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PRODUCT ORIENTED ENVIRONMENTAL POLICY - THE WAY TOWARD ENVIRONMENTALLY BENIGN CONSUMER GOODS

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Abstract. *At the same time as industrial development is taking place, increasingly tough environmental requirements and society's growing appreciation of environmental issues will lead to a new awareness. This in turn will result in need of new products and services designed to meet higher environmental and sustainability standards. The highest degree of creativity and innovative ability, combined with technological expertise, is required to continue this process of change toward reducing, recycling, and reusing. Environmental and sustainable design will become the new mark of quality.*

It is increasingly recognised that production and consumption are closely related, and that products and services can be seen as the 'cause' of environmental degradation or at least as 'carriers' of pollution, energy and materials. The ability to predict and understand environmental impact of an industrial product is the key to success and survival. There is a need for appropriate design that will result in well-thought-out products, that are easy to handle and operate in environmentally sound manner. A combination of sustainable design, life cycle assessment and overall environmental concern is therefore the optimum solution for the future.

Taking environmental aspect of a technological product into account should make it universally and entirely usable, thereby creating a technology environment built on a human scale.

Efforts are required of all actors in society: not only greening the production stage but also greening the products and services and the ways in which they are brought to the market, used and disposed of. Products could be also seen as the basic link between producers, traders and consumers.

Product surveillance reveals the chain of actors who influence the product during its life cycle, i.e., in production, distribution, use, disposal and beyond.

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Key words: *environmentally benign product, integrated product policy, material and energy consumption, design for environment*

1. INTRODUCTION

Basic prerequisite for realization of sustainable development concept is creation of environmentally friendly products. The ability to predict and understand environmental impact of an industrial product is the key to success and survival. Product design for the efficient manufacture of industrial products has been one of the basic industrial issues during the past decades. It is expected that environmentally sound manufacturing process development as well as product design for efficient dismantling and recycling would be equally important in the near future. Legislation of leading industrial countries proposes to eliminate landfill. Certain materials are not usually recyclable economically and are usually disposed of as shredder residue. It is the time to design environmentally sound industrial products for ease of disassembly and recycling. Profits from recycling, disassembly costs, and disposal costs should be reconsidered.

The general shift in values which is taking place in the world economy and the international community can be added the tremendous demographic challenge within certain countries. The consequence of this growth also could be increase in demand of consumer goods, and therefore growth in pressure on material resources and residue disposal facilities. It is only by combining creativity, innovative ability, and technology that it will be possible to improve existing products and services and generate new ones. New technological products will have to be created through environmental friendly design. The markets of the future will be determined by product innovation, and it is design for environment that will make significant difference.

2. ENVIRONMENTAL QUALITY OF A PRODUCT

Environmental quality of a product concerns essence and the nature of the technical object observed. On the general level, it could be pronounced by its efficiency and by its cost-effective recyclability. However, environmental friendliness of a manufacturing process that lead to a product conception should be taken in consideration in order to obtain relevant insight on entire environmental friendliness of an industrial product.

Environmentally benign product, being an idealized category, should be entirely recyclable, i.e. to have dismantling suitable structure that consists of monomaterial and recyclable components. Energy used in manufacturing such a product should represent minimal amount required to achieve the goal at present level of technological development. Technological process should be composed in such a manner that minimal material and energetic residuals are disposed into environment.

However, the environmental impact of a product is not bounded to the production of the technical object. The life-cycle –assessment (LCA) reveals that the major environmental impact of a product often lies not in the production, but in the use itself, Meijkamp (1994). This conclusion particularly applies for products that process energy and materials when used (cars, major domestic appliances, electric bulbs, etc.). Technical aspects of this fact should be reconsidered along with study on consumer's behavior and

attitude toward products itself. The manner in which the product is used can change over time. It has been observed simple fact that the consumers do not actually need the product itself, but the service that particular technical device provides. The value of the material product lies behind the value of it's performance.

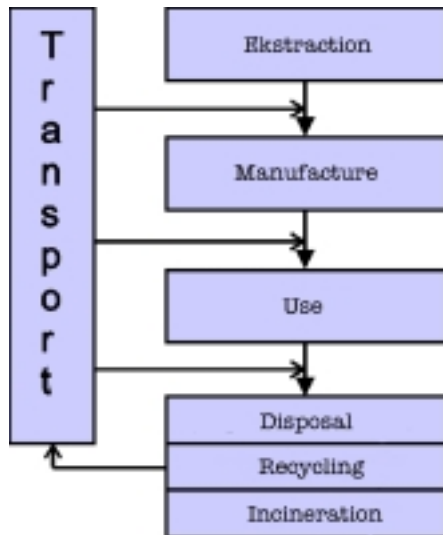


Fig. 1. LCA stages

This approach could lead to new business opportunities and integrated life-cycle extension service. Technical assistance, repair, maintenance and disposal should be included in selling the product of the future. The expected environmental benefits come from the life-cycle extension and extended use of materials and components, thus reducing the amount of waste and impact on resources. Those trends are of importance for product development in order to anticipate further steps or to enhance observed trends into an environmentally sound direction. The analysis of the use of the product can lead us to opportunities for innovation and quality improvement.

Environmental problem in essence lies in consumer character of contemporary industrialized societies. The input of raw materials and energy is high, and the output in the form of waste and emissions provide serious obstacles.

In other hand, the sustainable development concept presuppose that the needs of society are fulfilled more effectively and efficiently with the least impact of resources and the least output of waste. Extended lifetime of the product is usually more effective and efficient. Therefore, the mark of environmental quality in the future could be rather serviceability than recyclability as we know it today.

3. PRODUCT ORIENTED POLICY

Reducing consumption in the name of the environment seems an extremely difficult target to achieve. Consumption is on the rise and even becoming increasingly more material and energy intensive (Røpke 1999). From the average consumer's perspective, complex interrelationships between consumption, production and environmental degradation are still hardly understandable. It is increasingly recognised that production and consumption are closely related, and that products and services can be seen as the 'cause' of environmental degradation or at least as 'carriers' of pollution, energy and materials. This perspective is known as *product-oriented environmental policy*. At the EU, this approach has been called *integrated product policy*. This implies that efforts are required of all actors in society: not only greening the production stage but also greening the products and services and the ways in which they are brought to the market, used and disposed of. Products could be also seen as the basic link between producers, traders and

consumers.

The idea of product policy is quite novel and the concept has not yet been clearly defined. According to Oosterhuis et al (1996) it could be defined as a set of government actions aimed at reducing the environmental harm from producing, using, maintaining and disposing of goods.

There are three strategies of product policy:

1. lowering the product throughput,
2. changing the products with regard to their environmentally harmful features, and
3. changing the product use and disposal into an environmentally sound direction.

The first strategy aims at reducing the overall amount of products being used over a certain period of time. The aim is to encourage a general increase of resource productivity by intensifying and prolonging the product's life time.

The second strategy concentrates on changing the product itself. This includes the reduction and substitution of environmentally harmful substances, reduction in raw materials and energy consumption, alterations in the production process and product design. It contains the substitution of harmful products by less harmful alternatives and minimisation of products' environmental risks.

The third strategy relates to the way in which products are used and discarded. Both producers and consumers should be prepared for adequate actions in this stadium.

The environmental significance of product policy is related to the concept of environmental life cycle assessment (which means analysing the environmental impacts of a product during its whole life cycle, all the way from raw material extraction to product's disposal). Product surveillance reveals the chain of actors who influence the product during its life cycle, i.e., in production, distribution, use, disposal and beyond. The most important actors during the product life cycle are manufacturers, trade and consumers (Niva-Timonen 1999.). Certain actors, such as authorities and the media, are part of it in more indirect way. However, producers are in the position to "trace the product's route" by proper design based on anticipated usage and disposal patterns.

4. DESIGN FOR ENVIRONMENT

The present global environmental problems are generally caused by excess of energy and material consumption, population growth and waste agglomeration that are essentially embedded in the technological advances of contemporary civilization. It is necessary to establish a new environmental technology along with the radical reform of present economic and social system in order to achieve better environmental circumstances. A variety of environmental technologies such as energy saving, clean and renewable energy, waste management and materials recycling are now being studied in the world. New design strategies are fundamental issue that inevitably correlate with all above mentioned technologies. The waste management including recycling, pollution control and waste handling/disposal comprises "end-of-pipe" measures to prevent discharge of waste. New design strategies should consider the environmentally benign manufacturing or "front-end" environmental protection (Fig. 2). Applying front-end solutions is essential for a better global environment. The concept of design for environment is one such a strategy aimed to meet the present environmental requirements.

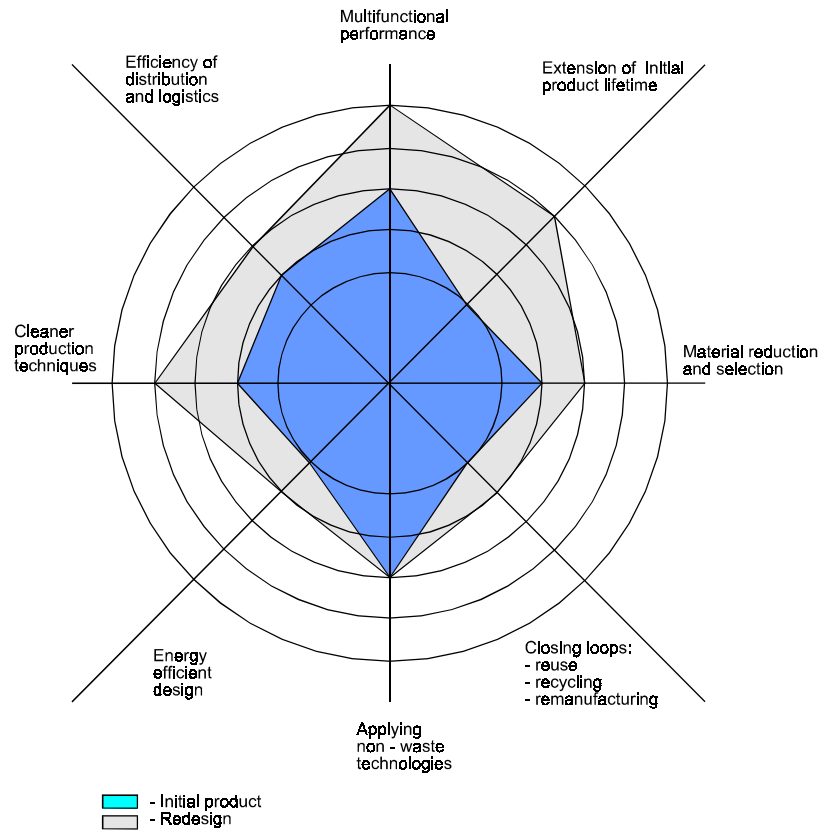


Fig. 2. Eko-circle: visual presentation of redesign analysis

Design criteria should be structured according to the general concept of sustainable development and derived from reliable life cycle assessment, as well as from the studies on consumers behavior. Basic requirements that take into account of environment could be defined as follows:

- Closing the material cycle
- Maximal energy savings (in manufacturing process, in use phase and under material recovery processes)
- Selectivity and reduction of material use (in manufacturing process as well as in use phase)
- Preference for renewable and recycled material
- Minimization of hazardous waste
- Extended lifetime of the product (i.e. period of use).

Re-engineering of products and technologies should be applied wherever possible in accordance with latest findings in the field of technology and consumer's behavior. While reconsidering design of an existing industrial product, designer should bare in mind the following issues that roughly describe environmental friendliness of an consumer good:

- functionality
- adequate response to some particular need
- efficient performance
- existence of alternative solutions for similar performance.

Design for recycling as one of the rather new strategies, means both design for easy disassembly and design with recyclable materials. Basic conditions for effective recycling of major appliances is possibility to separate different materials as well as materials from the same group, but with significantly different characteristics. New design concept takes into account of environment and recycling in early phase, to enable more convenient processes, to increase productivity and thus amount of products recycled. Some general criteria to achieve this ambitious goal are:

- implementing of modular solutions , with sections and grooves for dismantling of parts made of different materials
- application of materials with more pronounced recyclability
- using advantages of alternative assembling techniques, with no screws and/or permanent junctions
- avoiding "hybrid" components, and searching for so called monomaterial solutions.

Design for recycling concept is recently supported by specialized software packages such as ECO-IT, - "PRe Consultants" Amersfort, DFE - "Boothroyd & Dewhurst, Inc." and IDEMAT - Faculty of Industrial Design Engineering, Delft that provide valuable assistance under design procedures. Further development of expert systems in the field of environmentally friendly product design should be expected in the near future.

5. CONCLUSIONS

Environmental concern is becoming increasingly important in all fields and aspects of industrial, environmental, commercial and social activity. Environmental friendliness is of necessity multi-faceted and multi-dimensional in nature. It has a humanizing effect on the world of work and helps to improve living and working conditions. Environmental concern social welfare, economic success, and the quality of life in general. In other words, it affects all aspects of life that are determined by entire living environment.

As well, product redesign encompasses the overall arrangement of technological products within the environment. Possibilities to improve and modernize present procedures generally depend on developing products that are designed environmentally responsibly in early stage of their conception. There is a need for appropriate design that will result in well-thought-out products, that operate in an environmentally friendly manner, the benefits of which are easily noticeable. The ability to predict and understand environmental impact of an industrial product is the key to success and survival. The environmental significance of product policy is related to the concept of environmental life cycle assessment (which means analysing the environmental impacts of a product during its whole life cycle, all the way from raw material extraction to product's disposal).

It is recognised that production and consumption are closely related, and that products and services can be seen as the 'cause' of environmental degradation or at least as 'carriers' of pollution, energy and materials. Products could be also seen as the basic link between

producers, traders and consumers. Product surveillance reveals the chain of actors who influence the product during its life cycle, i.e., in production, distribution, use, disposal and beyond. However, producers are in the position to "trace the product's route" by proper design based on anticipated usage and disposal patterns. Efforts are required of all actors in society: not only greening the production stage but also greening the products and services and the ways in which they are brought to the market, used and disposed of.

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STRATEGIJA ZAŠTITE ŽIVOTNE SREDINE SA PROIZVODOM U FOKUSU - PUT KA STVARANJU NEŠKODLJIVIH POTROŠNIH DOBARA

Srdan Glišović

Industrijski razvoj prate sve izraženiji zahtevi za preduzimanjem mera zaštite životne sredine u skladu sa rastućom svesti društva o značaju ovog problema savremene civilizacije. Ovaj trend nužno dovodi do potrebe da se ponude novi proizvodi i usluge koji će biti u saglasju sa sve strožom regulativom iz domena prevencije zagađenja i održivog razvoja (sustainable development). Kombinacijom kreativnosti i tehničke ekspertize moguće je dizajnirati proizvode i usluge koji će duboko menjati navike stečene u doba nekontrolisanog privrednog rasta. Novi pojmovi i kriterijumi kvaliteta konstrukcija i samog proizvoda biće usko povezani sa kategorijama kao što su ekološka podobnost, reciklabilnost i "održivost" (sustainability).

Sve je uočljivije da su i u ovoj oblasti proizvodnja i potrošnja usko povezane, i da se industrijski proizvodi mogu posmatrati kao uzročnici degradacije životne sredine, ili bar kao "nosioci" zagađenja, energije i materije. Sa druge strane, predikcija i razumevanje dejstva industrijskih proizvoda na životnu sredinu je ključ za uspešno rešavanje globalnih problema opstanka. Neophodna je primena novog koncepta projektovanja koji će rezultovati u dobro osmišljenim proizvodima kojima se jednostavno manipuliše na ekološki ispravan način.

Kombinacija nove strategije projektovanja, analize životnog ciklusa (life cycle assessment) i institucionalizovane brige o stanju prirodnog ambijenta predstavlja optimalnu orijentaciju za budućnost.

Koncentrisanje na ekološku dimenziju industrijskog proizvoda dovešće postepeno do tehnološkog okruženja po meri čoveka. Potrošna dobra se mogu posmatrati i kao svojevrsna veza između proizvođača, distirbutera i potrošača. Analiza otkriva lanac aktera koji svojim postupcima mogu da usmeravaju i utiču na intenzitet uticaja industrijskog proizvoda na životnu sredinu u različitim fazama njegovog životnog ciklusa.

Ključne reči: ekološki podoban proizvod, strategija ekološkog proizvoda, potrošnja materije i energije, projektovana reciklabilnost