

Austrian Pilot Projects on Environmental Management Accounting and further integration with ECODESIGN

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Background for the strong interest in EMA

- The growing demand for integrated consideration of financial and physical aspects of environmental management
- The concept of sustainable development in addition requires a combined consideration of financial, environmental and social aspects.
- International rating agencies and award systems for environmental and sustainability reporting also put a strong focus on disclosure of financial aspects in environmental reports.

The UN CSD EMA Workinggroup

- The Expert Working Group on "Improving the Role of Government in the Promotion of Environmental Management Accounting (EMA)" was set up in 1999 by the United Nations Division for Sustainable Development (UN DSD) in cooperation with a number of government agencies and non-governmental experts to promote Environmental Management Accounting (EMA) through publications, pilot projects and by establishing an international forum for discussion on the role of governments in the promotion of EMA.

Jasch Ch., Environmental Management Accounting -Procedures and Principles, United Nations, New York, 2001

- The book was prepared for the UN DSD, Expert working group on "Improving the Role of Government in the Promotion of Environmental Management Accounting". It was commissioned by the Austrian Ministry for Transport, Innovation and Technology, the Austrian Ministry for Agriculture, Forestry, Environmental Protection and Water Management and the Austrian Chamber of Commerce. It is available for free for download in English under www.un.org/esa/sustdev/estema1.htm and has also been published in German by the Austrian Ministry of Transport, Innovation and Technology (available under www.ioew.at). Translations into spanish, portuguese, japanese, korean, basque, etc. are on the way.

12 Austrian EMA Pilotprojects

- Focus of the case studies is critical review of existing information systems in order to improve the decision basis for material flow management and investment decisions and development of a toolkit.

Methodology

- In each company, one or two workshops have been held to assess total environmental costs of 2001 and check the information system. The company team will consist of at least the environmental manager and the controller/accountant.
- All company projects have been compiled and described on the basis of existing data records, balance sheets, lists of accounts, cost centre reports, list of assets etc. Each company project has been transformed into a neutralised description, that allows recalculation of costs from scratch.
- A toolkit for environmental management accounting, structured that way, will allow environmental managers as well as accountants and controllers to actually trace the relevant costs in different records.

The case studies

Each pilot project has been transferred into case study for recalculation, that describes

- the company and its products
- the main production processes
- the situation with regard to waste and emissions
- the financial information system with the list of accounts, specific print outs of accounts, and, to the degree needed for the calculation example, other records for production planning, stock management, cost centre reports, calculation of prices, example from investment appraisal)
- the question to be answered
- the solution with further explanation.

Results for the companies

- Total annual environmental costs following the approach developed for UN DSD
- Investment projects calculated by company and recalculated with research team
- Improved information for decisions regarding investment appraisal, assessment of the costs of new products and the costs and benefits of projects
- Identification of improvement potential of the environmental and financial information system
- Improved consistency of data reported within an organisation
- “best-practice” example that can be published in the environmental report

Participating companies

Österreichische Nationalbank	Wien	Banking
Raiffeisen Holding NÖ Wien	Wien	Banking
Brau Union Österreich AG	Graz	Brewery
1. Obermurtaler Brauereigen	Murau	Brewery
Ennskraftwerke AG	Steyr	Energy
Österreichische Elektrizitätswirtschafts AG	Wien	Energy
VERBUND - Austrian Power Grid GmbH	Wien	Energy
Heuberger Eloxieranstalt GmbH	Graz	Galvano
Roto-Frank	Kalsdorf	Galvano
SCA Laakirchen	Laakirchen	Pulp & Paper
Fischer Ski + Tennis	Ried	Ski
SW Umwelttechnik Stoiser & Wolschner AG	Klagenfurt	Water treatment

Project Management

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 - DI Karin Taferner, JOANNEUM RESEARCH, Graz
 - Ulli Schöflinger, Plan B Werbeagentur, Wien

What are environmental costs

	Environmental Protection Costs (Emission Treatment and Pollution Prevention)
+	Costs of wasted material
+	Costs of wasted capital and labour
=	Total corporate environmental costs

1. Waste and emission treatment

Environmental media	Air + Climate	Waste Water	Waste	Soil + Ground Water	Noise + Vibration	Biodiversity + Landscape	Radiation	Other	Total
Environmental cost/expenditure categories									
1.1. Depreciation for related equipment									
1.2. Maintenance and operating materials and services									
1.3. Related Personnel									
1.4. Fees, Taxes, Charges									
1.5. Fines and penalties									
1.6. Insurance for environmental liabilities									
1.7. Provisions for clean up costs, remediation									

2. Prevention and Environmental Management

Environmental media	Air + Climate	Waste Water	Waste	Soil + Ground Water	Noise + Vibration	Biodiversity + Landscape	Radiation	Other	Total
Environmental cost/expenditure categories									
2.1. External services for environmental management									
2.2. Personnel for general environmental management activities									
2.3. Research and Development									
2.4. Extra expenditure for cleaner technologies									
2.5. Other environmental management costs									

3. Material purchase value of non-product output

Environmental media	Air + Climate	Waste Water	Waste	Soil + Ground Water	Noise + Vibration	Biodiversity + Landscape	Radiation	Other	Total
Environmental cost/expenditure categories									
3.1. Raw materials									
3.2. Packaging									
3.3. Auxiliary materials									
3.4. Operating materials									
3.5. Energy									
3.6. Water									

4. Processing costs of non-product output

Environmental media	Air + Climate	Waste Water	Waste	Soil + Ground Water	Noise + Vibration	Biodiversity + Landscape	Radiation	Other	Total
Environmental cost/expenditure categories									
S Environmental revenues									

Environmental revenues

Environmental media	Air + Climate	Waste Water	Waste	Soil + Ground Water	Noise + Vibration	Biodiversity + Landscape	Radiation	Other	Total
Environmental cost/expenditure categories									
5.1. Subsidies, Awards									
5.2. Other earnings									
Σ Environmental Revenues									

What are environment relevant plants? - Type 1- end of pipe plants

Fully environmental relevant: equipment that has been purchased out of environmental reasons alone and has not any practical use for the production e.g.:

- waste water purification
- dedusting
- garbage separation and collection
-

What are environment relevant plants? - Type 2 - IPCC plants

Partially environmental relevant: equipment for production that has been more expensive due to environmental reasons (integrated pollution prevention).

Proportionate fraction of plants, machines, buildings etc. that were more complex and more expensive for reasons of environmental protection, than they would have been only for production, e.g.:

- enameling line with afterburning
- bottle washing plant with separate discharge of broken glass, paper and metal caps
- plants with closed loop systems or encapsulated

What are environmental relevant plants? - Type 3 - Non- BAT plants

Equipment that causes unnecessary emissions and/or losses of raw material or energy conversion (efficiency losses), take proportionate fraction of plants, which produce avoidable wastes and emissions, e.g.:

- cutting machines, which produce useless parts
- enameling lines, which make products, which must be painted again
- plants with avoidable losses of energy

Evaluation of energy plants

1. Evaluation such as NPO, i.e. usually 100% environmental relevant, if energy does not go into the product
2. Evaluation by transformation and distribution losses; Energy in production processes is not regarded
3. Evaluation in comparison with the "best available technology"; only energy input beyond the necessary amount is relevant
4. Energy input of non - BAT plants is always 100% relevant

SCA Graphic Laakirchen Ag

The company was one of the first EMAS sites (registration number 23) and is often the one to test pilot projects, which then get implemented throughout the corporation. The company did a big pilot project on environmental management accounting, following the UN DSD approach, already in 2000 and publishes the report on the project as well as their environmental cost distribution to environmental media in their annual environmental statement.

www.sca.at

Percent distribution of environmental costs for 2000

Environmental media ¹⁾	Air and climate	Waste water	Waste	Soil and groundwater	Other	Total
Environmental costs categories						
1. Waste and emission treatment						
1.1. Depreciation for related equipment	0.2%	3.2%	0.5%			3.9%
1.2. Maintenance, operating materials and services		5.0%		0.1%		5.1%
1.3. Related personnel	0.8%	1.6%	0.7%			3.1%
1.4. Fees, Taxes, charges	0.7%	1.3%	3.6%			5.6%
1.5. Fines and Penalties						
1.6. Insurance for environmental liabilities						
1.7. Provisions for clean up costs, remediation						
2. Prevention and environmental management						
2.1. External services for environmental management					0.1%	0.1%
2.2. Personnel for general environmental management activities	0.1%				0.9%	1.0%
2.3. Research and Development		1.5%				1.5%
2.4. Extra expenditure for cleaner technologies						
2.5. Other environmental management costs						
3. Material Purchase value of non product output						
3.1. Raw materials			23.0%			23.0%
3.2. Packaging			0.1%			0.1%
3.3. Auxiliary materials			2.1%			2.1%
3.4. Operating materials	0.1%	32.0%	0.5%			32.6%
3.5. Energy	22.6%					22.6%
3.6. Water		0.1%				0.1%
4. Processing costs of non product output		0.2%	0.9%			1.1%
Total environmental costs	23.5%	44.9%	30.5%	0.1%	1.0%	100.0%
5. Environmental earnings						
5.1. Subsidies, Awards		-0.8%				-0.8%
5.2. Other earnings		-0.2%	-0.9%			-1.1%
Total environmental earnings		-1.0%	-0.9%			-1.9%
Saldo costs/earnings	23.5%	43.9%	29.6%	0.1%	1.0%	100.0%

The Excel Tool

- The Excel Tool consists of three files - ‚Detail‘, ‚Total‘ and ‚Percent Distribution‘. You only work in ‚Detail‘. All cost categories (in lines) and environmental media by SEEA (in columns) are already provided. The file ‚Detail‘ automatically aggregates to ‚Total‘ and ‚Percent Distribution‘. The Excel file can easily be used for the recording of the costs of each business year. It has a separate column for „source of information“. It is advisable in the beginning to use a separate Excel file for the EMA cost assessment and not try to immediately change the whole accounting system of a company.

General Input/Output Chart of Accounts

INPUT in kg/kWh	OUTPUT in kg
Raw materials	Product
Auxiliary materials	Main Product
Packaging	By Products
Operating materials	Waste
Merchandise	Municipal waste
Energy	Recycled waste
Gas	Hazardous waste
Coal	Waste Water
Fuel Oil	Amount
Other Fuels	Heavy metals
District heat	COD
Renewables (Biomass, Wood)	BOD
Solar, Wind, Water	Air-Emissions
Externally produced electricity	CO ₂
Internally produced electricity	CO
Water	NO _x
Municipal Water	SO ₂
Ground water	Dust
Spring water	FCKWs, NH ₄ , VOCs
Rain/ Surface Water	Ozone depleting substances

Results from the pilot projects

- Structure of the environmental costs by cost blocks
- Structure of the environmental costs by environmental media
- Environmental costs per employee
- Awareness about the amount of the environmental costs
- Recommendations

Expense distribution of the service and the production sector

Service Sector	Min	Average	Max
Materials	1%	3%	5%
Personnel	38%	42%	44%
Depreciation	4%	9%	34%
Interest	1%	9%	23%
Other Expenses	10%	25%	48%

Production Sector	Min	Average	Max
Materials	16%	44%	60%
Personnel	15%	24%	39%
Depreciation	1%	7%	16%
Interest	0%	1%	3%
Other Expenses	11%	24%	43%

Costa Rica

Item	Min Value	Average	Max Value
Material	42%	62%	84%
Personnel	2%	16%	35%
Depreciation	0%	3%	9%
Interests	0%	5%	11%
Others	4%	15%	35%
Total		100%	
Percentage (EMA/TC)	1.6%	4.2%	10.4%

Structure of the environmental costs by cost blocks

Austria	Min	Average	Max
1. Waste and Emission treatment	13%	29%	52%
2. Prevention and environmental management	1%	6%	14%
3. Material purchase value of NPO	39%	64%	85%
4. Processing costs of NPO	0%	5%	17%
5. Environmental revenue	0%	-3%	-9%

Costa Rica	Min	Average	Max
1. Waste and Emission treatment	6%	18%	38%
2. Prevention and environmental management	1%	9%	17%
3. Material purchase value of NPO	46%	72%	92%
4. Processing costs of NPO	0%	5%	20%
5. Environmental revenue	0%	-4%	-13%

Structure of the environmental costs by cost blocks in Austria

- The cost block “material purchase value of NPO” is most strongly weighted in the production enterprises. (with 45-85%)
- The expenses for the waste and emission treatment follow with values between 15 and 52 percent
- The cost block “prevention and environmental management” causes between 0,5 and 14% of the environmental costs.
- The “processing costs of the NPO” could only be assessed in some companies and amount for about 3% of the environmental costs, whereby sector-specific values of up to 20% are possible. These costs represent the production scrap evaluated by manufacturing costs.

Austria	Min	Average	Max
1. Waste and emission treatment			
1.1. Depreciation for related equipment	2%	9%	25%
1.2. Maintenance and operating materials and services	1%	5%	15%
1.3. Related personnel	1%	5%	20%
1.4. Taxes, Fees, Charges	4%	9%	14%
1.5. Fines and Penalties	0%	0%	0%
1.6. Insurance for environmental liabilities	0%	0%	0%
1.7. Provisions for clean up costs, remediation, etc.	0%	0%	64%
2. Prevention and environmental management			
2.1. External services for environmental management	0%	1%	4%
2.2. Personnel for general environmental management	0%	4%	10%
2.3. Research and Development	0%	1%	4%
2.4. Extra expenditure for integrated technologies	0%	1%	3%
2.5. Other environmental management costs	0,2	0,1	25%
3. Material purchase value of the NPO			
3.1. Raw materials	3%	21%	54%
3.2. Packaging	0%	3%	12%
3.3. Auxiliary materials	0%	7%	31%
3.4. Operating materials	0%	9%	37%
3.5. Energy	16%	24%	31%
3.6. Water	0%	1%	1%
4. Processing costs of the NPO	0%	5%	17%
5. Environmental revenues	0%	-3%	9%
Detailed distribution of the cost categories			

Structure of the environmental costs by cost categories

- **Depreciation, Maintenance and related Personnel:**

The average within this category is 20%. This part makes up a large component of the environmental costs particularly for breweries, where it can reach up to 45%.

- **Taxes, Fees, Charges:**

The values in this category lie around the average of 9% with hardly more variation than 2-3%.

- **Fines, Penalties, Insurances:**

Never occur in pilot companies for cleaner production and environmental management.

- **Prevention and environmental management:**

This block constitutes on the average 6% of all environmental costs, whereby the largest weight is on internal personnel expenses with nearly 4%.

- **Material purchase value of the NPO:**

This is where the largest part of the environmental costs accrues. The two most important points are raw materials (average 21%) and energy (average 24%), although there also are isolated outliers with auxiliary and operational materials.

- Processing costs of the NPO:

This block records the manufacturing costs of scrap, waste and other losses revealed by the stock inventory. It varies between 2 and 16% with an average value of around 5%.

- Environmental revenues:

Environmental revenues are obtained mainly by sales of scrap materials as well as by renting of “cleaning capacities” or selling power from own production. They correspond to an average of about 3% of the environmental costs.

Structure of environmental costs by environmental media

- The costs within the categories “soil and groundwater”, “noise and vibration”, “bio diversity and radiation” are negligible and almost never occur in the inquiries..
- The column “other” was used whenever the costs could not be attached clearly to a medium (e.g. general environmental management).

Here an overview over the range of the cost fractions. They obviously have a high variation and it is not possible to see a trend in the direction of a single environmental medium.

	Min	Average	Max
Air & Climate	14%	28%	41%
Waste Water	0,5%	30%	56%
Waste	3%	36%	83%
Other	0,2%	7%	17%

- However, the cost distribution by sector gives a clearer picture. Looking at the galvanic shop, the largest part of the costs (36%) is to be attributed to waste water, followed by waste and air & climate (power).
- In the breweries however the most important medium (over 38%) is air & climate (power), closely followed by waste water.
- With the remaining production enterprises most environmental relevant costs are attributed to waste with over 50%, followed by air & climate and waste water with approx. 20%.
- The banks accrue the by far highest environmental costs in the area of power, which leads to a portion of 77% for the medium air & climate and very low portions for the rest.

Awareness about the amount of environmental costs

- Apart from the distribution of the environmental costs their absolute amount is also of great importance.
- In this project it became obvious that the environmentally relevant costs were underestimated multiple times in most enterprises.
- The calculated environmental costs lay around 7-40 times over the values admitted before the start of the project and around 3-14 times over the values estimated by the enterprises in the workshop.

General observations on methodology

- It is possible to do the assessment of last years expenditure in one to two days
- The method is useful for companies with a certain level of environmental awareness and interest to increase material efficiency
- General management has a very limited idea of the environmental costs produced by the company. The tool is useful to create awareness amongst general management of the importance to have quantified information for decision making processes regarding environmental and material flow management

General observations on methodology

- Method is very useful for ISO 14001 certified companies in order to connect environmental management issues at operational level with the financial system
- Method helps SME to identify operational potential facts to reduce environmental costs
- Method is useful for increased consistency between financial data and material flow information

General observations on methodology

- The interest of many companies initially comes from environmental reporting and EMS but optimization actually focuses on traditional cost accounting, scrap percentages, material flow recording and material and energy efficiency improvements.
- Applying the methodology also works in a less developed country and actually has much more direct results on cleaner production and environmental management as these companies have not already spent 10-20 years on material efficiency and cost savings.

General Observations on Methodology

- Austrian companies are much more complex, so the motivation and results stay on the level of improving the accounting system, cost recording and the (environmental) management system, partly using the results for external disclosure, but there is no such direct effect on cleaner production as in Costa Rica.
- In Costa Rica, there are hardly costs related to legal compliance and municipal costs (disposal fees, waste water treatment fees), so the main argument for environmental management is cost savings and the potential therefor can easily been shown by the one-day workshop.

General Observations on Methodology

- As the companies are less complex, the results actually lead to direct discussions of improving the pricing strategy, the energy and material efficiency and installing the EMS.
- The main results of most companies in Austria are that they use this improved system for their systematic and consistent data collection and cost reporting as well throughout the corporation as for external disclosure. That was the goal for the Austrian pilot project and was the result (apart from the neutralized case studies for the toolkit).

Material flow cost accounting

As most companies belong to sectors, where the production process can be regarded as a black box as well from process technological as cost center perspective, detailed material flow cost accounting would be a waste of effort.

In sectors, in which a product is produced with a closed procedure (breweries, paper industry, energy industry) a intensifying allocation of the material flows to the different cost centers seems not useful.

Conditions for a recommendable application of material flow cost accounting are:

- portion of material costs of the entire expenditures of at least 20%, better 40%.
- Production procedures where a broad product range can go alternatively through various production steps.
- Calculation of divergent product prices on basis of the cost center accounts.

Follow-up project with Fischer Ski

- The results from the EMA pilot projects showed that material-flow-cost-accounting is only useful if the proportion of material costs with respect to total expenditure is significant. The implementation on cost center level is only worthwhile if the production includes a multitude of different single products in different processes, while a one to two-day survey on enterprise level seems sufficient if the production process can be treated as a black box (e.g.: breweries, paper industry).

Follow-up project with Fischer Ski

- In the follow-up project a more detailed assessment of material flow cost accounting on cost center level will be done with Fischer Ski, one of the 11 EMA-pilot companies of the first phase, as well as an integration with a tool for product development.

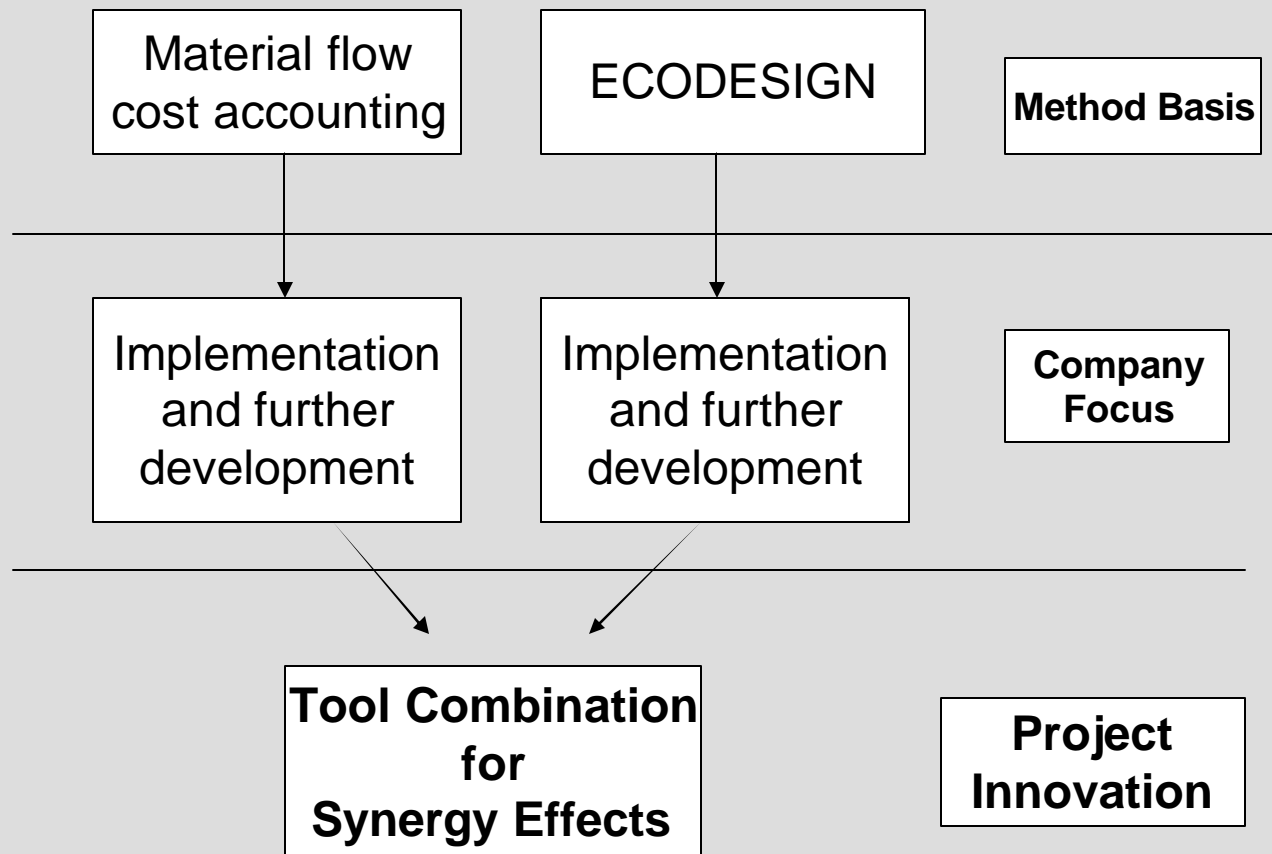
Company Results

- a consistent image of material flows together with information points
- actual values (instead of estimations) for scrap percentages of material flows
- internal work instructions for allocation, booking, stock withdrawal, measurement and data processing
- an instruction for the needed functions of the planned information system
- a company-specific tool for product development, which shows potentials for resource optimization in the product development process
- an e-learning tool for employee training as well for cost awareness as design implications

External Results

- a scientific report on implementation of material-flow-cost-accounting in an Austrian company
- an e-learning tool, containing the methodic approach combining process-flow-charts, material-flow-cost-accounting, EMA and product development
- Target groups for the external project results are environmental agents, product designers, financial controllers and accountants, as well as environmental research.

Combination of EMA and ECODESIGN



Follow-up project with Fischer Ski

- During product development not only the appearance and the functionality of a product are determined but of course also the method of fabrication. From this it follows that clearly during the product development a lot is decided and therefore anticipated (positively as well as negatively). In principle the whole lifecycle of a product, with all its effects – e.g.: environmental effects, costs – is planned during product development. Resultingly it is most interesting to combine ECODESIGN with a tool for resource oriented cost accounting (EMA).

Follow-up project with Fischer Ski

- With material-flow-cost-accounting it is possible to identify material efficiency improvement options for. With the product development tool for ECODESIGN it is possible to systematically test design options. The combination of EMA-cost-information with ECODESIGN will allow synergy effects far exceeding the separate application of each tool.

Follow-up project with Fischer Ski

- Furthermore it is important to be able to describe and estimate economic effects of changed product design on energy and material efficiency in the production process as well as during the whole lifecycle. Until now ECODESIGN-analysis focused totally on the materials in the product and not on those in the production process and the resulting financial impacts.

Follow-up project with Fischer Ski

- „Environmental slang“ (e.g. CO₂ - potential, climate change effects) are too complex for designers. The description of their task can't be: reduction of CO₂ - potential in a product. With ECODESIGN, material flow management and assessment of financial implications of non-product output these aspects can be transformed into understandable and manageable issues.

Fischer Ski

- The company participated in the PREPARE-initiative in 1994. At that time the first material flow assessment was performed and scrap percentages assessed.
- The company is one of the 11 EMA-pilot projects. 54% of environmental costs (about 5.7 mill €) are contained in material purchase value of non-product output. Saving potentials are likely.
- The company is one of the few participants that produces several different products in several different processes so that cost center specific assessment is needed.

Fischer Ski

- In addition it is planned to completely change the information system.
- Resultingly now is the time to define requirements to the structure of data recording (points of measurement, storehouses, accounts, cost centers)
- In addition the company is one of the few Austrian corporations that actually have a department for product design.

Recommendations

- It was shown that the UN DSD method encountered large interest and that the cost assessment is feasibly conducted in 1-2 days. The project resulted in suggestions for the improvement of the account billing, and for the reduction of the material and loss of energy values. All enterprises want to continue the instrument.
- The Verbund, Brau Union, and SCA were all interested in integrating the results of the site inquiry into a corporate-wide information and reporting system.

Recommendations

- It however also showed up that some aspects of the costing and investment calculation are not calculable in the enterprises, since the internal systems do not exhibit the degree of necessary complexity. A monetary comprehensible investment calculation is present only in a fraction of the participating firms. In this case, it deals only with large-scale projects such as power stations or paper-making machines, which are much too complex for didactical reasons. Also the professionalism of the cost calculation system rarely corresponds to the school theoretical requirement profile.

Recommendations

- The company projects revealed, that the motivation for the companies to participate in the project was influenced by expected internal and external benefits likewise. Since nearly all participants have an environmental management system, external communication via the environmental statement or report and via the case study in the toolkit were estimated as important, as the increased transparency of the environmental costs and information systems. This estimate is still stronger with the companies listed on stock exchange, who consciously try to communicate their sustainability profile for ethical investment decisions and link ecological with economic requirements.

Recommendations

- Definition of site specific environmental costs as well as their distribution to cost centers
- Data collection of material purchase by material groups in financial accounting
- Estimation and recalculation of material scrap percentages
- Consistency of system boundaries for material flow accounting

Recommendations

- Losses revealed by stock inventory as basis for the processing costs of the NPO
- Projects in the environmental program should have an investment decision and traceable account posting
- Separate cost category “environmental management”
- Treatment of missing values of the previous years
- Distinction to health, safety and risk management