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AN INTEGRATED APPROACH FOR INTRODUCING ECODESIGN INTO AN INDUSTRIAL COMPANY – FROM CUSTOMER DEMANDS TO AN ENVIROMENTAL PRODUCT DECLARATION

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Abstract

On the initiative of a multinational company key elements for driving a continuous improvements process were developed. These are: A tailor-made ECODESIGN tool for product development, a Material Selection Tool, an Environmental Product Declaration as well as an e-learning platform to train staff. The paper describes this ongoing process of integrating environmental thinking throughout the company.

Keywords: Design for Environment, ECODESIGN, Environmental Product Declaration

1. Introduction

Improvement of the overall environmental performance is mentioned as a strategic goal and objective in an increasing number of company policies. But what does it mean for a company to have a good environmental performance or "to be green", especially if we look at their products?

This paper describes experiences made so far in an ongoing process with a multinational company and their way of integrating environment into their products and activities. Although the starting point for the initiative described here had been to implement a tool for ECODESIGN respectively Design for Environment, it turned out that a lot more is important than mere tools. At least equally important preconditions for a company's successful "being green" are the integration of environmental thinking in every department and the installation of a continuous improvement process within companies activities.

Drivers for that initiative can be found in three areas: On the one hand there is an increasing number of environmentally aware customers, which are more and more asking critical questions about the life cycle of a product (e.g. "Do I buy an end-of-life problem, if I choose your product?" – "What is the environmental performance of your product?"). On the other hand, there are other stakeholders e.g. those who don't want to invest their money in enterprises with "unclear" environmental and social policies (A pool for such investors is e.g. the Dow Jones Sustainability Index). Furthermore, upcoming laws as well as European and international regulations (e.g. EU – IPP with WEEE and RoHS or the Recycling Law in Japan) are alerting companies to specifically consider environmental aspects.

2. Objectives

A series of projects has been launched on the initiative of Steelcase International S.A., a multinational company with branches in Europe and North America producing office

furniture at various global sites. In close cooperation with the R&D department in Europe, the Vienna University of Technology and the Technical University of Denmark have been carrying out the following activities in order to support product development at Steelcase to "be green":

- Development of a Steelcase tailor-made solution of the ECODESIGN – FURNITURE – PILOT (EFP),
- Building-up a Steelcase Material Selector Tool (MST),
- Performance of an Environmental Product Declaration according to ISO TR 14025 and
- Installation of an e-learning platform to train engineers in product development.

3. Methods

The methodical approach followed divides into actions taken before and after a product design is finished. Beforehand tools have been developed and trained to engineers in product development as well as criteria for suppliers have been worked out and circulated among them. A tailor-made ECODESIGN tool for office furniture was developed and has been linked up with a tool that helps selecting materials with respect to physical, functional and environmental properties. For both tools an e-learning platform was created to raise awareness among product developers and train them for the new environmental requirements.

On the finished-product side, an Environmental Product Declaration was prepared for an existing product in order to communicate the environmental performance of the product to customers.

All activities taken together should stimulate a continuous improvement process and involve departments and individuals in developing better products at lower costs by an improved environmental performance (see Figure 1).

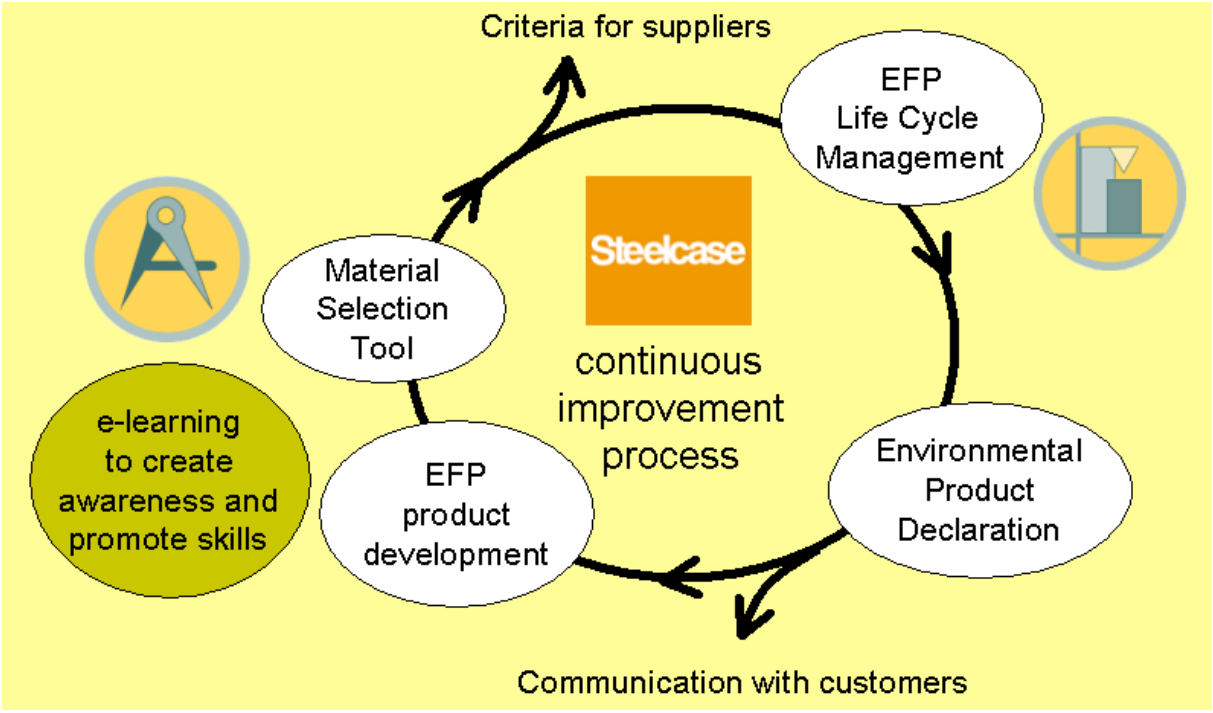

Figure 1 Elements of the continuous improvement process

3.2 ECODESIGN FURNITURE PILOT

The ECODESIGN **P**roduct **I**nvestigation, **L**earning and **O**ptimization **T**ool (PILOT) [1], [2], was developed as a tool for environmental conscious product development, offering a learning approach to rise the awareness for ECODESIGN and a qualitative design assessment procedure with checklists to identify possible product improvements. This tool is available on CD-ROM and in the Internet (see: www.ecodesign.at/pilot). It was designed as a generic tool, since requirements of companies are often very specific a tailor-made software solutions can be developed based on the PILOT, e.g. the recently finished EFP for Steelcase. This adaptation to product- and company-specific requirements was supported by the French Environmental Protection Agency (ADEME).

Figure 2 ECODESIGN FURNITURE PILOT

In a first step all ECODESIGN guidelines for office furniture were collected and described with text and via pictures or drawings of good examples. These guidelines were then grouped along the different stages of the product development process at Steelcase. This tool advises for each stage the relevant ECODESIGN guidelines for office furniture and supports their implementation, “to do the right things at the right time” during the development of new products. In a next step the EFP was extended by strategies applicable for improving existing products within the Life Cycle Management process at Steelcase (see Figure 2). Specifically relevant guidelines were grouped together in checklists to support designers in finding possible product improvements for the redesign of already existing products. Due to confidentiality no further details can be presented here.

The improved checklists can be filled out electronically and contain additionally fields for noting first ideas and for doing a rough cost estimation of possible product improvements. Additionally every checklist has a save-button to create an html-file of the checklist, that can be added to the regular product development documentation. By that a recording of the actions taken to improve a product can be achieved (see Figure 3).

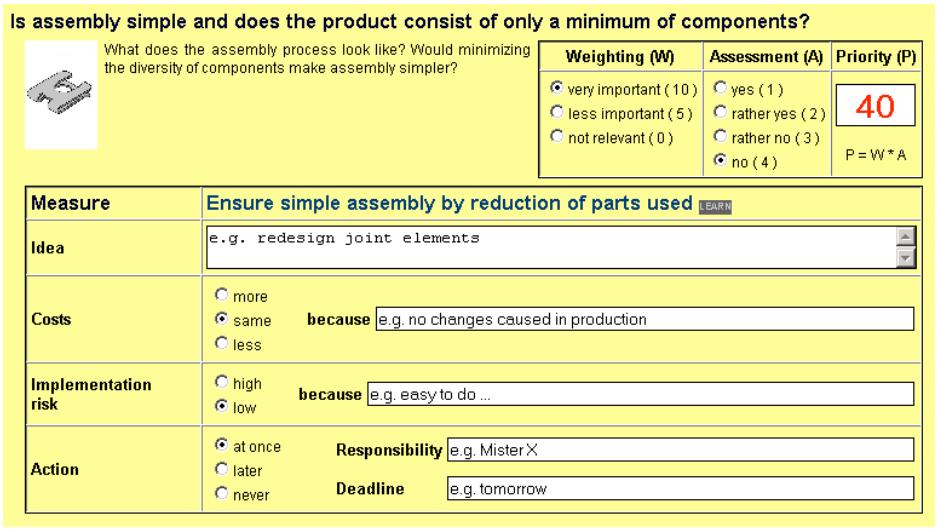

Figure 3 Improved checklist item for the ECODESIGN FURNITURE PILOT

The procedure for product improvements of existing products consists of the following steps:

1. Weighting: Rate the importance of the individual assessment questions with a view to your product. (10...very important for my product; 5...less important for my product; 0...not relevant for my product)
2. Assessment: Answer the assessment questions using one of the four possible answers (yes / rather yes / rather no / no); the additional questions serve only for better understanding of the assessment question and need not be answered.
3. Priority: Calculate the priority P by multiplying the value W (weighting) by the value A (assessment).
4. Idea: Note first ideas to fulfill the ECODESIGN measure.
5. Costs: Make a rough estimate of costs for the implementation of the measure.
6. Implementation risks: Make an estimate of time expenditure, technological problems, etc. involved in the implementation of the measure.
7. Action: Decide when to carry out the measures (at once, later, never) and determine the person or department that shall be in charge of further steps in the realization of product improvement and fix a deadline.

3.3 Material Selection Tool

In addition to the EFP the Material Selection Tool (MST) was developed. The aim was to create an easy to use solution, that should deliver within a short time a list of recommended materials for parts to be designed. The MST enables designers to choose the environmentally preferable alternative out of different materials. Based on specified aspects concerning *environment*, *function*, *surface* and *shape* a designer gets a pre-selected list of possible materials to choose from.

The tool uses a “filtering” method, where minimum requirements of different criteria are defined and those materials which are matching these requirements are recommended as possible materials. For the final decision, the product developer has to consider additional information available and to compare the detailed data sheets of the different materials and suppliers. The material database which the tool uses, contains all aspects and categories of material data which are relevant for product developers at Steelcase. To find those aspects and categories, a survey among product developers of R&D Steelcase was done. Figure 4 shows the request form of the MST.

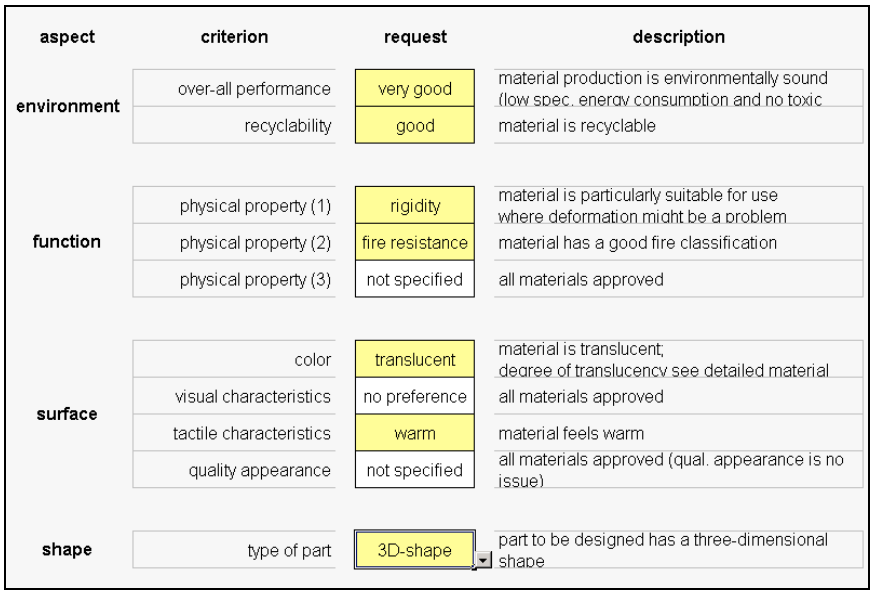

Figure 4 Request form of the Material Selection Tool

3.4 Environmental Product Declaration

In order to communicate the environmental performance of products to customers, Steelcase decided to use Environmental Product Declarations (EPD) according to ISO TR 14025 [3]. In order to learn about the procedure and steps involved, an EPD for an existing product was prepared. Experience gained and the developed format of the EPD could then later be used for other products, also including new and redesigned ones. The EPD completed the integrated approach by focusing on the increasing number of customers, already today inquiring about environmental features of products.

In order to provide customers with most comprehensive and transparent information the EPD should be of the so-called "Type III". This required to carry out a Life Cycle Assessment (LCA) as the main element in this type of EPD. It was decided to perform a screening LCA in order to identify relevant impact categories, such as *Global Warming* or *Ozone Depletion*. Contributions to those impact categories are mentioned in the declaration, e.g. Global Warming Potential in kg CO_2-equivalents. The amounts were quantified for all the five stages of the product life cycle following the suggested format in [4].

The LCA included all steps defined in the ISO 14040 series, i.e.

- Definition of Goal and Scope,
- Inventory Analysis,
- Impact Assessment and
- Interpretation.

The overall result was that the main environmental impacts occur in the materials stage followed by the manufacturing stage and transportation.

Besides the more quantitative information based on LCA results, a Type III EPD includes also qualitative data, e.g. a description of the product as such and a declaration of materials used in the product. Figure 5 shows the topics described in the EPD.

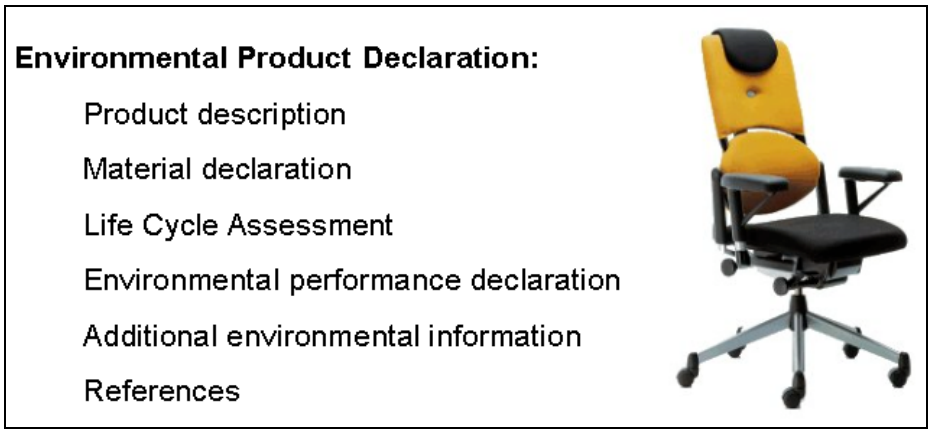

Figure 5 Elements of the Environmental Product Declaration

As the product is sold on various global markets, the descriptions and product properties had to relate to customer and legislative requirements on the different markets, including also relevant environmental labels such as the French "NF-environnement", the German "Blauer Engel" and the Japanese "EcoMark". Determining these requirements and finding the final format for the EPD was accomplished by collaborating in a cross-functional team with members from product development, R&D, production but especially purchasing, communication, marketing, logistics and sales.

The above-described version that complies with ISO TR 14025 was found to be most appropriate as detailed information source for business-to-business customers. In order to provide appropriate facts for other types of customers, two other ways of communicating the environmental performance of Steelcase products are currently under discussion:

- End customer version
  The EPD for the end customer should contain easy-to-understand information in terms of percentage of the environmental load over the product life cycle (e.g. "85% of the total environmental impacts result from the materials stage"). There should also be the possibility to highlight the various improvements in the lifecycle stages compared to a former product.
- Product sticker
  The most simplified version of the EPD should be a product sticker naming the most important environmental aspects of a certain product range (e.g. office chairs).

The implementation of these additional forms of communicating environmental information is not decided yet, but could support the continuous improvement process by delivering clear improvement targets.

The cross-functional working process itself yielded another important positive outcome: After initial problems of "understanding one another's language" had been solved in the first meetings, the cross-functional discussions necessary for preparing the EPD turned out be very inspiring and "eye-opening" for all participants. In this way the preparation of the EPD lead to a better understanding of environmental issues and opportunities to address these issues in the different departments throughout the company.

3.5 E-learning platform

In order to train staff, an e-learning platform was chosen as a company-wide means to distribute knowledge. For the first course three lessons were developed to reflect and understand the *continuous improvement process* and get advice on how to achieve product related improvements. Every lesson has a theory part for enhancing the environmental knowledge (e.g. Life Cycle Thinking) and a part where the user can learn the application of the different environmental tools respectively instruments.

Additionally to the three lessons a front area is under development that integrates all elements available in the e-learning shell and allows individual learning paths. The three lessons are related to the above described and are based on illustrative product examples (see Figure 6).

Figure 6 E-learning platform for training on the job

4. Results

The research described here is a close cooperation between the Vienna University of Technology, bringing in the experiences and tools about ECODESIGN, the cross-functional team of Steelcase International, bringing in their product know-how and the Technical University of Denmark with its experience in Life Cycle Assessment [5], [6]. This cooperation allowed developing a general procedure for integrating the complex issue of environment into a company and for improving the environmental performance of products.

The results from the set of projects described are a real-life example of implementing environmental considerations into the product development of a large company by supplying tools for decision-making like the ECODESIGN FURNITURE-PILOT and the Material Selection Tool, by providing training on the new issues with an e-learning platform and by communicating to the customers what has been achieved in respect to environment through an Environmental Product Declaration according to ISO TR 14025.

In that way, an ongoing *continuous improvement process* has been started in the company where the different departments – all the way from marketing via design, purchasing to manufacturing and logistics – are integrating environmental thinking in their designated area in order to achieve “greener” products.

Judging from the positive experiences already made with improving the environmental performance of products and with enhancing the environmental awareness of individuals, the continuous improvement is a learning process that has excellent preconditions to go on in the future with the support of all participants.

References:

[1] Wimmer, W., Züst, R., ECODESIGN PILOT, Product Investigation, Learning and Optimization Tool for Sustainable Product Development, with CD-ROM, Alliance for Global Sustainability Series Vol. 3, Kluwer Academic Publisher, Dordrecht, Boston, London, 2003 (ISBN 1-4020-0965-8)

[2] Wimmer, W., Züst, R., Strasser, Ch.: The Application of the ECODESIGN PILOT and Methodical Support for the Implementation of ECODESIGN in Products, Proceedings of International Design Conference, DESIGN 2002, Dubrovnik, 2002

[3] ISO/TR 14025: Environmental labels and declarations – Type III environmental declaration – guiding principles and procedure, ISO 1999

[4] Lee, K. M., Park, P. Application of Life-Cycle Assessment to Type III Environmental Declarations, Environmental Management, Vol. 28, No. 4, 2001, pp. 533-546

[5] Wenzel, H., Hauschild, M., Alting, L., Environmental Assessment of Products, Vol.1: Methodology, tools and case studies in product development, Chapman & Hall, London, UK, 1997 (ISBN 0-412-80800-5)

[6] Bey, N., Environmental Assessment - Gotten across to industrial designers, Proceedings of International Design Conference, DESIGN 2002, Dubrovnik, Croatia, 2002, pp. 1293-1298

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