4.2 Foundry Industry WM Case Study – The Experience of Acetech Metal Company

4.2.1 Company Profile

The Acetech Metal Company is located in Valenzuela City, Metro Manila. It has a total land area of about 4,320 square meters, 1,300 square meters of which is occupied by the processing plant and office building. The company began its trial operation in July 2002 and its actual operations started three months after. It has a production capacity of 18-20 tons per month and currently operates 8 hours per day with only one shift daily for about 300 days per year. The company employs about 12-14 employees with the operations being managed by Engr. Napoleon J. Tanganco. Some of the products produced by the plant include ferrous castings of manhole, pump casing, clamps, machine parts and gears.

4.2.2 Process Description

Acetech Metal Company manufactures ferrous castings such as carbon steel, gray and ductile cast iron, and low and high alloy steel. Its main operations include design, mold making, melting and casting. After the molten metal is solidified, sand shakeout and removal of the superfluous metal follows before grinding and shot blasting for clean finishing of the product.

4.2.3 Waste Stream Generated

Acetech generates solid wastes and gaseous emissions from its processes. Its solid wastes include slag, fly ash, saw dust, spent sand, and spilled metals. To reduce these, Acetech is undertaking several waste management activities.

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

On the other hand, gaseous emissions such as carbon monoxide, carbon monoxide, suspended particulate matter, and nitrogen oxides are emitted during the operation of the cupola furnace. The company uses a cyclone, a heat exchanger, and a bag house as pollution control systems to rebate these gaseous emissions.

4.2.4 Implementation of WM Options

Prior to the EMPOWER WM Program, Acetech already had some WM initiatives which were validated by the Waste Assessment. The WM Team thoroughly reviewed and expanded the recommended WM options to include improvement of Acetech's housekeeping practices, recovery of spent casting sand, recycling of metals, and improving the melting efficiency of equipment. Among the WM options implemented by Acetech are the following:

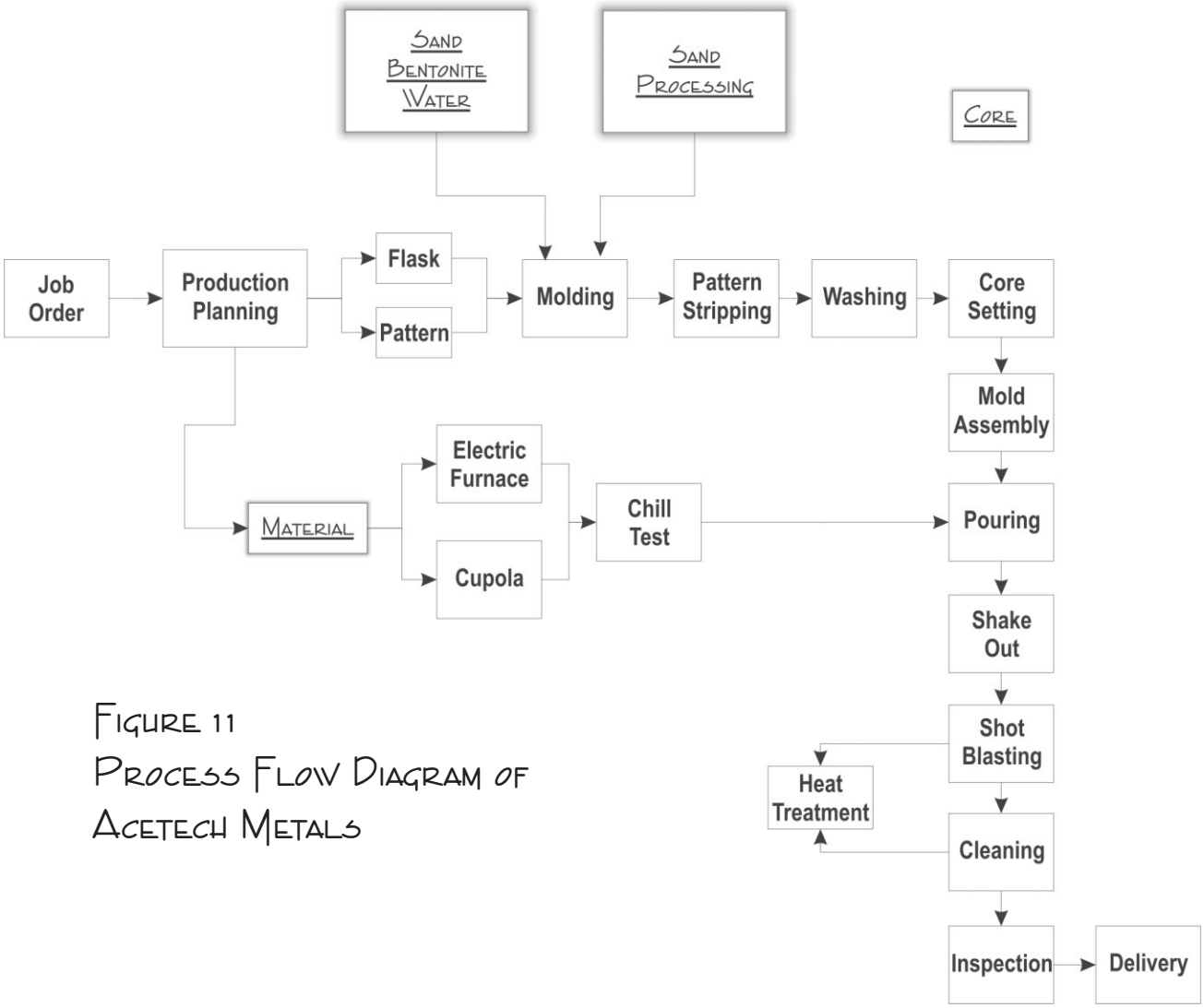


Figure 11
Process Flow Diagram of
Acetech Metals

- Recovery of sand spilled from conveyors
- Collection and reuse of sand from shot blast machine
- Recovery of sand sticking to castings and before sand blasting
- Recovery of metals from sand by magnet
- Change in refractory lining
- Reduction of size of scrap feed
- Reduction of limestone added to melt
- Recycling of off-specification products

Acetech incurred costs for implementing these waste minimization options. However, these costs were minimal compared to the derived benefits. An estimated savings of about Php 382,900.00 per year is achieved from an investment of Php 10,680.00 for implementing the WM options.

The melting of metal is the most important process in foundries. For this reason, improving this particular process without changing the quality of the metal or product poses a lot of challenges. Another important thing to consider is the efficiency of the cupola furnace. These thus were the focus of Acetech's WM implementation efforts as described in Table 9.

4.3 Chemical Processing Industry WM Case Study – The Experience of Kemwerke Inc.

4.3.1 Company Profile

Kemwerke, Inc. (KWI) is a 100% Filipino-owned corporation that belongs to the category of small to medium scale enterprises (SMEs). The plant occupies a 3,412 square meter lot in Malibay, Pasay City. KWI was established in 1983 to manufacture alkyd resin, polymerized vegetable oils, emulsion resins, saturated polyester, di-octyl phthalate, aluminum paste, penta ester, ester gum for the paint, ink and adhesive industry.

In **1998**, no-bake furan resin was introduced for the metal casting/foundry industry. In **2000,** Kemwerke used coconut oil in the manufacture of their main product the alkyd resin, also called Cocoalkyd Resin. Other products based on coconut are **Coco Methyl Ester (CME), Coco Diethanol Amide (CDEA), Coco Mono Ethanol Amide (CMEA), used f**or soap, shampoo and detergent industry. In the same year, Kemwerke was awarded the global ISO-9002 standard certificate, assuring their customer of international standard products.

4.3.2 Process Description

KWI's main product is the coconut alkyd resin, which is produced in a batch reactor at 200-240 ºC for about 10-12 hours reaction time. The manufacturing process consists of bubbling, mixing, distillation and filtration. The resultant polymer solution is stored in steel drums for shipment.

4.3.3 Waste Stream Generated

KWI generates solid and liquid wastes as well as air emissions from its processes. Some of the solid wastes generated by the company are chemical containers, which are typically segregated then stored in an isolated place before they are returned to the original manufacturer while some of the containers are recycled and reused. Other solid wastes generated by KWI are accumulated waste paper bags and spent filter cloth, which are temporarily placed in a container and donated to interested users.

On the other hand, the major source of liquid wastes at KWI is the water spent from equipment cleaning. About 468 m^3/yr of wastewater is generated from equipment cleaning where water used is eventually channeled to their wastewater treatment plant. Other liquid wastes generated by KWI come from chemical spills due to accidental or inadvertent discharges and spray water for nitrogen gas tanks. These are all channeled to KWI's wastewater treatment plant.

TABLE 9. SIGNIFICANT WASTE MINIMIZATION OPTIONS IMPLEMENTED BY ACETECH

WM Option:	The improvement of the melting process and reduction of wastes from the cupola furnace consisting of the following WM options:	
	1.	Reduction of size of scrap fed to cupola furnace
	2.	Reduction of limestone added to melt
	3.	Change in refractory lining of cupola furnace
	4.	Utilization of fly ash (solid waste) for risers
WM Option Summary:	1.	The average size of scrap iron charged to the cupola furnace was reduced from about 8-10 inches to about 4-6 inches. The audit of melting the same quantity of materials and fuel shows that the melting time was reduced by one hour resulting in savings in fuel equivalent to one hour of operation of the cupola.
	2.	Before the monitoring two types of slag was generated by the cupola, black and greenish colored slag. The target was to generate consistently greenish colored slag because the flow of the molten metal and metal quality was good under this condition. The results of analysis of the two types of slag showed that the black slag has a higher pH than the greenish slag. Since limestone has a high pH, the quantity added to the melt was gradually reduced by 1-4 kg/charge while at the same time observing the melt to reduce the pH. Reducing the amount of limestone charged to the melt by a maximum of 3 kg per charge produced a consistently green slag.
	3.	Change the refractory lining of the cupola furnace from fireclay to silica. During melting, the molten metal reacts with some parts of the refractory lining. Silica refractories used for lining the furnace reduces the generation of waste slag.
	4.	Utilize fly ash, a solid waste from the burning of coke fuel in the cupola furnace, as an exothermic compound in risers.
Input Material:	1.	Fireclay substituted with silica refractories
Wastes:	Slag (reduced)	
	Fly ash (utilized)	
Capital Cost:	New silica refractories cost P5,880.00	
Operation/Maintenance:	No additional cost	
Savings:	1.	Reduced coke fuel consumed by 7,350 kg/year equivalent to PhP 95,550.00/year
	2.	Reduced limestone material consumed by 7,875 kg/year equivalent to PhP 6,300.00/year
Disposal:	Reduced the slag to be disposed by 11,250 kg/year	
Feedstock Reduction:	1.	Coke, 7,350 kg/year
	2.	Limestone, 7,875 kg/year
Waste Production:	Waste slag is reduced by 11,250 kg/year	
Impact:	1.	Shortened the stack gas emission and the operation of the pollution control equipment by one (1) hour
	2.	Improved the flow of molten metal, which is a critical process in a foundry, prevent remelting and help maintain the quality of metal and product
	3.	Reduced the solid wastes (slag and fly ash) generated by Acetech Plant
	4.	The implementation of the WM options in the melting process in the cupola furnace generated a total cost savings equivalent to PhP 101,850.00/year

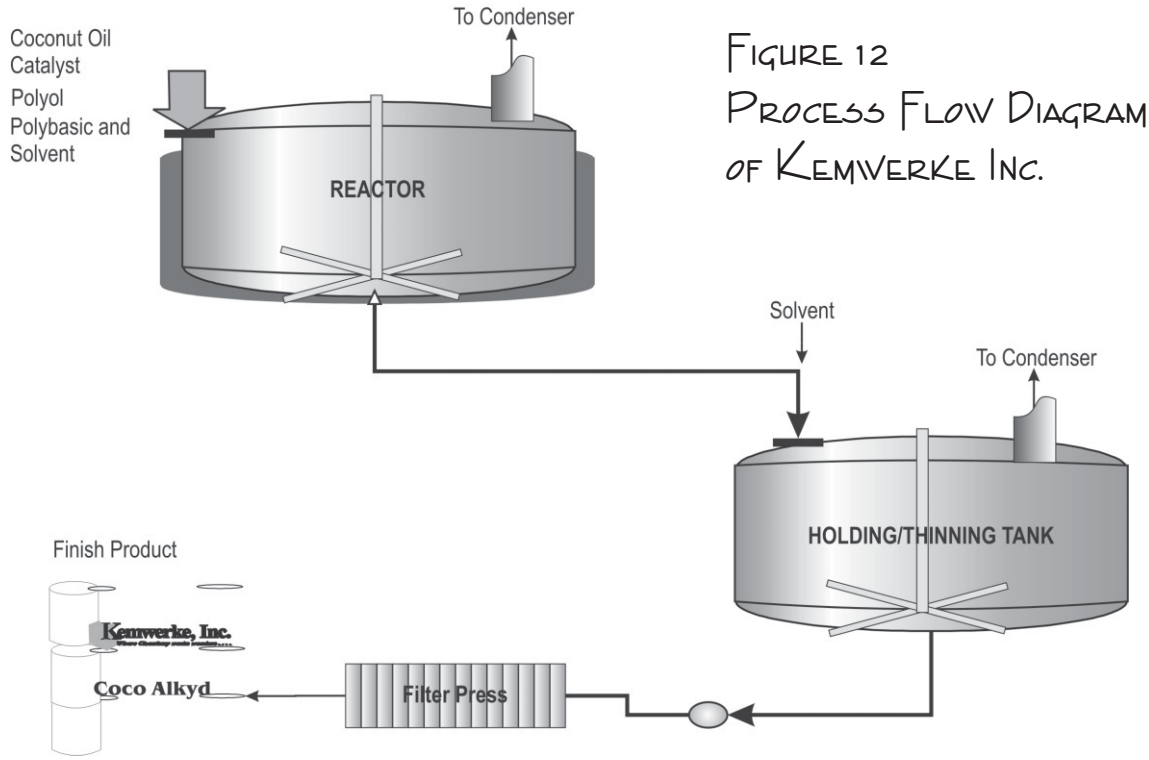


Figure 12
Process Flow Diagram
of Kemwerke Inc.

KWI's air emissions are the evaporated solvents produced from the reactor kettles. These evaporated solvents are collected, recovered and recycled as cleaning solvent. KWI has also installed fume scrubbers near the universal reactor tank to protect their workers from any possible exposure to air emissions.

43.4 Implementation of WM Options

Kemwerke, being an ISO 9001 certified company, has been vigilant in productivity improvement. Stiff competition in the export market has always been their impetus to maximize production. Moreover, Kemwerke recognizes that the very nature of their operation – processing of chemicals – could have adverse impacts on the environment, unless properly managed. This consciousness coupled with their paradigm of productivity improvement became the motivation and the guiding principle of Kemwerke in their WM implementation. As such, WM options were geared towards raw material (chemicals) conservation, maximizing unit operations, improving process efficiency, and strengthening equipment maintenance. The following are some of the WM options implemented by Kemwerke.

- Attempt to rework or convert raw materials packaging to recyclable materials or look for potential user of waste paper.
- 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.
- Maximize the usage of the reactor to a specific type of product or provide a reactor dedicated to a certain product.

- Improving or reorganizing existing storage area of raw materials by separating the hazardous from the non-hazardous.
- Recover and recycle carbon dioxide tank spray water.
- Provide general ventilation and conservation vents in the bulk storage and filling stations.
- Regular monitoring of wastewater and volatile organic compounds emission such as xylene in the workplace.

By implementing WM options Kemwerke has improved its operations and reduced environmental impacts. Reductions of wastewater volume and concentration (BOD, COD, TSS, Alkalinity, etc) were likewise achieved. Separation of hazardous materials from the non-hazardous materials resulted in higher quality products and improved prevention of accidental releases of toxic and hazardous chemicals. Good housekeeping practices were also improved thus reducing risk to the workers at the same time keeping them highly motivated and productive.

Adopting such pro-active approaches gave KWI some positive economic impacts. As an estimate KWI saves about Php 38,000.00 per month as a result of these approaches excluding the Php 50,000.00 per batch that it may lose as a result of misbatching in the production.

One of the most significant WM options implemented by Kemwerke is highlighted in Table 10, in relation to spill and leak control.

4.4 Pulp and Paper Sector WM Case Study -The Experience of Noah's Paper Mill

4.4.1 Company Profile

Noah's Paper Mills Inc. (NPMI) started its operations in 1996 and occupies a 9-hectare lot at South East Marcos Bridge, Marcos Highway, Calumpang, Marikina City. The company, which is being managed by David Hwang, employs a total of 86 employees and operates with 3 shifts of employees for 24 hours/day within 260 working days. The main products are printing and writing grades with an annual production capacity of 15,917.75 metric tons (MT)/year in 2001. It consumes electricity at a rate of 1,200 kilowatt hours/metric ton and consumes about 250 gallons per minute of fresh water per day in its production.

4.4.2 Process Description

NPMI's main process is papermaking. This papermaking process involves a number of processes such as screening, cleaning, flotation, thickening, dispersing, storing, and washing.

4.4.3 Waste Stream Generated

NPMI generates solid and liquid wastes from their processes. Some of the solid wastes include plastics, cloths, fasteners from the screening processes; wires, paper clips, sand from the cleaning processes; fines and fillers from the flotation processes; and sludge generated by the pulper. This sludge from NPMI is being disposed in a landfill.

Table 10. Significant Waste Minimization Option Implemented by Kemwerke

WM Option	Establish spill and leak control policy to include frequent scheduling of inspection and maintenance of equipment, pumps and pipelines, and cleanup procedures in the event of accidental spills or leaks
WM Option Summary	During the in-house seminar-workshop conducted by the Empower Team, the workers were given a chance to divulge all the problems encountered and observed in the plant which they think have a negative impact to the environment. The issues and concern raised are very crucial in the operation of the plant. Thus, the need for immediate implementation of this option is indispensable to prevent losses in raw materials, energy, manpower and production efficiency.
Input Material	same as in the normal operation of the plant
Wastes	Chemical spills and leaks
	About 3% of the total material unloaded in the process is released to the environment due to inadvertent leaks and spills
Capital Cost	P9,277.00
Operations and Maintenance	Minimal
Savings	P594,000/year
Impact	Prevented material losses during production and provided a safe workplace to the workers.

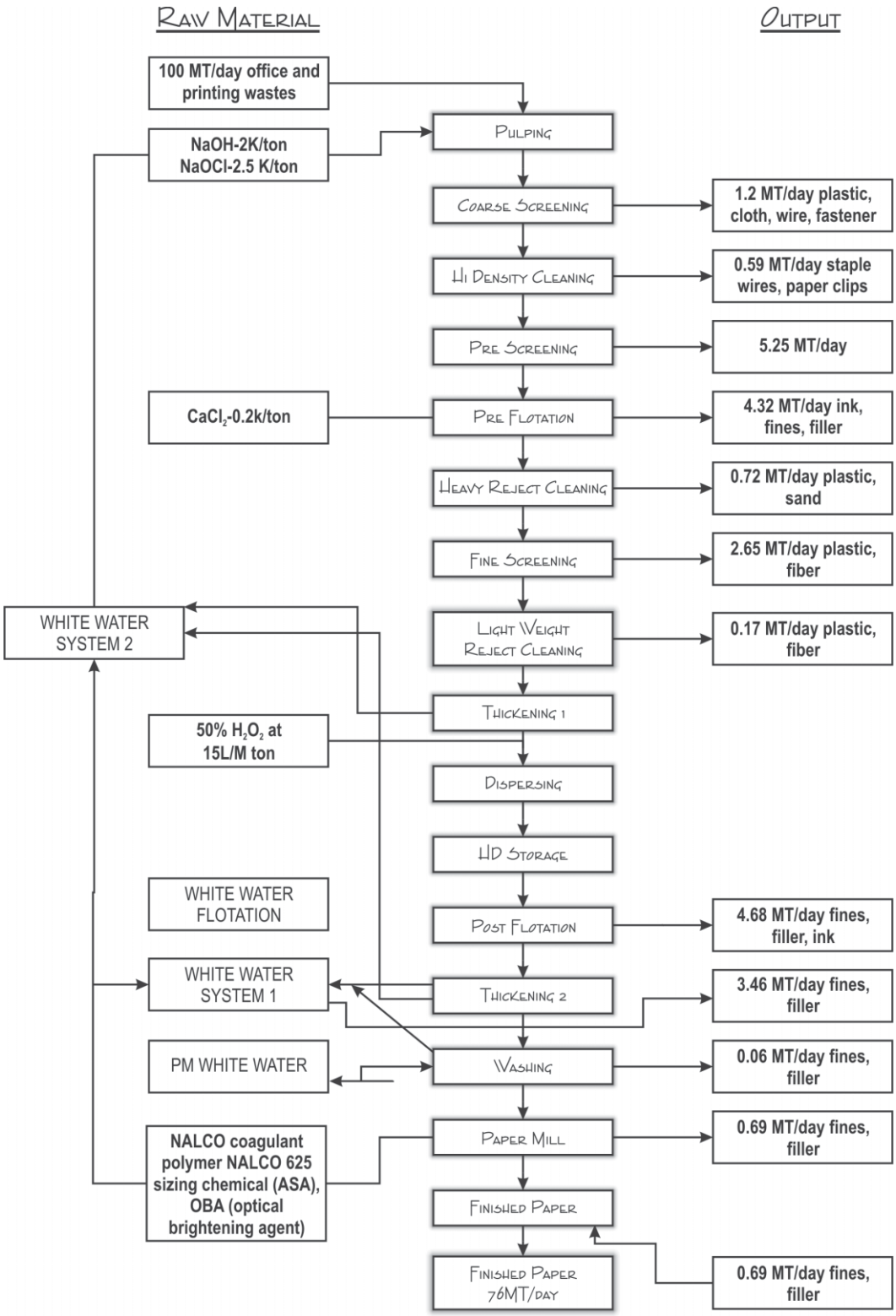
On the other hand, NPMI generates wastewater with a volume of 504 cubic meters per day, which exits to Marikina River after treatment in its wastewater treatment facility. Liquid wastes are generated mainly as a result of water and tank overflows, leakages in pumps, and valves, and from cleaning and screening processes. NPMI *has benchmarked to reduce its water consumption from 30 cubic meters per ton of product per day (m^3/t/d) to 15 m^3/t/d*. At present, NPMI has already reduced its water consumption to 19 m^3/t/d.

The paper mill produces white water, a portion of which is used in washing processes and some of which goes to the white water system. Basically, NPMI's white water is used as dilution water at each process.

4.4.4 Implementation of WM Options

For NPMI, WM options focused on improving fiber recovery, checking stock and sealing leakages and maximizing equipment capacity and performance at the pre-flotation process. Most of the WM options involved equipment monitoring and maintenance.

Figure 13
Process Flow Diagram of Noah's Paper Mill



Several low /medium cost WM options were formulated in the paper manufacturing process to:

- Attain a 0% fiber loss
- Recover the elutriation water at the high-density cleaning process
- Achieve a 0% adhering fiber on rejects
- Reprocess water upon treatment

The following are some of the WM options implemented by NPMI to achieve the above goals.

- Recovering adhering fibers on rejects through efficient drum sorter operation
- Conducting regular equipment monitoring and maintenance
- Properly training personnel on equipment operation and cleaning
- Rigidly inspecting the quality of incoming waste paper
- Providing containment for stock leakages
- Applying appropriate differential pressure requirement and desired elutriation water volume and pressure requirement at the high density cleaning
- Frequent check of flotator overflows at the pre-screening and pre-flotation
- Applying appropriate differential pressure drop, providing containment for elutriation water and excess cleaner solution, and retightening conical vessel assembly; providing plug for both vent and reject cap at the heavy reject cleaners
- Installing third Krofta or dissolved air flotation tank after the paper machine (PM) white water
- Installing additional modern metering gauges after every machine in the production area
- Increasing the capacity of sump pit pump and enlarging reject tank of coarse screen
- Installing a connection from the Krofta to the gravity table to pump the thick sludge of Krofta directly to gravity table

As a result of several water conservation schemes, NPMI was able to reduce its water consumption by as much as 36%. The company also has been observing the practice of fiber recovery in its production process to reduce the generation of large amount of fibers from its paper production process. Regular monitoring and maintenance of equipment has increased efficiency of equipment operation and improved product quality.

The WM options implemented by the company have also helped reduce its pollution load. As mentioned, NPMI was able to reduce its water through several water conservation schemes, thus reducing the pollution load of the wastewater. By reducing the volume of wastewater, the performance efficiency of its wastewater treatment systems will be enhanced and thus generate effluents with lower BOD/COD concentrations.

This WM program has had positive economic and financial impact on NPMI's capital, maintenance and operation costs. As an estimate, NPMI has incurred almost Php 85,000.00 for implementation cost. However, NPMI saves more than Php 500,000 per year as a result of these implementations excluding the amount it will save from overflows, pump clogging, gasket and pneumatic valve liquid cyclone repairs.

5.0 Other Environmental Management Approaches

After successfully implementing WM, companies are encouraged to explore and apply other environmental management approaches, in the spirit of continual improvement. This special section of the guidebook describes such approaches that the companies can pursue.

5.1 Environmental Cost Accounting (ECA)

What we can measure, we can control! ECA helps companies improve environmental performance and reduce costs by identifying, evaluating and more accurately allocating environmental costs which can be in the form of:

- **Hidden costs** such as costs of purchasing, processing and disposing of wastes, inefficient use of resources, insurance, monitoring and training
- **Contingent costs** like penalties, natural resource or personal injury damages, future compliance costs
- **Image and relationship costs** like advertising and lower earnings due to poor environmental image

Many companies do not even account for these costs, even if they do significantly affect profitability.The functions of ECA are thus to promote more accurate costing and pricing, provide information on environmental costs, help identify potentials for cost reduction and support decision making.

The benefits of ECA include:

- Improved environmental performance
- Cost reduction and avoidance
- Profitability enhancement
- Increased product quality
- Better decision-making including environmental aspects
- Staff motivation
- Satisfying information demands

Establishing ECA involves the following processes:

1. **Identify wastes or non-product output (NPO)**. Determine the amount, the sources of generation and the costs associated with them, by first starting with the most relevant NPO, identifing its flow and associated costs

2. **Use improvement potentials by identifying the most beneficial NPO flows**. Prepare a detailed description of those NPO flows in physical and monetary units, and develop and implement improvement measures

3. **Monitor and evaluate results.** Develop and implement further improvement measures.

NPO is a good starting point for implementing ECA especially in SMEs but ECA offers more. The process may be used to track other environmental costs such as inefficient resource-use, and to improve product design and investment decisions. It is not necessary to undertake a detailed material and energy flow analysis at the very beginning. To become familiar with how ECA works, a company may start with one type of NPO.

5.2 Greening the Supply Chain Management (GSCM)

GSCM is one of the emerging tools used by global corporate leaders to improve over all organizational environmental performance. It enhances the environmental quality of products and services by influencing the supplier's behavior and employs a collaborative approach in which all active players share responsibility for addressing the environmental performance of goods and services. Benefits of GSMCM include cost reduction, greater operational efficiency, enhanced value to customers, increased sales, positive media attention, and positive ratings from socially responsible investment groups

Among the techniques used to initiate GSCM in the company are:

Collaborative Partnering with Suppliers and Contractors. In this technique, both customers and suppliers stand to gain by collaborating on environmental and efficiency improvements, through green product or process design initiatives, and improvements in operational efficiency. A few examples of partnering between supplier and customer include:

- Collaborating on green design (or redesign) initiatives
- Sharing tools used for environmental improvement
- Researching alternative materials, products, equipment, and methods that have lower life cycle impacts
- Managing of inventories by the supplier (e.g., chemicals, cleaning supplies, lab supplies, office supplies, etc.)
- Designing environmental packaging (e.g., bulk, reusable packaging, recycled-content)
- Devising ways to take back and recycle or refurbish end-of-life items

General Motors Partnering with Suppliers to Conserve Resources and Prevent Pollution

General Motors of Canada Limited (GMCL) works in partnership with suppliers to reduce packaging and transportation waste. The GM Environmental Packaging Addendum encourages suppliers to provide recyclable and/or minimal waste packaging containers. GMCL has reduced packaging waste by approximately 20 percent by working cooperatively with suppliers to increase the number of reusable containers and return-to-vender shipping aids. In 1998, GMCL facilities were able to divert more than 5,000 tons of waste from landfills through the use of recyclable and/or returnable packaging materials

Environmental Procurement and Product Specifications. This may involve developing procurement policy and product specifications, and by carefully, clearly and consistently introducing the information to suppliers and contractors. The company must also be ready to offer assistance and to educate suppliers and contractors on its requirements, and decide how to finalize the agreement.

Establishing Environmental Standards, Criteria, or Management Systems for Suppliers. The company must decide what environmental criteria, standards and management systems will apply to which suppliers. It should develop an evaluation or certification plan and schedule. Companies normally notify the suppliers well in advance, and offer assistance, incentives and flexibility. They also determine a policy for suppliers and contractors that can not meet the criteria set.

McDonald's Apply Environmentally Preferable Purchasing

McDonald's approach is to encourage, but not necessarily require, suppliers to integrate sustainable-forestry criteria into their sourcing. To judge how well they're doing, McDonald's created a "forestry scorecard" that grades each supplier's efforts. The scorecard rates paper and packaging suppliers on each of ten key criteria, says Robert Langert, director of community affairs, adding: "We're going to ask suppliers to report back every year as to what they're learning and how they're applying what they've learned. And we're asking for a preference for sustainable forestry given that other criteria are at parity."

Evaluation and Certification of Suppliers. This means verifying suppliers and contractors' compliance to environmental requirements. Supplier evaluation whether by the company or third-party auditors, requires evaluation procedures and methods based on the criteria set earlier. Levels of evaluation for different suppliers must be determined. A company must also have a policy and plan for suppliers and contractors that do not meet the criteria

Outreach and Assistance to Suppliers. Companies should make suppliers aware of their environmental requirements, and offer them education, assistance, and/or training on how to meet these. Companies also conduct assessments and provide recommendations, offer technical support services, and educate customers.

The following are some successful companies implementing GSCM:

- General Motors
- Andersen Corporation
- Nike
- Intel Corporation
- Hewlett Packard

5.3 Environmental Management System

An Environmental Management System (EMS) helps an organization address its environmental impact in a systematic manner, while maintaining or even enhancing financial needs and objectives. It provides order and consistency in organizational methodologies by allocating resources, assigning responsibilities, and continuously evaluating practices, procedures, and processes.

An EMS is essential to an organization's ability to anticipate and meet growing environmental

performance expectations and to ensure ongoing compliance with national and international requirements. An EMS succeeds when corporations and organizations make environmental management their highest priorities.

5.3.1 Benefits of EMS

The two basic objectives of EMS are: to comply with all relevant environmental laws and regulations and to improve business/environmental performance

Organizations wishing to establish an EMS generally want to contribute to the improvement of environmental conditions by minimizing their own negative impact on the environment. At the same time, the establishment of an EMS can translate into increased profit. The assumed result when EMS is implemented is pollution prevention, waste minimization, and natural resource conservation. In general, companies adopt EMS for the following reasons:

- Ease of trade
- Improve regulatory compliance
- Enhance credibility
- Reduce liability and risk
- Optimize resource use
- Increase profit
- Improve internal management methods
- Improve social acceptability

Other reasons include pressure from shareholders and from non-government organizations (NGO), and competition in the industry.

5.3.2 EMS Development Process

This section briefly presents the process of developing EMS in a company. The first phase involves setting foundations: getting management support, and organizing and training a core environmental group. Commitment from the highest level of management is vital to successful implementation of the EMS.

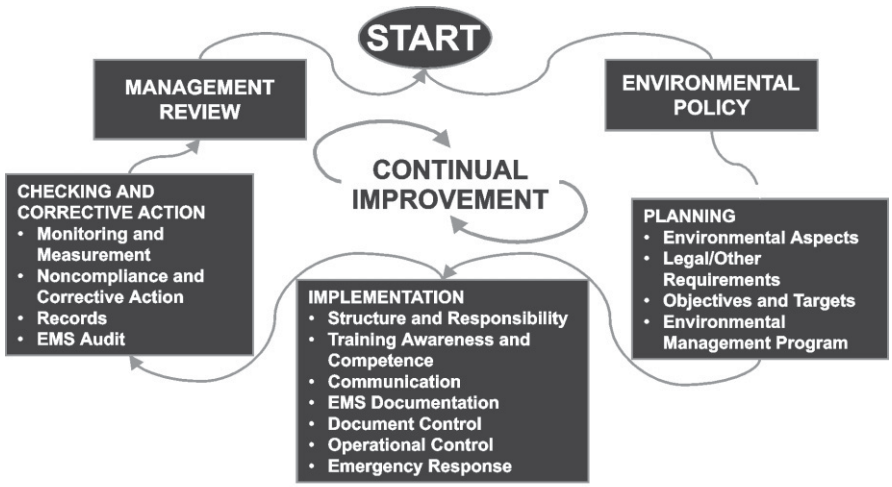
Developing Environmental Policy

The first step in developing EMS is to understand the company's environmental aspects and to set up a corporate environmental policy.

The environmental policy must:

- Set the company's overall direction
- Identify the principles under which it will operate
- Commit the organization to sound environmental management

THE EMS CYCLE



Planning an EMS

Planning means identifying and developing action plans on how the company could prevent environmental impacts from their operations. The industry may get the assistance of a consulting group to assist in:

- ❑ Defining the scope of the EMS
- ❑ Reviewing the existing management system
- ❑ Determining the kind of environmental management system most suitable for the industry (following ISO 14001 EMS international standards)
- ❑ Identifying the current legal requirements
- ❑ Analyzing the gaps between existing and proposed EMS
- ❑ Preparing a plan of action to fill the gaps
- ❑ Allocating sufficient resources to match the plan
- ❑ Developing ways to measure the environmental impacts of the company
- ❑ Developing goals for minimizing the negative aspects and maximizing the positive
- ❑ Developing internal performance criteria to meet these goals

The plan will have to be communicated to all concerned stakeholders by the EMS Team to gain their support and their commitment.

Implementing the EMS

After the gaps are identified and the action plan is formulated, the EMS plan should be immediately implemented. This phase is basically internal to the facility. An EMS can be externally audited and certified to the ISO 14001 standard for international recognition.

The following tasks form the logic underlying the ISO 14001-based EMS and the expected action to be undertaken under this phase by the facility:

- ❑ Develop and implement environmental management program to attain goals and targets

- Define employee's roles, responsibilities, and authorities
- Identify training needs of personnel necessary to do their jobs effectively
- Develop EMS documentation system
- Develop and implement measurements and controls of critical processes
- Identify and develop emergency response procedures
- Integrate EMS with existing management systems

One important component under this phase is the development of the EMS documentation system as physical evidence that an EMS is in place. This will form the basis of the EMS audit, top management review, and of developing strategies for continual improvement.

Communication is very critical during the implementation of EMS. Reporting, using of memoranda and bulletin boards, and conducting regular meetings can enhance this.

Checking the Progress of EMS

This involves measuring and monitoring performance of the EMS implementation. It means analyzing the reports and determining what works and what does not.

The following are ways to check the progress of EMS:

- Internal monitoring of performance
- Internal quality control of monitoring
- Internal audits on how the system is working

Based on the results of the various monitoring activities, corrective actions or preventive measures will be designed. Sometimes the results of monitoring may lead to modifications in the standard operating procedures or even dismissal of the whole EMS and starting the cycle again.

5.4 Life Cycle Analysis

Life-cycle assessment (LCA) studies the environmental impact of either a product or the function the product is designed to perform over its entire life period. It helps increase resource-use efficiency and decrease liabilities. It is commonly referred to as a "cradle-to-grave" analysis. As LCA is a continuous process, companies can begin an LCA at any point in the product/function cycle.

LCA can be used to develop business strategy purchasing decisions, improve product and process design, setting eco-labeling criteria and communicating environmental aspects of products. The key elements are as follows:

- Identify and quantify the environmental loads involved; e.g. the energy and raw materials consumed, the emissions and wastes generated;
- Evaluate the potential environmental impacts of these loads;
- Assess the options available for reducing these environmental impacts.

Benefits of Life Cycle Approaches

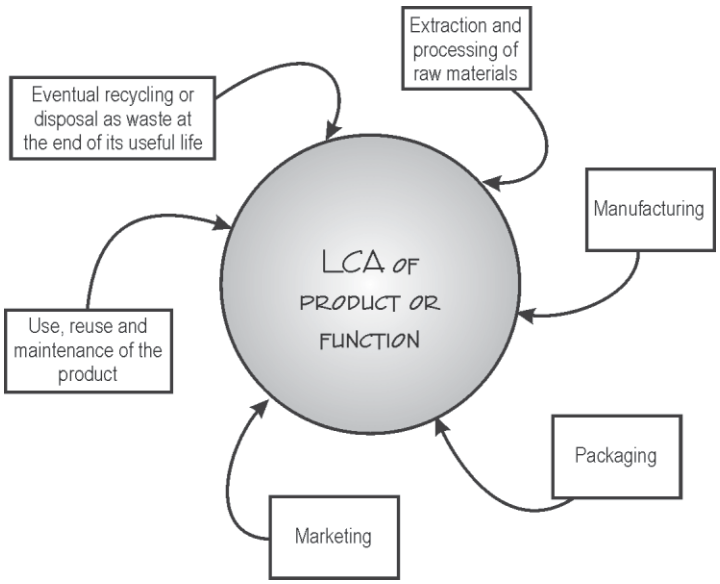
For Industries

With LCA, organizations can harvest more benefits to environmental, occupational health and safety, risk and quality management, as well as develop and apply cleaner process and product options. Incorporating life cycle and sustainability management will improve image and brand value for world market players and smaller suppliers and producers.

For Governments

- LCA of product or function
- Extraction and processing of raw materials
- Eventual recycling or disposal as waste at the end of its useful life
- Use, reuse and maintenance of the product
- Marketing
- Manufacturing
- Packaging

Life Cycle Analysis Diagram



LCA will help governments secure and strengthen the position of the industrial and service sectors in regional and global markets, and ensure overall environmental benefits to society balanced with economic and social aspects. In so doing, governments can show global responsibility and governance by sharing and disseminating sustainability options world-wide.

For Consumers

Life cycle approaches offer consumers better information for purchasing, transport systems and energy sources. They offer a platform for multi-stakeholder dialogue and public involvement with industries and governments in political and practical initiatives, going from local agenda to national and international strategies for sustainable development.

5.5 Ecolabelling

Ecolabelling is a voluntary method of environmental performance certification and labelling that is practised around the world. It is a process of assigning a label or awrd to an entyity, a product, or group of products,for the purpose of communicating its environmental performance to the public.

An “ecolabel” is a label which identifies overall environmental preference of a product or service within a specific product/service category based on life cycle considerations..

In contrast to “green” symbols or claim statements developed by manufacturers and service providers, an ecolabel is awarded by an impartial third-party in relation to certain products or services that are independently determined to meet environmental leadership criteria.

The International Organization for Standardization (ISO) has identified three broad types of voluntary labels and these are:

- Type I — a voluntary, multiple-criteria based, third party program that awards a license that authorizes the use of environmental labels on products indicating overall environmental preferability of a product within a particular product category based on life cycle considerations
- Type II — informative environmental self-declaration claims
- Type III — voluntary programs that provide quantified environmental data of a product, under pre-set categories of parameters set by a qualified thirdparty and based on life cycle assessment, and verified by that or another qualified third party

These three labels share a common goal, which is:

> “...through communication of verifiable and accurate information, that is not misleading, on environmental aspects of products and services, to encourage the demand for and supply of those products and services that cause less stress on the environment, thereby stimulating the potential for market-driven continuous environmental improvement.”

Ecolabels have two general objectives – to educate and assist consumers in their purchase decisions and to motivate and assist industry in marketing environmentally accepted products.

The following are examples of countries and the ecolabels they have established:

- India – Ecomark
- Singapore – Green Label
- New Zealand – Environmental choice
- Germany – Blue angel
- Europian Union – Ecolabel Award

Place the GREEN CHOICE logo here and the first Philippine product with this logo – PRIDE detergent (c/o graphics artist)

The Philippines has adopted “GREEN CHOICE” as the name of the ecolabelling program in the Philippines. For more information, visit the site www.greenchoicephilippins.org.

6.0 References

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