


Optimization of the Waste Management System

Sociedade Central de Cervejas e Bebidas

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Abstract

The main goal of the present dissertation was to optimize the Waste Management System and define a strategy that, without interfering with operational issues, could lead to cost reduction, increase of the Environmental Performance Indicators and a bigger involvement of all human resources in these subjects.

It was based upon a 7 month internship at Sociedade Central de Cervejas e Bebidas (SCC).

The defined strategies and implemented actions focused mainly in 2 categories:

- 1) Behavioral actions: aiming to change human resources' way of thinking and operation methods to become more efficient and environmentally conscious. Also bringing changes into Waste Management practices. In this category are projects like: "New Final Destinations", "SCC Composting", "Small Measures, Big Results", "Feeding the ones in need" or "Waste Fortnight" .
- 2) Strategic Measures: being the ones that better results can bring in the company's Performance, bigger economic gains e added value to the Brand. Since they are complex mechanisms, an introduction was made to the Industrial Ecology and to Refuse Derived Fuel. The strategy defined, and the initial path developed must be continued in future studies.

As result of the behavioral actions it was confirmed the need to change common practices and implement a more environmentally friend attitude.

Concerning the strategic path presented, the results can only be confirmed with their acceptance and implementation by Top Management.

Keywords:

Brewery, Community Advisory Panel, EcoIndustrial Network, Industrial Symbiosis, Refuse Derived Fuel, Waste management, Waste & Services Stock Exchange.

Acronyms

ACSR	Azienda Cuneese Smaltimento Rifiuti - Municipal Solid Waste Management company from Borgo de San Dalmazzo, in Italy
BIW	Banal Industrial Waste
CAP	Comunnity Advisory Panel
CEO	Chief Executive Officer
EIN	EcoIndustrial Network
HQ-RDF	High Quality- Refuse Derived Fuel
IDEA	(Integrazione Dell'Energia nell'Ambiente - Integration of Energy into the Environment
ISP	Industrial Simbiosys Plan
MOR	Mercado Organizado de Resíduos - Organized Waste Market
PACOPAR	Painel Consultivo Comunitário do Programa Actuação Responsável de Estarreja - Responsible Care's Community Advisory Panel of Estarreja
PNALE	Plano Nacional de Atribuição de Licenças de Emissão de Carbono - Carbon Emission's National Attribution Plan
RDF	Refuse Derived Fuel
S.W.O.T	Strenghts, Weaknesses, Opportunities and Threats.
SCC	Sociedade Central de Cervejas e Bebidas
WMS	Waste Management System
WSE	Waste and Services Stock Exchange

1. Introduction

One of the main concerns that every CEO face is the necessary balance between the Company's economical development and it's environmental impact. Assuming they aren't necessarily incompatible, one of the indicators that allow that balance is the waste streams generated by the production processes and their management system.

Sociedade Central de Cervejas e Bebidas (SCC) is a company deeply involved in assuring its sustainable development along its production chain: from raw material extraction, through its production methods and with the environmental impact of its generated wastes. The adoption of a sustainable procurement policy – acquiring

all of its barley to national producers committed with the sustainable development of their plantations; the implementation of an Environmental Management System and Total Productive Maintenance program; and the construction of an anaerobic digester for their Waste Water Treatment Plant's sludge are some of the many examples of that commitment.

Acknowledging that sustainability is a long and constant work consuming path, the motivation of the dissertation was to survey the Waste Management System (WMS), evaluate improvement opportunities that could lead to a reduction in waste production, optimization of the WMS, improve environmental performance indicators and suit the company's waste

approach to the strong environmental and social commitment to sustainable development; without changing WMS operational procedures.

In this article we can find some of the projects developed aiming to improved selective waste separation, new waste final destinations that are more social, environmental and cost effective. The conceptualization and implementation of these projects revealed that a broader approach was needed and in order to achieve the work's objectives. Therefore, a macro strategy was defined, within the Local Municipality, resulting in an Industrial Symbiosis Plan (ISP) with the creation of an Ecoindustrial Network (EIN), a Community Advisory Panel (CAP), a Waste & Services Stock Exchange (WSE) and a Refuse Derived Fuel (RDF) production unit, between strategically chosen partners.

2. New solid waste final destinations

After acknowledging all the aspects of the WMS and the path taken by waste since its production to its final destination, new destinations were searched. Among other waste streams, the search included:

- Green waste: resulted in the elaboration of a composting project in order to process it within SCC's facilities.
- Food Waste: Pig farms that could receive the meals scraps and private charity associations take could take the excess meals were searched. Led to the "Solidarity SCC-Feeding the ones in need" project.
- Diatomaceous earth: Dry matter tests were made in order to evaluate the possibility of diverting this waste stream to expanded clay production.
- Banal Industrial Waste: to avoid use of landfill, Residue Derivate Fuel companies were contacted. In the absence of cost effective alternatives the implementation of a RDF production unit was considered and the project was introduced in the ISP.

The search for new final destinations, waste by waste, revealed itself to be exaggeratedly time consuming. In order to increase the number of options, the solution came in the form of a WSE project.

3. Composting in SCC

In order to divert green waste from landfill, an aerobic, mesophilic, open and static green waste composting project was created.

This project consisted in:

- Evaluation of the seasonality, in cooperation with the chief gardener, of green waste production and fertilizer use
- Assessment of the type of composters to use and cost-benefit evaluation of the project
- Creation of a composting manual gathering all the information needed for the composting process, including the process itself, materials to compost, essential factors (temperature, moist, airing, Carbon: Nitrogen reason and particle size), composting pile fauna and their role, composter location, composting pile construction and handling, result monitoring methods and common problems and solutions.
- Gardener training materials, for the composting process, were also created.

4. Waste Fortnight

Aiming to increase separation rates of the recyclable waste streams, improve worker-team leader relationship, detect WMS improvement opportunities, Waste Fortnight was created for the following production areas:

- Malt production
- Mashing
- Cellar and filtration
- Filling
- Workshops (Utilities and Production)

Consisting in 3 distinct actions:

- Waste separation good practices presentations:

Prior to the fortnight, workers from the above mentioned areas attended presentations in how to separate waste, the economical impact of diverting recycled waste from its stream to the banal industrial waste stream, how to act when they produced an sporadic waste and what to do when waste recollection is not running efficiently. These presentations were also important because they increased worker-team leader interaction and was a powerful tool to assess WMS operational improvement opportunities.

- Separate to Win competition:

During the 15 days of the fortnight, the areas competed to see who could achieve the highest waste separation rates. The assessment of these rates was made by checking each individual waste container of the 5 listed areas, in 3 rounds occurring at 3 different schedules.

An Index was created, in which a container was considered not valid if 10% or more of its total volume was occupied by a waste from a different stream other than the originally intended. The attribution of prizes was thought of but due to the high number of workers it became unfeasible to distribute prizes for all.

- Questionnaires:

Two sets of questionnaires were distributed by the areas: The first one was given out in the first day of the fortnight and aimed to evaluate waste separation practices of employees either in their workplace or on everyday life. The second questionnaire aimed the evaluation of the impact of the Waste Fortnight on works and assesses the main difficulties workers feel and felt, in waste separation.

5. Industrial Symbiosis Plan

In order to achieve bigger environmental and economical results, surpass some of the difficulties felt when implementing some of the projects an ISP and aiming to develop tools that could bring an extra flexibility to WMS, an ISP was created. Based on the premise that SCC is not an isolated in the region, the main objectives can be summarized as:

- Promoting a more harmonious integration of the industry in the region and with its population,
- Seeking synergies with nearby companies in order to reduce costs in energy, water and byproducts,
- Consolidate its Corporate Social Responsibility plan.

- Creating new business in the region and assess cost reduction opportunities

The first step was to find suitable partners to engage in ISP. In this case, 7 strategic partners are suggested and presented:

- Cement manufacturer
- Chemical industry
- Fertilizer industry
- Food processing industry
- Wholesale and distribution Group
- Biofuel industry
- Local Municipality

In order to assess and evaluate which synergies can be created between these partners in the 3 main areas (energy, water and byproducts) is necessary for the ISP to be accepted by SCC's Top Management.

Some of the projects that can be created were started. All of the project described below are dynamic and should be suited to the needs and orientation pretended by SCC and its partners.

All of the projects, within the ISP, can be implemented alone but their integration allows them to increase their results exponentially.

5.1. EcoIndustrial Network

Without the acceptance of the project, by the partners of the ISP, without transparency of the production processes and strict cooperation between them it's impossible to point reliable synergies and cost reduction opportunities. In order to strengthen the need and opportunities that an EIN can provide the successful Case Study of the Kalundborg Municipality [1] was introduced and detailed.

5.2. SinerXira: Community Advisory Panel

A CAP is a mean of communication between the main industries in the region, the Municipality and its population, Civil Protection, Universities and other entities that can reveal themselves important in achieving the CAP's objectives. In order to highlight the importance of this project to SCC, a deep integration of the opportunities offered by the CAP were made with the company's Corporate Social Responsibility (CSR) Plan. Following the model provided by the Portuguese example of Responsible Care's initiative, PACOPAR [2], a model for SinerXira was created and the following points were developed:

- a) Scope of action
 - Environment & Safety
 - Health & Education
 - Culture & Social Solidarity
 - Communication
- b) Strategy
 - Mission
 - Vision & Objectives
 - Values
- c) Work Groups:
 - Communication
 - Health & Safety
 - Risk Prevention
- d) Implementation Procedures, including set-by-step guidelines in how to implement the CAP.

If an EIN is created and the number of synergies is still too low in order for an Institute of Symbiosis to be created, the partners can use the CAP meetings to develop work of both those projects. If the CAP is implemented by the EIN, the actions developed as EIN will be accordingly to the high ethics standards defined in the strategy of SinerXira, helping to avoid subversion of the EIN objectives. Therefore the integration of the EIN and

CAP can reveal itself to be an asset for both projects.

5.3. Refuse Derive Fuel Production Unit

The possibility of such an installation was taken in account by the need to divert BIW from landfill, the existence of a cement kiln on the region that can use the produced RDF, the presence of strong international corporations which, all of them are BIW producers and have the necessary cash flow to make such an investment.

Throughout the dissertation we can find Caputo & Pelagagge's (2001) [3] view on RDF production and its costs. Since the objective is to create a High-Quality RDF (HQ-RDF), the insertion of end-of-life tires and tyres chips were considered in the production costs described.

In order to materialize the theory present by Caputo & Pelagagge, Pirelli Ambiente's IDEA Granda project [4] was also described. In this Case Study the gathering of MSW is made by ACSR, who is responsible also for the pre-treatment of the waste. After the treatment of the wet fraction, the dry fraction is sent to the IDEA Granda production unit where HQ-RDF is produced by the introduction of end-of-life tyres and non-chlorinated plastics. The resulting HQ-RDF can then be sent to the Buzzi Unicem Robilante cement kiln as a particle replacement of the fossil fuel traditionally used.

Adapting the case study to the local Municipality dictates that the production unit to be implemented should be able to pre-treat the BIW received, separating the wet from the dry fraction and removing inert materials, but also, the incorporation of the high calorific materials (rubber and plastics). The location of such a unit is suggested considering:

- Presence of a private BIW landfill
- Distance from cement kiln
- Several industrial areas and the contribution of SME
- A RDF production unit and a cement kiln who proceeds to their incorporation can already be found in the southern shore of the Tagus region

5.4. Waste and Services Stock Exchange

This project was originally created as free cost tool that SCC could use in order to find new final destinations in an easier and less time consuming way. The Introduction, in September of 2009, of the Waste Market legislation [5] brought some changes to the project in order to fulfill the demands of this Law, especially the confidentiality demands on companies and waste traded information.

In order to develop this web based tool, the project was created within Junitec, IST's junior enterprise. By using this student, non-profit association, it was possible to create the WSE using students from the university and therefore at a low cost for the companies which wish to purchase such a service. The project is still ongoing and is expect to be finished soon, although without a defined date.

For the WSE to be effective it needs a good implementation strategy. Relying on Paulo Ferrão's manual on ISP [6], the most important critical factors are presented and discussed. In order for the WSE to succeed an implementation strategy is also presented allowing for the ISP partners the needed understanding of how a WSE should work, be implement and critical factors that can lead to the failure of the project.

6. Conclusions

In order to summarize the dissertation's conclusion a SWOT analysis was made and presented in Fig. 1 and the corresponding S.W.O.T. matrix is presented in Fig. 2.

6.1. S.W.O.T. Analysis

This analysis is presented in order to summarize most of the conclusions in the dissertation. Allowing the evaluation of the Strong and Weak points of the actions developed (internal analysis) with the opportunities and threats found in the external environment (external analysis)

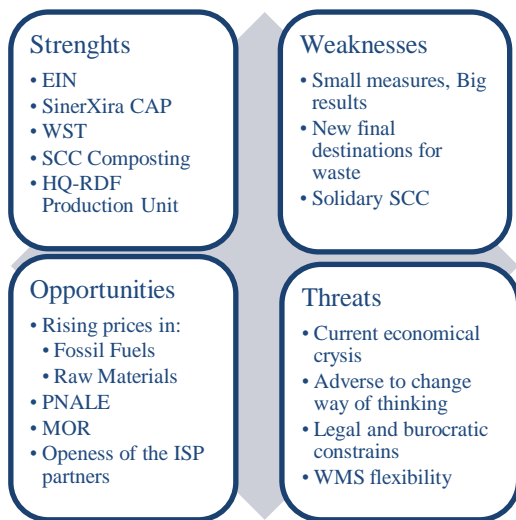


Fig. 1 - S.W.O.T. Analysis

6.2. S.W.O.T. Matrix

If we overlap the internal and external analysis it provides us an easier way to understand its variables and it provides for strategies in how to take the utmost advantage of the strong points as a mean avoid the threats and potentiate the opportunities. It also allows for an easier understanding of what strategies to use in order to minimize the weak points either by utilizing the opportunities or by surpassing the threats.

The S.W.O.T. Matrix and it's strategies can be found in Table 1.

	Strenghts	Weaknesses
Opportunities	<p>Rising prices accentuate the need for EIN, WST and HQ-RDF production unit</p> <p>PNALE creates carbon dioxide emission opportunities if EIN or CAP are implemented</p> <p>MOR opens the market for HQ-RDF</p> <p>Openness of the partners is essential for implementation of EIN, CAP, WST and HQ-RDF production unit</p>	<p>The Implementation of a WSE allows to find new final destinations easier and benefit from the created waste market</p> <p>The creation of an EIN and the CAP can potentiate and allow for the implementation of the Solidarity SCC project</p> <p>Good practices campaigns between ISP Partners can lead to the implementations of the Small measures, big results and change the adverse way of thinking in some workers</p>
Threats	<p>EIN and HQ-RDF production implementation reduces effects of economical crisis</p> <p>All of strong points can have a positive impact on actual way of thinking of SCC's workers</p> <p>EIN and CAP can create a lobby strong enough to surpass legal and burocratic constraints</p> <p>EIN and byproduct exchange will lead to an increase in WMS flexibility</p>	<p>The implementation of the strong points allow for the weak points to be implemented and lead to the extinguishing of the threats</p>

Table 1 - S.W.O.T. Matrix

7. Acknowledgments

I would like to thank my Professor, PhD Susete Martins Dias, for the counseling and support given throughout my Master Thesis; all of SCC for the wonderful experience and opportunity provided; Engineer Carlos Rama for the time and counseling on the possibility of an RDF production unit; and my parents for all they have provided throughout the years.

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