

An Analysis of Environmental Costs for a Middle Sized Printing and Packing Company

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Abstract: In the past three decades, awareness of the companies towards the environmental issues increased because of new regulations and increased public awareness. In order to satisfy the public demand and accomplish the legal obligations companies initiated using environmental friendly technologies and made changes in their manufacturing processes and material usage. Implementation of environmental friendly manufacturing systems brings additional costs to the companies. In this study the classification of environmental costs in small and medium sized enterprises (SMEs) are discussed and previously suggested environmental costs classification system for SMEs were applied to a middle size printing and packing company. The share of environmental management cost of the company was calculated as 2.7% of annual expenses while the average annual cost of environmental investments were about at the level of 0.6%. In the main part of this study, we discussed how environmental costs are being done varies in a number of respects and applications for a selected type of work sector, how they can be grouped or classified, and what could be the magnitude of the environmental investment to fulfill new national regulations established.

Key Words: Accounting, cost, environment, management, SME.

Introduction

However the Environmental Protection Agency (EPA) was established in 1969, environmental reporting in company level was not required till the end of 1980s. In 1990s environmental disclosures appear in company reports. The International Organization for Standardization (IOS) issued the first of the ISO 14000 family of standards in 1996. The ISO 14000 family addresses various aspects of environmental management. The very first two standards, ISO 14001:2004 and ISO 14004:2004 deal with environmental management systems. Major milestones in the development of external reporting on environmental performance appear as Figure 1 (Fleishman and Schuele 2006).

In recent years with increased public awareness on environmental issues environmental accounting is became a popular research issue. Environmental accounting is mainly divided into two categories as environmental financial accounting (EFA) and environmental management accounting (EMA). EFA focuses on financial reporting and provides information to external decision makers and EMA provides environmental financial information for internals. This study focuses on environmental costs issues within environmental management accounting. Xiaomei (2004) defines EMA as “the identification, collection, estimation, analysis, internal reporting, and use of materials and energy flow information, environmental cost information, and other cost information for both conventional and environmental decision-making within an organization”. Jasch (2003) defines EMA as “a combined approach that provides for the transition of data from financial accounting, cost accounting and mass balances to increase material efficiency, reduce environmental impacts and risks and reduce costs of environmental protection”.

In order to satisfy the environmental requests of the public and to fulfill the legal responsibilities the companies initiated to use environmental friendly manufacturing systems, material and processes. Implementation of environmental friendly technologies brings additional costs to the companies. Companies should carefully understand, measure, and control the environmental cost. Environmental cost are classified is different ways in the literature.

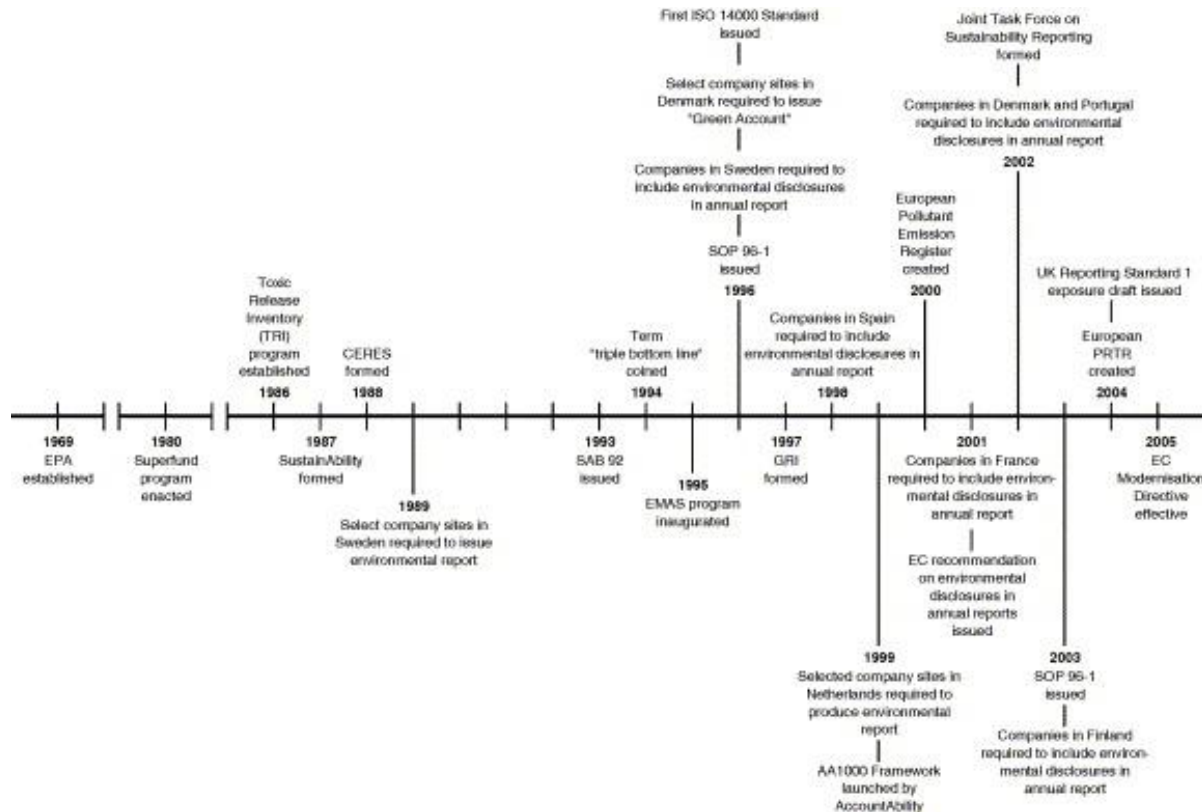


Figure 1. Major milestones in the development of external reporting on environmental performance
Source: Fleichman and Schuele (2006:45).

Coskun and Karaca (2008) classify the environmental costs for small and medium sized enterprises (SMEs) into three categories: environmental investment costs, environmental management and operating costs and environmental risk management costs.

De Beer and Friend (2006) classify environmental costs as internal and external costs. Internal costs include conventional costs, potentially hidden costs, contingent costs, and image and relationship costs. External costs include environmental degradation costs, and human impact costs.

Steen (2005) defined costs and revenues associated with environmental issues as process costs, sales, accidents and goodwill changes, and Taxes and fees on emissions and resource consumption. Process costs include costs of control equipment, environmental permit, environmental monitoring, certification cost, labeling costs and environmental management.

Jasch (2003) classifies environmental costs in four categories: conventional waste disposal and emission treatment costs, prevention and environmental management costs, Material purchase value of non-product output, and production costs of non-product output. In addition Environmental revenues can be derived from sales of waste or grants of subsidies. Waste disposal and emission treatment costs includes depreciation for related equipment, maintenance and operating materials and services, related personnel costs, fees, taxes, charges, fines and penalties, insurance for environmental liabilities, and provisions for clean-up costs, remediation. Prevention and environmental management costs includes external services for environmental management, personnel for general environmental management activities, research and development, extra expenditure for cleaner technologies and scrap percentage of operational plants, and other environmental management costs. Material purchase value of non-product output includes costs associated with the raw materials, packaging, auxiliary materials, operating materials, energy and water

Kumaran, et.al. (2001) developed a life cycle environmental cost analysis (LCECA) model is to include eco-costs into the total cost of the products. They classified eco-costs of the cost breakdown structure (CBS) in eight categories: eco-costs: cost of effluent/waste treatment (implementation, operation, and maintenance); cost of effluent/waste control (implementation, operation, and maintenance); cost of waste disposal (collection, transportation, and land fill or incineration); cost of environmental management systems - EMS (implementation,

operation, maintenance, and certification); costs of eco-taxes (country- or product specific eco-taxes, levy, etc.); costs of rehabilitation in case of environmental accidents (damages like health disorders, accidents, and production losses caused by the damages); cost savings of renewable energy utilization; and cost savings of recycling and reuse strategies.

Kirlioglu and Can (1998), classify environmental costs into three categories as mitigation / avoidance costs, utilization costs, and impairment / damage costs.

Method

In order to determine the environmental costs for small and medium sized enterprises (SMEs) in the printing and packing sector, we used an environmental costs classification system previously suggested by Coskun and Karaca (2009). One can obtain detailed information about this classification system from the related studies (Karaca 2008; Coskun and Karaca 2009). Here, only some brief information about the method is summarized as follows. Environmental costs of SMEs are divided into three categories: "environmental investment costs", "environmental management and operating costs" and "environmental risk management costs". There are some subcategories within these three main categories as they are summarized in Table 1. The total number of these subcategories of environmental costs may vary depending on industry type. In this study all the classified environmental costs and their share in total annual costs were calculated for a selected company.

Classification	Environmental costs
Environmental Investment Costs (EICs)	Environmental planning costs
	Environmental management system and organizational costs
	Wastewater treatment plant costs
	Waste gas control and filtration systems costs
	Solid waste storage (management) costs
	Hazardous and toxic waste storage (management) costs
	Waste monitoring and testing equipments and investments costs
	Administrational costs
	Environmental education costs
	Consultancy and cost of other services received
	Others
Environmental Management and Operating Costs (EMOCs)	Test and analysis costs
	Labor costs
	Consumables (chemicals)
	Legislation and management costs
	Administrational costs
	Consultancy and cost of other services received
	Waste disposal and treatment costs
	Wastewater treatment plant operational costs (electricity, water consumption, etc.)
	Taxes
	Others
Environmental Management Risk Costs (ERMCS)	Punishment and indemnity costs
	Costs for complain investigations and compensations
	Air, water or soil treatment (in the case of any fugitive or accidental contaminations)
	Bonding and guaranty costs
	Selling or production cutback costs
	Other unexpected losses and costs
	Other

Source: Coskun and Karaca (2009).

Table 1: Possible environmental costs for SMEs

Case Study

In this study a company in printing and packing sector was selected. This company is a typical one in the related sector and can certainly be classified into one of the most active and modern corporation operation in Turkey. They have large production capacity and they define themselves as an environmental friendly and responsible company. The rationality of selecting such a company for our study is their eagerness in environmental investments for upcoming environmental costs which had already appeared by new regulation period during the integration period of Turkey to European Union. In the following part the possible treats or new regulations in which they invested a certain amount of environmental budget are discussed.

The company reported that they have one typical waste which has been generated during printing operations is wastewater. Thus, the costs and/or needs for wastewater treatment or discharge are the number one environment related hot topic for this sector. Water and Sewerage Directorate for Istanbul Greater Metropolitan City (ISKI) is the responsible authority who regulates and controls all the wastewater discharges and water demands of all bodies located within the boundaries of Istanbul Megacity. Based on the related ISKI regulation; if any company does not fit wastewater discharge limits two times in a sequential 6 months all activities of the company are stopped. This regulation is actually an important environmental risk for companies, so they have to invest money and make certain plans for sustainable production. In our case study, this regulation and related actions were the main legislative factor for environmental costs and efforts invested by the company. In addition to that, there are other environment related activities which not only result in costs but also benefits.

Annual costs of the company which are taken from the company's accounting records are summarized in Table 2. In that table environmental costs of the company do not appear because under the uniform accounting system of Turkey there is not a proper section that classifies environmental costs and environmental investments of the company separately.

In Table 2 values were recorded during the year 2005 and all the records were originally in Turkish Liras (TL). We converted all these TL based values in Euros (€) to present in European Union (EU) currency unit to have a better understanding. In converting these values to original format, one can use conversation factors available on the website of the Central Bank of the Republic of Turkish (<http://www.tcmb.gov.tr/kurlar/200505>).

Costs	Total (€)
Direct materials	218,057
Indirect materials	85,771
Electricity	34,286
Water	1,143
Fuel	4,571
Labor costs	548,571
Maintenance and Repair	57,143
Copyright and patent	6,143
Marketing and sales	85,714
Packing	11,429
Depreciation	14,714
General overhead	34,286
Total	1,101,829

Table 2: Annual costs for a printing and packing company during 2005 in Turkey.

As it stated before, the most important environmental costs for the company is related to wastewater discharge or treatment. ISKI regulation⁴⁰, namely "Wastewater discharge directive", defines some responsibilities for the companies which result in environmental costs, are summarized as follows.

- Wastewater discharge into sewage system is directly under the permission of ISKI, and companies should obtain a "discharge quality control permit" (item 11)
- Bodies having a wastewater source should install a septic tank, preliminary treatment plant or treatment plant to responsible of its operation (item 11.3)

⁴⁰This regulation is available online on the web site of ISKI in Turkish (http://www.iski.gov.tr/Web/UserFiles/File/mevzuat/pdf/Y_Atiksularin_Kanalizasyona_Desarji.pdf).

- They should have an engineer as “Technical Manager” which is responsible in wastewater treatment (item 13.2)
- Industries are classified in two main groups based on their wastewater capacities; i) ones having less than 0.5 m³/day and ii) having more than the 0.5 m³/day flow rate. First group of companies can buy a service for their wastewater from collective treatment plants. However second group of companies should have their own treatment plants (items 16.3 and 16.4)

Based on the above mentioned regulations, the company decided to install a wastewater treatment plant (a packed batch wastewater treatment plant with the capacity of 6~8 m³/day) at the begging of 2006. It was a typical treatment plant used in this sector and it works based on the chemical coagulation and flocculation followed by a sedimentation tank. Details of this treatment plant and design parameters can be obtained from Karaca’s work (2008). In the following part, cost analysis of the wastewater related investment is discussed.

Firstly, EICs are given in details. Initialization costs (cf. Table 1) of a packed wastewater treatment plant can vary from thousands Euros to hundreds of thousand, this is up to size and capacity. This company bought one small sized treatment plant about 52,000 € including setup and startup costs. Secondly, EMOCs (cf. Table 1) are calculated. Annual EMOCs are generally expected to be higher than EICs (Coskun and Karaca, 2009). In this case study, this rule was not broken and it was calculated about 56,000 €. All the details and subcategory costs are summarized in Table 3. In addition to above mentioned costs, company was reengineered and started to collect or recover used materials (waste paper) for trading. This is a typical environment friendly application and recorded as an environmental benefit. Total income of this action was estimated about 5,700 € per year. Than practically EMOCs were decreased about 10%. Finally, ERMCS were estimated based on the regulatory fines and penalties which is based on the ISKI directive. It suggests a certain amount of Contribution Payment Charge (KÖP) if the discharge limits are exceeded. ERMCS are expected to be 10% of EMOCs. No environmental damage or environmental health risks were considered in this estimation.

As a result share of environmental costs of the company was calculated as 2.7% of all expenses while the yearly environmental investments were about at the level of 0.6%.

Environmental Costs		Monthly	Annual Total (€)
Consumables	Basic chemicals	1,429	17,143
	Granule active carbon used in sedimentation	1,429	17,143
	Granule active carbon used in filtration unit	571	6,857
Electricity		143	1,714
Waste disposal	Combustion (this price is paid for the incineration of hazardous wastes)		3,400
	Transportation		143
Training costs			571
Labor costs	Technical Manager (Engineer)	354	4,251
	Operator	429	5,143
Total			56,366

Table 3: Environmental Management and Operational Costs of a Printing and Packing Company.

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