CAPTURING ENVIRONMENTAL COSTS BY USING ACTIVITY BASED COSTING METHOD

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Abstract:
The value of Environmental Management Accounting in establishing a culture of pollution prevention and waste minimization within industry is clear. However, the success of government and corporate programmes to promote EMA depends on developing EMA systems that are cost-effective for industry. Decades ago environmental costs were very low, so it seemed wise to include them in the overhead account for simplicity and convenience. Recently there has been a steep rise in all environmental costs, including energy and water prices as well as liabilities.

Key words: *environmental management accounting, environmental costs, Activity-based costing (ABC);*

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Introduction

The main problem of environmental management accounting is that we lack a standard definition of environmental costs. Depending on various interests, they include a variety of costs, e.g., disposal costs or investment costs and, sometimes, also external costs (i.e., costs incurred outside the company, mostly to the general public). Of course, this is also true for profits of corporate environmental activities (environmental cost savings). In addition, most of these costs are usually not traced systematically and attributed to the responsible processes and products but simply summed up in general overhead.

The fact that environmental costs are not fully recorded often leads to distorted calculations for improvement options. Environment protection projects aiming to prevent emissions and waste at the source (avoidance option) by better utilizing raw and auxiliary materials and requiring less (harmful) operating materials are not recognized and implemented. The economic and ecological advantages to be derived from such measures are not used. The people in charge are often not aware that producing waste and emissions is usually more expensive than disposing of them.

Experience shows that the environmental manager barely has access to the actual cost accounting documents of the company and is only aware of a tiny fraction of aggregate environmental costs. On the other hand, the controller does have most of the information but is unable to separate the environmental part without further guidance. In addition, he or she is limited to thinking within the framework of existing accounts. Also, the two departments tend to have a severe language problem.

Activity-based costing improves internal company cost calculation by allocating costs typically found in overhead costs to the polluting activities and products. Significant material flows are traced throughout the company and their costs are allocated back to the polluting cost centres.

1. Overview on Environmental Management Accounting

Companies are interested in their actual costs. Costs incurred elsewhere are of little interest for corporate decision-making. Therefore, the focus of this report is on actual company costs rather than on externalities and estimated future price changes. It is the task of governments, not of accountants, to ensure that prices reflect the real costs to society.

All expenditure should refer to the same reporting period and be derived from the annual list of balances, which in the first round means a yearly monitoring of total annual environmental expenditure. This does not include external costs and envisaged future price changes, and the scheme for total annual environmental expenditure is not used for the calculation of investment options or project costs and cost savings.

Environmental management accounting thus represents a combined approach which provides for the transition of data from financial accounting and cost accounting to increase material efficiency, reduce environmental impact and risk and reduce costs of environmental protection. The term expenditure is always used where a precise distinction to implicit cost approaches is necessary. Otherwise, the term cost is used. For the different cost categories of the environmental cost scheme, guidance is given on where to find them and how to deal with them when expenditures or costs are assessed.

Environmental management accounting (EMA) is performed by private or public corporations, but not nations, and has a monetary as well as physical component.

2. Calculation of non-product output costs

One of the goals of EMA is to highlight the contribution of environmental costs to unit product costs. This is particularly true for non-product output costs, which usually represent the most significant share of total environmental costs, but often are forgotten or ignored. The establishment of an EMA system will result in more control over environmental costs. This information can assist in directing decisions towards the adoption of cleaner production measures or new technologies to reduce these costs.

As can be found in literature the usual practice for calculating non-product output costs is to take into consideration the entire value of inputs that do not go into to the final product. However, this approach ignores the fact that not all wastes and emissions can be eliminated even when state of the art technology (BAT) is in use, and thus, companies usually feel that this approach is too penalising. To better help managers plan cleaner production measures and/or investments in new cleaner technologies, it can be useful to create three different benchmarks against which companies can compare their non-product output costs. The three benchmarks reflect how companies can manage and eventually reduce those costs both in the short-term as well as in the long-term.

The first, and normally least stringent benchmark, is what we can call technological norms. These represent the most efficient level of input consumption and emissions achievable by the technology that the company has in place. Technological norms allow for the fact that some wastes, emissions and scrap outputs cannot be avoided, even when the existing technology is operated in the most efficient way. These values can be found in engineering design specifications and operating parameters, manufacturer's technical manuals and process flow sheets (which have been modified to quantifiably reflect volumes where wastes are concerned). These data could be consolidated into technological flow-charts. In this case, the difference between the actual costs of the inputs and the costs of the inputs if the technological norms were adhered to, demonstrates how much companies can save in the short-term by operating their existing technology in the most efficient way.

The next, and usually more stringent benchmark, is the Best Available Technology (BAT) levels. These will be technologies, that for particular sectors and/or products, are considered the most efficient and/or protective of the environment currently available on the international market. By using this benchmark to calculate non-product output costs, a company is signalling that it recognizes that it could switch to the best available technology (BAT), or at least implement technological changes to come closer to BAT levels (by purchasing equipment with efficiencies closer to BAT) or significantly modify its current technology. The difference between the actual costs of the inputs (or between the input costs for the technological norms) and the costs of the inputs for BAT norms shows how much companies could save by switching to BAT (or close to BAT).

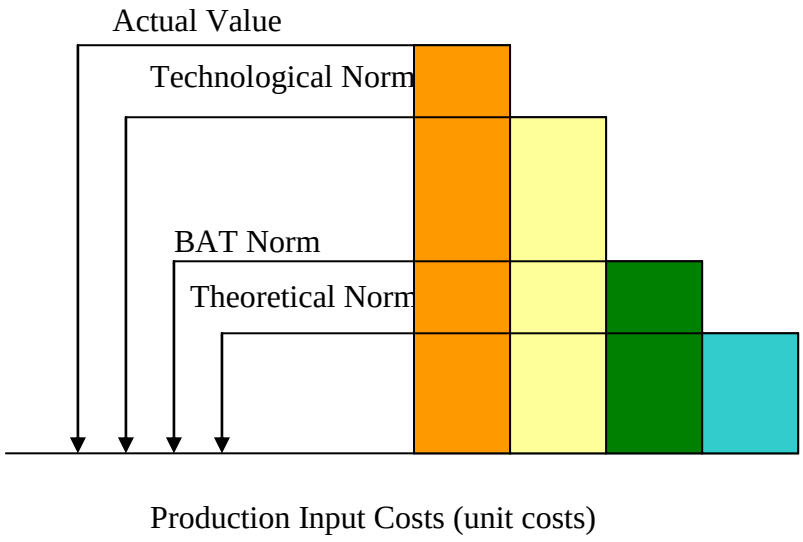
The use of this benchmark, like the technological norms, recognizes that some waste and pollution will always be generated (although lower in quantities). This cost difference is the one that companies should definitely use when important decisions are made regarding the choice of new technologies and is best addressed in an analysis over a medium-longer time line.

The final benchmark is the theoretical norms. Theoretical norms assume 100 per cent efficiency and do not allow for any wastes or emissions. As such, they can never be achieved, only approximated. As mentioned above, this is implicitly or explicitly the benchmark used in most literature on the calculation of non-product output costs. In the chemical industry this amount is determined by the reaction equation. In other industries a thorough input-analysis could be required to show the portion of the inputs that would directly become part of the product. Technological flowcharts can also be used for this purpose in non-chemical based operations.

In the end, as technology develops, BAT can change and move closer to the theoretical norm efficiency levels, so the gap between the last two benchmarks will continue to narrow.

The relationship between the above-mentioned norms to calculate non-product output costs are shown in figure below, where the technological norm is higher than BAT and BAT is higher than the theoretical norm.

Figure I. Comparative Short-Term Normative and Actual Product-Based Environmental Costs



For operational purposes, companies are most likely to be interested in the difference between the actual non-product output costs and the costs for the

technological norms. This information shows how much they deviate from the cost they could achieve by using their existing technology in accordance with its technological descriptions. In these cases, the nonproduct output costs can be used to highlight those areas where a company can usually reduce its wastes and emissions by better housekeeping e.g. better monitoring of raw material consumption, avoiding/reducing scraps and wastes and reducing energy and water consumption. Companies need this information on a monthly basis to be able to react quickly.

The difference between the actual non-product output costs and the nonproduct output costs for BAT could also be interesting for a company, although on a less frequent basis as the difference cannot be reduced in the short term. The difference shows the point up to which it is economically feasible to perform technological improvements. This information is very important when a company considers changing technology, so it must be calculated every time such a decision is to be made, probably every 3-7 years depending on the technological life cycle of the equipment.

In cases where a company is reporting total environmental costs, the latter is only correct when the non-product output costs related to BAT are considered. A good practice would be to calculate these costs annually, when the information can be used for internal reporting purposes to facilitate stakeholders' decision-making for new investments.

Non-product output costs tend to be very high when they are calculated in relation to theoretical norms, because first, 100 per cent efficiency is not achievable, and second, many inputs are never meant to go into the product (they are auxiliary inputs or "helpers" in the process) and so inevitably become 100 per cent waste. For example, catalysts are needed in chemical reactions, but 100 per cent of them become non-product output costs because they do not go into the product and eventually become spent and need to be replaced. Another example would be the energy that is required to maintain temperatures in the company buildings at a certain level: that energy never goes into the product and eventually is all wasted (with respect to the product). This comparison can be discouraging for companies, because these costs are considered inevitable and non-controllable.

On the other hand, a calculation of very high values of non-product output costs in relation to theoretical norms can represent a strong motivation for better use of resources and innovative thinking. They can spur the adoption of BAT and in the case of auxiliary inputs the levels of use can often be reduced and sometimes completely eliminated.

2. An Activity-Based Costing Approach of Environmental Accounting

More companies are now identifying and measuring direct environmental costs by revising allocation bases so as to separate out indirect environmental costs using activity based costing, (ABC). Environmental cost accounting can be seen in part as a specific application of ABC, which focuses on the environment as a key cost driver.

Environmental management accounting's emphasis on end of life costs and on other costs which are either upstream or downstream from the organisation itself compliments the growing emphasis on product life costing in management accounting generally. ABC, when applied to environmental costs, distinguishes between environment related costs normally attributed to joint environmental cost centres (e.g. incinerators or sewage plants) and environment driven costs, which can be direct, indirect and contingent, and which are hidden in the general overhead.

Using ABC, environmental costs are removed from overhead costs and traced to products and services by identifying the resources, activities and the attendant costs and quantities used to produce the output. This reduces the potential for cross subsidization

of dirty or environmentally damaging products, processes, sites and departments. ABC can be employed to chart the use and allocation of material, financial and energy resources on the basis of process and product lifecycles. It should include the allocation of usual production costs such as pollution control and the use of raw materials and energy, as well as hidden and less tangible costs and benefits, (capital costs such as emissions monitoring equipment, and expenses such as monitoring and testing procedures), plus liability costs. Removing environmental costs from overhead costs and accurately allocating them to specific products results in far fewer distortions in product costing.

Table below illustrates an Environmental Costing Framework based upon Activity Based Costing / Management.

USUAL PRODUCTION COSTS AND REVENUE		
Capital Costs	Production Costs	Production Revenue
buildings	residual mgmt /disposal	recycled residuals
production equip	energy	managed residuals
pollution control equip	raw materials	
	misc. supplies	
HIDDEN & LESS-TANGIBLE COSTS AND BENEFITS		
Capital Costs	Expenses	Benefits
emission monitoring	monitoring / testing	green marketing
equip.	reporting / record	brand equity
facility & product	keeping	corporate reputation
	insurance	risk management
	environmental taxes	consumer loyalty
	reduced capital	costs & insurance
	labeling	premiums
	R&D	
LIABILITY COSTS		
penalties & fines		
future liabilities from contamination of production & residual disposals		
soil & waste removal & treatment		
ground water removal & treatment		
economic loss & natural resource damage		
bans & taxes on chemical usage		
fines for non compliance		
R&D to identify environmentally benign alternatives		

Activity based costing also applies to the end of a product's life cycle. This is particularly important in Europe where environmental legislation is increasingly forcing companies to be responsible for the “take back” and disposal of products at their end of life, and to remediate land used for production facilities. Companies wishing to minimise product take back, recycling and site clean up costs will need to recognise and consider environmental costs during product and process design stages where they have the greatest influence. A comprehensive ABC model will help identify all the activities

and the total resource costs related to preventing and remediating expected environmental damage. Current environmental costs must be correctly attributed to both existing products and past products. A failure to recognise in today's production costs the costs of future disposal, recycling and remediation will underestimate the total costs of producing today's products. Activity based costing can also be used to create activity based energy consumption models. Here energy consumption is translated into a cost driver. In a similar way, waste indices and indicators can be developed, becoming waste drivers where costs can be assigned to specific waste generation and waste disposal.

Comprehensive analysis of environmentally related activities is also a key requirement in order to assess levels of environmental hazard and toxicity and their associated costs. Such analysis identifies and assigns key cost drivers and product consumption patterns thus permitting a good attribution of environmental costs to individual products. To the extent that some environmental costs are traced to specific processes, all the products converted by these processes will be assigned a share of the process-specific environmental costs. Thus an ABC model of environmental expenses can inform product design and process selection decisions in order to reduce total life-cycle costs of products: including materials acquisition, materials conversion, materials disposal and recycling. In addition, ABC can be applied to environmental costs so as to quantify the cost saving effects of environmental measures.

Activity based costing is only one of the means by which environmental management accounting is introduced into business. ABC initiatives do not automatically reveal environment driven costs – substantial inputs by environmental managers are required in order to ensure the costs of all environmentally related activities are included. Using ABC to identify and allocate environmental costs requires the clear definition, monitoring and reporting of such costs. Tracking systems for environmental wastes and toxicities of wastes from manufacturing systems is necessary in order to most accurately assign such costs. This in turn provides data for the estimation of potential liabilities, costs of disposal and other life cycle costs. One of the main advantages of using ABC to assess environmental costs lies in its use as a means to integrate environmental cost accounting into the strategic management process – thus linking environmental issues into management objectives and activities. In addition, in using ABC, environmental costs can be more accurately integrated within manufacturing planning, control and other information systems. This provides an extensive consideration of the environmental effects throughout the product life-cycle. It also ensures that intangible and uncertain environmental factors can be brought into any decision-making framework, even while debate continues over which environmental costs are the most relevant or material to the organization. From a management accounting perspective, the next step beyond activity based costing of environmental impacts is strategic cost management. Here cost data is used to develop superior strategies in order to gain sustainable competitive advantage.

The inclusion of internal environmental costs in its accounting assists a company in maximizing its current profitability. Inclusion also helps ensure that the company recognizes and accounts for its external environmental costs, especially where it is likely it will be required to internalize these costs in the near future.

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