

IMPACT OF LIFE CYCLE ON STRATEGIC ENVIRONMENTAL MANAGEMENT OF THE COMPANY

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Abstract:

Consideration of the environmental protection requests a number of changes from each individual company which must concern not only specific corrective actions of usually technical and technological character, but particularly the whole corporate management system. The trends of waste and rejected product disposal are changed in the Czech Republic, which trends bring extension of preventive actions and minimization of waste generation. Incorporation of the environmental protection into the company practice requests implementation of the environmental approach to the whole company management system, incl. the *strategic environmental management*. Important point of applying active environmental strategy is to move from final actions to preventive actions. This application is necessary in the whole live cycle of the product.

Incorporation of the environmental protection into the company practice requests implementation of the environmental approach to the whole company management system, incl. the *strategic environmental management*. Nowadays care of the environment and interest in the sustainable development are considered the characteristic features of the prudent management. There is no escape from serious problems of the future development in the environmental field; the problems will have to be resolved at all company levels.

The *strategic environmental management* defines long-time objectives and spheres of business, where the company intends to be active, the competence to be obtained and the necessary resources for launching the market and for successful competing; in order to reach its environmental objective the company values up and utilizes its potential, thus being able to cope with the continuing changes in the conditions of the environment and also determines the methods how to reach these environmental objectives. The life cycle is an important factor affecting content of the strategic environmental management.

The strategic environmental management should know contribution of the good environmental profile for the business and financial fields, influence of environmental aspects and impacts on the income of the company, on its financial situation, management and influence of the environmental costs on the economic situation of the company.

Key words: *strategic environmental management, life cycle product, environmental accounting, environmental managerial accounting, environmental costs.*

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INTRODUCTION

The product life cycle is in principle understood as all the activities which the product in question or certain parts of it enter into, irrespectively of who decides it. This point of view includes all preceding perspectives except a single one: the marketing perspective. Taking the product back is the problem belonging to the product life cycle end (how to dispose of the products); monitoring of the environmental costs is naturally connected with the product life cycle end.

From the point of the *environmental approach* under the term product life cycle we understand all stages which each product passes through, i.e. the stage of procurement of raw materials and processing of materials for production of the product in question, production itself, product distribution, product use by the customer connected with product maintenance and service and finally product-waste disposal.

Course of the *life cycle* displayed on *Fig.1* reflects the environmental approach to evaluation of the product life cycle.

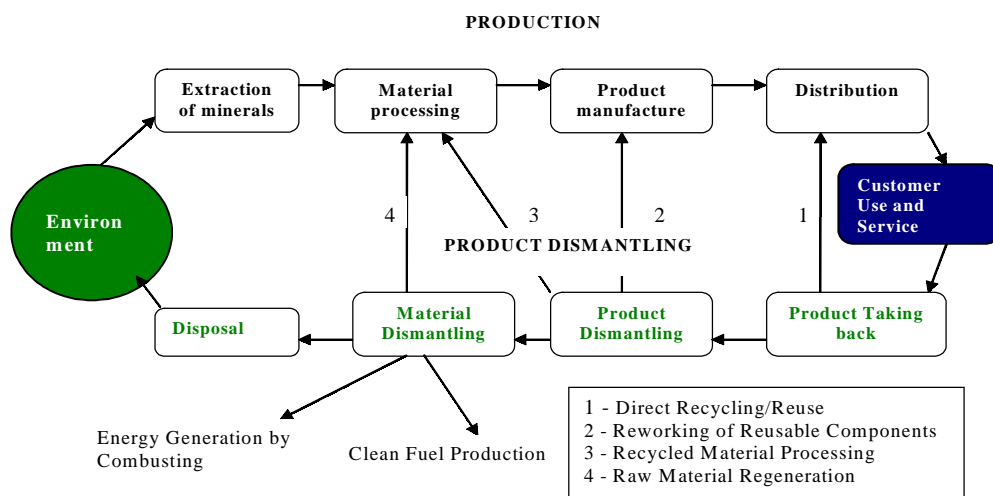


Figure 1 Generation Product Life Cycle (Emblemsväg, Bras, 2000, p.23)

Product life cycle analysis from the environmental point of view, see *Fig. 1* :

PRODUCTION/MANUFACTURE - the producer/manufacture concentrates on the top product life cycle part.

USE, SERVICE - the customer concentrates on the right-hand product life cycle part.

PRODUCT DISMANTLING - the company is liable for the bottom product life cycle part.

ENVIRONMENT – the left-hand product life cycle part began to be considered another life cycle part recently.

The bottom product life cycle part becomes the environmental strategy of the company, see *Fig. 1*; several more strategies of the product life cycle end, incl. their advantages and disadvantages, have to be defined in this respect. Taking the product back is the problem belonging to the product life cycle end (how to dispose of the products); monitoring of the environmental costs is naturally connected with the product life cycle end.

The corporate strategy should be focused on improvement of the environment by reducing product impacts on the environment for the whole life cycle. This strategic approach leading to improvement of the environmental product profile is linked with cost definition for the whole life cycle, starting by natural resource extraction, through product use till waste disposal. It is a relatively new environmental approach which shall contribute to environmental protection.

Conception of the life cycle should contribute to solution of the strategies in the environmental field focused on the product for their whole cycle life until their disposal, thus becoming an indispensable tool of the strategic environmental management.

4. CONTRIBUTIONS OF ECONOMIC ASPECTS FOR STRATEGIC ENVIRONMENTAL MANAGEMENT

The value information for decision making from the point of the strategies related with environmental profile of the company is very important for the strategic environmental management; identification of internal and external (externalities) environmental costs which could be based on assessment of the product life cycle can assist the management in reaching the set environmental strategies. The environmental

accounting and environmental managerial accounting, related closely to the environmental costs, becomes naturally the inevitable integral part of monitoring, recording and accounting of these costs for the products, processes as well as the whole company.

Environmental Accounting

Development of the environmental accounting is tied in with introduction of the environmental management systems.

The environmental accounting will affect the accountants both in the business and in the industry; it is also necessary to consider relevant tasks of the accountants within the scope of their professions, should they act as auditors or specialized advisers. The accountants could judge everything as the unwelcome change on the one side or as a great opportunity for construction of proactive business managerial tasks on the other side (Kocmanová,2003,p.67)

Schaltegger, Burritt (2000,s.63) analyze the basic framework of the environmental accounting and apply different strategies of the stakeholders interested in the two core groups of environmental information relating to the company:

- financial impacts caused by environmental issues of the company,
- physical environmental impacts.

The extended definition by Kocmanová (2001,p.125) follows from the comparison below:

„The environmental accounting represents the integral part of the financial and managerial accounting focused on collecting, recording, evaluating and transmitting the information about financial impacts² and environmental impacts, caused by affection of the environment by corporate activities, products and services, for the environmentally-oriented management“.

Environmental Managerial Accounting

The environmental managerial accounting is defined by the International Federation of Accountants (IFAC 1998, § 1):

Environmental managerial accounting is management of environmental and economic activities based on the relevant accounting systems and procedures

² The *environmentally called financial impacts* are reflected in monetary units as the impacts on the cost and revenue (i.e. on the comprehensive income) or on receipts and expenditure of the company, on assets and liabilities of the company related with affection of the environment by the company .

concerning the environment, though it can result in reporting and auditing in certain companies. The environmental managerial accounting usually includes the life cycle calculation, full cost accounting, assessment of contributions and strategic planning for the environmental management.

The environmental managerial accounting defined by Schaltegger, Burritt (2000,p.89-90) is focused on financial environmental aspects facilitating the managers to adopt the decisions and be liable for these decisions. The information concerning non-financial environmental impacts are contained in a separate accounting system, named the „Internal ecological accounting“. The environmental managerial accounting and the internal ecological accounting create one complex whole and are the integral part of the eco-efficiency.

The environmental managerial accounting is one of important information tools for the management, it supports strategic planning by defining strategies and methods of introduction of these strategies (e.g. improvement of the corporate environmental efficiency), represents the basis for decision making how to reach the requested strategies (e.g. limitation of waste volumes), facilitates result feedback and acts as the control tool (e.g. environmental reports) .

Environmental Costs

For identification of the environmental costs and for their incorporation into the managerial decision-making process the United States Environmental Protection Agency (1995, p.7) applies the following simple structure:

- the costs designated as the “current” (and/or “basic/core”) costs,
- the costs which may be neglected or covered in the overhead costs or the costs for research and development allocated incorrectly to other centres or “neglected” are designated the "hidden costs", "conditioned costs", "less tangible costs."

Conception of the environmental costs by the United States Environmental Protection Agency confirms that the conception is based on assessment of the life cycle. Life cycle of the product, process, system or equipment can relate to the sequence of activities.

The life cycle prospect can both support development of the well-founded internal cost accounting (and prospective cost savings) and contribute to elaboration of more systematic and complex method of evaluation of impacts of corporate activities on the company and external costs (externalities).

Determination of corporate environmental costs is of great importance for the needs of the environmental management:

The corporate environmental costs can be broken down into two basic components:

- *the costs spent for environmental protection* – i.e. the costs connected with corporate activities focused on limitation and/or compensation of negative affection of the environment by the company, and
- *the costs connected with damaging the environment.*

The strategic environmental management includes the tools above inevitable from the point of deciding the suitable economic environmental strategies. Defining of the tools of the strategic environmental cost management, using the tools for cost determination in conformity with progressive methods of calculation focused on the strategic environmental cost management, is the necessary precondition for increase of profitability, cost reduction, satisfaction of customers' needs by environment-friendly products, etc.

2. RESEARCH OF STRATEGIC ENVIRONMENTAL MANAGEMENT IN COMPANIES

Objectives of the research in 2003 were as follows: to continue the obtained knowledge of the carried out research of the grant project and the institutional plan, to be based on the defined fields of the environmental management, environmental accounting and environmental costs and to be focused on the environmental cost management (allocation of the environmental costs in the line of performances, departments and processes) and on the strategic environmental cost management in the Czech companies with the implemented environmental management system.

Concentration of research on the strategic environmental cost management becomes a relatively new topic, including particularly the field of costs and contributions oriented on their relation towards activities and processes. The corporate strategy should also include the environmental aspects connected with the strategic environmental cost management, i.e. how the costs, incl. the environmental costs, are allocated in the companies to the products, services, etc. what tools are used by the companies.

Objectives of the research in 2003 were focused on establishment of:

- Main environmental strategies in Czech companies.
- State of the strategic environmental cost management and its priorities.

The companies with the certified ČSN EN ISO 14 001 or registered EMAS were selected for the research in 2003.

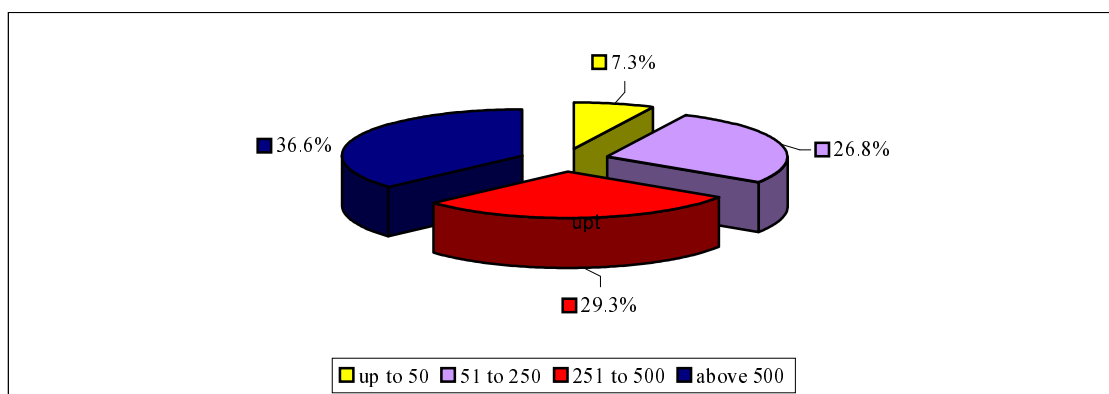
The following hypotheses have been raised, based on the question of the carried out research:

- H1: From the point of the strategic environmental position the Czech companies will most probably fulfill the tasks following from the environmental requirements consistently.
- H2: From the point of environmental requirements the Czech companies will most probably monitor and allocate the environmental costs connected with pollution, recycling and waste disposal to the products and services, using the tools of the environmental cost management.

3.1 Under examination sample by size companies

In a questionnaire survey, 80 organizations of the examined set were addressed, 41 valid questionnaires could be recovered, i.e. 50 % of the addressed organizations, which is a sufficient set to obtain fairly general knowledge and conclusions and to formulate possible recommendations in the sphere of the strategic environmental management.

In the given specimen, organizations of various sizes are represented. For the distribution of the specimen according to the size of the firms, see *Chart No.1*.



Char

t No.1 Specimen structure as per defined size groups.

The most important sector of the classification of economic activity in the examined specimen is the manufacturing industry. The representation of other sectors is very limited and they constitute an insignificant part of the respondents. It follows from the

results of the survey that the 87.8 % of the companies include a reference to the environmental management into their management arrangements.

3.2 Analysis of strategic environmental management in czech establishments

Within the framework of the survey, emphasis was laid on strategic issues related to the environmental management:

- * Environmental tasks in the establishments from the view of the strategy, performance and changes.
- * Environmental accounting and its tools for the fulfilment of strategic targets.

Environmental tasks in the organizations from the aspect of strategy, performance and changes.

The survey has shown that the main strategic environmental mission of the establishments is particularly the suppression of negative impacts on the living environment. From the view of the relative proportion share, a maximum of 68 % of organizations focus on an efficient commercial waste management, its after treatment etc., on the emission reduction, dust nuisance, annoying sounds, construction of waste water treatment plants, or the production of environmentally-friendly products. Further important strategic tasks include the observance of legislation, reduction of production input – water, power, raw materials (22 %). The other strategic targets include focusing on the environmentally-friendly technologies (15 %), elimination of environmental impacts (10 %) and implementation of the EMS in the whole organization (7 %). It is evident that in organizations with a lower number of employees, there also exists a correlation between the protection of the environment and the motivation, education of the employees, personal approach and personal responsibility. This approach is also defined within the framework of the individual positions of the company management and all the organizations should take such an approach into account .

The most frequent answer to the question: „Will the principal strategic environmental tasks change in the course of years?“. The major part of the respondents do not believe that the principal strategic environmental tasks for their organization will change in a decisive way in the course of years (78.0 %), eight respondents expect a substantial change.

The strategic environmental tasks quoted by the respondents in connection with their performance is primarily the implementation of the environmental management system as per ČSN EN ISO 14 001. They have also mentioned investment in the environmental installations as waste water treatment plants, dust-removing plants, reconstruction of sewer systems and also reduction of the waste, emissions, power consumption etc. It follows from the survey results that some strategic tasks are still under way and they are continuously solved by the organizations.

Environmental accounting and its tools for the fulfilment of strategic targets.

Within the framework of the research, the investigation also tried to find out whether the environmental accounting is important for the performance of the main environmental strategic tasks and whether it could be used within the framework of the strategic environmental changes. From the results of the survey it is quite evident that almost one half of the respondents (46.3 %) regard the environmental accounting as important for the achievement of the main environmental targets and only 6 companies (14.6 %) would make use of it in the case of a definite change of the main environmental targets in the course of forthcoming years. Full 80 % of the respondents do not plan any use of the environmental accounting for the above-mentioned changes.

In the context of the environmental accounting, the respondents were asked about the use of the accounting tools not only from the aspect of the present, but also from the aspect the strategic environmental tasks in the companies, which tools are regarded by the respondents as insignificant, significant and essential, see *Chart No. 2*.

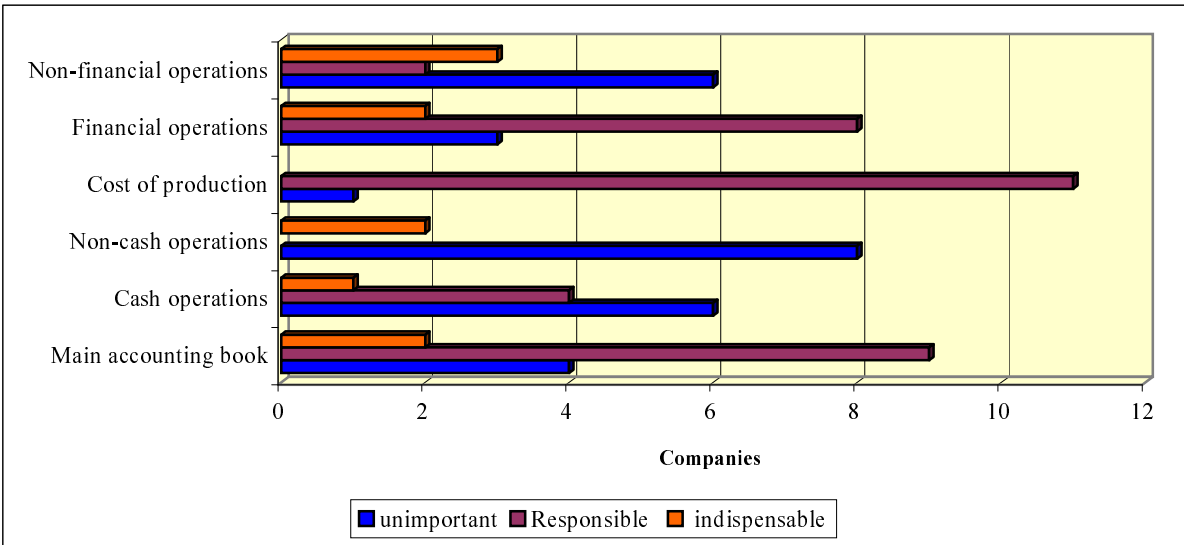


Chart No. 2 Individual accounting tools for the implementation of environmental accounting today

From the results of the survey it follows that at present 22 % of the respondents regard as important the *Main account-book*, 26.8 % of the respondents the *Cost of production* and 19.5 % of the respondents the *Financial operations*.

From the other accounting tools as *Non-cash operations*, *Cash operations* and *Non-financial operations* it follows that a number of respondents – 66.5% have not understood the correlations implied in the asked question and the results of the research have thus been distorted.

3.3 Strategic priorities of environmental management

On the basis of the defined environmental accounting and environmental costs, the relation can be analysed from the aspect of the strategic environmental management of the company. The respondents were asked to specify on the 7- item Likert Scale their strategic environmental priorities, the development in the years 2001 through 2003 from zero importance (score 1) to great importance (score 7) in the following spheres:

1 = No emphasis 2 = Very little emphasis 3 = Little emphasis 4 = Medium emphasis

5 = Medium-great emphasis 6 = Great emphasis 7 = Strong emphasis

For the sake of clarity, only the year 2003 is presented

	1 = No emphasis	2 = Very little emphasis	3 = Little emphasis	4 = Medium emphasis	5 = Medium-great emphasis	6 = Great emphasis	7 = Strong emphasis
To provide high-quality products						8	28
Low cost of production				3	4	14	15
Provide unique characteristics of the product	3	1	2	8	5	10	5
Low price	1		5	6	7	12	4
To implement design changes	4	2	2	7	10	3	3
To implement prompt changes of the volume	6	2	3	8	2	6	4
To ensure prompt deliveries	1			3	6	13	12
To ensure promised fixed-date deliveries	1				2	13	19
To provide efficient and after-sale service	1	2	2	3	6	9	8
Delivery possibilities		1		4	7	13	9
To adapt the products and services to the customer's needs			1		1	11	23

The firms regard as strong strategic priorities the Provision of high-quality products, Adaptation of the products and services to the customer's needs, Provision of promised fixed-date deliveries. We may judge from it that the organizations are mainly customer (consumer)-oriented. Further strategic priorities are Low production costs, Delivery possibilities, Provision of prompt deliveries, Low price and Provision of unique characteristics of the product. For the majority of the organizations, these strategic priorities are found at the level of the *organization* (83%) and at a great distance from it they may be found at the level of the *producing plant* and of the *process* (both 22 %). The other levels are negligible.

3.4 Influence of the product life cycle and the strategic environmental management

In connection with strategic environmental management, the respondents were asked whether they had included the product life cycle into their environmental procedures: Pre-production phase (research and development), Design, Production, Distribution (complete with packing), Application, Disposal.

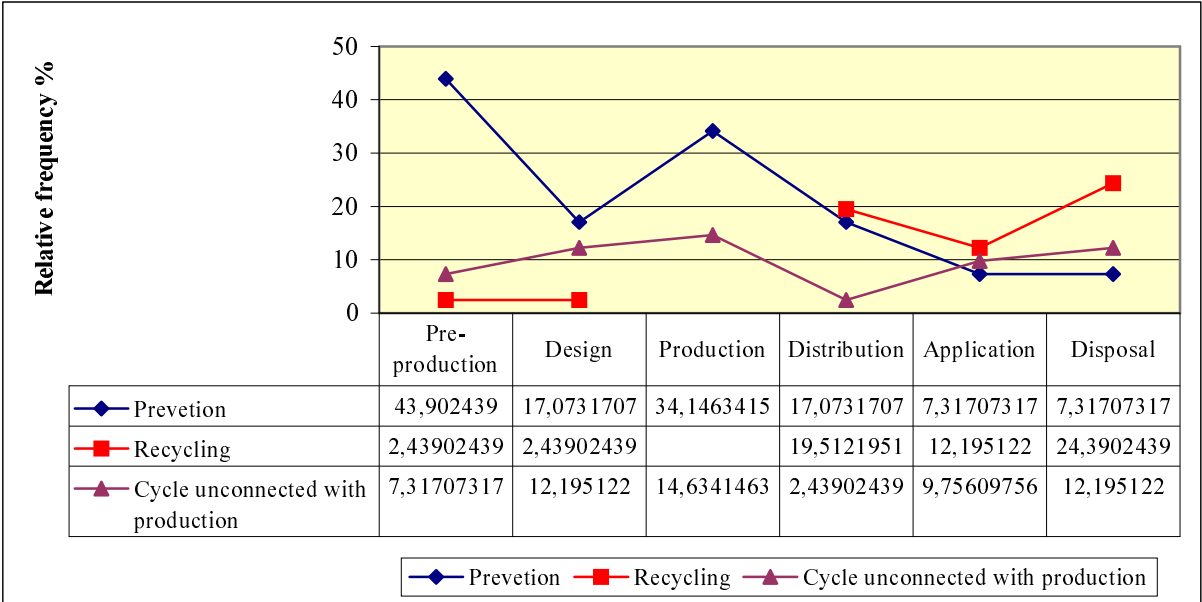


Chart No. 3 Product life cycle in organizations using one of the methods of prevention, recycling and process unconnected with production

- It follows from Chart No. that Prevention is used mainly in Research and development and in Production (43.9 and 34.1 % of the respondents). Preventive measures in Distribution, Design (17.1%), Disposal and Application (7.3 %).

- Disposal (24%), Distribution (19.5%) and Application (12.2%) are connected with *Recycling*. Contrariwise the organization do not connect Design (2 %), Research and development (2 %) with recycling.
- *Process unconnected with production* appears mainly in Disposal (12.2 %), followed by Production (14.6%), Design (12.2%), Application (9.7%), Distribution, research and development (7.3%).

The high percentage of responses that were not filled in especially in the phases of Design (68.3%), Application (63.4%), Distribution (41.5%) and Research and development (39%) confirm that the phase is not suitable for the output of the given organization (design – power distribution) and/or for external collaboration (distribution and research and development). The connection of prevention and recycling is used by the organizations in Production and Distribution. The connection of prevention, recycling and cycle unconnected with production is used by the organizations in Production and Disposal.

4. SUMMARIZATION OF RESEARCH RESULTS

The carried out research of evaluation of the current state in the field of environmental information in the Czech companies can answer the raised hypotheses as follows:

- H1: From the point of the strategic environmental position the Czech companies will most probably fulfill the tasks following from the environmental requirements consistently.

The main strategic environmental tasks of the companies resulting from the research are as follows: effective waste management, waste processing, further reduction of emissions, reduction of dust and noise level, production of environment-friendly products; the companies are focused on reduction of consumption of material and resource inputs - water, raw materials and resources. Orientation on environment-friendly technologies, removal of environmental load, introduction of the environmental management systems in the whole company belong among other strategic objectives of the companies. The elements of staff motivation and liability from the point of environmental protection appear. Investments into environment-friendly equipment, e.g. waste water treatment plant, dedusting device, sewer refurbishment, etc., are material for the companies.

The companies consider introduction of the environmental management systems pursuant to ČSN ISO 14 001 or EMAS I,II, - as well as introduction of certain optional tools, e.g. the Cleaner Production, LCS - the strategic environmental tasks.

This hypothesis confirms that the Czech companies accept the strategic environmental approach to satisfy both the social liability and the binding environmental requirements.

- H2: From the point of environmental requirements the Czech companies will most probably monitor and allocate the environmental costs connected with pollution, recycling and waste disposal to the products and services, using the tools of the environmental cost management.

The next part of research was focused on monitoring of the environmental costs in the Czech companies. Over one half of the respondents was able to define the environmental costs, we are speaking particularly about the ecologists, the middle management, the top management and the economists. Results of the research confirm that the companies begin to be acquainted intensively with the term environmental costs and, moreover they link them with the costs for environmental protection. The companies consider incorporation of the environmental costs into the calculation methods; the number of positive answers rises with the company size. From the point of environmental cost breakdown the predominant majority of companies in principle neither takes them out of the overhead costs nor monitors them separately.

The costs for wastes are considered generally the important component of the environmental costs. The majority of companies monitors these costs from the point of waste disposal and revaluation. The companies usually charge the external organization with waste disposal. From the point of product calculation the companies consider all the waste related costs the environmental costs (e.g. waste and waste water disposal, the costs for waste storage, recycling, the costs for metal plating, the costs for the machining scrap, the costs for cutting and machining liquids and oils, technological waste, iron scrap). In practice the predominant majority of companies does not include the sum for product disposal (recycling) into the environmental costs. This hypothesis has confirmed that the companies will really have to monitor very carefully the environmental costs in connection with pollution of

the environment and include all the environmental costs within the scope of the product life cycle into their strategic objectives.

5. CONCLUSION

The corporate strategy is the factor, which all activities of the company are based on. Each individual company should consider incorporation of the aspects relating to the environment into its strategies for very important; they should reflect the importance and attention paid by the company to the environmental issues during manufacture, namely by applying the ***strategic environmental management***.

Evaluation of the strategies concerning the environmental threats and opportunities can be based on analysis of the external fields and internal fields of the company, using the SWOT analysis.

Results of the empiric research of environmental and strategic environmental management testify to the knowledge concerning Czech companies.

Introduction of the EMS/EMAS system has the explicit positive impact on better and more active approach of the companies to the environment. It is also confirmed that results of introduction become evident on the positive corporate economy; the positive impact can also be seen in the improved image of the launching companies - competitive ability of the company.

Improvement of efficiency of the whole system of introduction of ISO 14 001/EMAS requests better approach of the state administration to the companies with the implemented system of environmental management - support of negotiations with the banks and insurance companies, preferential evaluation (advantageous) of the companies having the environmental system already implemented, support to introduction of the ISO 14 001/EMAS system for the small and mid-size companies in the form of financial subsidies for consulting and certification costs up to the level of e.g. 80 %.

From results of the research in the field of the environmental costs and environmental accounting it follows that the companies should start to work with the ***corporate environmental costs***.

The information system for the environmentally oriented company management has to be implemented in the companies. The environmentally oriented information system must be created in view to grant the information to the important users and to

contribute to improvement of the environmental profile of the company, thus going towards the sustainable development.

The research focused on the main strategic environmental tasks of the companies has proved that reduction of the negative impacts on the environment, particularly the field of waste management, waste processing, reduction of emissions, reduction of dust and noise levels, construction of waste water treatment plants or production of environment-friendly products, is considered the core strategy of the companies. The companies are also focused on adherence to the legislation and on reduction of consumption of the inputs - water, raw materials and resources. Orientation on environment-friendly technologies and removal of the environmental load belong among other strategic objectives of the companies.

Introduction of the environmental management system pursuant to ČSN EN ISO 14 001 belongs to the strategic environmental tasks shown by the respondents in connection with their fulfillment. The respondents also stress investments into the environment-friendly equipment, e.g. the waste water treatment plants, dedusting devices, sewer refurbishment as well as reduction of wastes, emissions, resources, etc.

It follows quite explicitly from results of the research that the companies consider environmental accounting important for fulfillment of the main strategic environmental objectives. Results of the research also prove that lack of funds, problems in the HR field, missing directions for the systems, non-uniform management and customers needs are understood barriers of strategic tasks of the companies.

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