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THE WAY TO DO ECODESIGN IN COMPANIES – INSTALLING A CONTINUOUS IMPROVEMENT PROCESS

W. Wimmer and N. Bey

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1. Introduction

More than two years ago a multinational company producing office furniture requested an appropriate tool to integrate ECODESIGN into their product development process. This lead to the development and implementation of a company adaptation of the ECODESIGN **P**roduct, **I**nvestigation, **L**earning and **O**ptimization **T**ool (PILOT) [1]. The project initiated a continuous improvement process within that company. Today the former tool is well established and just one out of a whole set of elements supporting different functions involved in product development. Within a partnership between the company, the Vienna University of Technology and the Technical University of Denmark the integration of environmental thinking in the product management, development and communication is aimed at. This paper describes experiences made so far in this ongoing process and points out mayor steps for integrating environmental responsibility into the company's products and activities.

2. Objective

The idea was to support a company willing to work on the sustainability idea with environmental knowledge and to put the conveyed knowledge into every-day practice in a multi-national enterprise, involving the whole related supply chain and rise awareness among customers and suppliers.
The main purpose was to identify and to integrate environmental requirements into the (re)design process of a product. It is understood that engineers in industry are well aware how to design products, but need some guidance on how to integrate environmental issues into product design and development.

3. Method

In a first step the development of a tailor-made solution of the ECODESIGN PILOT was completed, then a tool for material selection was built up to show "how to improve" products and to support design and R&D departments in decision making. The issue of "communicate what you did" was addressed by performing an Environmental Product Declaration [2]. Therefore it was necessary to "analyse" in detail the environmental performance of the products. This was done with Life Cycle Assessment (LCA) [3]. All these activities require a deep understanding about the environmental problems we are facing today and about possible solutions. This has been tackled with the installation of an e-learning platform to "educate" not only engineers in product development but also related functions in the company like marketing, purchasing, production among others. Figure 1 shows the elements of this continuous improvement process.

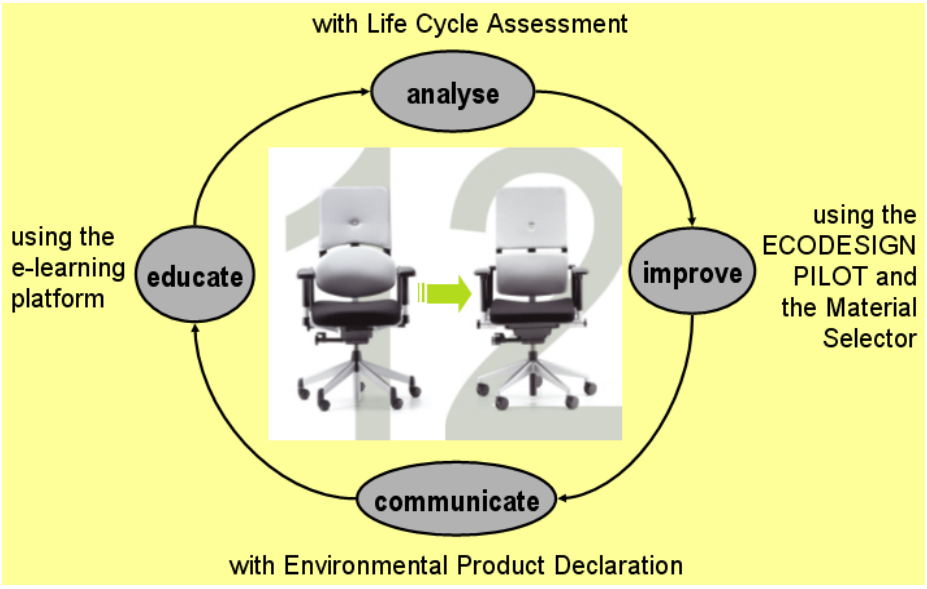

Figure 1. Elements of the continuous improvement process

All activities have strong support from the company's top management and are adopted openly by employees. Their response and feed-back, e.g. in the course of workshops, is integrated as a corner stone in the described continuous improvement process.

4. Results

The result described here is a real-life example of implementing environmental considerations into the product development of a large company by supplying tools for decision-making, by providing training on the new issues with an e-learning platform and by communicating the achievements to customers through an Environmental Product Declaration (EPD).
The corner elements of the initiated continuous improvement process – Analyse, Improve, Communicate, and Educate – comprised the activities described below.

4.1 Analyse - Life Cycle Assessment

It was decided to perform a LCA according to ISO 14040 to identify relevant environmental impact categories, such as *Global Warming* or *Ozone Depletion*. This was done to gain insight into the environmental performance of the product as a whole, but also to find out the product's contributions to selected environmental impact categories. These contributions need to be stated in an EPD according to ISO TR 14025.

	Category	Unit	Total	Materials	Production	Transport	Disposal
	Global warming	[kg CO_2-eq.]	91.5	66.1	14.5	7.4	3.5
	Acidification	[g SO_2-eq.]	646	545	45	66	-11
	Eutrophication	[g NO_3-eq.]	696	543	43	110	0
	Photochemical smog	[g C_2H_4-eq.]	76	60	10	7	-1

Figure 2. Distribution of the environmental impacts over the life cycle

In this type of declaration, LCA is a main element to express the environmental impact categories in the relevant equivalents e.g. *Global Warming Potential* in kg CO_2-equivalents (see Figure 2). For the particular EPDs carried out, the equivalents were quantified for all stages of the product life cycle following the suggested format in [4].

4.2 Improve - ECODESIGN tools

The ECODESIGN PILOT was developed as a tool for environmental conscious product development, offering a learning approach to raise the awareness for ECODESIGN and as 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). Originally, it has been designed as a generic tool, but since requirements of companies are often very specific, tailor-made software solutions can be developed based on the PILOT.
An adaptation was done for the manufacturer of office furniture and the ECODESIGN – FURNITURE – PILOT was created. The adaptation comprises product-specific ECODESIGN guidelines as well as company-specific design procedures (integrating the product development process). In a first step, all ECODESIGN guidelines for office furniture were collected and described with text and pictures. These guidelines were then used to advise for each stage in product development the relevant ECODESIGN guidelines for office furniture. The idea was to give support in "doing the right things at the right time" when developing new products. Additionally, the tool was extended by strategies applicable for improving existing products within the Life Cycle Management process of the company (see Figure 3).

Figure 3. The ECODESIGN FURNITURE PILOT

In addition, the Material Selection Tool (MST) was developed. The aim was to create an easy to use tool, which enables a designer to choose the environmentally preferable alternative among 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 material database, which the tool uses, contains all aspects and categories of material data which are relevant for product development (see Figure 4). A filtering method, where minimum requirements of different criteria are defined, points out those materials, which are matching these requirements. For the final decision the product developer can compare the detailed data sheets of the different materials and suppliers.

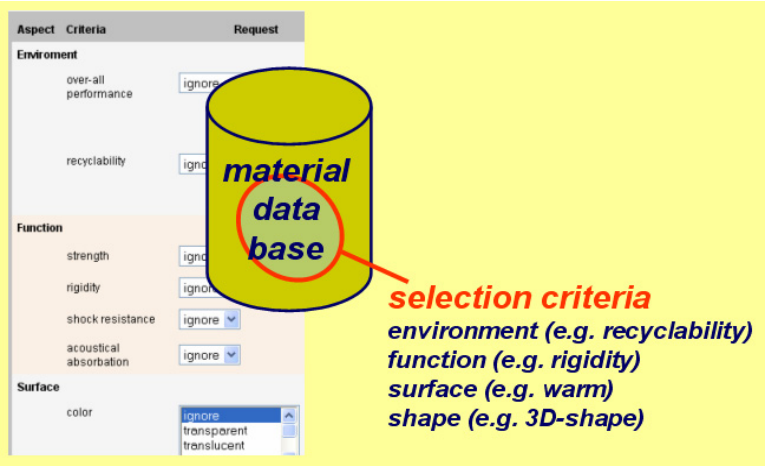

Figure 4. Concept of the Material Selection Tool

4.3 Communicate - Environmental Product Declaration

With the EPD according to ISO TR 14025 an instrument for business-to-business communication was found. Figure 5 the main elements of an EPD. The environmental information given consists of:

- Life Cycle Inventory Analysis
- Life Cycle Assessment
- Environmental Aspects
- Distribution of the environmental impacts over the life cycle stages
- Additional environmental information

Figure 5. Elements of the Environmental Product Declaration

Finding the final format for the EPD was accomplished by collaborating in a cross-functional team with members from product development, R&D, production and especially purchasing, communication, marketing, logistics and sales.

As the product is sold on various global markets, the descriptions and product properties had to relate to requirements on the different markets, including also relevant environmental labels such as the French “NF-environnement”, the German “Blauer Engel” and the Japanese “Eco Mark”.

In order to provide appropriate facts for other types of customers such as end customer (buyer), a product sticker is currently under discussion. This could be the most simplified version of an environmental declaration, naming important environmental aspects of a certain product range (e.g. office chairs).

The implementation of these forms of communicating environmental information could support the continuous improvement process by delivering clear improvement targets (for product developement) as well as influence the purchasing decisions of the customers.
The preparation of the EPD lead to a better understanding of environmental issues in the different departments throughout the company and to a common understanding of opportunities to address these issues.

4.4 Educate – e-learning course

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 give 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 actually learn the application of the different environmental tools and instruments.
The three lessons are related to the above-described elements and are based on illustrative product examples:

- Lesson 1 – ECODESIGN FURNITURE PILOT
- Lesson 2 – Material Selection Tool
- Lesson 3 – Environmental Product Declaration

To enhance the acceptance of the e-learning course different media such as video have been integrated (see Figure 6).

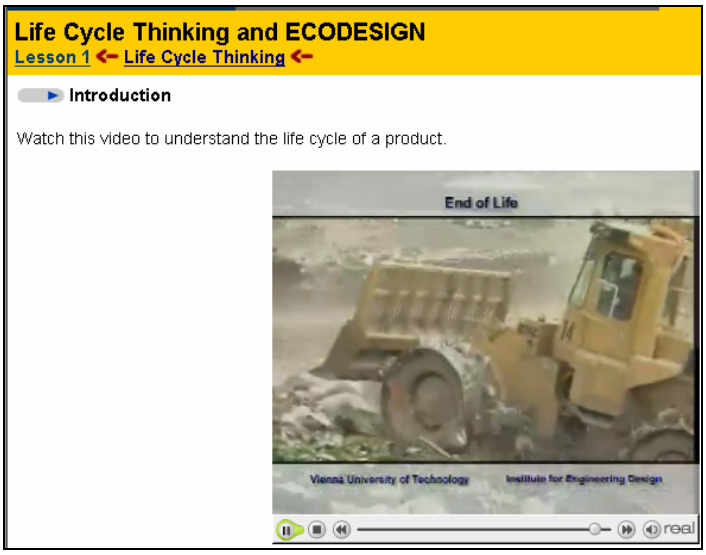

Figure 6. Example of an e-learning lesson

5. Summary

Judging from the positive experience already made with improving the environmental performance of products and with enhancing the environmental awareness of individuals, this learning process within the company has excellent preconditions to go on in the future with the support of all participants.
In that way, an ongoing *continuous improvement process* has been started where the different departments – all the way from marketing, design, purchasing to manufacturing and logistics – are integrating environmental thinking in their designated area in order to achieve better products.
The initiative started within the company has consequences going beyond the company itself since suppliers and customers are involved. The environmental ideas are spread out through that: On supplier side, to enhance the understanding "what to deliver?" and on customer side to raise awareness on "what to buy?". In that way the whole value chain is addressed and pushed towards sustainable consumption.

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Ao. Univ. Prof. Dipl.-Ing. Dr. Wolfgang Wimmer
Vienna University of Technology
Institute for Engineering Design
Getreidemarkt 9, 1060 Wien, Austria
Telephone: +43 1 58801 30744, Telefax: +43 1 58801 30799
E-mail: wimmer@ecodesign.at