Getting Started On Environmental Performance Evaluation[1]

The experience of a rubber glove manufacturing company.

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This paper reports on the progress Perusahaan Pelindung Getah (M) Sdn Bhd has made over the last 2 years in implementing the Environmental Performance Evaluation study made possible through its cooperation with the Rubber Research Institute of Malaysia. It shares the experience and achievements gained as well as identify some areas that require further work to make EPE an effective control tool in the management of the environment.

Introduction

Perusahaan Pelindung Getah (M) Sdn Bhd (or PPG) was incorporated in 1988 as a manufacturer and exporter of non-sterile latex examination gloves. From a one-line operation, the company expanded to its present capacity of 6 lines that can output up to 270 million pieces of gloves per year. In 1999 the company obtained the ISO9002 certification for its manufacturing process. In March 2001, the company was recommended for upgrading to the EN46002 certification.

In 1998, PPG was approached by Dr. Nordin Abd Kadir Bakti of the Rubber Research Institute of Malaysia to participate in the environmental performance evaluation (EPE) study that relates to the rubber industry. At the EPE Workshop during the 7th ISO/TC207 meeting in Seoul, Korea from May 29 - June 6, 1999 Dr. Nordin has presented a preliminary report entitled "*Environmental Performance Evaluation of a Rubber Glove Manufacturing Company: A Case Study*". This report is available for downloading at our website at www.gloves.com.my.

This paper is a continuation of the first report with the purpose of sharing both our experience and achievements for the benefit of the manufacturers in similar industries.

What is EPE?

Environmental performance evaluation (EPE) is based on the principles of ISO 14031, which is one of the standards under the ISO 14000 series. ISO 14031 defines the EPE process for management systems. Under the ISO 14000 series, the EPE is a critical support tool that helps measure whether environmental performance criteria has been met. It is a voluntary programme and does not set any standard or specific requirement.

EPE introduces a systematic work process to evaluate environmental aspect of performances against what had been identified to achieve. EPE helps to address the issue of regulatory requirement (by the Department of Environment), obligation in meeting customers' requirement, management needs, etc. Indirectly, EPE will yield intangible benefits and credibility to a business. By following the principles established it help us look at the environmental aspects of the manufacturing process. EPE offer the tools

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to do a systematic performance evaluation besides generating valuable reports that may be useful both as a public relations exercise or for marketing purposes.

Starting up the EPE

Before starting up the EPE exercise, a clear understanding of the manufacturing process, its products and related activities has to be developed. Manufacturing activities and products that can impact the environment will have to be identified. The company also needs to consider the human factors, and as such identify who are going to be the interested parties. For example, the users of the waterways that receive the effluent discharged from the factory, and the law enforcement agencies.

Next the company needs to define what environmental performance criteria that has to be met. Inherent amongst these criteria is compliance with regulations pertaining to the environment as well as zero public complaint record. Specific to each business will be criteria related to productivity and quality.

Within each criterion decided the company is required to identify measurable indicators that shall serve to determine if the criterion objective has been met or otherwise. For example, in the case of PPG, because of concerns over latex protein allergy arising from the use of latex gloves, we have set a criterion of producing gloves with extractable protein content of not exceeding 0.3 milligram per gram glove. We chose the extractable protein content as the indicator to match the criterion selected.

The choice of indicators is important in addressing the environmental performance criteria decided. In most cases, these indicators already exist within the company's operational control protocol, such as production yield and efficiency, and quality of products and waste generated. In the initial period, the company may decide to review and amend the criteria and the indicators chosen. It is a healthy situation as it suggests the management is actively monitoring the effectiveness of the EPE programme.

There are 3 basic categories of indicator:

Management Performance Indicators (MPI)
Operational Performance Indicators (OPI) and
Environmental Condition Indicators (ECI).

Within each category will be a set of indicator types selected. The following is our structure for the EPE programme:

Under MPI	Annual cost of implementing the EPE
	Number of environment-related complaints received annually
	Number of monthly samples tested that comply with regulatory standards.
Under OPI	Percentage of defective gloves produced monthly
	Extractable protein content
	Quantity of zinc discharged
	Quantity of COD discharged
	Quantity of dried sludge produced
Under ECI	Incidence of protein allergy associated with use of latex gloves
	Changes in water quality upstream and downstream of the factory's effluent discharge point.

Performance Review

Table 1 summarizes the MPI for all the 3 years under review. Except for Suspended Solids, which showed a poorer performance in 2000, all other indicators showed progressive improvements from year to year. Annual cost for 1999 was significantly higher than in 2000 because of greater testing frequency. With the enforcement of Standard A quality for wastewater discharged effective 1999 by the Department of Environment the factory will find it harder to meet the regulatory requirement especially on COD and SS. The company has invested in additional treatment capacity to ensure compliance to the requirements.

Table 2 summarizes the OPI of all the 5 performance indicators. The defective gloves produced were within the 3% maximum limit set in the criterion. This was in spite of greater losses arising from start up of 2 new production lines as well as a failed attempt to produce a new range of products. The company is reviewing the 3% limit downward to either 2.5% or 2%.

The extractable protein content managed to improve year on year although some samples exceed the 300ug/g limit. This limit is expected to tighten as consumer expectation of lower protein content is set to increase. Discharges of zinc and COD over the years, based on million gloves produced, are quite consistent, especially for years 1999 and 2000. Rubber and chemical lump production improved substantially in 2000 over the previous years resulting is significant raw material cost savings. The company disbanded with the use of dried sludge as an indicator as the information is not accurate.

Finally, Table 3 summarizes the ECI established. There are no official and accurate statistics on latex protein allergy and especially on how reduction in extractable protein content in latex gloves help in reducing the incidence of sensitization. While it is recognized that latex protein in gloves can sensitize certain users, the levels that trigger reactions are as yet unavailable. Hence this particular indicator serves for the moment to keep us more aware of the need to constantly monitor the trend of allergy development arising from the use of latex gloves.

The other indicator on changes in upstream and downstream wastewater quality clearly shows that while our wastewater has help improve the BOD, COD and SS, it introduced more zinc than the upstream discharge. This arose because the manufacturing activities upstream do not use as much zinc-based raw materials as we do. In the glove manufacturing process, zinc oxide and zinc accelerators are used in substantial quantity and some of them are dissolved in the wastewater.

The very high BOD, COD and SS results upstream from PPG suggest either little or no treatment of wastewater located in that area and is a cause of concern.

Future Actions

Resource management is becoming more critical, especially energy and water, which tend to be taken for granted. We will include water and energy consumption as part of the OPI from this year onward. Excessive energy consumption is not only wasteful but contribute to global warming. Excessive water usage will increase cost of treatment and supply apart from endangering plant and marine lives. The EPE programme is useful in seeking ways to manage resource with a view to control wastage and improve the environmental quality.

Conclusion

The EPE programme as implemented over the last 3 years have helped us in more than one way. It helped us identify areas in our environmental management, especially wastewater management, where we can further improve upon the quality of our wastewater discharge. It also helped us control our waste treatment costs. Most importantly, it brings about a greater awareness of the need for corporations in business to take care of the environment. The EPE will be useful to any company to do something positive in making the environment clean and healthy.

[a] **Table 1 – Management Performance Indicators**

Indicator	1998		1999		2000	
Annual Cost* of Implementation, RM/million gloves	Not available		RM51		RM18	
Number of Complaints Received	None		None		None	
Number of Monthly Samples Complying -	Standard A	Standard B	Standard A	Standard B	Standard A	Standard B
BOD	50.9 %	90.5 %	78.0 %	100 %	87.5 %	100 %
COD	35.8 %	69.8 %	43.9 %	78.0 %	54.2 %	87.5 %
Suspended Solids	32.1 %	62.2 %	41.5 %	70.7 %	37.5 %	79.2 %
Zinc	67.9 %	67.9 %	78.0 %	78.0 %	95.8 %	95.8 %

* only for cost of flocculants used and testing fees. Labour, equipment and upkeep costs excluded.
Standard A was applied by the DOE from 1999 onward.

[b] **Table 2 – Operational Performance Indicators**

Indicator	1998	1999	2000
% Defective Gloves Produced Monthly	0.1 – 3.3 % (range) 1.18 % (mean)	0.1 – 2.8 % (range) 1.28 % (mean)	0.5 – 3.7 % (range) 1.94 % (mean)
Extractable Protein Content	190 – 440 mg/g (range) 306 ug/g (mean)	182 – 270 mg/g (range) 270 ug/g (mean)	165 – 307 mg/g (range) 230 ug/g (mean)
Quantity of Zinc Discharged	20.5 kg per year 0.20 kg per million gloves	17.6 kg per year 0.14 kg per million gloves	20.2 kg per year 0.14 kg per million gloves
Quantity of COD Discharged	2076 kg per year 20 kg per million gloves	1908 kg per year 15 kg per million gloves	2400 kg per year 17 kg per million gloves
Quantity of Dried Sludge Produced	Not available	Not available	Not available

Indicator using dried sludge replaced with indicator using rubber and chemical lumps generated.

Quantity of Rubber and Chemical Lumps Produced	284 kg wet per million gloves	254 kg wet per million gloves	108 kg wet per million gloves

[c] **Table 3 – Environmental Condition Indicators**

Indicator	1998	1999	2000
Protein Allergy Association with Latex Gloves	No official statistics available. It was reported in Infection Control Today, September 2000, that 1 - 6% of the general public in the United States are prevalent to protein allergy. Among the healthcare workers, the risk increases to 8 – 17%.		
Changes in Upstream and Downstream Quality*	A better result downstream suggests the effluent discharged from the factory has 'improved' the overall quality		
Indicator	Upstream	Factory	Downstream
BOD	434	8	174
COD	1189	74	376
Suspended Solids	567	73	307
Zinc	0.54	2.03	1.26

* results from monitoring carried out between April and May 2001.