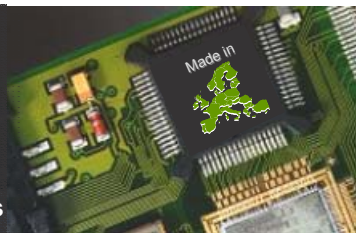
2005

EcoDesign

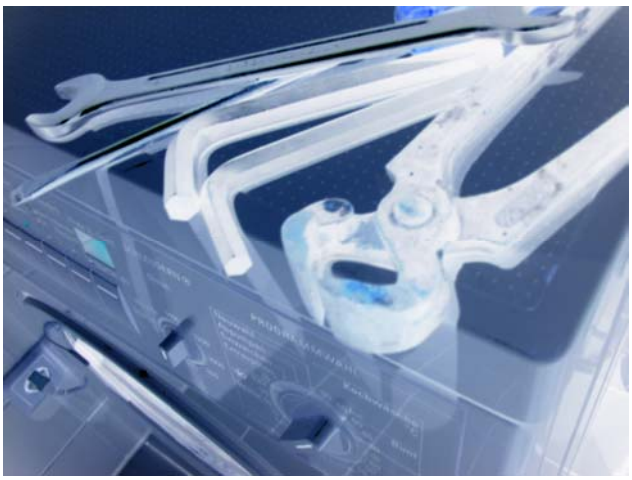
Awareness Raising Campaign
for Electrical & Electronics SMEs




# A Guide for EcoDesign Tools

2nd Edition, August 2005

Eco-Design is about better products, but designing better products needs appropriate, efficient tools. There are different types of tools, ranging from guidelines and checklists to one-score screening indicators and full life cycle assessment, meaning methodologies, process simulation software and extensive databases on materials and processes. When to use which tool depends e.g. on the development target, the resources you have to undertake such an exercise and availability of tools.



This guide provides a selection of eco-design tools specifically for the electrical and electronics sector. However, especially Life Cycle Assessment usually target at a broader range of industry sectors. This is not an exhaustive list of all available tools, nor does it mean a specific recommendation only to use these tools.

The EcoDesign Awareness Raising Campaign is a project financed by the Multi-annual Programme (MAP) for SMEs aiming to increase awareness of SMEs about EU policy orientations and best practices in eco-design, to identify appropriate and targeted types of assistance for SMEs in implementing eco-design, and in complying with current and forthcoming related EU legislation.

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# Guidelines / Checklists / Handbooks

## Electrical and Electronic – Practical Ecodesign Guide

The Guide intends to help the electrical and electronic industry introduce and apply Ecodesign methodology during the production of equipment. The application of this methodology will improve the environmental performance of manufactured equipment during their entire life cycle, and most importantly at the end-of-life-stage when this equipment turns into waste.

This guide is mainly written for those who are active or interested in electrical and electronic product design processes as well as product development processes and for those responsible for developing the environmental issue in electrical and electronic companies.

Reference: Julio Rodrigo, Francesc Castells: Electrical and Electronic – Practical Ecodesign Guide, Tarragona, Spain, ISBN 84-8424-010-X (book)

## ECMA 341 - Environmental design considerations for ICT & CE products

This ECMA Standard identifies design practices for Information and Communication Technology (ICT) and Consumer Electronic (CE) products with a rated voltage not exceeding 1000 V r.m.s., intended for domestic or commercial use that could reduce the environmental impact of the product.

This Standard specifies requirements and recommendations for the design of commercially viable, environmentally conscious products. Specifically, the Standard covers:

- Energy efficiency
- Material efficiency
- Consumables and batteries
- Chemical and noise emissions
- Extension of product lifetime and end of life considerations
- Substances and preparations needing special attention
- Product packaging
- Documentation

This Ecma Standard is applicable to final electrical and electronic products. Although it does not apply to individual components, component manufacturers also need to consider this Standard, to enable products manufacturers using such components to meet the requirements herein.

Annex A presents an example design checklist that can be used to evaluate and record environmental design features of electrical and electronic equipment.

Internet: http://www.ecma-international.org/publications/files/ECMA-ST/Ecma-341.pdf

## Guideline „Design for Recycling“

The "Leitfaden zur recyclinggerechten Produktentwicklung" ("Guideline for 'Design to Recycling' ", in German only) obtains substantial realizations of the publically funded research project ProMeKreis.
The guidline recommends and demonstrates in a comprehensible way a systematic co-operation between product developers, manufacturers and recyclers.
The guideline is addressed primarily to product developers of simple and complex products, modules and devices and to persons from marketing, planning and environmental departments.
The practical notes, case examples and suggestions were developed in the context of the ProMeKreis-project.

Internet: http://www.pe.mw.tu-muenchen.de/recyclingleitfaden/index.html

## Smart ecoDesign™ checklists

The eco-design checklists for electronics manufacturers, 'systems integrators', and suppliers of components and sub-assemblies, published in its 2nd version by the Centre for Sustainable Design in November 2002 is a systematic, 58 pages guideline on eco-design.

The checklists comprise

- Principles
- Managing the process
- Planning
- Technical guidelines
- Application checklists

The document is downloadable for free on the internet.

Internet: http://www.cfsd.org.uk/seeba/

## ECODESIGN PILOT

The Ecodesign Pilot is a qualitative tool enabling the user to quickly identify appropriate eco-design measures for the improvement of a product. Concrete measures are presented in a language understood by product developers and may be implemented immediately. The pilot is a systematic tool, enabling the user to consider ecodesign in the development of new products.

The pilot is a knowledge base containing examples to learn about eco-design and develop a broad understanding in the context of sustainable development.

The Ecodesign Pilot is available as a webbased tool.

Internet: http://www.ecodesign.at/pilot/ONLINE/ENGLISH/INDEX.HTM

See also:

Wolfgang Wimmer, Rainer Züst, Kun-Mo Lee: Ecodesign Implementation - A Systematic Guidance on Integrating Environmental Considerations into Product Development, Springer Verlag, 2004, ISBN 1-4020-3070-3 (book)

## A Designer's Guide to Eco-Conscious Design of Electrical & Electronic Equipment

The design-guide is developed in Denmark by IPU, DTC, and GN-Teknik. This set of tools is made for all those involved in design and development of electrical and electronic equipment, e.g. management and marketing, engineers (mechanics, electronics, software etc.), quality/environmental specialists.

This guide contains several sections, e.g. a "Green Tutorial", a tool to perform an easy environmental assessment already at the very early stage of product development, guidelines, and environmental calculators.

The design-guide including the calculators are downloadable on the internet.

Internet: http://www.ecodesignguide.dk/

## Guide: Sustainable design of electrical and electronic products to control costs and comply with legislation

The main issue driving electrical and electronics companies to consider sustainable product design is compliance with two new items of EC legislation: Directive on Waste Electrical and Electronic Equipment (WEEE); Directive on the Restriction of Use of Certain Hazardous Substances (RoHS) in electrical and electronic equipment. This Good Practice Guide, which is applicable to all sizes and types of company in the electrical and electronics industry, describes the regulatory requirements and business opportunities and explains how to: manage sustainable product design within companies and across supply chains; select more environmentally friendly materials and mechanical design; and reduce the environmental impact of electrical and electronic design. The Guide includes industry examples highlighting the benefits of different approaches and techniques, a worksheet for sustainable product design, and contact details for the mentoring group involved in its preparation.

Internet: http://www.envirowise.co.uk

# Screening / Management Methodologies and Tools

## Fraunhofer IZM/EE Toolbox

The integration of environmental issues into the product design flow requires a lean modular assessment tool, based on a comprehensible methodology. The Fraunhofer IZM developed a toolbox of screening indicators to address specific environmental issues, e.g:

- Product toxicity screening: Toxic Potential Indicator (TPI) for products / components,
- Process toxicity screening (ProTox): TPI assessment of processes based on material flow analysis
- Recycling potential Indicator: suitability of product contents for specific recycling paths,
- Energy Intensity ERM based on the raw materials for the product, EP for production processes and EPU for product usage.

The TPI calculator is downloadable from the internet.

Internet: http://www.pb.izm.fhg.de/ee/070_services/75_toolbox/index.html

## KEPI – Key Environmental Performance Indicators

KEPIs are a small number of product environmental indicators validated as representative of the most important environmental impacts of an electronic product's life cycle. The development of this KEPI methodology was jointly commissioned by Motorola, Nokia, Panasonic and Philips.

Literature: Singhal, P. et al.: Key Environmental Performance Indicators (KEPIs): A new approach to environmental assessment, Electronics Goes Green 2004+, September 6-8, 2004, Berlin

## EIME

EIME, Environmental Information and Management Explorer, is a pragmatic, commercial tool to model products:

- Modules representative of materials, components and processes usually used in electric and electronic industry are at the user's disposal to model products.
- Once the architecture of the product is built, the software calculates the environmental contributions by impact and module.

The EIME Database contains generic environmental data on the most commonly used materials and electronic parts within industry processes and transportation modules.

The EIME modules include quantitative life cycle flows, toxicology and regulatory information, product descriptions and end of life aspects. The life cycle analysis are in compliance with ISO 14040 standard.

EIME is offered by CODDE.

Internet: http://www.codde.fr/english/tools_services/software.html

## Smart ecoDesign™ (Electronics) strategy wheel

The Smart ecoDesign™ (Electronics) strategy wheel, developed by the Centre for Sustainable Design is a tool to quickly determine the environmental strengths and weaknesses of electronics products and services.

Internet: http://www.cfsd.org.uk/seeba/

## QWERTY/EE concept

The QWERTY/EE concept addresses recyclability and eco-efficiency of take-back and recycling of consumer electronic products. Through the environmental part of the concept an alternative for usual weight based recycling percentages is presented. In addition, economic effects of take-back and recycling are included in a quantitative eco-efficiency approach for evaluating technological, design and policy strategies. The approach itself and the valuable insights in recycling of consumer electronic products are highly interesting for policy makers, legislators, product designers, manufacturers, recyclers, take-back system operators and scientists.

Reference: Jaco Huisman: The QWERTY/EE concept, Quantifying Recyclability and Eco-Efficiency for End-of-Life Treatment of Consumer Electronic Products, Delft University of Technology, 2003

## Eco-Efficiency Analysis

The aim of the eco-efficiency analysis, developed by BASF, is to compare similar products or processes. This involves carrying out an overall study of alternative solutions to include a total cost determination and the calculation of ecological impact over the entire lifecycle. The results are used for the comparison with competitors. They may increase market opportunities or assist product improvement. They also provide arguments for the sales department. Recently BASF enhanced the methodology to include also social aspects, naming the methodology now SEEbalance®.

Although developed from a chemical industry background, this eco-efficiency analysis is also applicable for other sectors.

BASF offers to perform eco-efficiency analyses on a service contract basis.

Internet: http://corporate.basf.com/en/sustainability/oekoeffizienz

## GreenPack Material Declaration Tool

Although not a eco-design tool per se, the GreenPack Material Declaration Tool helps to provide a sound basis for further eco-design activities.

Within the GreenPack project a group of companies and research institutes have joined forces on how to cope with the issue of "Material declaration for electrical- and electronic equipment" in a rational manner. The web page is a result of the joined efforts to make the data handling as smooth as possible for all actors along the supply chains. The basic concept is that each actor in the supply chain only gives information about the materials that he/she adds to a product, and pass on questions for "unknown" items down the line.

Internet: http://www.greenpack.org/results

# Life Cycle Assessment Methodologies and Databases

A huge number of methodologies, databases and software tools are available, but most of them have not been developed for the electrical and electronics sector specifically. Below you find a selection of methodologies and tools.

Notice: Currently a project is under way to set up an “Internet site on life-cycle assessment tools and services and life cycle inventory data in support of European Integrated Product Policy”. Results of the project are due in December 2005. Check the webpage of the European Commission on latest project developments (http://europa.eu.int/comm/environment/ipp/studiesevents.htm)

## IMPACT ASSESSMENT AND WEIGHTING METHODOLOGIES

### Eco-Indicator 99

The Eco-indicator 99 is a state of the art, "damage oriented" impact assessment method for LCA. The method is also the basis for the calculation of eco-indicator scores for materials and processes. These scores can be used as a user friendly design for environment tool for designers and product managers to improve products. The impact assessment method is widely used by life cycle assessment practitioners around the world. All Eco-indicator reports are freely available to download.

Internet: http://www.pre.nl/eco-indicator99/default.htm

There are several more methodologies to assess the environmental impacts within an LCA, among them

- CML 2001

Internet: http://www.leidenuniv.nl/cml/ssp/index.html

- EDIP 2003

Internet: http://www.lca-center.dk

- EPS 2000

Internet: http://www.assess.se/software.htm

## LCA DATABASES

### ProBas

ProBas (“Prozessorientierte Basisdaten für Umweltmanagement-Instrumente”, in German only) is a webbased database on life cycle data for a broad variety of processes and materials.

Internet: http://www.probas.umweltbundesamt.de/php/

### EcoInvent

The ecoinvent database has been developed by the Swiss Centre for Life Cycle Inventories. The database accommodates more than 2,500 datasets for products, services and processes often used in LCA case studies.

The database is available on a commercial basis.

Internet: http://www.ecoinvent.ch/

### APME/Boustead data

The Association of Plastics Manufacturer (APME) published on its webpage eco-profiles of a number of relevant plastics and basic chemicals. These eco-profiles, comprising major Life Cycle Inventory data is very helpful as upstream data also for the electrical and electronics sector.

Internet: http://www.apme.org

## WEBBASED LCA TEACHING COURSES

### World Wide LCA Workshop

The World Wide LCA Workshop is a webbased tool developed by Chalmers University to organise and manage LCA projects.

The workshop allows to calculate impact assessment indices as well as full LCAs.

Internet: http://workshop.imi.chalmers.se/workshop/

# Life Cycle Assessment Tools – Screening and Full-Scale

## eVerdEE

eVerdEE is a webbased screening Life Cycle Assessment tool for European Small and Medium sized Enterprises. Its main feature is the adaptation of ISO 14040 requirements to offer easy-to-handle functions with sound scientific bases. An introductory course, accessible via the eco smes webpage provides a description of the tool and a step-by-step guide with examples and exercises.

Internet: http://www.ecosmes.net

This project also provides a LCA training course for SMEs. This course is recommended for product designers, purchasers and environmental strategists - who want to have an introduction to Life Cycle Assessment (LCA).

The course has been produced in the context of the EU-project CASCADE. The document "LCA course for users of LCA data and results" was developed for CASCADE at Industrial Environmental Informatics, Chalmers University of Tecnology. It has been used as the basis for the web course with simplifications, inclusions and adaptations made by FEBE EcoLogic to make the language and the content more suitable for newcomers, especially from SMEs.

## EUP EcoReport

Within the “Eco-design of EuP methodology” project a tool has been developed to assess the life cycle of energy-using products. Although, the Excel based tool is intended for product group assessments within the EuP legislative process and not as a tool for companies from the electrical and electronics sector it gives certain guidance to identify major environmental aspects of a product. The Excel sheets are downloadable for free, including a methodology report.

Internet: http://www.eupproject.org

## SimaPro

SimaPro is a commercial LCA tool to collect, analyze and monitor the environmental performance of products and services. The user can model and analyze complex life cycles in a systematic and transparent way, following the ISO 14040 series recommendations. To get started with your LCA projects, SimaPro comes inclusive of several inventory databases with thousands of processes, plus the most important impact assessment methods.

Internet: http://www.pre.nl/simapro/

## GaBi

The commercial software system GaBi is a tool for build up life-cycle-balances. GaBi supports the user with handling with a large amount of data and within modelling of the product life cycle. GaBi calculates balances of different types and assists the user in aggregating the results.

GaBi software assists the user – besides Life Cycle Assessment - within:

- Greenhouse Gas Accounting
- Life Cycle Engineering
- Design for Environment
- Energy Efficiency Studies
- Substance Flow Analysis
- Company Ecobalances
- Environmental Reporting
- Sustainability Reporting
- Strategic Risk Management
- Total Cost Accounting

GaBi includes several databases.

Internet: http://www.gabi-software.com

## Umberto

Umberto is a commercial software tool to model, calculate and visualize material and energy flow systems. It is used to analyze the process systems, either in a plant or a company, or, along a product life cycle. Results can be assessed using economic and environmental performance indicators. Cost data for materials and processes can be entered to support managerial decision making.

Internet: http://www.umberto.de/en/

## IDEMAT

Idemat is a computer database for designers, developed by the section for Environmental Product Development of the faculty of Industrial Design Engineering at the Delft University of Technology. It provides technical information about materials and processes in

words, numbers and graphics, and puts emphasis on environmental information. The program has been developed to be used by students of technically oriented academic disciplines like Industrial Design Engineering, Civil Engineering, Material Science and Aerospace Engineering.

Internet:
http://www2.io.tudelft.nl/research/dfs/idemat/index.htm

## LCA-E

LCA-E was created in a cooperation between IVF and CPM, Chalmers.

The tool allows users to do simplified life cycle assessments of electronic circuit boards. The tool can show how different component selection and different operating conditions can change the environmental impact.

All the text in the tool is in Swedish. The inputs from the user are: amount of components (of 14 different types), how many cm of wiring, energy use in normal operation and in stand-by mode and the lifetime of the component. The output is a LCI data or a weighted environmental impact for the circuit board. The user can evaluate the environmental impact from manufacture or the environmental impact from use or the impact from both.

The use of the tool is simple and no special training of a user is needed for the handling of the tool. Once the user has entered data on the circuit board, the user have to select what type of results he wants and click on calculate. The result is presented both in tabular and graphical form.

Internet:

http://extra.ivf.se/lcae/

## LCALight

LCALight was developed at ABB Corporate Research.

LCALight is a web-based LCA (Life Cycle Assessment) tool for "quick and adequate" environmental impact calculations. LCALight was developed for the ABB intranet to be used by all ABB employees. Due to the simplicity of the tool, it is well suited for self-learning and to demonstrate the LCA methodology. Once a user has learned the methodology and starts to have questions that are more difficult than the tool can answer the user is ready to use a more advanced LCA tool.

LCALight can calculate environmental impact from materials, energy and transports. The LCALight tool contains LCI data (with metadata) for 45 materials, 47 electricity mixes, 6 fossil fuels and 9 transports..

Internet:
http://www.dantes.info/Tools&Methods/Software/webbasedtools_LCALight.html

Project webpage:
**www.EcoDesignARC.info**