Incentives for ESP activities – as listed in 1999 Investment Priorities Plan of the BOI;

(6) Special pricing for SMEs of EEC consultations; and

(7) Annual trade fair or exhibit with special feature on environment involving ESPs and SMEs – could be tied up with DTI's SME week and supported by DENR.

7.5 Summary of the IEM Information System Pilot Project

7.5.1 Empowerement of Relevant Parties through Pilot Project Implementation

The IEM information system pilot project aimed to enhance capacity of relevant parties through project implementation. Table 7.5.1 summarizes targeted parties and types of the empowerment through the project implementation (from November 2002 to August 2003).

Table 7.5.1 Empowerment of Relevant Parties through the IEM Information System Pilot Project

Target	Type of Empowerment	Method
PBE	Organized IEM information providers and established an institutional framework to provide IEM information	Project implementation
	Internalized the IT skill to maintain the IEM information website	Training on maintenance of website
Companies with Internet access	Became able to obtain IEM information through Internet	Launching of IEM information website, Seminar on the use of IEM information website
ESPs	Obtained another channel to provide information to potential customers	Launching of IEM information website
	Increased opportunities to reflect their needs and concerns to government policy	Policy dialogue with BOI
IEM information providers	Obtained another channel to provide IEM information	Launching of IEM information website
	Established a structure of cooperation for improvement of IEM information	Design of INDENET

7.5.2 Evaluation of the Pilot Project

(1) Results of the Pilot Project

The IEM information system pilot project steering committee evaluated the project using the PDM in August 2003, when the project was almost completed. The members of the committee confirmed that most of the results that were planned at the beginning have been realized although it is necessary to change contents of the website (see Table 7.5.2).

Table 7.5.2 Results of the IEM Information System Pilot Project

Project Summary	Objective Verifiable Indicators	Results	Important Assumption	Status of Assumption
Overall Goal 1. More companies obtain useful IEM information from the integrated IEM information system to promote IEM. 2. Environmental service providers (ESPs) expand their business chances through the integrated IEM information system. 3. Industries can participate in the seminars relevant to IEM in a more planned manner through utilizing the integrated IEM information system.	1. Average 100 visits of the IEM Knowledge Network per month are counted by June 2004. 2. More than 30 % of ESPs that put advertisement on the IEM Knowledge Network expand their business chances by June 2004. 3. More than 30 % of the participants to seminars relevant to IEM evaluate that the integrated IEM information system is helpful to plan attending the seminars by June 2004.	Unable to obtain information	The IEM Knowledge Network is continuously updated and improved.	The IEM Knowledge Network is updated every two weeks.
Project Purpose 1. Activities to coordinate and improve information useful to promote IEM are initiated. 2. Information useful to promote IEM is provided in more understandable and applicable manner to Philippine companies with low technical expertise.	1. The Editorial Committee of the IEM Knowledge Network is established and starts its activities by August 2003. 2. More than 30% of the users of the IEM Knowledge Network evaluates that IEM information provided through the network is more understandable and applicable than before by June 2004.	1. The first Editorial Committee meeting was held on Aug. 7, 2003. 2. A survey will be carried out for seminar participants in Jun. 2004.	The Editorial Board of the IEM Knowledge Network fulfills its responsibility.	Impossible to judge at this point
Outputs 1. Framework of an integrated IEM information system (institutional and financial arrangement to support the maintenance as well as continuous improvement and updating of the information useful to promote IEM) is prepared for an input to	1. Framework of an integrated IEM information system is prepared and integrated into the national IEM Action Plan by July 2003. 2. An integrated IEM information web site is developed and its service is commenced by June 2003.	1.The framework has been integrated into the IEM Action Plan. 2.The website was launched partially in Jun., and fully in Aug. 2003. 3.BOI identified	1. Resources necessary for the realization of the framework are secured. 2. Enough number of IEM information users and providers are utilizing the	1. Resources have not been secured. 2. Impossible to judge at this point

Project Summary	Objective Verifiable Indicators	Results	Important Assumption	Status of Assumption
the national IEM Action Plan. 2. An integrated IEM information web site is developed and its service is commenced. 3. Partnership between BOI and ESPs is initiated.	3. Needs and concerns to promote ESPs are identified by BOI by July 2003.	ESPs' needs through the policy dialogue.	IEM information web site	

(2) Summary of Project Evaluation

Based on the PDM prepared during the pilot project, the JICA Study Team evaluated the project as follows:

Table 7.5.3 Evaluation of IEM Information System Pilot Project

Evaluation Item	Evaluation Results	Basis for Evaluation
Efficiency	Slightly high	• Equipment necessary to develop the IEM information website was supplied without any delay. • A framework of an integrated IEM information system was designed. • The IEM information website became fully operational with two-month delay. • The IEM information website has not fully utilized the existing IEM information whose contents, forms, and sources are identified.
Effectiveness	One purpose was achieved as of Aug. 2003	• The activity to improve and coordinate IEM information was started (the meeting of the Editorial Committee for the IEM information website was held in Aug. 2003). • It is impossible to judge whether information useful to promote IEM is provided to the Philippine companies without knowledge of high technology in more understandable manner before feedback from users of the IEM information website is obtained.
Impact	Positive impact	• For industries, means to obtain IEM information are increased. • For ESPs, means to provide information to their potential customers are increased. • Companies became able to obtain comprehensive information about seminars related to IEM if they have an access to Internet.
Relevance	Slightly high	• Provision of IEM information meets the needs of the industry. • There is no major improvement in providing IEM information to those who do not have an access to Internet.
Sustainability	Slightly high	• Although necessary funds for maintaining and updating the IEM information website have not been secured, financial independence, for example by collecting advertisement fees, has been pursued. • PBE staff is now capable to update/develop web pages and manage the database through the training. • The structure of cooperation among relevant government organizations, private companies, PBE, and donor agencies to promote environmental services to the industry (INDENET: Industrial Environmental Extension Program) has been developed and integrated into the IEM Action Plan. Donors who would support the INDENET are being sought.

(3) Conclusion

The IEM information system pilot project was highly evaluated in the items other than effectiveness. The evaluation results are attributed to high capability of the implementing body and easiness of the project to be managed due to simple combination of project activities.

The output 3 was originally set as "Partnership between BOI and ESPs is established," and the project aimed to develop BOI policies to promote ESPs. Since the number of the BOI staff who could be involved in EMPOWER is limited, a wide range of activities such as attending steering committee meetings of the other pilot projects and preparing BOI's green procurement policy, EMS, and IEM Action Plan left little time for the BOI staff to prepare BOI's policy to promote ESPs.

Considering this situation, the output 3 was changed to "Partnership between BOI and ESP is initiated," and the project targeted identifying needs and concerns of ESPs. Because establishment of BOI-ESP partnership was not considered as must-to do during the pilot project period and not crucial for achieving the project purpose, this change was appropriate.

7.5.3 Recommendations

(1) Continuation of Policy Dialogue between BOI and ESPs

Under this pilot project, due to time limitation, only the first step for establishment of partnership between BOI and ESPs (identification of needs and concerns of ESPs) was taken. During the policy dialogue held between the BOI and ESPs, the latter expressed their requests such as asking BOI to be a mediator to match a ESP and SMEs in the same sector for cost reduction in acquisition of ECC and their willingness to continue the policy dialogue with BOI. It is desirable that BOI will continue the dialogue with ESPs and develop and implement adequate measures to promote ESPs.

(2) Higher Utilization of Existing IEM Information

Under this pilot project, contents, forms, and sources of existing IEM information were most identified (see Annex 7.2). It is recommended that the Editorial Committee of the IEM information website select from the existing IEM information those still useful to promote IEM and upload them in a downloadable format at the IEM information website.

7.5.4 Lessons Learned

Because PBE, the implementing body of this project, has experiences in functioning as IEM information center, the project activities were smoothly carried out. Information about

experiences in the related field is very useful to evaluate capability of an implementing body of a project.