

Some Short-term Benefits of Environmental Management Systems

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Since the publication of the ISO-14001 standard in 1996, several mining companies have implemented Environmental Management System (EMS) as a framework for their environmental protection activities. These management systems aim to reduce environmental impacts, minimize environmental risks and improve environmental performance. About five years after complete implementation, environmental and business added value might not be obvious to interested communities. The first and most noticeable benefit of an EMS implementation is a general involvement from direction and employees. Then, a close sight reveals implementation and maintenance of several simple measures that altogether lead to a concrete improvement in environmental performance. This paper present example extracted from Environmental management Systems of some Canadian mining companies including Cambior inc., Omai Gold Mines Ltd., Mine Niobec, Société Minière Raglan du Québec and Compagnie Minière Québec Cartier. Measurable improvement in mine sites surroundings and economic benefits are next to be evaluated.

Introduction

An environmental management system (EMS) may be described as a tool kit that defines the rules of an organization regarding the control of its actual and potential impacts on the environment surrounding its operational sites. The brevity of this description merely illustrate the clerical outcome that implementation of an EMS can have on the operational activities of the organization. The environmental and sustainable benefits are not yet clearly demonstrated to the scientific community.

Saying that EMS is a scheme that links environmental priorities and economic activities, one that management can use to organize activities so as to improve production efficiency, minimize pollution and to reduce the risk of environmental incidents is still a white lie to many organisations.

This paper intends to demonstrate how EMS implementation increases environmental awareness and internal communication among all employees and create other positive results within the whole organisation, as soon as during implementation phase.

The first implementation task of an EMS represents a commitment to reducing the organization's impact and risk on the environment, which essentially implies

commitments to environmental legislation compliance, pollution reduction, use of best economically available technologies, environmental performance continual improvement and other environmentally sound statements in matters of minimizing actual and potential on- and off-site environmental consequence. A set of procedures are then developed to ensure the fulfilment of this commitment.

Even though, a complete EMS usually entails more twenty procedures and seems complex, it could be relatively simple. There are two key principles underlying EMSs. They are: a) the control of environmentally significant aspects, and b) continual improvement of environmental performance.

Control of environmentally significant aspects

Environmentally significant aspects are interrelationships between the organization's normal activities and the environment. They include land occupancy, the consumption of energy and other inputs, and output flows (effluents, atmospheric emissions, waste materials and uncontrolled losses). They also include potential events of environmental

consequence, such as spills, leaks from conduits or pipelines, incompatible mixtures, fires or explosions.

A given activity may have several environmental aspects, each of which might generate several impacts, such as surface water contamination, ground water contamination, and soil contamination. The environmental aspects are environmentally significant when impacts they generate are significant. This is a case-specific concept, which usually considers scope, duration, reversibility and public perception with respect to the impact. The criteria used to evaluate the significance of the impacts are similar to those used in environmental impact studies. When an activity generates at least one significant impact, control measures must be applied to eliminate or at least reduce the impact. In the case of potentially significant events, control measures are oriented to minimize their probability of occurrence.

Control measures

The development of an EMS requires the identification of the environmental aspects of all activities, followed by development or documentation of existing front-line control measures. The front-line control measures are the sets of procedures to follow. There are procedures describing the operations, those regarding monitoring, those concerning emergency response and those concerning administrative tasks. A procedure defines when, how and by whom a given activity or each segment of this activity is to be executed, what standards and thresholds are to be respected, what to do when abnormalities arise, as well as how the activity is to be documented and to whom the information must be forwarded.

A second type of control measure is the plan of action or program. The plan of action refers to the steps to be taken in developing and implementing a procedure (where one does not already exist), and to the steps to be taken towards attaining given objectives in the context of continual improvement of environmental performance.

Examples from the mining industry

Environmental performance rarely improves by quantum leaps. Sustainable improvements are rather the result of local and individual actions and require the participation of all. The following examples of practices that lead to improved environmental performance may appear rather banal to some readers; nevertheless, they were all implemented after the establishment of an EMS, and they involve suggestion and participation of operational staff as much as management. These examples were drawn from Cambior inc, Omai Gold Mines Ltd (OGML), Mine Niobec, Société Minière Raglan du Québec (SMRQ) and Compagnie Minière Québec Cartier (CMQC).

Management of explosives

Mine waters are often laden with ammonia-nitrogen derivatives from the explosives used. Reduction of the nitrogen load to the environment requires either a reduction in the quantity of water used, or minimization of the concentration of the nitrogenous compounds. Prior to development of a new procedure for handling explosives, near-empty powder bags were left in the drifts, as permitted by law. Since these were an obvious source of contamination of the wash water, the procedure included the requirement that the bags be brought back to the depot, where residual material could be recuperated.

This resulted in less contamination of effluent as well as a savings in explosives input.

Cleaning and recycling of empty containers

Mines and ore processing plants use many chemical and petroleum inputs. The residues left in the containers are considered as contaminated empty vessels and should normally be disposed of at an authorized site. However, some of the containers are now washed on site and reused for other purposes or disposed as solid waste, whereas the residues in the rinse water are circulated back for ore-processing needs. Other containers are returned to the supplier where they are refilled.

This procedure reduces the quantity of hazardous waste to dispose of.

Loading trucks

It has been recognized that disposal of mine tailings as a thick paste is a viable and efficient alternative to acid drainage in northern climates. This new approach has nevertheless resulted in different problems. Since paste tailings cannot be pumped to the tailings pond, they are transported by trucks. However, even when equipped with tarpaulins, residues often overflowed. The solution to this problem was to paint a line inside the box to indicate the maximum allowable fill level. This resulted in an extra truckload per day.

Nevertheless, this simple visual aid to the operator of the loading equipment eliminated overflow, and reduced the overall cost of this aspect since clean-up costs were significant relative to the cost of an extra daily trip.

Maintenance of tanks diked areas

The procedure regarding storage of petroleum products required emptying and maintenance of the tanks diked areas by the mechanical department and inspections by the environment department. However, the diked areas always contained oily water because it was emptied infrequently. Visitors often questioned its capacity. A line was painted inside it to indicate the maximum fluid level allowed such that the residual capacity would remain adequate in case of leaks or breaks in the holding tank, and this unit was included in the procedure for site inspection by the environment department.

The result was a better working relationship between the mechanical and environmental departments.

Daily inspection of tailing dykes

Daily inspections of tailing dykes were implemented in the procedures regarding tailing pond management. Although inspections were made by different people, observations were always entered on a standard form and everyone

assigned to these inspections have been trained for. During one routine inspection, a wet spot was noticed. Follow-up led to an investigation of the cause and to the conclusion that there was a construction defect which was rapidly rectified.

The result of diligent inspection was that a major spill was averted. The personnel costs of daily inspections are negligible compared to the losses and clean-up costs of a major spill.

Recovery of used oils

Monitoring of the recovery of used oil from trucks and other equipment, showed that only 46% was recuperated, whereas only 15% was burned during operation. An investigation showed that certain equipment was leaking and that there was a high frequency of breaks in the hydraulic lines.

As a result, the preventive maintenance program was revised. In the first year following the revision, recovery increased to 58% and has increased since then.

Communications and response to emergencies

The minimum freeboard of tailing impoundments must be respected to ensure stability of the dam. In one incident, the staff at the processing plant decreased the solids ratio of the pulp without advising the environmental personnel. The water level rapidly surpassed the minimum freeboard and emergency measures had to be implemented. The cause of the incident was attributed to lack of communication.

As a result, a couple of procedures were revised as well as operation meeting attendance list in view of ensuring adequate communications between all departments.

Internal audit and regulatory updates

Keeping up with regulatory changes is an important administrative activity. Insofar as it is the environmental department duty to gather this information, it is also responsible for disseminating to all department affected. An

internal audit revealed that the management of the ore processing plant had not been informed of the impending change in the authorized concentration of suspended solids in effluents. This mechanism compensated for poor communication, and resulted in the speeding up a project to eliminate process water in the effluent, reducing thereby the level of suspended solids in time to avert a regulatory infraction.

Management review of the EMS

The procedure regarding this management review describes what the environmental department's report should include so that top management can pronounce itself on the appropriateness, sufficiency and efficiency of the EMS at that time. Beyond standard reporting items, a top management team added specific requirements as the information regarding how incidents and corrective actions reports were perceived and answered by authorities.

The result is that top management is well informed of all activities and events of environmental consequence and is fully aware of the implications of the organization's environmental performance status. The management review is the ultimate indicator of due diligence.

Continual improvement

The other key principle of an EMS is the continual improvement of environmental performance. This requires regular monitoring and evaluation of performance indicators, as well as revision of, and setting of new objectives, targets and preventative measures.

An objective such as the reduction of CFC emissions, is pursued by replacing these ozone-depleting gases by those with less impact, such as HFCs. An EMS can ensure that the objective is attained through a combination of mechanisms: audits, information dissemination, monitoring of indicators, follow-ups on progress and justification of delays. Given all these control mechanisms, it is next to impossible to neglect one's objectives.

For example, at a site with insufficient communication, the mechanical shop had been advised of the new CFC objectives, whereas the purchasing department had not. The arrival of a delivery of CFC's at the shop was the indicator that the purchasing department was unaware of the reduction plan. Communications procedures were appropriately amended.

At another site, a broad objective was to reduce inputs of natural resources. Following information sessions for employees, one of the outcomes was the installation of recycling bins at underground construction sites. The resulting is a 40% increase in the recovery of wood, much of which could be used elsewhere in the site, and an overall reduction of 20% in wood purchases.

Preventative measures are often integrated with the objectives and targets such that potential non-conformities are averted. One example is the installation of a pH meter in the oil-water separator to improve the dissolution of emulsions, even if the efficiency of the separator is within expected limits.

These programs, i.e. objectives, targets and preventative measures, are often proposed by operation employees. They generate a direct outcome on environmental performance.

Registering a system

Being recognized as ISO 14001, EMAS or other formal certification is not shared an ultimate goal for every organization and is not essential to an EMS but it facilitates its sustainability. A certified EMS necessarily responds to specific criteria regarding administration, evaluation of all activities (without exception), integration with other departments in matters of shared responsibility, such as drinking water, emergency response, Material Safety Data Sheets, and explosives mixing.

There are several advantages to being accredited. The most obvious is the regular external reviews of a registered EMS that provides an objective evaluation. That is as beneficial for the organization as it is for its clients, consumers and society in general. It

constrains to keep on with the EMS development and maintenance.

As a result, a well maintained EMS facilitates relationships with officials and local communities because the information necessary to respond to their expectations and to demonstrate the organization's dedication to environmental protection during day-to-day operation is always at hand.

Furthermore, it could have an impact on the efficiency of public spending for inspections concerning regulatory compliance, in that the personnel of relevant agencies should spend less time evaluating the performance of accredited sites and more time evaluating and assisting problem cases.

Concluding remarks

These examples of local initiative demonstrate the primary benefit of implementation of an EMS: the commitment to environmental protection by all employees. The pride in working for an environmentally responsible organization, one that is conscious of the impacts of its activities, leads to the development of a spirit of initiative and an increase in the frequency of local actions towards a global vision.

The process of implementing an EMS involves the ranking of activities relative to the significance of the impacts that they generate, and thus permits the organization to identify the main priorities.

Since the activities covered by the environment department are linked to those of other auxiliary departments, such as health and safety, training and communications, the first years of development of the EMS have a domino effect on the organization of the latter.

The establishment of an EMS is added assurance of due diligence for the organization.

The improvement of local, regional or global environmental quality is difficult to evaluate on the short term. Measurable improvements

require the implication of several industry members over the long term. The potential economic benefits of sound environmental management are also difficult to evaluate; however, the USEPA in conjunction with the University of North Carolina and the Environmental Law Institute are currently gathering a database in view of answering these questions. Canadian mining industry could also carry a similar study in assistance to its sustainable mining plan.