“Ecodesign, a new challenge for Engineers”

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Daniel FROELICH
Ecole Nationale d’Arts et Métiers de Chambéry
daniel.froelich@chambery.ensam.fr

ENSAM is composed of:

- 8 teaching and research Centres (CER):
  - 1000 Engineers /years
  - 270 full-time research staff
  - 160 PhD students, 50 PhD’s awarded each year, 22 research laboratories
  - 8 laboratories associated to the National Research Council (CNRS)
- Three post-graduate Institutes:
  - Chambéry, Chalon-sur-Saône, Bastia

ENSAM Chambéry

Institute « Design, Mechanics, Environment

Created in 1995
Structure focused on training and on research for products ecodesign and recycling

Training

- Specialized Master on Ecodesign and environmental management
- Specialization on Ecodesign integrated in the engineering training
- Training for companies
Research at ENSAM Chambery

An academic research linked to result valorization with industrial partners

ENSAM

SERAM TECHNICAL PLATFORM

Research: Product life cycle

Eco-design

End of life processes

Energy saving

Design procedure
- Environmental evaluation methodologies / labeling
- Method and tools to integrate Env. criteria into design project

Technological Process
- Dismantling methods and material sorting
- Low energy consumption / renewable energy

Sustainable consumption: a Challenge for Ecodesign

<table>
<thead>
<tr>
<th>Environmental impact</th>
<th>Projection level in 2040</th>
<th>Necessary reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil consumption</td>
<td>Unsustainable resource</td>
<td>85%</td>
</tr>
<tr>
<td>Gas consumption</td>
<td>Unsustainable resource</td>
<td>50%</td>
</tr>
<tr>
<td>Coal consumption</td>
<td>200 years resource</td>
<td>20%</td>
</tr>
<tr>
<td>Copper consumption</td>
<td>Unsustainable resource</td>
<td>50%</td>
</tr>
<tr>
<td>Radioactivity</td>
<td>Disappearance of 50%</td>
<td>99%</td>
</tr>
<tr>
<td>CO2 Emissions</td>
<td>45 GtCO2/Ga/yr</td>
<td>80%</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>45-60 million of tons</td>
<td>85%</td>
</tr>
</tbody>
</table>

Example of allowed CO2 emissions per inhabitant for SD

For Europe SD = 1.6 t of CO2/inhab.
With today average products:
- 1 trip Paris / Tokyo
- 8000 km Year family Car
- 200 kg of beef meat
How companies currently manage product ecodesign

Main approaches on product ecodesign

- Legislation or ecolabel driven (in a proactive way)
  - Hazardous substance substitution
  - Recycling
    - Reach recycling targets (material substitution/association, part disassembly)
  - Use of recycled material
  - Energy saving
  - Use of renewable materials
- Natural Resource Saving (part/packaging/process optimization, overquality tracking, specific material grade limitation, part standardization, audit of list of requirements)
- Multi criteria basis on LCA (maxima degree of progress)

Ecodesign processes in companies

Environmental Evaluation of (n-1) Products

Identification of weak points (Competitor, policy, coming law, in absolute...)

Set up of objectives, improvement tools, indicators

Solutions implementation compromise

Designers

Environmental experts

Set of environmental requirements

Guidelines, management system

Improvement methods (Triz,...)

Set up of integrated ecodesign processes in companies

Environmental Evaluation of (n-1) Products

Identification of weak points (Competitor, policy, coming law, in absolute...)

Set up of objectives, improvement tools, indicators

Solutions implementation compromise

Integrated methods

Value analysis

Risk assessment
**Example of industrial redesign process**

- Better knowledge of EoL treatment processes to reinforce the current design process (2002)

**Design of a thermobag**

**Société Camping Gaz**

**Objective:** Design of a friendly environmental thermobag

**Approach:** LCA of 4 existing thermobag and design definition for new model

**Results:**
- Weight reduction
- Packaging reduction
- Use of less toxic materials
- Improvement of dismantling

**Redesign:**

- Environmental evaluation of a circuit breaker

*Schneider*
Recyclability Evaluation of products in the objective of eco-design

How to manage DFR

Product model
Recovery model

Method to define design rules

Recovery indicators construction & calculation

Scenario 1
Scenario 2
Scenario n

% Possible scenarios - Process performances,
% Based on field research (interviews)

Scenarios database

Recyclability Evaluation of products in the objective of eco-design

Recycling network

Emergence criteria

Scenarios
P1/S1
P2/S2

What if method
Elitist method

Environmental impacts
- Global warming
- Ozone layer
- PCO2
- Acidification
- Eutrophisation
- Eco-toxicity substances
- Human toxicity substances
- Resource depletion
- Wastes

Design criteria
- Choice materials
- Process
- Weight, volume, ...
- Type of function
- Type of assembly ...

Functions and mechanical subparts

Environment items
- Materials
- Energy
- Water
- Emissions
- Chemical products
- Wastes

Development of an integrated eco-design methodology for SMEs
Stephane LEPOCHAT

Causes for unsuccessful eco-design

- Company’s Policy concerning product environmental targets doesn’t exist or is incomplete
- Environmental target is considered as a “soft” parameter
- Designer’s Environmental/technical background or guidelines don’t exist
- Environmental evaluation methods are too complex or not appropriated for product improvement
- Technical solutions don’t exist or are not validated (no risk)
- Over cost
Toward environmental labeling

- Transparency for the real cost of the product during life cycle
- Possible comparison with service
- Possible progress for environmental improvement

Eco-design synergism with customer’s costs

- Production cost
  - Recycled material
  - Carry over
  - Substances
- After sell
  - Accessibility/Dismantling
  - Reconditioning
- Marketing
  - Use
  - Energy/fluids consumption
- Service
  - Dematerialisation
  - Global warranty