Example of a working EMS project

General

This example is taken from a working EMS project and aims to illustrate how all the various elements of phased EMS implementation fit together. This EMS example focuses on a limited number of operations and activities: a company-wide EMS would include a wider range of aspects and impacts, associated legislation and operational controls.

The general manager and owner of XYZ, a small metal fabricating plant with 14 employees, including a process engineer, a supervisor, two administrative officers and 10 workers, wanted to see if an EMS would bring about overall environmental improvements to his company.

At a management team meeting, attention focused on a series of minor spills that had occurred in the chemicals delivery and storage area. Although the spills represented a modest cost in loss of raw materials, the clean-up operation added substantially to the cost of waste disposal. Moreover, it was acknowledged that these incidents could have had a significant impact on the environment and were inconsistent with the plant's publicized policy commitment to prevent pollution of their property. Management was aware that local NGOs had been alerted by newspaper reports on the spills. Advice from the regional Association of Metallurgical SMEs also indicated that there was a legal requirement to report spills to the environmental regulatory agency.

The management team recognized this was a serious issue and decided to initiate an environmental management project to address the problem.

*Without knowing, at this point, the following EMS elements (structured according to the clauses of ISO 14001:2015) had been established to some degree of maturity: 4.1 (Understanding the organization and its context), 4.2 (Understanding the needs and expectations of interested parties), 5.1 (Leadership and commitment), 5.2 (Environmental policy), 6.1.1 (Actions to address risks and opportunities, general), 6.1.2 24 (Environmental aspects), 6.1.3 (Compliance obligations), 6.1.4 (Planning action), 6.2.1 (Environmental objectives). “Degree of maturity” refers to Annex A of ISO 14005:2019.*

The supervisor, responsible for unloading operations, analysed past spills and found that each spill could have been prevented by the safeguards already installed. Five spills occurred with untrained employees, who had not made use of appropriate equipment such as drain covers; and the last occurred when one of the safeguards was improperly used. The team therefore agreed that their objective would be the elimination of spills.

*By performing these actions, the following additional EMS elements were established to some degree of maturity: 8.1 (Operational planning and control), 9.1.1 (Monitoring, measurement, analysis and evaluation, general), and 10.2 (Nonconformity and corrective action).*

The first step with respect to the elimination of spills was to raise environmental awareness among the four operators responsible for loading operations about the environmental impacts associated with the spills and to agree to an action plan to prevent further spillage. This plan was agreed on at a follow-up meeting with the four operators.

The general manager set a programme to meet the objective, which included the following actions:
— issuing instructions to the operators to ensure adequate operational control by clearly defining how the loading and unloading procedure should be undertaken;

— issuing a further instruction to ensure that, in the case of a spill (emergency situation), the equipment is properly located and ready to be used;

— providing instructions on how to mitigate the impact and dispose of the waste;

— informing the local authority of the spillage and actions taken; this instruction should help to ensure compliance with the relevant legal requirements;

— scheduling drills monthly; after a drill, the emergency procedures were reviewed and only employees who had demonstrated to the supervisor their competency in these procedures were allowed to undertake loading and unloading work;

— using signage and photos to illustrate work instructions on how the safeguard equipment should be used.

Responsibilities were assigned and milestones defined.

By implementing these actions, the following additional EMS elements (based on the structure defined in ISO 14001) were established to some degree of maturity: 7.2 (Competence), 7.3 (Awareness), 5.3 (Organizational roles, responsibilities and authorities), 7.1 (Resources), 8.2 (Emergency preparedness and response). Most of the previously mentioned elements (5.1, 5.2, 6.1.2, 6.1.3, 6.1.4, 6.2.1) were enhanced to a higher level of maturity.

The operational controls included amending the unloading logbook, such that the operator could record whether the safeguards were in place or, if they were not used, a justification for this. The logbook was reviewed weekly at the managers’ meeting (i.e. the regular meeting of the general manager, process engineer and supervisor).

After two months, the records showed there had not been spills. However, the early morning operator had begun to omit using safeguards giving the reason “insufficient time”. Action was taken to correct this in the form of reviewing the morning schedule and revising it to ensure that there was sufficient time. Preventive action was taken in the form of training all of the operators to notify their supervisor when there were operating problems that interfered with procedures.

The general manager and owner of XYZ acknowledged the success of this environmental improvement project and decided to implement a more systematic approach to deal with environmental issues (but to not yet aim for a full environmental management system), and to establish and implement the actions needed.

To understand the context for EMS implementation, he considered that in the past there hadn’t been any concerns raised by employees or authorities regarding environmental issues. However, some immediate neighbours complained from time to time about too-high noise levels; these complaints had occurred when the company had to work longer hours or even night shifts at times of high workload. The general manager saw this issue as a risk that would need to be addressed due to his intention to increase the production volume over the coming years.
By implementing these actions, the following additional EMS elements (based on the structure defined in ISO 14001) were established to some degree of maturity: 4.1 (Understanding the organization and its context), 4.2 (Understanding the needs and expectations of interested parties), 6.1.1 (Actions to address risks and opportunities, general).

Identification of significant environmental aspects and compliance obligations (legal and other requirements)

The general manager decided to involve an environmental advisor from the trade association to support implementing a more developed EMS, covering all elements of ISO 14001, in his company.

Acknowledging his employees’ experience of the company’s processes, the owner organized a morning meeting at the plant and asked them to help him to identify all the environmental aspects and potential impacts related to the activities and products of XYZ. The team identified five categories in which activities, goods and products could produce an environmental impact or pose risk of adverse effects on the organization, including:

— emissions to air, discharges to water and soil;
— noise, odours or light that could affect neighbours;
— use of goods and services;
— energy consumption (electricity, gas, fuel); and
— materials consumption (e.g. metals, plastics/timber for packaging, water, paints, solvents, oil, cooling fluids and cleaning agents).

The team reached a consensus on 12 environmental aspects that could lead to environmental impacts. Following a further meeting with the environmental advisor of the regional Association of Metallurgical SMEs, the general manager developed an approach to determine the most significant environmental aspects. To this end, he assigned to each aspect a likelihood (i.e. how frequently the respective operation was carried out), the potential severity of the associated environmental impact, and an exposure factor covering issues such as compliance requirements and stakeholder concerns. It was decided that five of the identified environmental aspects should be considered significant. These included: electric energy consumption, discharge of water to the drainage, noise produced by the four lathes (all three being aspects in normal conditions), fires in the chemicals deposit and spills dealt with by the first project (these two being potential emergency situations). For the time being, the general manager decided not to take environmental aspects into account that the company could not influence, or only to a very limited extent.

By implementing these actions, the following additional EMS elements (based on the structure defined in ISO 14001) were established to some degree of maturity: 4.3 (Determining the scope of the environmental management system), 4.4 (Environmental management system), and the following EMS elements were enhanced to a higher degree of maturity: 6.1.2 (Environmental aspects), 6.1.3 (Compliance obligations).

Legal requirements (including permits, report of spills, monitoring of emissions and other regulations) applicable to all the identified aspects were also discussed with the environmental advisor. Four
applicable requirements were identified, including: noise to neighbours (mentioned in the association charter), report of spills, local fire regulations and discharge to the drainage.

The general manager then prepared an aspects list, highlighting those that were significant, and a second list detailing all the compliance obligations, including the applicable legal requirements as well as the “environmental charter” of the local association, to which he had decided to voluntarily adhere to as part of the EMS implementation. He also started to identify risks and opportunities linked with the aspects and needs and expectations of interested parties, such as the risk that expansion of production might be impossible due to noise issues, or the potential need for air-conditioning (and therefore increased consumption of electrical energy) due to increasing temperature levels in summer, caused by global warming.

The general manager established a procedure to meet with the environmental advisor every six months to review and update information related to the identification and evaluation of environmental aspects and legal and other requirements, as well as related risks and opportunities. Details and results from these meetings were communicated to all employees.

By performing these actions, the following EMS elements were enhanced to a higher degree of maturity: 6.1.3 (Compliance obligations), 7.4.2 (Internal communication). The following additional EMS element was established to some degree of maturity: 9.1.2 (Evaluation of compliance), 9.3 (Management review).

Environmental policy

Following the review of significant aspects, the general manager prepared and documented a new environmental policy for XYZ which included the following company aims and commitments:

— commitment to comply with the applicable legal and other obligations, such as the environmental charter of the Association of Metallurgical SMEs;

— protection of the environment and prevention of pollution (mentioning intended reduction of energy consumption and waste material, and avoidance of spills);

— continual improvement of the EMS to enhance environmental performance.

The environmental policy was explained to all employees, with particular emphasis on the “protection of the environment and prevention of pollution” topic, as defined in ISO 14001. Copies of the policy were placed in visible locations around the factory for the benefit of employees and visitors.

By implementing the environmental policy as described, the following EMS element was enhanced to a higher degree of maturity: 5.2 (Environmental policy), The following additional EMS elements were established to some degree of maturity: 7.4.2 (Internal communication), 7.4.3 (External communication).

Objectives, targets and programme

The next step was to ensure that XYZ was managing the significant aspects and to take further actions, where necessary.

In the case of the six significant aspects, XYZ established objectives (to improve or to maintain a certain level of performance):

Table 1: Objectives related to significant environmental aspects of company XYZ
Environmental aspect

Objective for the next year(s)

Energy consumption
Maintain it below 5 500 kWh in spite of business growth, increase profitability

Generation of scrap metal
Reduce scrap from machining (relative to metal purchased) by 10% over the next 3 years – increase profitability due to reduced material consumption and waste handling cost

Discharge of water
Keep meeting relevant regulations, avoid problems with authorities

Noise, triggered by the complaint of two neighbours and the organization’s intention to meet their needs and expectations
Reduce the level in the premises, such that the noise level at the two closest neighbours doesn’t exceed 60 dB at night (reducing the risk of complaints when the production volume will be increased)

Spills
Zero spills, not only to avoid damage to the environment, but also to prevent a negative company image

Potential for fire in the deposit of chemicals improvement efforts triggered by a new requirement in the environmental charter of the local trade association, but also by the intention to reduce the risk of interruption of production due to a fire

Comply with the environmental charter before September of the coming year

*By establishing the environmental objectives as described, the following element of its EMS was established to some degree of maturity: 6.2.2 (Planning actions to achieve environmental objectives).*

An environmental programme was developed and implemented to ensure immediate improvement of four of the key objectives (discharged water, noise, spills and fire). For the other two objectives (energy and scrap metal), it was agreed to first perform feasibility studies and establish detailed action plans in the following year. The programme established the actions needed to meet the respective objective, the timetable and the resources needed, and the operators responsible for those actions.

The environmental programme covered the following topics:

— discharged water: improve the continuous water monitoring system;

— noise: identify sources of noise, review and improve the maintenance of the four lathes, consider using sound barriers close to the machines, measure noise levels at neighbours’ premises to verify the objective has been met;

— spills: improve and repeat the train operators; raise awareness for supervisors; provide improved blocking devices for the sewer system;
— fires: provide clear and detailed information about requirements, train personnel, conduct a new calculation of “fire charge”, analyse the material safety data sheets (MSDS) of the chemicals stored and procedures to ensure the continuous availability of fire extinguishers.

The programme listed the responsible person for each action item, and where appropriate, the resources planned to be utilized. It also gave the respective timeframes. The environmental programme is reviewed once a month by the supervisor and the process engineer.

*By implementing the environmental programme as described, the following EMS elements were enhanced to a higher degree of maturity: 6.2.1 (Environmental objectives), 9.1.1 (Monitoring, measurement, analysis and evaluation, general).*

**Competence and awareness**

The general manager decided that based on the experience with mitigating spills, it would be required to raise the awareness of the workforce for environmental issues in general and those related to the individual job in particular. With the help from the association’s environmental advisor, a competence matrix was established, indicating the type of environmental knowledge required for specific company functions. This was used to determine the competence level for all employees, and consequently the individual training needs. A training plan was set up and one of the courses dealt with handling of chemicals.

**Operational control**

The next step was to analyse how XYZ was managing those significant aspects that were not involved in improvement projects.

*Table 2: Operational controls implemented in respect of specific environmental aspects of company XYZ*

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Operational control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption</td>
<td>The process engineer defined methods for using electric equipment and lighting and for the preventive and predictive maintenance of the four lathes, and communicated it to the personnel.</td>
</tr>
<tr>
<td>Drainage</td>
<td>An instruction clearly defined the process to operate the treatment plant to ensure the pH of industrial effluents met legal requirements; the instructions explaining the sequence of operations were signposted close to the set of valves.</td>
</tr>
<tr>
<td>Spills (first project)</td>
<td>Support of trained personnel by using signage and photos on the unloading and handling of chemicals using corresponding guidance from MSDSs.</td>
</tr>
</tbody>
</table>

Once a month, the general manager, the supervisor and the process engineer reviewed operational control of these aspects, including:
— all measurement and monitoring activities;
— competence of all personnel involved;
— corrective actions, where required.

By implementing operational controls as described, the following EMS elements were enhanced to a higher degree of maturity: 8.1 (Operational planning and control), 10.2 (Nonconformity and corrective action).

**Emergencies**

XYZ identified two emergency situations relating to spills and fire protection.

In the case of spills, the process engineer is now required to:
— establish a routine to check the availability and the conditions of the safeguards;
— perform a drill every month to ensure that all personnel know how to react in the case of a spill;
— review the emergency procedure after each drill and after real emergencies.

The second potential emergency (a fire in the chemical deposit) is included in the EMS objectives and, on completion of the programme, full legal compliance will be achieved. All employees will be trained in the application of the new emergency procedure.

By implementing these actions related to emergency situations, the following EMS elements were enhanced to a higher degree of maturity: 8.2 (Emergency preparedness and response).

**Monitoring and measuring**

The process engineer established a programme to monitor the activities related to the environmental aspects, including:

Table 3: Monitoring programme

<table>
<thead>
<tr>
<th>Topic</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>composition of water discharged</td>
<td>once every week</td>
</tr>
<tr>
<td>noise in and out the site</td>
<td>once every 6 months</td>
</tr>
<tr>
<td>electricity consumption</td>
<td>monthly (invoice of local electricity supplier)</td>
</tr>
<tr>
<td>status of the elements to respond to emergencies</td>
<td>monthly</td>
</tr>
</tbody>
</table>
maintenance plan of the infrastructure

— monthly

Noise measurements and water composition are subcontracted to a local laboratory, which provides the reports with the results together with calibration records of the equipment they used.

Achievements of objectives, established under the EMS, are also monitored monthly.

All reports are kept in the XYZ environmental logbook.

By implementing the monitoring programme as described, the following EMS elements were established to some degree of maturity: 9.1.1 (Monitoring, measurement, analysis and evaluation; general), 7.5.1 (Documented information, general). 7.5.2 (Documented information, creating and updating) was enhanced to a higher degree of maturity.

Environmental performance

The general manager established a set of environmental performance indicators (EPIs) to monitor the company's commitment to environmental improvement, to promote environmental awareness and to compare XYZ with other companies.

The EPIs selected included:

— energy consumption per material processed (kWh/t);
— water consumption per material processed (l/t);
— scrap metal per material processed (kg/t);
— hours of environmental training per employee (h/a);
— number of complaints regarding exceedances of the noise limit per month;
— degree of compliance with the environmental programme (delays and costs).

These indicators are calculated regularly and reviewed during the management meetings.

By implementing the EPIs and related processes, the following EMS elements were enhanced to a higher degree of maturity: 9.1.1 (Monitoring, measurement, analysis and evaluation; general).

Internal audits

The owner and the process engineer attended a two-day internal auditor course at the trade association, which helped them to develop a standard checklist for undertaking internal EMS audits.

A full internal EMS audit is now undertaken once a year, one week before the planned management reviews. In shorter intervals, audits of critical processes or areas are undertaken, depending of the significance of respective environmental aspects.

If the result of an internal unit is not as expected, the owner can initiate additional internal audits to check that appropriate actions have been taken.
The audit report is analysed during the management review or, when appropriate, during the weekly meetings. These reports are kept in the XYZ environmental logbook.

By implementing an internal audit programme as described, the following EMS elements were enhanced to a higher degree of maturity (level 5): 9.2.1 (Internal audit, general), 9.2.2 (Internal audit programme), 7.5.2 (Documented information, creating and updating).

Managing when things do not go as planned

A special clause of the XYZ environmental logbook was established to record any deviation from the EMS requirements, incidents and accidents, complaints from external parties and the results of the internal audits.

For each entry, the process engineer should analyse the cause of the problem, take corrective action, take further action to prevent its recurrence and keep the corresponding records in the logbook.

This logbook is reviewed at the weekly management meeting.

By implementing these processes, the following EMS elements were enhanced a higher degree of maturity: 10.2 (Nonconformity and corrective action), 7.5.2 (Documented information, creating and updating).

Management review

During the weekly management meeting, any environmental issue that needs attention is analysed and action is taken if necessary. Additionally, at the end of April each year, one of the weekly meetings is dedicated to the EMS management review. This review covers presently:

— review of the status of actions from previous meetings;

— changes regarding external and internal issues that are relevant to the environmental management system;

— changed needs and expectations of interested parties (e.g. local authorities and neighbours), including compliance obligations;

— changes in respect of significant environmental aspects or risks and opportunities;

— the extent to which environmental objectives have been achieved;

— the environmental performance of XYZ, covering:
  — results of internal audits and the evaluations of fulfilment of compliance obligations, nonconformities and the corresponding corrective and preventive actions;
  — monitoring and measurement results;

— potential changes in regulations and in the business in general, which could affect the organization’s environmental performance;

— opportunities for continual improvement, including recommendations coming from any member of the company.
The process engineer prepares a brief report of the annual EMS review and the weekly meetings, with a summary of the key issues. A list of actions is distributed to those responsible for resolving the issues, in line with continual improvement. Follow-up happens at management meetings and, as a whole, at the next management review. A copy of this report is kept in the XYZ environmental logbook.

*By implementing the management review process as described, the following EMS elements were established to some degree of maturity: 9.3 (Management review) and 10.3 (Continual improvement).*

**Documents and records**

The company’s EMS is fully described in an “EMS manual” which also includes figures and flow diagrams. The manual is kept in the supervisor's office and is available to all personnel.

All records are kept in the XYZ environmental logbook, which contains documents such as:

- list of environmental aspects;
- list of legal requirements;
- environmental programme;
- evaluations of compliance;
- training records;
- communications;
- other records mentioned previously.

*By implementing processes to create and maintain documented information as described, the following EMS elements were enhanced to a higher degree of maturity: 7.5.1 (Documented information, general) and 7.5.2 (Documented information, creating and updating).*

Based the experience with implementing the basic elements of an EMS, the general manager and owner of XYZ decided to follow a suggestion from the environmental advisor and start implementing a fully mature EMS, in accordance with ISO 14001. Ultimately, it should be possible to demonstrate conformity with ISO 14001, if appropriate, by third party certification. In order to understand where XYZ stood in terms of its EMS, the environmental advisor helped the management team of YXZ to perform a maturity assessment, using the matrix given in Annex A of ISO 14005:2019. The assessment revealed that most of the EMS elements had already reached maturity levels between 3 and 4, some even level 5, and only one element was still on level 1: 7.5.3 (Control of documented information), which hadn’t been formally implemented due to the limited size of the organization.