

# ECODESIGN in the electronics industry – achieving legal compliance with the EU-directives and environmentally improving products by using the new EEE-PILOT

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## Abstract

*Because of the rising number of waste of electrical and electronic equipment the European Union implemented two new directives. There is the directive for the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) and the directive on waste electrical and electronic equipment (WEEE). In order to facilitate for enterprises to fulfill the directives, a practical tool has been created. In which first information over the frameworks of the directives are mentioned and target group, validity and deadlines for reports are given. The EEE-PILOT is a software tool, which helps product developers to find suitable strategies and measures in order to improve its product in such a way that it corresponds to the requirements of the WEEE and the RoHS directive. The EEE-PILOT is divided into four areas. In the first area, WHO?, it will be determined whether one (manufacturers, dealers and importers) is concerned at all. In the second, WHAT?, the content of the directives is prepared easily understandable, in the third, WHEN?, the exact deadlines for implementation are listed and in the fourth area, HOW?, strategies and measures for the implementation in practice are mentioned. Achieving the legal compliance is very much simplified by working with the checklists. The results of the EEE-PILOT are concrete instructions which can be realized easily. A case study carried out using a Digital Voice Recorder is presented in the paper. With the use of the EEE-PILOT a list of improvement ideas has been generated.*

**Key words:** Ecodesign, European regulations, WEEE, RoHS, electronic, design, legal compliance, software tool, etc

## 1. Introduction

Existing and upcoming environmental regulations such as the European WEEE directive [1] and the RoHS directive [2] as well as the new EuP directive [3] are forcing companies in the electronic sector to specifically consider environmental requirements within their product design and development. Apart from fulfilling legal compliance the intention to offer environmentally sound products on the market is often a driver in companies to develop products according to ECODESIGN principles.

## 2. Objective

Specific strategies and guidelines on how to develop electrical and electronic products with ECODESIGN are currently under development and will be available soon in form of a free available software tool - the so called EEE-PILOT.

The aim of the paper is to demonstrate ECODESIGN in the electronics industry applying the new EEE-PILOT to a Digital Voice Recorder developed at Philips Austria.

## 3. Method

The EEE-PILOT is a sector specific adaptation of the ECODESIGN Product-Investigation, Learning- and Optimization-Tool for sustainable product development (PILOT). The generic version of this software tool is available under: [www.ecodesign.at/pilot](http://www.ecodesign.at/pilot) and has been published in W. Wimmer and R. Züst, 2002 [4]. A systematic guidance on how to work with the tool using the ECODESIGN checklists is demonstrated with an electrical product in W. Wimmer, R. Züst, and K.-M. Lee, 2004 [5]. Out of the experiences with WEEE and RoHS the new EEE-PILOT as sector specific adaptation of the

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ECODESIGN PILOT (see Fig. 1) is the result of a joint research project from Vienna University of Technology and the Austrian Centre of Excellence for Electronic Scrap Recycling & Sustainable Product Design.



Fig. 1: Frontpage EEE-PILOT

The EEE-PILOT supports engineers in product development in four main areas:

- Validity Check: Is the product or the company effected by the RoHS or WEEE directives?
- Legal compliance: What environmental requirement has to be fulfilled by the product?
- Timetable: Until when the requirements have to be fulfilled?
- Design support: How can the new requirements are realized in an environmentally improved product?

To find out if the own product or the own organization is affected by the directives a short validity check is offered. Through answering questions one can see if the product is affected and to what extend.

The Validity Check is directly linked to the Legal Compliance section, where environmental requirements for each product category are listed. The environmental requirements of the EU-directives have been summarized in an understandable way.

Further Design Support is provided through ECODESIGN checklists tailor made for electrical and electronic products in this category (see Fig. 2).



Fig. 2: Main support areas of the EEE-PILOT

### 3.1 Validity Check – WHO

The first area “WHO” is to check if the product (or in general the company) is even effected by the WEEE or RoHS directives. The EEE-PILOT’s “Validity Check” will be a good support to get an answer. The user is guided through the relevant legal requirements by simply worded questions (e.g. Does the product require electromagnetic fields in order to function?) concerning the product, the company and relevant exemptions from the WEEE and RoHS directives. By answering the multiple choice questions the EEE-PILOT will indicate the relevance of the directives to you. Online help is available should any question need explanation.

### 3.2 Legal compliance – WHAT

In the legal compliance area - What environmental requirements have to be fulfilled by the product? – the content of the directives is presented and prepared in an easily understandable way. For an efficient handling with the tool the requirements are divided into the product categories, according to the WEEE directive [2] (see Fig. 3).

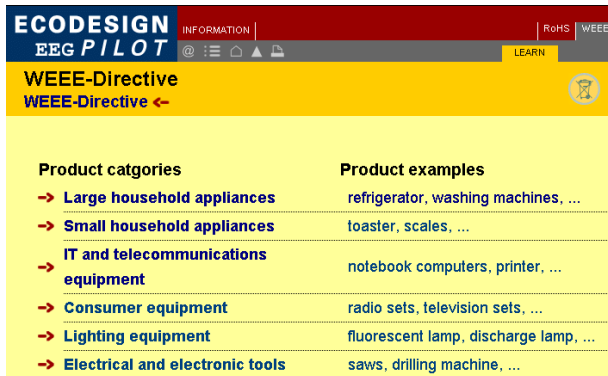


Fig. 3: WEEE-WHAT area

For example producers of large household appliances just have to concentrate on requirements for large household appliances. If one doesn't know the product category of his product, an exemplary list and a detailed list of products for each category are provided. For the different product categories a set of requirements arise, which have to be realized in the early product development process. These requirements are prepared that they are well understandable for product developers. For example in the product category small household devices the minimum rate of recovery is 70% and the minimum rate of re-use and recycling is 50% of the average weight per equipment is required. Additionally information on which plastics can be recycled well or can be utilized only are provided (Fig. 4).

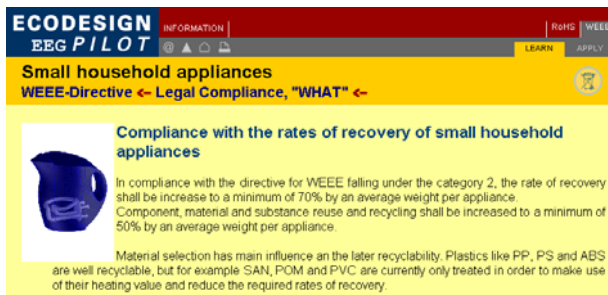


Fig. 4: Legal compliance-product category

Furthermore the following requirements are made for products of the category of small household devices.

- Marking of electrical and electronics devices
- Selective treatment: Remove of liquids or construction units, which contain dangerous materials
- Product conception: Make re-use possible by changing the design characteristics
- Information for users
- Information for treatment facilities

### 3. 3 Timetable – WHEN

In this section deadlines for activities and demanded messages from the WEEE and RoHS directives, are represented (see Fig. 5). The deadlines and the demanded messages are categorized and divided in three groups:

- Single obligations and first reporting
- Annually repetitive reporting
- Important times for implementation of the WEEE and RoHS directives



Fig. 5: WEEE timetable

### 3. 3 Design support – HOW

The result of the legal compliance section is a list of requirements of the two EU-directives [1] and [2]. The product developer is placing now the question of realization - How can the new requirements be realized in an environmentally improved product?

For that strategies and guidelines have been formed. With these guidelines the requirements of the EU directives and the national directives can be fulfilled. This strategy contains from *Supply of information to users and treatment facilities* to *Selective Treatment – depollution* (see Fig. 6).



Fig. 6: Obligatory strategies

For each strategy one checklist is available. The checklists can be printed and contain the assigned guidelines for the realization of the strategy.

The checklists on the one hand evaluate the product design and on the other hand by questions and examples stimulate product improvements.

The evaluation is an examination, to what extent the product or its parts, already fulfil the formulated requirements in the checklists. The additional questions point out the surrounding field of the evaluation question and place them into a larger context.

The checklists can be completed electronically and contain a field for noting first ideas of possible product improvements. Additionally every checklist has a save-button to create an html-file of the checklist, which can be added to the regular product development documentation (see Fig. 7).

Relevance (R)	Fulfillment (F)	Priority (P)
<input type="radio"/> very important ( 10 )	<input type="radio"/> yes ( 1 )	<input type="text" value="P = R * F"/>
<input type="radio"/> less important ( 5 )	<input type="radio"/> rather yes ( 2 )	
<input type="radio"/> not relevant ( 0 )	<input type="radio"/> rather no ( 3 )	
	<input type="radio"/> no ( 4 )	

**Measure** **Make possible separation of materials for recycling**

**Idea for Realization**

Fig. 7: Element of a checklist

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

1. Relevance: Rate the relevance of the assessment question 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. Fulfillment: Estimate the fulfillment of the assessment questions using one of the four possible answers (yes / rather yes / rather no / no); the additional questions support understanding of the assessment question and need not be answered.

3. Priority: Select ECODESIGN measure with high priority (P) and continue only with these.

4. Idea for Realization: Find ideas to realize these ECODESIGN measures. The content of the learning part with its examples shall assist you in doing that.

In the EEE-PILOT the *Relevance* is set to „very important“ causing the requirements of the directives are bound on law. The first step is then to grade the *Fulfillment*. The priority will then be calculated automatically through multiplication of the *Relevance (R)* and the *Fulfillment (F)*. With this one can find those guidelines which are on the one hand “very important” and on the other hand “not fulfilled”. Those have a high priority. The guidelines with a high priority should be considered for realization.

#### 4. Case study

A Digital Voice Recorder has been chosen as case study. It will be demonstrated how to obtain support in environmentally improving this product and achieving legal compliance through applying the new EEE-PILOT.



Fig. 8: Digital Voice Recorder

#### 4.1. Validity Check

Using the Digital Voice Recorder as an example, the validity check section concerning the company would look like given in Fig. 9 to Fig. 12. Of relevance to the directives is that the company markets (or exports) their products under their own brand name in Austria and other EU-countries.



Fig. 9 Validity check – decision tree stage 1

The Digital Voice Recorder is a 3 Volt electrical device and is a consumer product (see Fig. 10).

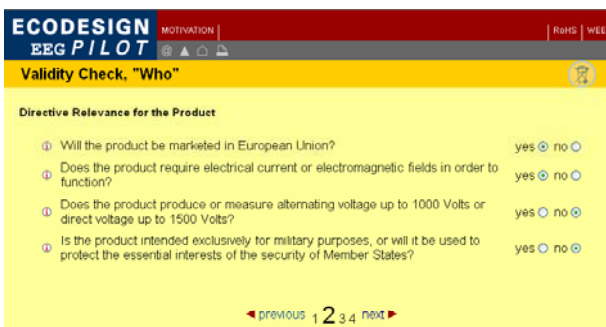


Fig. 10: Validity check – decision tree stage 2

The next page covers the relevant exceptions from the WEEE- and RoHS directives (Fig. 11).

The Digital Voice Recorder can be categorized under “IT and telecommunications equipment”. For the product it is also relevant if the product will still be on the market on 01.06.2006.



Fig. 11 Validity check – question package 3

At last the result of the evaluation is presented (Fig. 12). The Digital Voice Recorder does have to comply with both requirements the WEEE and the RoHS.

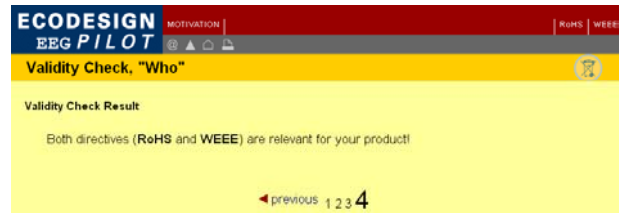


Fig. 12 Validity check – result page 4

## 4.2. Legal compliance – WHAT

In the legal compliance section the specific requirements of the two directives RoHS and WEEE are listed. For the Voice Recorder the *Restriction of using lead* from the RoHS directive is relevant.

This restriction means that the product may not contain more than maximum concentration value of 0,1% by weight in “homogenous material”. Where as homogenous material means a material that cannot be mechanically disjoined into different materials.

In the legal compliance section of the WEEE directive the product category has to be defined first. After checking the detailed list the Voice Recorder can be allocated to the IT and telecommunications equipment. Out of the EEE-PILOT the following requirements from the WEEE directive are relevant for the Voice Recorder:

- Secure Tack-Back, Collection and Treatment
- Supply of information for users and treatment facilities
- Recovery-friendly product conception - material choice
- Disassembly-friendly product conception - connection techniques

### 4.3 Legal Compliance- WHEN

In this area the manufacturer of the Voice Recorder can see the deadlines for the requirements listed in chapter 4.2. For example products put on the market later than 13 August 2005, each producer is responsible for the financing of the collection, treatment, recovery and environmental sound disposal of WEEE from private households. Furthermore the *Restriction of using lead* from the RoHS directive comes into force after 1 July 2006.

### 4.4 Design support

Performing two workshops with the design team of the Voice Recorder design support have been done through using the EEE-Pilot's checklists. In the following table selected strategies and guidelines together with the derived improvement ideas for the Voice Recorder are listed (see Tab. 1). The following guidelines have been given high priority.

Tab. 1: Identified guidelines and Improvement ideas

Selected Strategies and identified guidelines from the EEE-PILOT	Improvement ideas – What to do
<b>RoHS</b>	
<b>Restriction of using lead</b>	
Usage of lead-free product parts	Certifications from subcontractors for lead-free parts (resistors, printed circuit boards, etc) have been sent.
Investigation of the existing soldering machine on lead-free usage	Investigation of the soldering machine on lead-free production
<b>WEEE</b>	
<b>Secure Tack-Back, Collection and Treatment</b>	
Participation in an existing collecting and utilization system	Joining a collection system. In Austria this would be: Umweltforum Haushalt (UFH) European Recycling Platform (ERP) Elektro Recycling Austria GmbH (ERA) Erfassen und Verwerten von Altstoffen GmbH (EVA)
Registration of the collecting and utilization system	Registration in Austria at: <a href="http://edm.umweltbundesamt.at">http://edm.umweltbundesamt.at</a>
Secure orderly treatment	Joining a collection system

<b>Supply of information for users and treatment facilities</b>	
Proper marking	Print crossed-out wheeled bin on the packaging, on the instructions for use, on the warranty and on the product.
Prepare information for the treatment facilities	Creation of a CD-ROM containing information of components, materials and location of the accumulator.
Prepare information for the user to animate for separate collection take-back of WEEE	Add to instructions for use: (a) not to dispose of WEEE as unsorted municipal waste and to collect such WEEE separately; (b) the return and collection systems available to them; (c) their role in contributing to reuse, recycling and other forms of recovery of WEEE; (d) the potential effects on the environment and human health as a result of the presence of hazardous substances in electrical and electronic equipment; (e) the meaning of the crossed-out wheeled bin
<b>Recovery-friendly product conception - material choice</b>	
Reduction of materials used	Shell technique – use just one material for the outer parts
Ensure that materials are suitable for recycling	Use PS, ABS and PP which can be recycled with a rate of up to nearly 100%
Reuse of components in other products	Reuse of the power supply unit in the next generation of the Voice Recorder as an option
<b>Disassembly-friendly product conception - connection techniques</b>	
Reduction of components used	Shell technique - parts between the top and the base are not necessary

### 4. Conclusion

The EEE-PILOT prepares in an easy accessible way the content of the RoHS and WEEE directive especially from the viewpoint of product development. The case study showed that finding improvement options works quite well using the EEE-Pilot's checklists. A next update of the EEE-PILOT will cover the content of the EuP directive.

## References

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