A Practical Guide for Scoring Environmental Aspects for Impact on the Environment

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The ISO 14000 Standard requires facilities to identify the environmental aspects of the organization's activities, products or services, and to determine those environmental aspects that have or can have significant impact on the environment. This paper will present a practical guide for the required scoring. The analysis considers the severity, the frequency of occurrences and the likelihood of detection for each aspect identified. A simple mathematical calculation is then performed for each aspect to determine its unique Risk Priority Number (RPN). The RPN will help determine which of a facility's aspects represent the greater impact on the environment. This will provide a benchmark in developing the specific environmental target and objectives to ensure continual improvement, conformance with the standard and progress made.

Everyone knows that the job of the environmental manager, without any assistance, is to do everything necessary to get a facility, plant, division or company registered as an ISO 14000 Company. Quite an easy feat, considering that the Environmental Policy and Procedures Manual developed under that scenario will, no doubt, rest in a dusty place on a shelf, never to be opened again. And yes, the facility will have so many major non-conformances during its registration audit that the environmental manager should probably sit on the shelf next to the manual, since both of them are out-of-date. So, how do you put it all together?

Establishing An Environmental Management Committee

The environmental manager is one of the members of the Environmental Management Committee (EMC). The EMC, with input from others, develops a structured process for determining the environmental aspects and impacts of its products, activities and services. This includes the use of material reviews and the definition of business processes. After a business process has been defined, it is then analyzed for its environmental impact. It is assumed that all regulated activities have significant impact or they would not be regulated. For non-regulated aspects, the EMC reviews the probability and severity of the impact should it occur.

The EMC should have, as a minimum, the following disciplines represented:

(a) Environmental Manager
(b) Operations Manager/Production Manager
(c) Human Resources Manager
(d) Industrial Engineer
(e) Facilities Engineer
(f) Process and Design Engineer
(g) Purchasing Manager
(h) Administrative Assistant
(i) Quality Manager
(j) Other Relevant Plant Personnel

The EMC is now challenged with the task of identifying environmental aspects and determining which of them have or can have significant impact on the environment.

Identifying Environmental Aspects

The EMC should meet to identify all processes performed in the plant. If the plant produces multiple products, they will identify the processes for all product lines. They will also identify all non-production processes (office, laboratory, sanitary, HVAC, storage tanks, vehicles etc.) that may interact with the environment, including all materials received, handled, stored or otherwise used in the plant.

The EMC will review the environmental aspects to consider what can go wrong with each process and material identified. The EMC will then score each of the processes and materials to determine those that have or can have significant impacts on the environment.

Scoring Environmental Aspects

Two possible scoring methods are:

1. *Environmental Potential Failure Mode & Effect Analysis (EPFMEA)*

The origin for the EPFMEA methodology described below is derived from ISO/QS 9000 Quality System Requirements Process. These FMEAs were established for quality management systems to improve the process to achieve defect prevention rather than defect detection.

For *severity*, score as follows:
7-10: Violation of a regulation; irreparable/severe damage to the environment.
4-6: Excessive resource depletion; release to the environment.
1-3: Resource depletion; noise impacting the community release, but not to the environment (*e.g.*, indoors).

For *frequency of occurrence*, score as follows:
7-10: Every day
4-6: Once per month
1-3: Once per year

For *likelihood of detection*, score as follows:
7-10: Five percent or less detection rate
4-6: 6-50 percent detection rate
1-3: 51-100 percent detection rate

In calculating the scores, take into consideration existing process controls. Calculate the relative risk of each aspect scored by multiplying *severity x frequency x likelihood of detection.* This score is defined as the Risk Priority Number (RPN).

Initially, aspects with a risk priority score greater than 100 will be deemed significant. As the aspects rating becomes tighter, the EMC will establish an RPN of the aspects that will be deemed significant.

Aspects regulated by legal or other requirements and aspects specially addressed in your environmental policy will be deemed significant.

Each aspect is then subdivided into the following potential failure modes:

A - Spill
B - Emit
C - Noise
D - Burn
E - Discharge
F - High Energy

For Example:

Let's consider a plating facility's wastewater treatment system. The facility has a State regulated wastewater discharge permit. The treated wastewater is then discharged through an open sump to the publicly owned treatment works (POTW). The wastewater treatment system consists of acid neutralization and metal precipitation.

"X" signifies that the aspect is regulated; by definition it is significant.

(1) Spill - This facility spills some acid monthly in a bermed area. The spill is visually detected, but not released to the environment.

(2) Discharge - The wastewater discharge is regulated by the permit issued by the POTW. This facility has permit violations, on average, once per year. The facility discharge is to an open sump; therefore, the likelihood of detection of someone dumping something into the sump, by-passing the treatment system, is great, thereby decreasing the detection rate to five percent or less.

Aspect	Potential Failure Mode	Regulated	Severity	Occurrence	Detection	RPN Total
Wastewater Treatment	A—Spill		3	6	1	18
	B—Emit					n/a
	C—Noise					n/a
	D—Burn					n/a
	E—Discharge	X	7	5	7	245
	F—High Energy					n/a

Let's consider a non-regulated aspect of this same plating facility, which has two loading docks. Both docks receive acids, bases and plating chemicals. If a truck is delivering or picking up at Dock "A," any other trucks are diverted to Dock "B."

Loading Dock "A"

Aspect	Potential Failure Mode	Regulated	Severity	Occurrence	Detection	RPN Total
Receiving Raw Material	A—Spill		3	2	3	18
	B—Emit					n/a
	C—Noise					n/a
	D—Burn					n/a
	E—Discharge		10	2	2	40
	F—High Energy					n/a

Loading Dock "A" has a sump system with a valve to prevent a discharge (if the valve is closed during deliveries). The facility has, on average, two spills per year that are captured by the sump and valve system. The dock is also diked and sloped towards the sump.

Loading Dock "B"

Aspect	Potential Failure Mode	Regulated	Severity	Occurrence	Detection	RPN Total
Receiving Raw Material	A—Spill		5	2	3	30
	B—Emit					n/a
	C—Noise					n/a
	D—Burn					n/a
	E—Discharge		10	2	10	200
	F—High Energy					n/a

Loading Dock "B" has a sump system but *does not* have a valve to prevent a discharge to the stormwater system. The facility has, on average, two spills per year. The dock is in poor shape and does not have any diked area, but is sloped toward the sump.

2. *Aspects Ranking Analysis System*
Areas Affected:

(a) Pollution Issues
Significant impact to air = 3
Minimal impact to air = 0
Significant impact to water = 3
Minimal impact to water = 0
Significant impact to land = 3
Minimal impact to land = 0

(b) Local and Global Impacts
Significant environmental impact = 1
Minimal environmental impact = 0

(c) Use of Natural Resources
Significant depletion = 1
Minimal depletion = 0

(d) Legal and Business Issues
Significant legal or business issues = 1
Minimal legal or business issues = 0

If the legal issue column contains a 1, the aspect is regulated and, by definition, it is significant.

Severity is scored as follows:
Very significant = 5
Significant = 4
Moderate = 3
Minimal = 2
None/Very Little Significance = 1

The RPN number is calculated by summing all of the areas affected and multiplying by the severity. Now let's consider this system for the previous examples:

The plating facility has a wastewater treatment system that is regulated by a State issued wastewater discharge permit. The treated wastewater is then discharged through an open sump to the publicly owned treatment works (POTW). The wastewater treatment system consists of acid neutralization and metal precipitation.

Wastewater Treatment	Pollution			Local Impact	Global Impact	Natural Resources	Legal Issue	Business Issue	Sum of Columns	Severity	RPN
	Air	Water	Land								
	0	3	0	1	0	1	1	0	6	5	30

Let's consider the two loading docks which were non-regulated aspects: Same conditions as stated previously.

Loading Dock "A"

Receiving Raw Materials	Pollution			Local Impact	Global Impact	Natural Resources	Legal Issue	Business Issue	Sum of Columns	Severity	RPN
	Air	Water	Land								
	0	1	0	0	0	0	0	0	1	5	5

Loading Dock "A" has a sump system with a valve to prevent a discharge (if the valve is closed during deliveries). The facility has, on average, two spills per year that are captured by the sump and valve system. The dock is also diked and sloped toward the sump.

Loading Dock "B"

Receiving Raw Materials	Pollution			Local Impact	Global Impact	Natural Resources	Legal Issue	Business Issue	Sum of Columns	Severity	RPN
	Air	Water	Land								
	0	3	3	1	0	1	0	0	8	5	40

Loading Dock "B" has a sump system but *does not* have a valve to prevent a discharge to the storm water system. The facility has, on average, two spills per year. The dike is in poor shape and does not have any diked area, but it is sloped toward the sump.

Conclusions

Both scoring systems offer different alternatives for you to consider as appropriate or not appropriate for each specific facility. There isn't any perfect method or right method. This is an individual and on-going process. Whatever methodology that you use should bring you back to the same basic place: This document is a "living" document. It's constantly changing due to business conditions, the community, global issues, regulation, plant equipment and processes. Please remember to keep your scoring system as simple as possible, and make sure that you define all of the factors so that anyone can use and understand the system.

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