

## **PRODUCT DEVELOPMENT FROM ECODESIGN POINT OF VIEW IN PRACTICE**

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**Abstract:** During the development of new product designers must care about thousand of things to finally deliver a successful product to market. There is high pressure from manufacturing to using easy and usable technologies, quality team asking design robustness, management wants to see the product in the right time and on perfect cost level both from project product cost viewpoints. Nowadays, a responsible company and product development team must care and put high focus for an environmentally friendly solution and for sustainable product development. These things have to work together as a system. This paper presents a product development project in a household equipment producer company and company efforts to reduce environmental footprint.

**Keywords:** *new product development (NPD), design for environment, footprint reduction, product development in practice, project success*

### **1. INTRODUCTION**

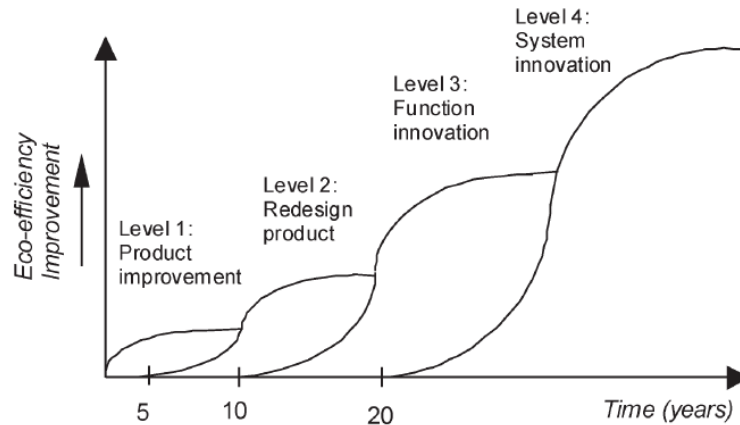
The importance of environment protection is relevant to all industries in the 21<sup>st</sup> century. The company is aware of these environmental rules and knows the importance of strategy-based control and evaluation of environment protection in everyday life. In accordance with the ISO 9001 standard, they were also aiming to reduce the harmful effects on the environment during the product development process and design of new industrial or automotive products.

With the supervision of Health, Safety and Environment Team, the investigated company is aiming to increase its performance according to environment protection, including the reduction of the ecological footprint.

This paper explains via an example of how possible to manage multi-level requirements of new product development.

In the 21<sup>st</sup> century, ecodesign directives came in the foreground at product development area too. Sustainable product designs and production systems become inevitable requirements from a social point of view. Every high runner at customer product market has to for new requirements. These wishes from market and customers also provide high opportunities to marketing and communication teams of companies.

The buzzword 'Ecodesign' could open new doors for products into the heart of customers easily.



**Figure 1**  
Four stage model of ecodesign innovation [1]

## 2. PRODUCT RELATED GREEN ACTIVITIES

**Table 1** [6]

<b>Ecodesign strategies</b>	<b>Ecodesign principles</b>
<b>1. Selection of low-impact materials</b>	Clean materials Renewable content materials Recycled materials
<b>2. Reduction of materials usage</b>	Reduction in weight Reduction in volume
<b>3. Optimisation of production techniques</b>	Clean production techniques Fewer production steps Low/clean energy consumption Less production waste Few/clean production consumables
<b>4. Optimisation of distribution system</b>	Less/clean/reusable packaging Energy-efficient transport mode Energy-efficient logistics
<b>5. Reduction of impact during use</b>	Low energy consumption Clean energy source Few consumables needed Clean consumables No waste of energy/consumables
<b>6. Optimisation of initial lifetime</b>	High reliability and durability Easy maintenance and repair Modular/adaptable product structure Classic design Strong product-user relation

<b>7. Optimisation of end life</b>	Reuse of product Remanufacture/refurbishment Recycling of materials Safe incineration (with energy recovery) Safe disposal of product remains
<b>8. New concept development</b>	Shift to service provision Shared product use Integration of functions Functional optimisation

### 2.1. Green approach by company and people

Green product development, which addresses environmental issues through product design and innovation, is receiving significant attention from consumers, industries, and governments around the world [2].

Communication, innovation, and education of employees is an important aspect of environmental protection. Therefore, the employees of the company regularly take part in training. From the aspect of environmental protection, they are aiming for the minimum impact during the full life-cycle of our products, including the conceptual and constructional design, manufacturing, transportation and recycling of our products.

During the design phase, the usage of paper is restricted, and only a minimal amount is allowed under critical conditions. Various design computers, simulation software and hardware contribute to a fast and efficient design process in our company. Our developer team communicate using internal digital systems during the different cycles of the pilot valve design.

An everyday effort is to reduce the amount of communal waste. It is a daily task to separate, store, and transfer the waste generated in the plant, involving employees in any kind of activities. The storage of hazardous waste is a relevant example because companies of today are using several electric equipment and batteries during manufacturing and construction processes (during the constructing of the pivot valve too). In case of the machines that have independent power sources, there is a bin placed for collecting the used batteries in the near of the activity. This allows a safe way of storing hazardous waste and makes the transfer simpler from the production line.

The protection of products against dust and liquid is indispensable during shipping; therefore, the packaging phase is necessary. While doing so, the production line strives using more effective packaging and consuming less material. This means that the usage of thin wrapping material is the solution for this requirement.

Usage and properties of the wrapping material comply with European standards. Applied materials can easily be recycled and are degradable. Fully domestic and in-house production also reduces packaging of used semi-finished products, because it is not necessary to ship or pack these.

## **2.2. Details of product development**

The design of the suspensions of vacuum cleaner motor is also delivered by Hungarian engineers. With optimal sizing, a significant proportion of engine vibration and noise levels have been reduced, thus contributing to the creation of a state-of-the-art product in terms of noise load. Selection of the raw material for the suspension was determined by detailed, multi-stage design and analysis of experimental results. Determining the technically impeccable design, technology and raw materials was a significant challenge, but at the same time, by preferring Hungarian suppliers, the highest proportion of the technological background available in Hungary was incorporated into the production and design process.

The complete verification of the product – including the new electronics, the accessory system and the high-efficiency engine – took place in the Hungarian test laboratory. Test equipment park was designed for the needs of the Energy Labelling and ECO design directives by Hungarian designers. In connection with the preparation for the Energy Labelling regulation, in recent years test laboratory in Hungary has grown into one of the largest centres for testing vacuum cleaners in Europe due to the significant expansion. Thanks to continuous improvements, there is no such thing today for the performance of vacuum cleaners. The European standard for longevity, for which we would not be able to carry out the necessary tests and inspections. The most important test equipment, which is the most important from the point of view of Energy Labelling – dust collection ability tester, suction power tester, dust emission tester equipment – was designed and constructed in accordance with the standards, but also in cooperation with Hungarian suppliers. I'm proud to say that the technical standard of these types of equipment reaches and even exceeds energy labelling grades of equipment manufactured by the suppliers and available in the market.

Motorised suction head developed by Electrolux is designed for high-efficiency carpet cleaning. There are different types of carpets in households with different heights (fibre lengths) that we want to clean with the same high efficiency. One of the main features for effective dust removal is the distance between the suction head and the mat. As we want to meet the needs of all our customers to the maximum, motorised power nozzle is equipped with a unique height adjustment mechanism, which can be adjusted comfortably with the pedal on top of the nozzle. The given height setting is confirmed by the LED lighting, which illustrates the four height levels in the low-extra high range. In the low (LO) position, hard floors or low fibre length carpets, while in the highest (X-HI) position, extra-sized carpet fibres can be cleaned above the level specified in energy class "A".

## **2.3. Maximum grade in all class**

In addition to the basic features of the device, AAAA rating is made possible by the following features:

Achieving "A" energy efficiency is ensured using high-performance, yet very low energy, high-efficiency and high suction power level motors.



**Figure 2**

*AAAA and ECO force label to show high suction power to customers [3]*

Dust removal on carpet “A” is aided by a motorised suction head, which allows you to clean the deeper layers of the carpet without much strain, as the motor-driven rotary brush bristles can be removed from the carpet increase the dust content to  $\geq 91\%$  according to tests performed in accordance with the relevant regulations.



**Figure 3**

*AeroPro Extreme Power Pro nozzle for A grade dust pick-up on carpet [4]*

Dust removal “A” on the hard floor is provided by specially designed AeroPro Parketto Pro suction head, which, thanks to its special design, allows a suction range beyond the width of the head, in addition to removing fine dust particles from the gaps in the floor; due to the arrangement of the brushes built into the nozzle and the distance between the nozzle and the floor, dust removal is  $\geq 111\%$ . 111% means that head can suck up all dust on test track under suction head what means 100%. Further extra dust is collected from outside of nozzle what cause extra amount of dust, in that case about 11%.



**Figure 4**

*Parketto Pro hardfloor nozzle for A grade dust pick-up on hardfloor [5]*

The combined use of high-quality sealing materials at the joints, the high-efficiency s-Bag dust bag and the Allergy Plus outlet filter achieves the “A” dust emission in the design of the device, as it was an important consideration in creating a healthy home. The amount of dust picked up by the appliance and returned to the air in the apartment should be kept to a minimum.



**Figure 5**  
*Hepa H13 washable filter for A grade dust emission [5]*

### 3. ENVIRONMENT SAFETY OF PRODUCT DESIGN

Based on the results of market research, our customers are looking for products that are easy to use, have outstanding cleaning efficiency and can be used well on any surface in their home, with no obstacles in front of them. Protecting the environment and reducing the burden on the environment is one of the top priorities of our present and future. Customers are also becoming more environmentally conscious and, in addition to the above expectations, energy efficiency, and the use of recycled raw materials are important to them.

The Quattro was also the highest model in the Ultra One family, a true flagship, a well-thought-out and redefined version of the product family in the sense of the above. The product is described in detail in the so-called “EcoDesign” requirements, which came into force on 1 September 2014.

In addition to energy efficiency, another important aspect in design of the device’s plastic components was the reduction in the weight of the vacuum cleaner, which, in addition to making the device easier for consumers to use, significantly reduced the mass of materials used.

The design of the vacuum cleaner, as well as the use of recycled raw materials and a motor with minimal energy consumption in its production, not only set an excellent example of environmental awareness but also met the need for the fullest level of compliance with market and regulatory requirements.

All in all, as a result of the technical improvements and innovations described above, the Quattro of the Ultra One product family protects not only the environment but also our personal environment.

#### 4. SUMMARY

Strict ecodesign rules and regulations by government does not cause any competence back draw for companies, if regulation is mandatory and valid for all parties in market. [7] Quattro vacuum cleaner development was extremely successful in that time when European Union introduced this regulation. Later due to pressure from some parties on market this regulation was cancelled and today it's not mandatory in EU, because some technology get potential market disadvantage – that technology was cyclonic dust separation systems.

This product development process analysis shows that possible to make market winner, best in class product development if targets are crystal clear in project. Other success factor was here the knowledge base what was in head of designer engineers and also in lessons learned database. Combination of these knowledge, experience and available good base of product for further improvement make Electrolux Small Appliances sector to 1<sup>st</sup> in the world who could provide AAAA rated cleaner to market.

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