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Managing the closure process with an effective safety, health and environmental management system

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Abstract

An Environmental Management System (EMS) plays a critical role in providing organisation, consistency, and compliance to an organisation. An EMS is not just for "active" facilities—it can be a useful approach to managing environmental issues for any operation with the potential to impact the environment and with regulatory obligations. This case study presents the benefits gained from implementing an EMS at a mine undergoing closure.

A systematic approach was used to develop working relationships with the mine staff and ensure the EMS process was understood as each phase was approached. This approach aided in achieving a common vision for the EMS and helped each staff member feel responsibility for the EMS. By adapting corporate policies to site specific conditions and understanding EMS activities at the operational level, including the health and safety issues, an effective and integrated Safety, Health and Environmental Management System (SHEMS) was developed and implemented.

Many benefits were realised at the facility including improving sampling methods for surface and groundwater monitoring which led to a request for reducing monitoring requirements, identifying additional training needs, improving safety performance and increased employee morale. In addition, much of the facility's environmental and health and safety operations were retained by specific individuals with a long history at the facility. The SHEMS provided a mechanism for systematically documenting that institutional knowledge to ensure continuity as personnel transition away from their current positions.

1 Introduction

Managing a mine throughout all phases of the mine lifecycle requires managing environmental risk. Traditionally, this was accomplished by managing activities based solely on compliance requirements. While adequate, this approach did not look to proactively predict and reduce risk as well as potential future liabilities. More recently, companies are implementing environmental management systems (EMSs) for greater success in achieving compliance and managing risk and providing for consistent execution throughout the mine lifecycle.

1.1 What is an EMS?

Simply stated, an EMS is a way for a mining company (or any organisation) to identify those activities that pose a risk to the environment and to minimise those risks through a combination of engineered controls and/or standard operating procedures. The EMS requires the company to train employees and contractors to follow these procedures and to create a culture that encourages them to proactively identify and reduce environmental risks.

Most EMSs use a "Plan, Do, Check, Act" model which is expanded to encompass several elements as required. Figure 1 provides a simple schematic of the Plan, Do, Check, Act model.

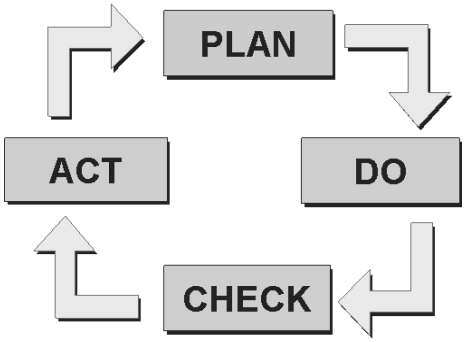

Figure 1 Plan do check act cycle for continual improvement

1.2 Benefits of an EMS

Companies that have an EMS note an increase in environmental awareness among their workforce and improvement in environmental performance as measured by reduced waste emissions, a reduction in the use of hazardous materials, increased reuse and recycling rates and a reduction in external inspections and penalties. While specific benefits will vary for each facility or site, the overall benefit for implementing an EMS is the ongoing management and mitigation of environmental risks.

1.3 EMS challenges

Implementing an EMS is no small undertaking – it typically involves internal and external resources and requires staff training and the adoption of new processes and procedures. It also requires a process for managing documents and records. For these reasons, an EMS is often seen as burdensome.

1.4 Barrick and EMS

Barrick recognised the benefits of applying EMS to drive a consistent set of global environmental management expectations. The company developed a corporate EMS standard designed to be consistent with, and go beyond International Organisation for Standardisation (ISO) 14001 (ISO 14001 is the international standard describing the specific requirements for an EMS). The Barrick EMS consists of 16 elements. Each element contains a statement of the standard of environmental conduct that the Company expects, followed by a list of Management System Requirements (the "Requirements"). The Requirements represent the specific policies, practices, procedures or tasks that are, at a minimum, required to meet the standard of conduct.

Following roll out of the corporate EMS and training in the standard, each business unit was required to adapt and implement an EMS tailored to each of their sites.

The specific objectives for the EMS programme at this site were threefold:

- Develop and implement an environmental management system compliant with corporate EMS policies and ISO 14001 standards.
- Align corporate EMS policies with Barrick Safety and Health System (SHS) policies.
- Ensure compliance with all EHS legal and other requirements (e.g. corporate requirements and commitments, stakeholder obligations, inspections, etc.).

This paper presents how this was accomplished at a gold mine site in the closure and reclamation phase in northern California.

2 Methodology

The mine closure process requires management of multiple elements including reporting requirements, monitoring and maintenance, permitting compliance, tracking of regulatory changes as well as associated health and safety issues. Staffing and management are also critical components to consider.

These elements of mine closure dovetail nicely into elements of an EMS; thus, an EMS presents opportunities to effectively manage the closure process. Contrary to open mines, closed mines have very limited staff resources and project timelines can stretch over many years. Implementation of a Safety, Health and Environmental Management System (SHEMS) had the potential to organise and formalise multiple closure efforts and assure consistent transfer of responsibilities and operations when on site personnel retire.

Backed by interest and direction from corporate management, an SHEMS was initiated, initially based on standard tools that had been created at the corporate level for active mine sites. The project methodology involved the following four major tasks:

- Initial gap analysis.
- Modifications to align with the Safety and Health system and scale provided tools to a mine undergoing closure.
- Implementation.
- Auditing to assure continual improvement.

2.1 Background

The mine is located in the Coast Range province of Northern California, approximately 100 miles northeast of Sacramento. Mine construction began in the fall of 1983 with the first gold produced in spring of 1985. Open-pit mining was completed in 1996, milling and processing of low grade stockpiled ore was completed in 2002. Between 1983 and 2002, the mine produced nearly 3.5 million ounces of gold from over 38 million tons of ore. Decommissioning and reclamation activities began in 2002 and by 2004, several facilities in the mine and processing areas were removed and the grounds were re-contoured to final grades and revegetated. Reclamation has been ongoing since that time and remaining reclamation is limited to a few areas. Several active permits and plans require on-going maintenance, monitoring, and reporting. The mine is under the supervision of six full time staff.

Due to the variety of closure activities to be undertaken, an EMS made sense to ensure continuity of compliance and other risk management objectives. However, given the remoteness of the site and the relatively small staff, the EMS had to be something that would truly add value given the limited resources available. Initial review of the SHEMS tools confirmed staff's concern that the tools prepared for active mine operations did not include all closure-related activities.

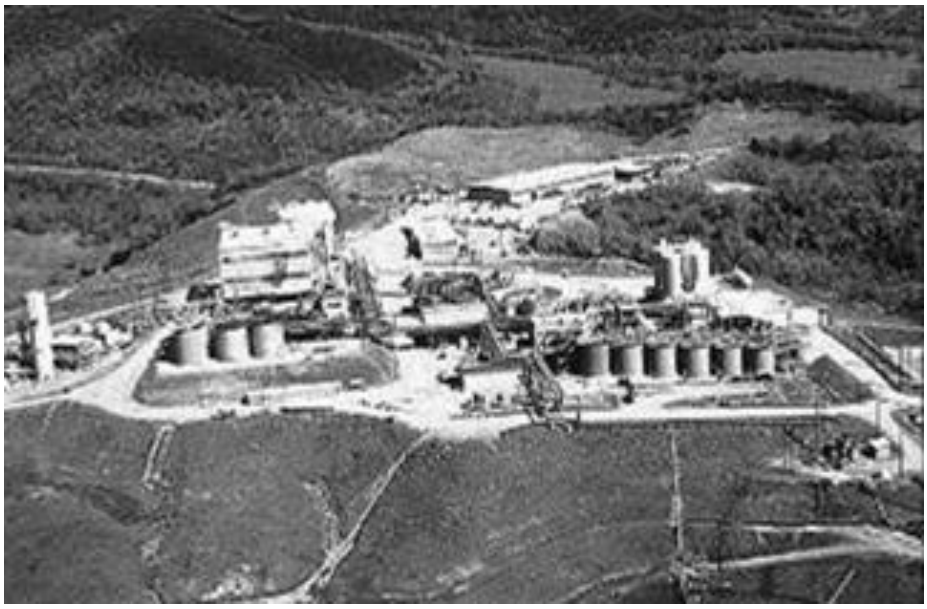

Figure 2 Site layout during operations

2.2 Gap analysis

An EMS consists of discrete elements (aspects analysis, objectives and targets, training, document control, audit, management review, etc.) many of which may already be in place in an established workplace. As described above, the Barrick EMS consists of 16 elements that generally reflect the elements presented in the ISO 14001 EMS standard. In some cases, Barrick's structure adopted additional elements, combined elements, or expanded on certain elements to provide for a more robust and site-specific system. One example includes a Formal Risk Assessment in place of a traditional environmental aspects analysis.

To understand the extent to which the facility's existing management practices already meet the requirements of a formal EMS, a Gap Analysis is performed. This exercise involves interviewing staff and reviewing documents to see how they are working and how they meet the EMS standard.

The Barrick Gap Analysis was completed in one week using a standard audit tool. The analysis considered corporate EMS tools as well as existing on-site practices and procedures. This comparison allowed for:

- Alignment and streamlining of initiatives where there is overlap between environmental and health and safety programmes.
- Using the concept of 'signposts' to point to existing procedures and documents already in place.
- Identification of system gaps.

From this analysis a path forward and implementation plan was developed.

2.3 Integration of safety and health and streamlining the system

Based on the gap assessment, the facility faced challenges implementing a meaningful EMS that is tailored to the tasks at hand. In addition, the facility wished to build a system that would address both environmental and health and safety management needs; therefore, the design of a system needed to account for the needs of both programmes without being redundant or awkward. One of the main recommendations coming out of the gap analysis process was to combine the safety, health and environmental requirements, and scale back the tools into one streamlined system.

The on-site team worked through both the Corporate Environmental and Corporate Safety systems, aligned the elements where there was overlap, and created one set of procedures and matrices to address safety, health and environmental elements. In addition, all of the corporate tools were reviewed and tailored to simplify the implementation. As an example – the Environmental Management System and the Safety and Health Management System processes for identifying and implementing legal and other requirements were combined. At this site under the SHEMS, one complete legal and other requirement matrix was created that addressed safety, health and environmental requirements. In addition, the matrix was created with hyperlinks to all applicable online regulations, internal procedures, and copies of permits and licenses. The tailoring of this tool allowed one user to quickly and easily access all requirements.

2.4 Implementation plan

Key elements of the Implementation Plan involved the following tasks:

- Create a Compliance Matrix and a Compliance Calendar that align with each other. The compliance matrix lists all local, state and federal SHE regulations, including permit and plan requirements that are applicable to the site. Generating the matrix highlighted required permit conditions and drove the need for a shared Compliance Calendar that assigned specific work tasks to the site personnel. Where these requirements contained routine monitoring and reporting tasks, compliance tasks were input into a Shared Outlook "Compliance" Calendar shared by all site personnel.
- Establish clear document control and records management procedures. The mine had developed a complex document and records management programme while in operation. The document organisation structure was no longer applicable once the mine transitioned into closure activities. An updated document structure was organised to reflect the closure and monitoring activities.

- Review and update the risk assessment matrix. The risk matrix was revised to reflect the environmental and health and safety risks of a closed mine site. These risks were not necessarily less severe than an active operation, but different.
- Review the EHS compliance matrix and risk assessment matrix to identify the need for standard operating procedures for the site staff (such as groundwater monitoring) which had not been updated since mine closure. Procedures, checklists, and other tools were also formalised and modified to streamline processes and ensure compliance.

3 Data

During implementation of a management system, data is not typically collected to specifically monitor performance during the implementation process. At this mine site, the following performance areas were assessed during the process:

- As part of the corrective action process, all open corrective actions and non-conformance items were entered into a single database. Over the course of the first year of implementation, we noted an initial increase in corrective actions that stabilised as the system became functional.
- Improved document and records management was noted. A series of documents were revised to account for new procedures and were put under a defined document management process. These documents included formal plans submitted to agencies, internal required plans, internal procedures for monitoring, and training records. A system for preserving and accessing historical documents and data while allowing for ready access to current documents and data improved document retrieval and allowed for consistent file structures between various programme areas.
- A comprehensive database of applicable legal and other requirements were compiled into a legal registry. The final database addressed environmentally based permit and license programme areas, all applicable EHS regulations, and includes a total of approximately 285 entries (60 permit and report entries, 75 environmental regulatory entries, and 150 health and safety regulations).

4 Results

By adapting corporate policies to site specific conditions and understanding EMS activities at the operational level, including health and safety issues, an effective SHEMS was integrated in such a way to produce beneficial results which are described below.

4.1 Engagement

The entire mine staff were engaged during the development process to ensure the EMS process was complete and understood as each phase was approached. This approach aided in achieving a common vision for the EMS and helped each staff member feel responsibility for the EMS. The engagement and training process ensures that the SHEMS is being implemented and continuously improvement upon.

4.2 Customisation

Corporate policies were adapted to site specific conditions to ensure that they were relevant and added value. Current site processes were identified and incorporated into the system to take advantage of existing best practices. This customisation at the operational level resulted in an effective and integrated SHEMS. Examples where corporate policies were adapted to meet the needs at the operational level included using the Corporate Formal Risk Assessment Guideline to provide a risk assessment for operations pertaining to McLaughlin, utilising the Corporate Change Management Procedure to assess major operational changes at the site, incorporating the Corporate Crisis Communication Plan as a guideline to revise the site's emergency plan, and developing a contractor EHS training matrix for the site with guidance from the Corporate EMS and BSHS Contractor requirements.

4.3 Integration

The processes used to manage both environmental and health & safety risks were identified, analysed, and merged to ensure a streamlined and integrated management system that was of an appropriate scale and scope for a closed mine site. This resulted in a system that is more efficient, less duplication of efforts (e.g. document control, record keeping, and inspections), and enables cross-training of limited staff resources.

4.4 Performance

As a result of the implementation of a robust and thoughtful SHEMS, many unexpected benefits were realised at the facility including improved safety performance and increased employee morale through shared responsibilities and collaboration. Other results of implementing the SHEMS include:

- Identifying the need for updated and improved sampling methods associated with water samples which resulted in reduction of monitoring requirements (e.g. fewer sample locations, reduced parameter list, etc) associated with the permit.
- Identifying additional training and cross-training needs and implementing an annual training programme.
- Verification that the database of applicable and other legal requirements was complete.
- Establishing a tracking and reminder system for training and routine monitoring, maintenance, and reporting requirements.
- Developing a streamlined process for electronic and hard-copy document storage and retrieval.

5 Conclusions

Barrick is using EMS to drive compliance with a consistent set of global environmental management expectations. Following development of a corporate EMS policy (based on ISO 14001), each business unit was required to adapt and implement an EMS at their sites. Using a systematic and employee-focused approach, an EMS was successfully implemented at the mine. This process resulted in the following benefits:

- The Gap Analysis was completed over a period of two weeks using a standard audit tool that provided a clear picture of present and missing system elements. From this, an EMS Baseline Assessment Report and EMS Implementation Plan were prepared. During the Gap Analysis, it became apparent that the mine (and possibly other sites undergoing closure) had a unique challenge of adapting the operational system to a closed site.
- The Gap Analysis revealed that many elements of the environmental and safety systems overlapped at the site; for efficiency, it made sense to combine systems at this site to be comprehensive and due to limited resources. Therefore, a single SHEMS that would meet both corporate standards was created, which results in more efficient and robust system for this mine.
- A compliance matrix was created, along with a closely aligned Compliance Calendar for routine monitoring, maintenance, reporting obligations, and tracking. Generating the matrix highlighted required permit conditions and drove the need for a shared Compliance Calendar that assigned specific work tasks to the site personnel. It also highlighted the need for standard operating procedures.
- Clear document control and records management procedures were established. The document and records management process was streamlined and made easier to manage by a single administrator. This was seen as a direct benefit of the EMS by the site personnel.

Not all environmental management systems are created alike. Nor should they be. When developing and implementing an effective EMS for mine sites in various stages of the mine life cycle, attention must be given to specific conditions at the facility as well as the staff, current and future, that is ultimately responsible for using the EMS.

Key components of a successful EMS include:

- Customise the system to reflect the scope and scale of the operations.
- Create a system that reflects the resources available to manage it.
- Engage employees.
- Adopt existing processes where possible rather than create new processes that can result in confusion and unnecessary burden and/or training.
- Identify and condense legal obligations into a useful reference matrix and compliance calendar to support planning and resource allocation.
- Where applicable, integrate environmental and health & safety management system processes into a common framework to streamline implementation, improve employee understanding, and ensure ongoing success.