

Establishment of an Environmental Management System According to ISO 14001 Standard Version 2004 Case of a Dairy Company

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Abstract: *The Goal involves implanting a practical approach to setting up of an environmental management system and adopting a complete environmental analysis.*

Method: -A company, leader in the dairy industry in Morocco has experienced significant development. The company seeks to demonstrate its commitment to improving its environmental performance level, it has developed a project to set up an environmental management system.

Results: In general, the process of a dairy industry involve important water consumption and energy and large volumes of wastewater with high organic load (2600m³ / J) and the company will only meet 30% of the requirements of ISO 14001, according to the environmental analysis we found significant environmental impacts which represents 28%.Corresponding to the production of waste, water pollution, air pollution and consumption of natural resources.

Keywords: *Environment, ISO 14001, Impact, Performance.*

1. INTRODUCTION

The continued development of our companies will be possible only in the context of respect for the environment. All enterprises must be mobilized to direct their activities towards Sustainable Development, in other words, by integrating economic development with environmental protection and social progress. Factor for innovation and progress, companies have a critical role to play in this development. They will meet with constraints, difficulties but also market opportunities.

Companies gathered in "Enterprises for Environment" know that the challenge of this evolution towards sustainable development can be met only if all companies suppliers and customers, whether this company is large and small, are also committed firmly in this direction. [1] It is therefore essential to take action to remove even reduce the negative effects [2]

To do this, there are a number of environmental assessment tools among them, The Life Cycle Analysis (LCA) Analysis of the effects of their failure modes and their criticality on Environmental (FMEA-E) the Environmental Impact Assessment Study (EIA), environmental audits etc.

A Dairy company has experienced significant development. It seeks to demonstrate its commitment to improving its environmental performance level notably with its main prime contractor, namely the

ecosystem. To do so, the company has developed a project to implement an environmental management system, a subject that sparked my interest and subject of this work.

2. MATERIALS AND METHODS

2.1. Study Area

The proactive integration of environment in most industrial enterprises is made by reflecting on the reduction of environmental impacts at the production site by adopting the EMS aimed at continuous improvement of its environmental performance by integrating environmental concerns at all levels of the company. The environmental evaluation has many tools. The most used is the Impact Study (EIA) (European Commission, 2007). [3]

2.1.1. The Methodology of Work

a) Initial Diagnosis: "Check list". [3]

This part aims to self-assess the environmental management level within the company. Self-assessment is conducted around 9 themes, for which it is appropriate to answer some questions. It is important in a first phase that management clearly communicates the issues and objectives sought by the certification. The company's assembly should know the requirements of the ISO 14001 standard and define their conformity percentage. A Check List presents a model for analyzing the gaps within the company according to the requirements of ISO1400 Standard. we take the example of the environmental policy.

Table1. Model of the check list

Environmental policy	Comment	Deviation	
Question	Answers	Yes	No
- Is there an environmental policy? - Political she includes a commitment : - Continuous improvement, - Prevention of pollution	Non	×	

b) The Environmental Analysis

The objectives are defined; the environmental analysis is done in three distinct steps which are the subject of a participatory approach at all levels of the organization to involve staff in the analysis. The different steps of Environmental analysis are: [2]

➤ Division and Mapping of the Site Area

We conducted a division into sector and activity to be placed at a sufficient level of detail to analyze the environmental aspects and impacts. This division will cover all business activities (workshops, construction sites, storage room ...

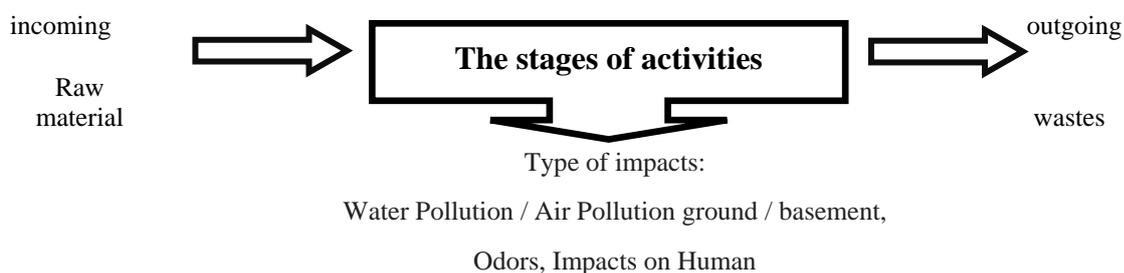


Fig1. Division and site mapping

➤ Identify the Environmental Aspects and Impacts

The purpose of the environmental analysis is to identify and prioritize the negative environmental impacts "significant" and "manageable". In this stage of analysis, it is necessary to conduct a comprehensive identification of aspects related to the activities and products of each area in normal operation / accidental.

Through the different manufacturing stages to know especially dusting, boiler, pasteurizers and cleaning up the plant consumes a considerable amount of water that are supplied from city water (distributed by Redal) and well water treated by reverse osmosis. Table 3 gives the facts concerning the drinking water at the site level.

Wastewater Management:

Water consumption in cleaning generates inevitably a considerably importante amount of wastewater with degraded quality that requires treatment before discharge to the receiving environment. Table 2 presents the volume of waste water discharged

Table2. Wastewater management generated by the plant

Question	Answer			Commet
Volume of wastewater discharged daily	2600 m ³ /j			Loss ratio global water 6,89m ³ / T. From 24/04/12: Leaking water at Osmosis A has generated a loss of 7m ³ / 15min therefore 600m ³ / d. No metering in the washing.
Existence of a separate system of rainwater drainage / sewage and sanitation process	yes	No	partially	Unitary network collecting wastewater from process of sanitation and storm water to be discharged directly into the sea without treatment (no STEP onsite or nearby).
		×		
	Public network without WWTP			
	Natural environment		×	
	Combination			

✓ Solid Waste Management

Like any plant, this site also has its share of solid waste of various types (hazardous, non-hazardous, household or others). And management of this waste is essential for the plant. Table 10 shows the quantities of each type of waste that is produced and its treatment.

Table3. Quantities of various types of solid waste and the treatment given to

Quantity of hazardous waste generated last year		
Type of waste	Quantity(ton)	Type of traetement
used oil		Landfilling
Chemical waste	-	Landfilling
Contaminated empty drums	-	Landfilling
worn ink	-	Landfilling
Quantity of nonhazardous waste generated last year		Type of traetement
Type of waste	Quantity(ton)	
Paper	30,9 t	other treatment
Plastic	71,5 t	Recycling outsourcing
Wood	24,3 t	Landfilling
household waste	-	Landfilling

The unavailability of the majority of data regarding solid waste is due to lack of mastery of the amounts generated by the factory (no calculation of the quantity of each type separately but just a heterogeneous collection without indication of the mass produced of waste).

✓ Atmospheric Emissions

The plant includes a steam generating unit this is the boiler room where there are three boilers which emit sulfur dioxide SO₂ from the combustion of fuel. Also, the exhaust semitrailers and aerosols escaping to the atmosphere. Table 6 shows only the main sources of atmospheric emissions.

Table4. Sources of air pollutants emitted by the plant

List of main emission sources		features
description	Type of emission	
Emission source 1	Ch EGFI 12 t	Heavy fuel oil No. 2 50 t
Emission source 2	Ch BANCOK 4 t	Heavy fuel oil No. 2 50 t
Emission source 3	CEGFI 6 t	Heavy fuel oil No. 2 50 t

c) Hierarchy of Environmental Impacts

An evaluation is made of the aspects, hierarchical and estimated significant for the company, that is to say, those deemed as priority depending on the method used. Therefore, the evaluation of the environmental aspects chosen by the company method is to list the aspects in relation to the evaluation criteria namely the frequency, severity, and control.

Table5. Evaluation Matrix

Scale for assessing environmental aspects and impacts manageable					
Symbol	wording	1	2	3	4
F	Frequency	Never during the life of the plant	Happened 1 time during the life of the plant	Happened more than one time during the life of the plant	-
		Never or a few times during the life of the plant	Several times a season (high output)	Several times a month	Continuous or several times per day
S	Severity	Minimal consequences and may be deleted.	Consequences can be significant over time.	Important and immediate consequences, but manageable after that time	Serious, costly and difficult to master.
C B	Brute Criticality	= F x S x M			
M	Mastery	The impact is perfectly controlled through (x) means (s) in place	The means put in place to control the impact is moderately satisfactory.	The means put in place to control the impact are ineffective or non-existent	-

The calculation of the global rating appearance is achieved by multiplying the scores for each criterion. (See the evaluation matrix)

Each of the criteria is assigned a score between 1 and 4. A high score for a criterion results in:

- An occurrence / high frequency (high repetition ...)
- A High severity (high volume or high hazard)
- An inefficient mastering (The means in place to master the impact).

✓ The Evaluation Criteria: [5]

Rating criticality:

➤ **Occurrence / Frequency:** The occurrence characterizes the frequency of appearance. The frequency introduces the concept of time "exposure" of man or the environment. In normal operation, it is the frequency of exposure to the dangerous situation or the environmental aspect.

- **Gravity:** Environmental, gravity takes into account both the intrinsic danger of the appearance and quantity / volume of the aspect (the higher the quantity or the volume consumed or rejected, the more gravity will be high). It may also take into account the sensitivity of the environment is impacted, this criterion can be processed separately.
- **Mastery:** Finally, control is defined by the features:
 - The prevention: to limit the probability of impact or damage,
 - The protection /intervention: to limit the severity of impact or damage.

It can be:

- The technical provisions: pollution control equipment, monitoring and detection, collective protective equipment and/or individual response equipment in case of emergency...
 - -The organizational arrangements: operations to ensure the availability and proper use of all equipment, practices to limit the risks and impacts through operating modes and instructions, skills management, preventive maintenance on equipment, test instructions and equipment, recordings ...
- The Significance Threshold

This notion of "significant" implies to make a choice between those who are significant and those that are not.

It is a threshold that the organism is fixed arbitrarily and may not be affected. In our case the assessment was done at the activity retaining the triplets (activity / look / impact), significant aspects are identified along with the impacts. After the identification of all issues and environmental, it is necessary to conduct an assessment and prioritization of the severity of the impact from the level of mastery of every aspect.

3. RESULTS

3.1. The Results of Initial Diagnosis the "Check List"

3.1.1. Percentage

Compliance:

According Check List we have 60 requirements according to ISO 14001:

- 42 Non-Conforming. (deviations)
- 18 Compliant.

We have found the following compliance percentage:

$$\Rightarrow 42/60 * 100 = 70\% \text{ (NC)}$$

$$\Rightarrow 18/60 * 100 = 30\% \text{ (C)} \text{ (NC: Not compliant, C: Complies)}$$

Therefore the company meets 30% with the requirements of ISO 14001, the results show that there are deviations, to be 100% compliant with the requirements, the LC must implement compensatory measures to minimize the differences.

3.2. Results of Environmental Analysis

3.2.1. Division of the Site and the Flow Chart

We conducted a division into sectors allowing getting a sufficient degree of detail to analyze aspects /

environmental impacts.

Units in which the environmental analysis is performed are the following:

- Units manufacturing process,
- Unit cleaning and disinfection,
- Units auxiliary operations: Atelier Reverse osmosis, boiler, cold production workshop, and compressed air production workshop,
- Quality Control Laboratory,
- Cold room
- Shipping

3.3. Evaluation Results of the Environmental Aspects and Impacts

3.3.1. Listing (Evaluation Scale)

The calculation of the global rating appearance is achieved by multiplying the scores for each criterion according to Table 5:

When listing the environmental aspect is greater than the significance level, the appearance is said to be significant.

If for one aspect, the site is not in compliance and some of its rating; it will be declared significant for the environment. To assess this, we applied the scoring table.

3.3.2. Quotation Example

**** Gravity**

For each aspect, and depending on the impact occurring, it applies the following quotations:

Water pollution

- Water pollution by hydrocarbons (oil, gas oil, heavy fuel oil) or an organic chemical (glycol), taking a high time for biodegradability; was rated by the number 3;
- Water Pollution by an inorganic chemical (nitric acid, sodium hydroxide, ...) having means for time biodegradability takes listing 2;
- Pollution of water by a dairy (milk, cream, milk powder) having biodegradability occasionally takes 1 listing.

After assessing the environmental aspects, it prioritizes to determine Significant Environmental Aspects. The meaning of an Environmental Aspect is determined based on the comparison of the evaluation score as described above and the significance level set by the company. The scores obtained are used to rank the issues and prioritize actions. Regarding AES, they must have a score above 12. This threshold may be revised management review.

An environmental aspect can:

- ⇒ Being controlled or monitoring
- ⇒ Make the subject of an environmental action plan
- ⇒ Undergo corrective action

The criticality of each impact is assessed through the rating scale (Table 5). It corresponds to the product of the parameters "Frequency", "Gravity" and "Mastery". The impacts beyond the criticality threshold (12) are called Significant Environmental Impact (IES).

The table on the following page shows the evaluation results and prioritizing environmental aspects and impacts of one unit (The manufacturing process) of the company, The other units on which the environmental analysis is performed are: Units manufacturing process, Unit cleaning and disinfection, Units auxiliary operations: Atelier Reverse osmosis, boiler, cold production workshop and workshop production of compressed air, quality control laboratory, Cold Room, Shipping.

Table6. *Assessment and Prioritization of Environmental Aspects and Impacts*

Units / workshops	Activity	Aspects	Impacts	G	F	M	C	Significativity
The manufacturing process	reception / store	Energy consumption (electricity)	Depletion of natural resources	1	1	2	2	not significant
		Water consumption	Depletion of natural resources	1	1	1	1	not significant
		solid waste	Pollution of soil	2	1	1	2	not significant
	pasteurization homogenization	Water consumption	Depletion of natural resources	4	4	1	16	significant
		Discharge of cleaning products	Pollution of water and soil	1	2	2	4	not significant
		Waste boxes Ferment	Pollution of soil	1	2	3	6	not significant
		steam	Air pollution	1	2	1	2	not significant
	Cleaning / Disinfection	Water consumption	Depletion of natural resources	2	3	1	6	not significant
		Wastewater discharges	Pollution of water and soil	2	2	3	12	significant
		Solid Waste	Pollution of soil	3	3	2	18	significant

3.3.3. Distribution of Significant Environmental Impacts (AES)

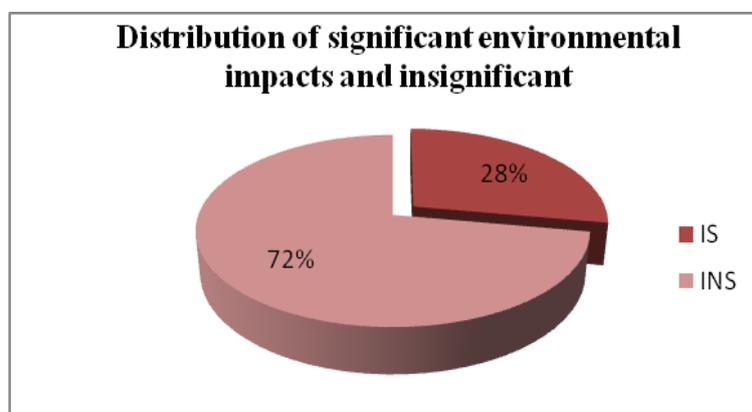


Fig2. *Répartition des impacts environnementaux significatifs (AES)*

We found 73 environmental aspects identified in the site, the significant environmental impacts represents 28%; it corresponds to the first generation of waste, followed by water pollution, and air pollution, resource consumption and finally the noise emissions. This prioritization of significant

environmental impacts resulted largely to define action plans. In general, the process of a dairy industry involves water consumption and significant energy and large volumes of waste water with high organic load (Table 2, 3, 4). For this reason, we have proposed a variety of Clean Production Opportunities in order to reduce consumption and final discharge without production is so far affected.

4. DISCUSSION

According to the results of the overall environmental risk assessment (6 sector, 14 activities, 73 areas) it is clear that the level of risk management by the plant is unfavorable given the significant impact it has obtained. Thus, it is essential to put in place an action plan defining the preventive and corrective actions for each unmanaged risk or mismanaged whether in the field of accidents, reputation or administration. In a certification process, the main focus is on managing the environmental aspects and the control of environmental impacts. [6] Step we have treated in this work, Proposed improvement actions for significant aspects Generally, a dairy industry processes involve water consumption and important energy and large volumes of wastewater with high organic load.

For this reason, we have proposed a variety of Clean Production Opportunities in order to reduce consumption and final discharge without production is so far affected. The Clean Production Opportunities were classified according to the following points:

- Reduction at source, or any modification of processes, facilities, composition of the product or substitution of raw materials with the reduction of the generation of waste streams (quantity and / or potential danger), both during the process production and subsequent stages of their production.
- Recycle or the recovery option involving the reintroduction of a waste stream in the process itself or in another process. If performed in the production center where it was generated, it is considered recycling at source.
- Valuation or the processes that allow the recovery of resources contained in waste.

The ISO 14001 standard prescribes how a company can develop an environmental policy, identify environmental aspects and impacts of their activities, products and services, define the significance of these impacts; rank them, identify legal and other requirements governing the organization's operation, establish objectives and targets, implement programs to meet those standards, establish an auditing system and procedures for management review, and implement corrective action, if needed, based on audit findings [7,9] .

5. CONCLUSION

As part of setting up of a management system according to ISO 14001 standard for a dairy company, all of my work has focused on the development of environmental analysis, and define objectives relation to this theme. The realization of such analysis is an indispensable basis for the development of an environmental program which must, first, be on the various environmental aspects of its activities. Then the company will have to determine which ones are significant. This is how it can reduce its impact and contribute to environmental protection.

Analyzing the negative results of the plant, it is clear that the latter has many significant health risks threatening and even degrading the quality of almost all environmental compartments (water, air, soil, water table...). Thus, the factory obliged to apply the proposed action plan after a detailed financial study to determine the possible actions that the plant must be undertaken in the short term.

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