GENES

Integrated software platform for Green ENgineering dESIgn and product sustainability

Progettazione Europea un caso di successo: progetto G.EN.ESI

SEVENTH FRAMEWORK PROGRAMME

Sviluppo Sostenibile per il Made in Italy

Date: 23/01/2015

Place: Ancona (Italy)

Agenda

Introduction to Eco-Design

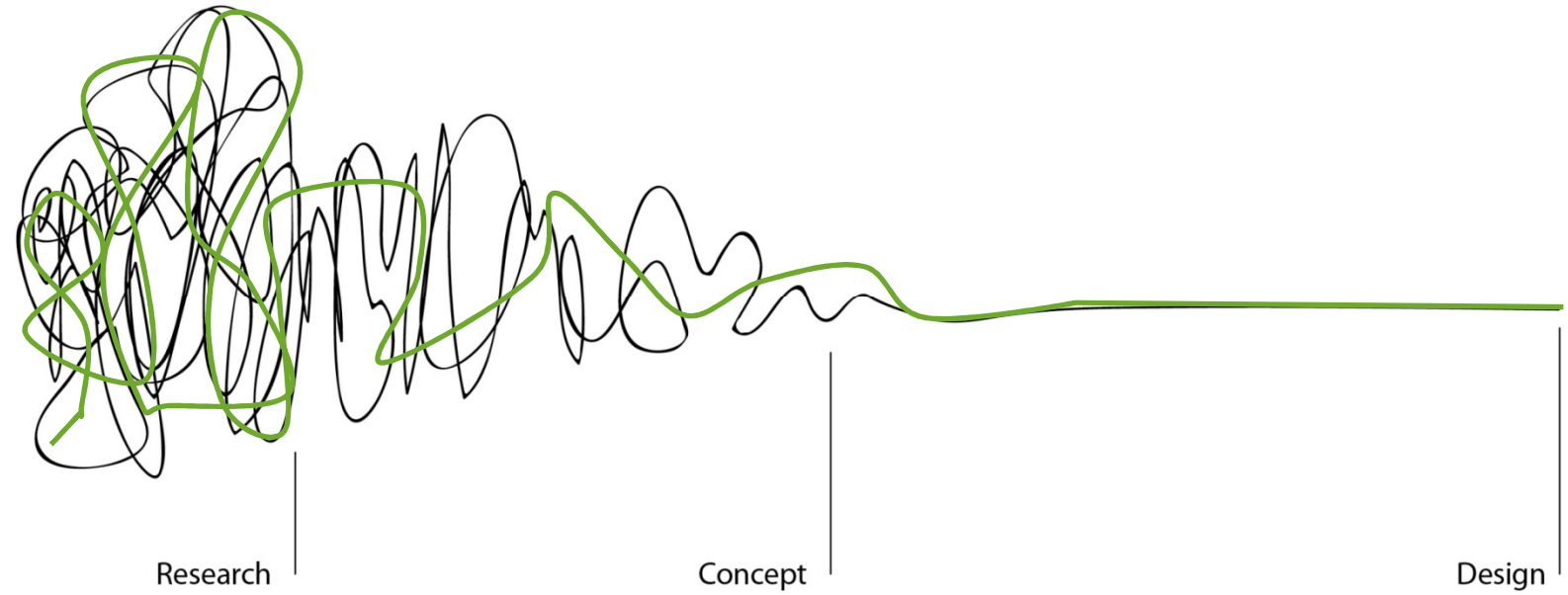
The G.EN.ESI project

Eco-design methodology

Genesi Eco-design software platform

Case study

What is Eco-design?



The design process + environmental considerations

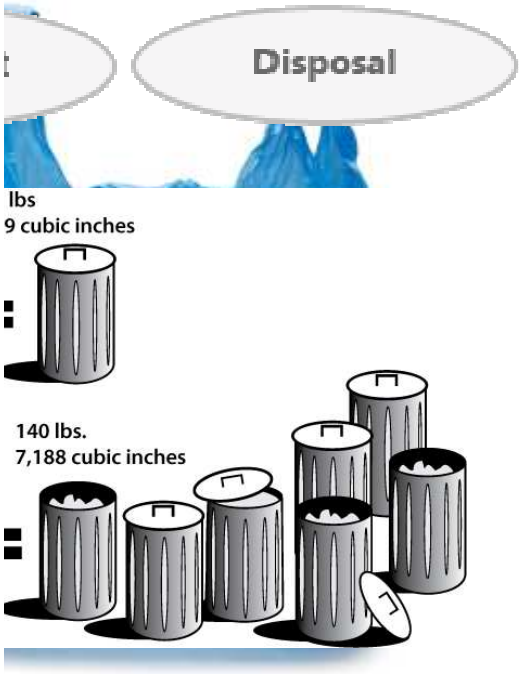
Environmental information is used to make design decisions

What is Eco-design?

Lifecycle Thinking: Taking a lifecycle perspective of the products you design

What is Eco-design?

Which product has a higher environmental impact?

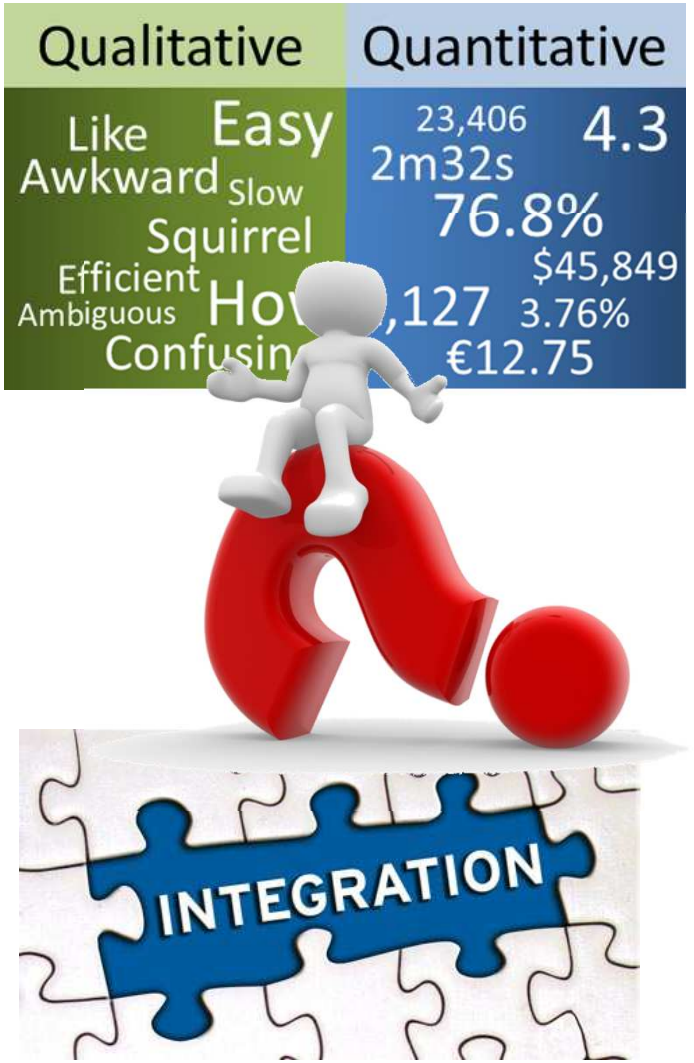


Raw Material Extraction → Production → Transport → Product use → Disposal

Current gaps

Shortcomings of currently available eco-design tools:

- Too qualitative/subjective to be used by designers with limited experience
- Too quantitative, costly and time consuming for use during the early stages of product development
- Do not integrate easily with traditional design tools



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GENESI

Integrated software platform for Green Engineering dESIgn and product sustainability

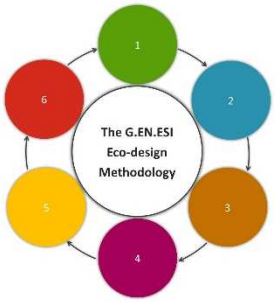
Three year research and development project which began in February 2012, will be completed in 2015

Project includes eight partners from research and industry across Europe

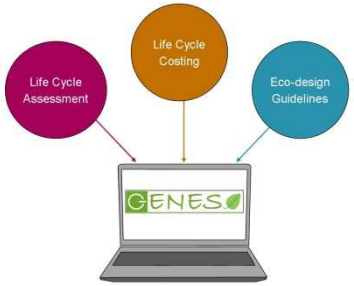
This project is co-financed by the European Commission and made possible within the VII Framework Programme

Project objectives

The G.EN.ESI Project aims to support the integration of eco-design within the design and development process by developing:



1) **The G.EN.ESI Methodology**: A structured workflow for introducing environmental considerations into an existing product development process



2) **The G.EN.ESI Platform**: A set of inter-operable, CAD PLM integrated software tools that help assess and address the environmental impacts of the products you design

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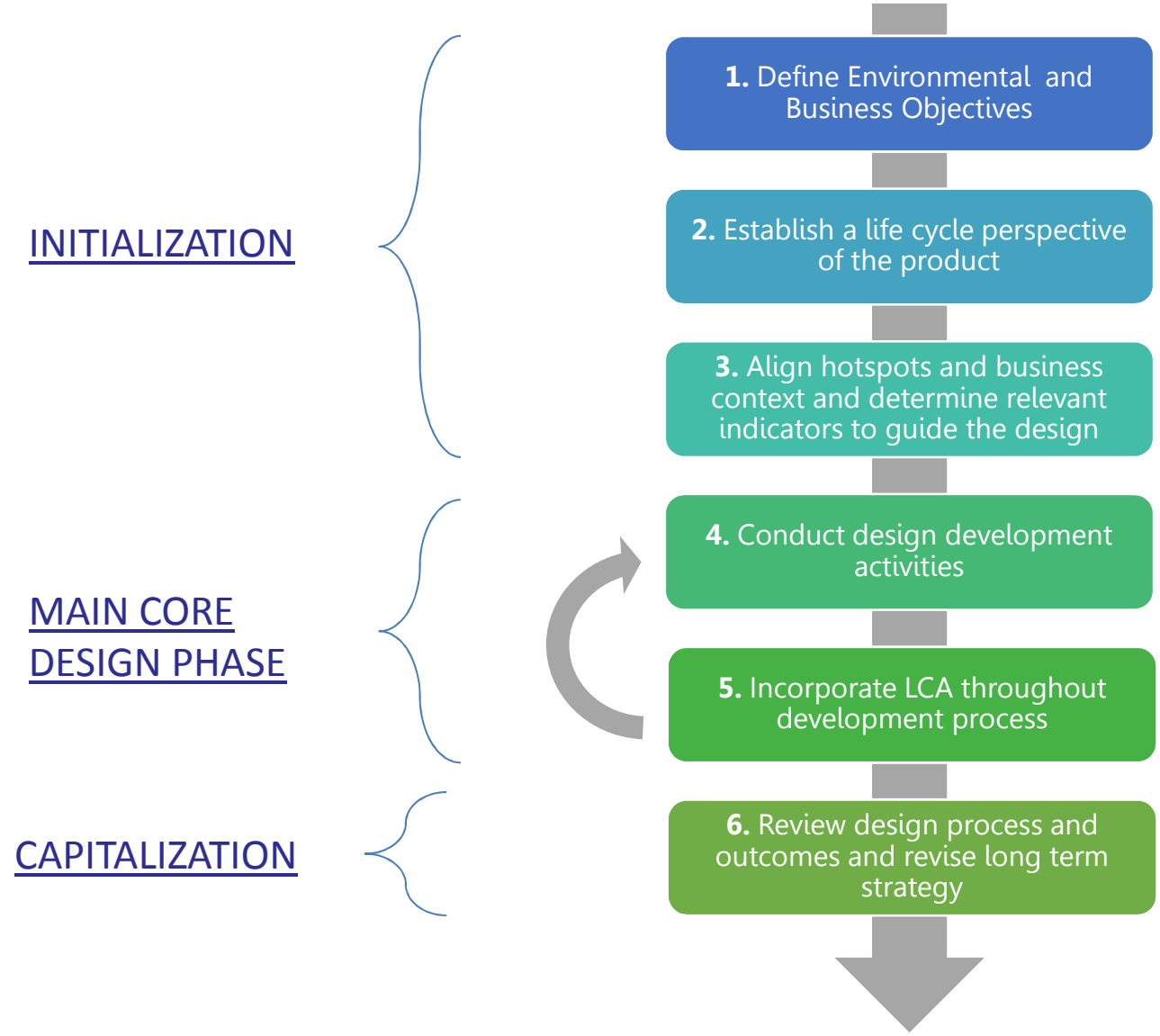
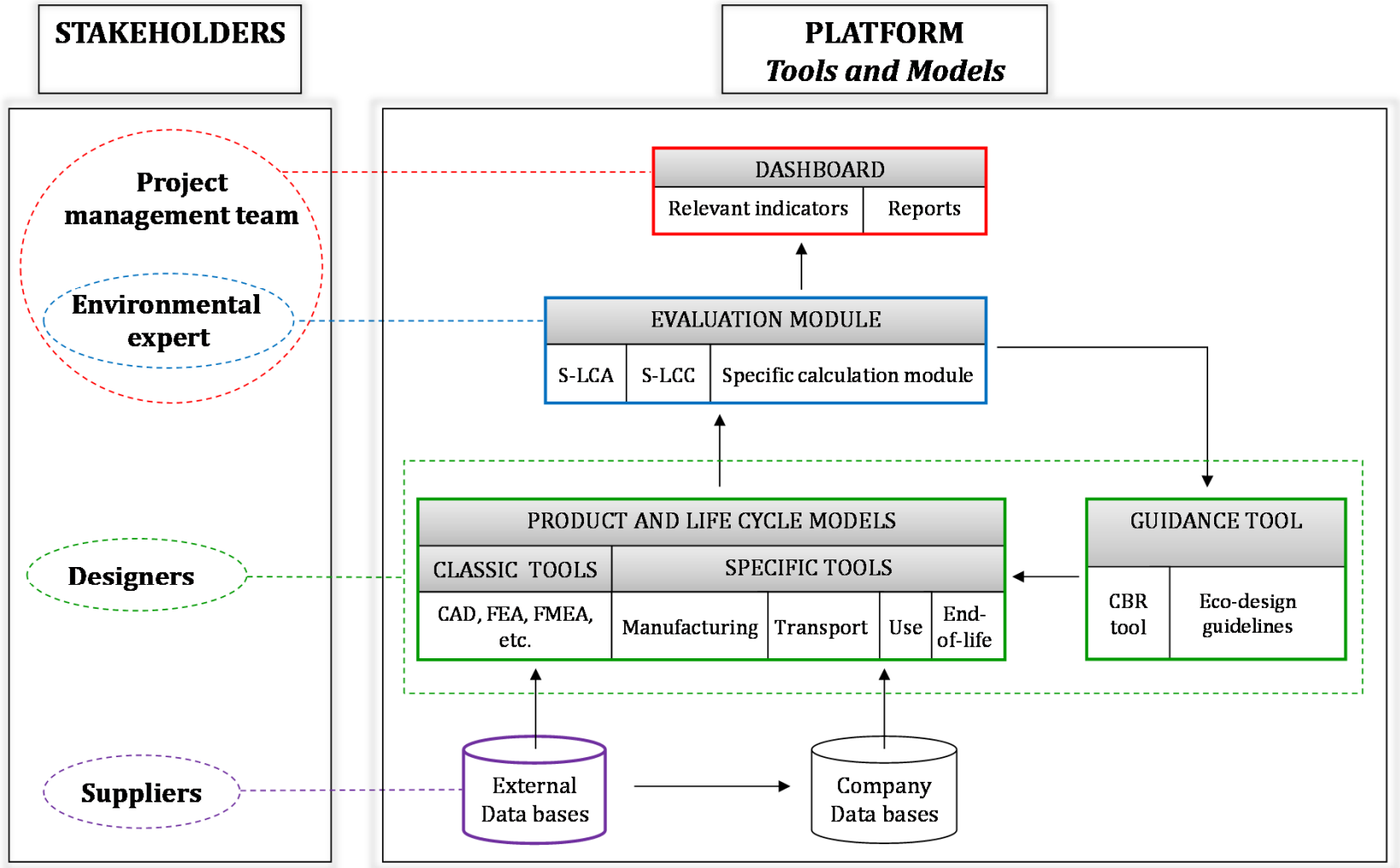
The G.EN.ESI Methodology



Stakeholders and platform structure



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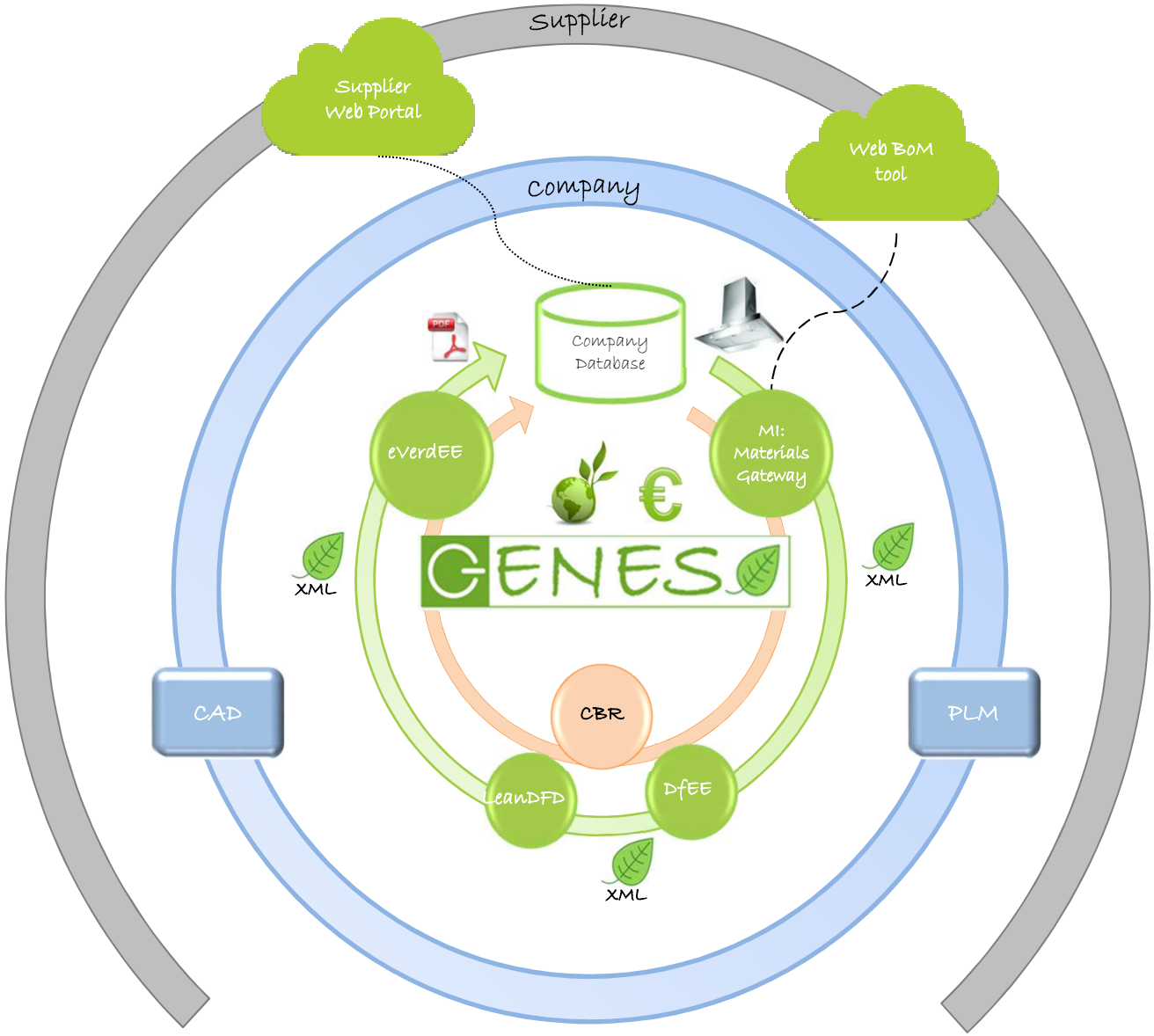
G.EN.ESI Platform – Architecture



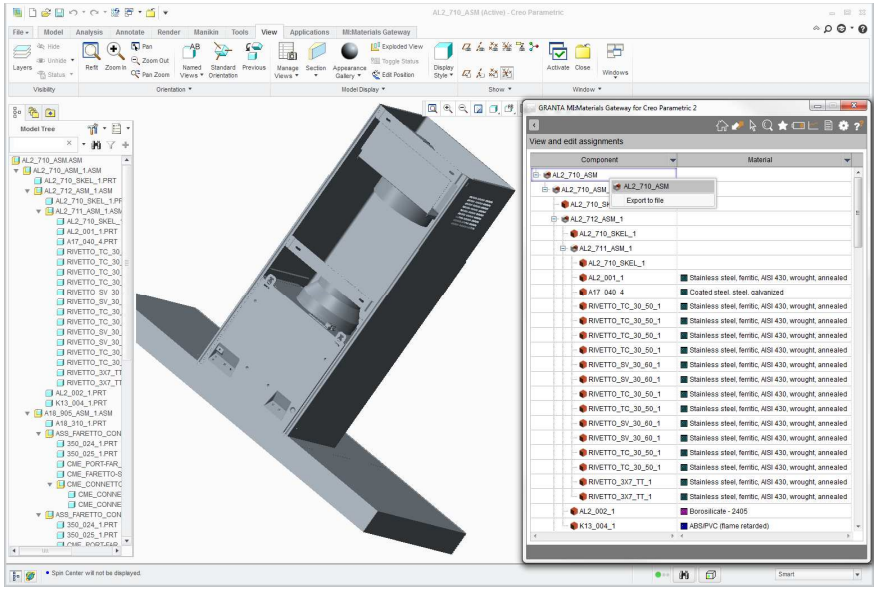
MI:Materials Gateway

SEVENTH FRAMEWORK PROGRAMME

Mi:Materials Gateway

Purpose

Give the designer a quick and simple way to perform a simplified life cycle assessment in early stages of his design

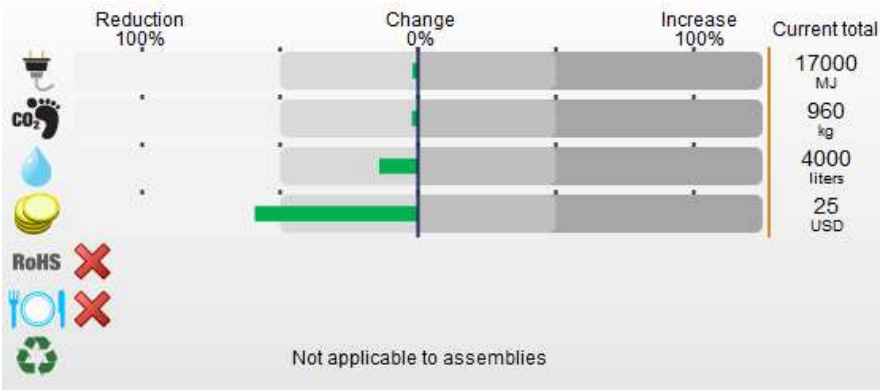


Tool benefits

Guide materials selection, enabling design of more sustainable, cost-effective, and durable products

Analyze environmental impact to key environmental indicators

- CO2 footprint
- embedded energy
- water usage
- RoHS
- food compliance
- end-of-life behavior



LeanDfD

SEVENTH FRAMEWORK PROGRAMME

LeanDfD ISASSEMBLY

Purpose

Support the designer in the evaluation of the product disassemblability and end of life performance

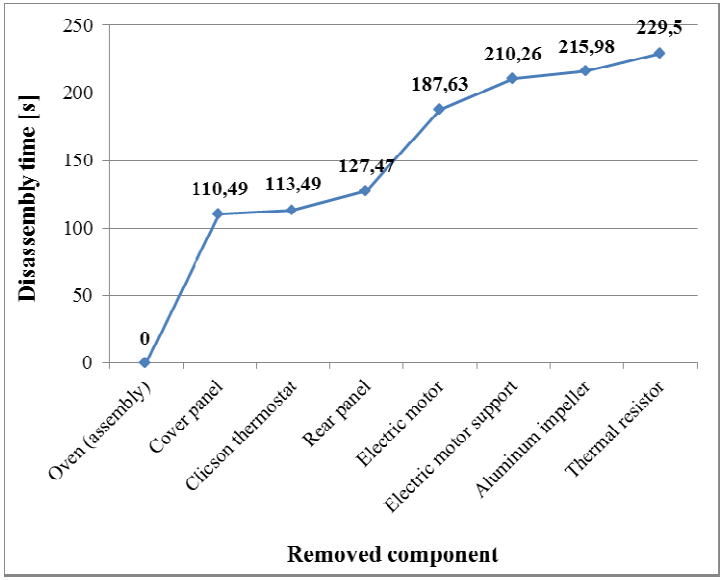
Tool benefits

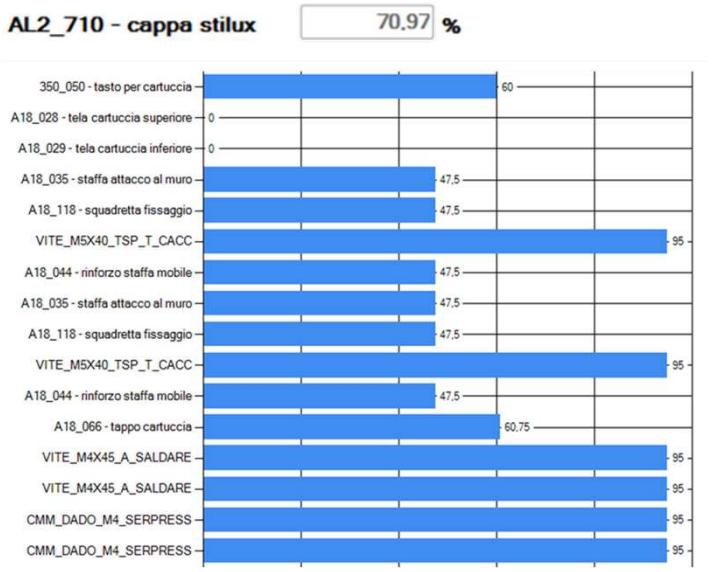
Understand the product disassembly criticalities

- Calculation of the product disassembly time and cost
- Identification of the most critical connections
- Comparison of alternative connections performances

Understand the product recyclability criticalities

- Calculate the product recyclable mass at end of life
- Identification of the components with the lowest recyclability index
- Evaluation of benefits related to the modification of material components
- Retrieve suggestions on critical components and their recyclability level





DfEE

SEVENTH FRAMEWORK PROGRAMME

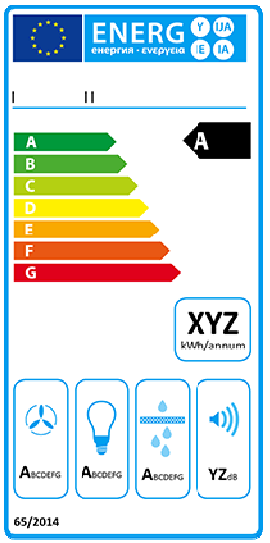
Purpose

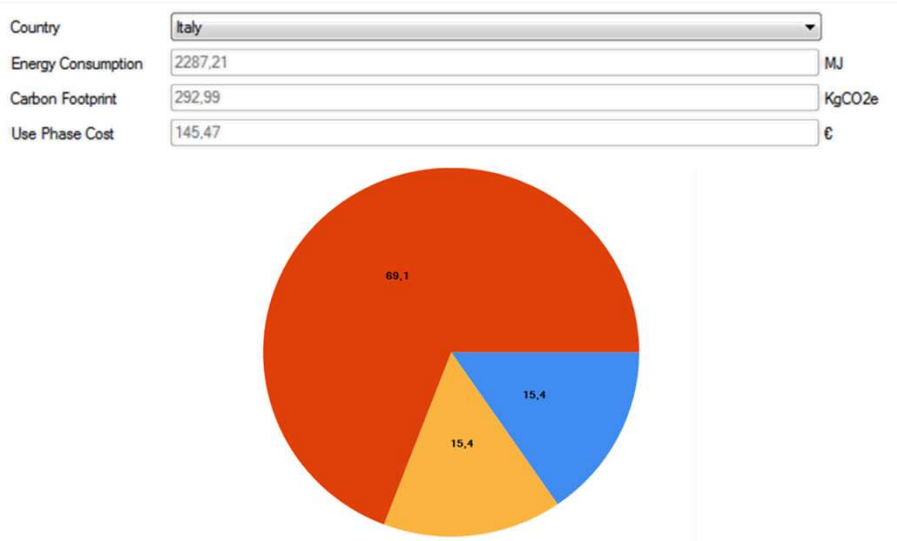
Support designer in the evaluation of the product energy consumption

Tool benefits

Understand the product consumption during the use phase

- Evaluate the compliance with the product category energy label
- Evaluation of the contribution of different energy using components in the product
- Identification of the components responsible of the major energy consumption in the product
- Comparison of different component alternatives
- Comparison of the consumption related to different use scenarios





Purpose

Detailed analysis of the environmental impacts of product life cycle (Life Cycle Assessment) compliant with standard ISO 14044 - ISO 14040

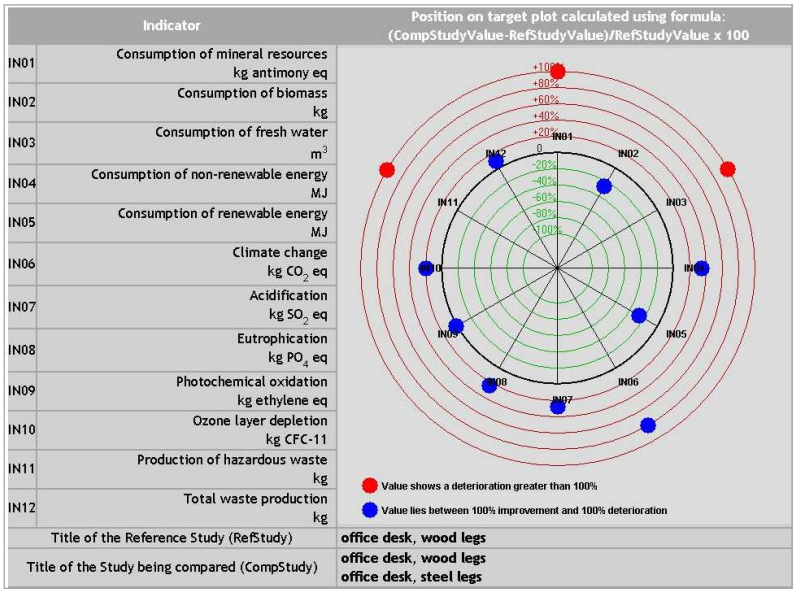
Tool benefits

Simplified data input phase suitable also for non-expert users

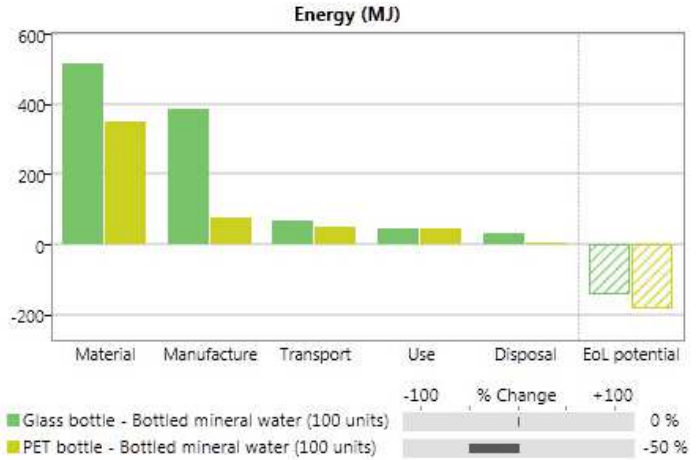
Deeply understand the environmental hot-spots by using multi-indicator results:

- Consumption of mineral resources
- Consumption of non-renewable energy
- Climate change
- Acidification
- Eutrophication
- Ozone layer depletion
- hazardous and not hazardous waste production indicators
- Toxicity
- …

Easy comparison of two product options



	Indicator	Position on target plot calculated using formula: (CompStudyValue-RefStudyValue)/RefStudyValue x 100
IN01	Consumption of mineral resources kg antimony eq	
IN02	Consumption of biomass kg	
IN03	Consumption of fresh water m^3	
IN04	Consumption of non-renewable energy MJ	
IN05	Consumption of renewable energy MJ	
IN06	Climate change kg CO_2 eq	
IN07	Acidification kg SO_2 eq	
IN08	Eutrophication kg PO_4 eq	
IN09	Photochemical oxidation kg ethylene eq	
IN10	Ozone layer depletion kg CFC-11	
IN11	Production of hazardous waste kg	
IN12	Total waste production kg	
	Title of the Reference Study (RefStudy)	**office desk, wood legs**
	Title of the Study being compared (CompStudy)	**office desk, wood legs** **office desk, steel legs**



CBR

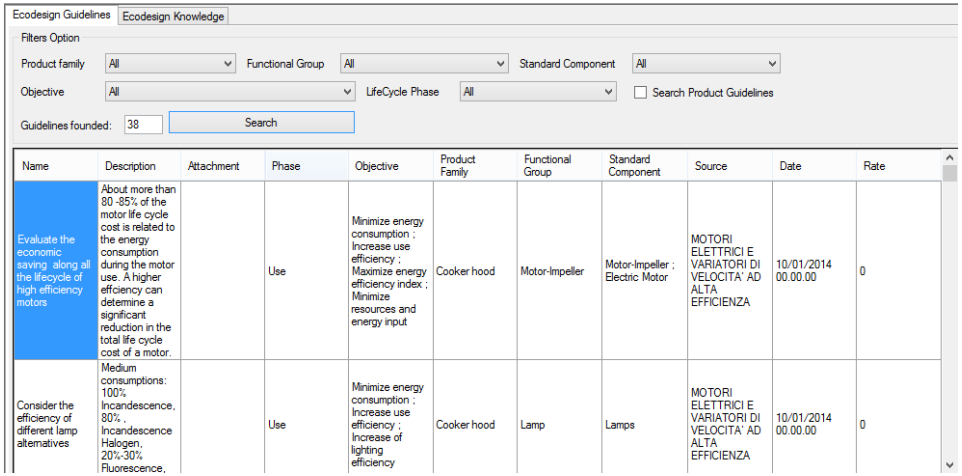
Purpose

Support designers during the design/re-design process of environmental sustainable products

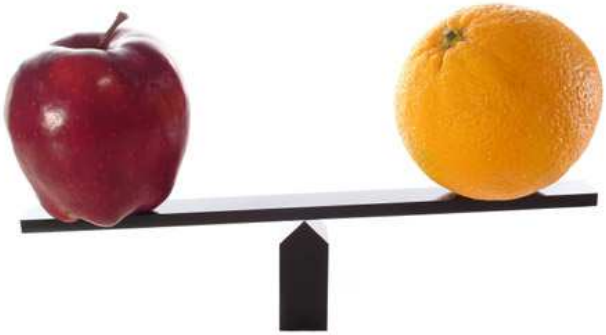
Tool benefits

Improve the product environmental performances by the suggestion of the eco-design guidelines

Collect and share eco-design knowledge within the company



Comparison



Mi:Materials Gateway

v2.0

GaBi
Product Sustainability
Performance

everdee

LeanDfDisassembly

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Motivation

- Energy label requirements on domestic range hoods,
- Beyond the energy label: waiting for life cycle certification

- *"…In the year under review, we have continued to pro-actively address and improve our performance in sustainability topics that are relevant to our business. I am pleased to report that Franke Group is on track to meet the targets related energy and water consumption, CO2 emissions and occupational health & safety. Yet, we have to strengthen our efforts in reducing the amount of hazardous waste…"*

Alexander Zschokke
President/CEO Franke Group

Case study – cooker hood

Volumetric airflow
800 [m^3/h]
280 [W]
IEC 61591

AISI 430

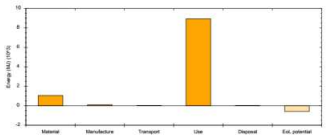
Electronic board
Inside (10x5 [cm])

Glass frontal
panel

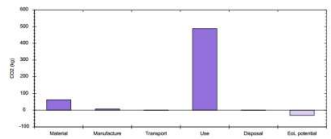
Halogen lamps 40 [W]

Aluminum grease
filters

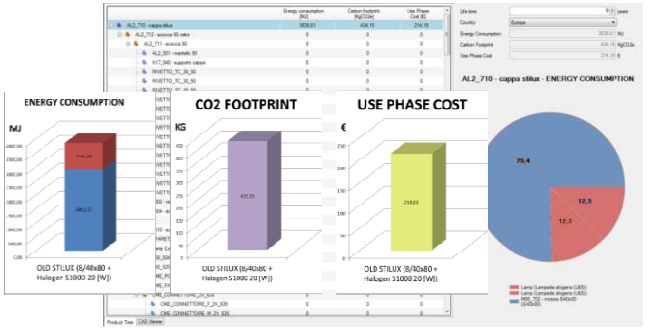
Cooker hood environmental hot spots

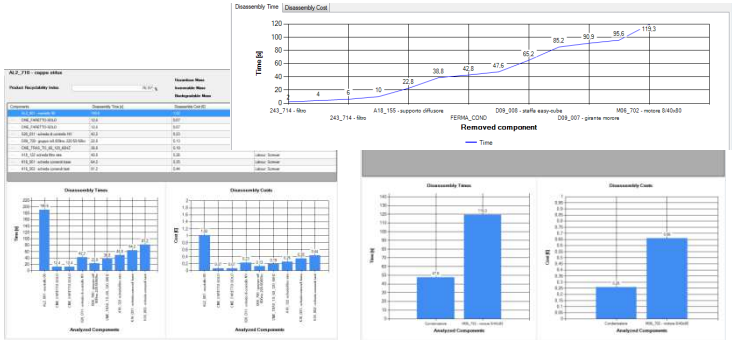


	Energy (MJ)	Percentage
Material	1100	10 %
Manufacture	94	0.9 %
Transport	12	0 %
Use	8900	88 %
Disposal	11	0 %
Total (for first life)	10000	100 %
End of life potential	-580	
Total	9500	



	CO2 (kg)	Percentage
Material	62	11 %
Manufacture	7.1	1 %
Transport	0.85	0 %
Use	490	87 %
Disposal	0.66	0 %
Total (for first life)	560	100 %
End of life potential	-31	
Total	530	





High energy consumption during the use phase

→ **80% of the total environmental impact**

Limited product recyclability

→ **around 70%**

Limited blower/motor disassemblability

→ **around 120 seconds**

Energy consumption

Electric motor

Induction

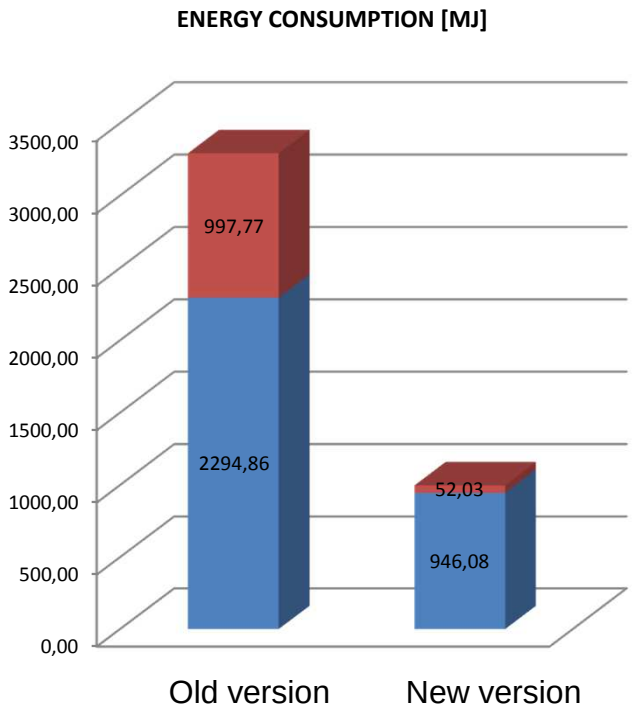
Brushless

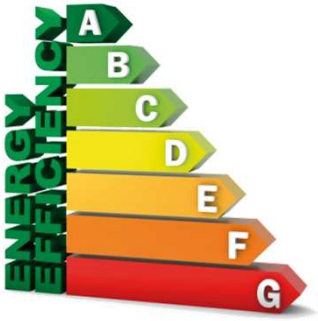
Lamps

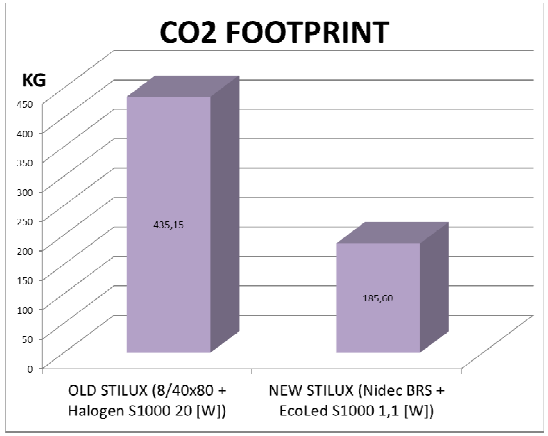
Halogen

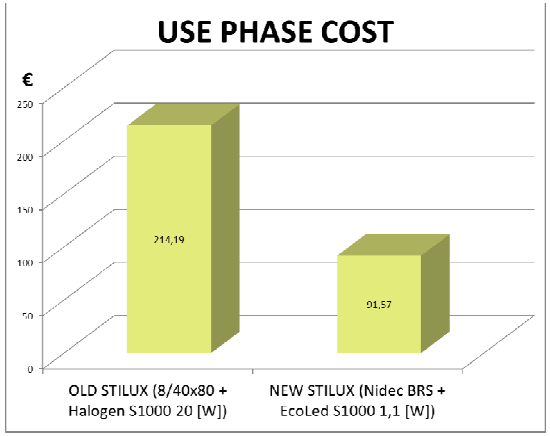
LED

Energy consumption







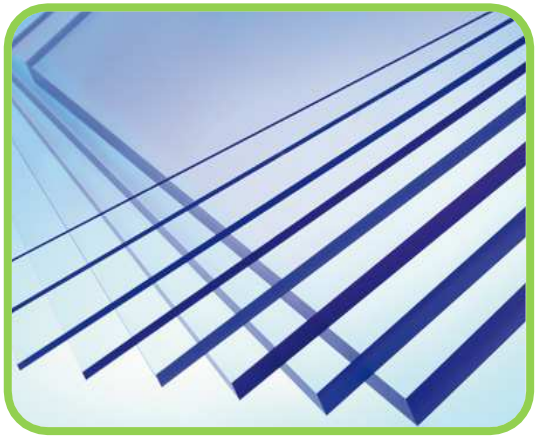


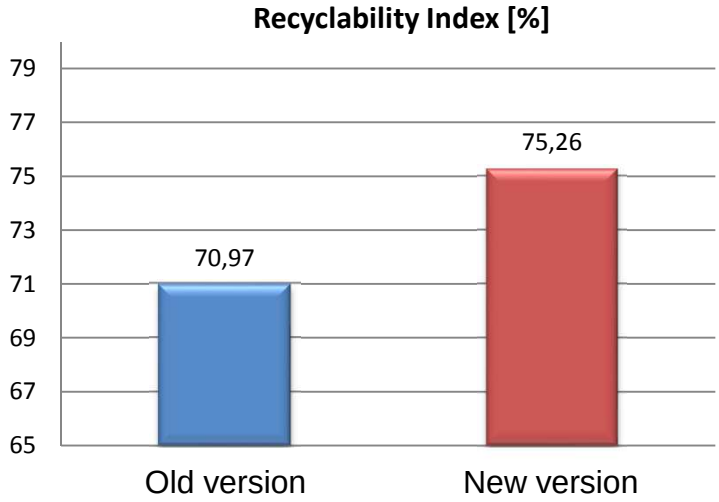
Recyclability

Frontal glass

Glued Glass

Mounted PMMA

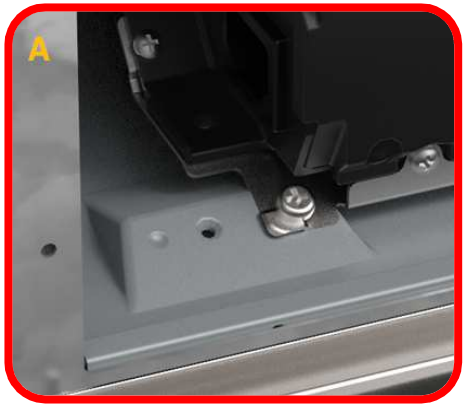




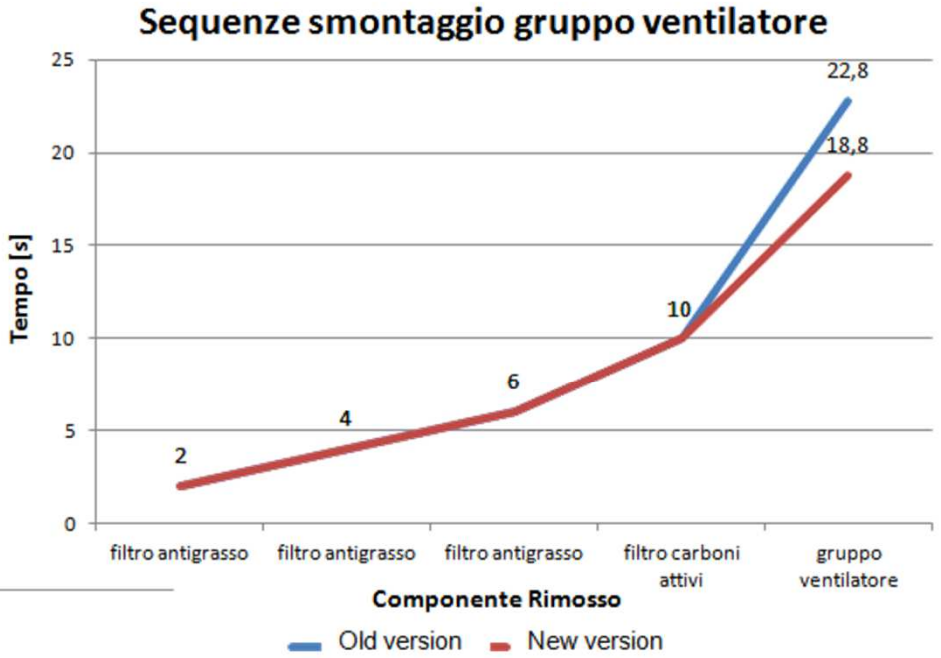
Blower fixing and coupling

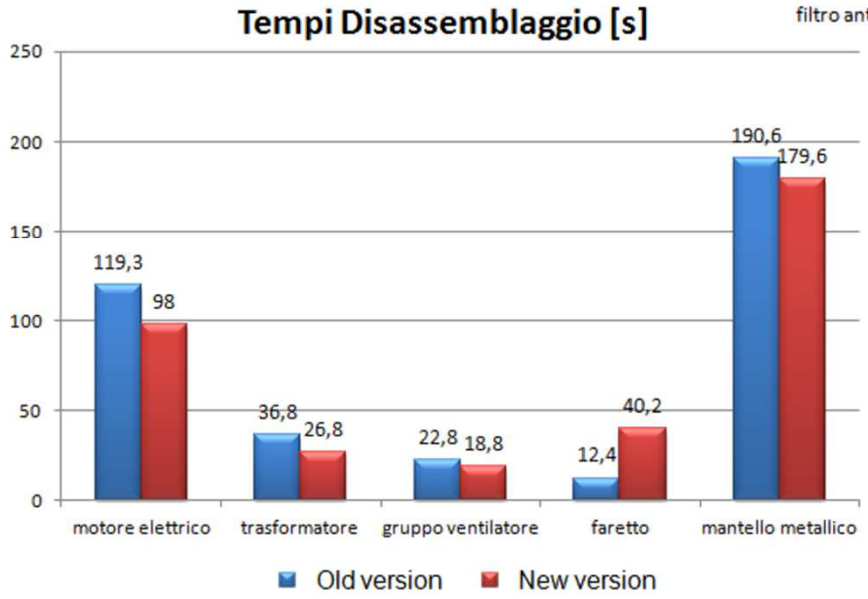
Screws

Rapid joints

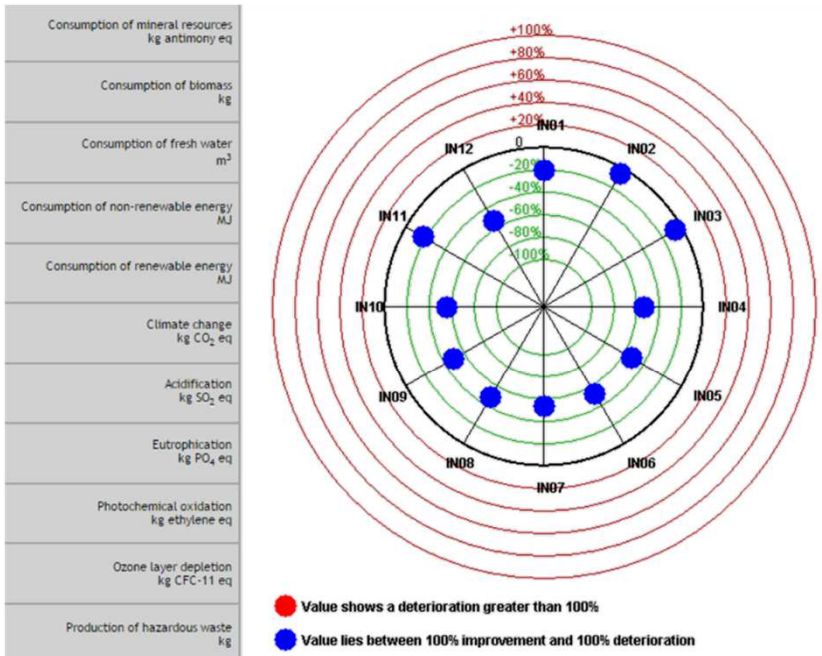


Disassemblability



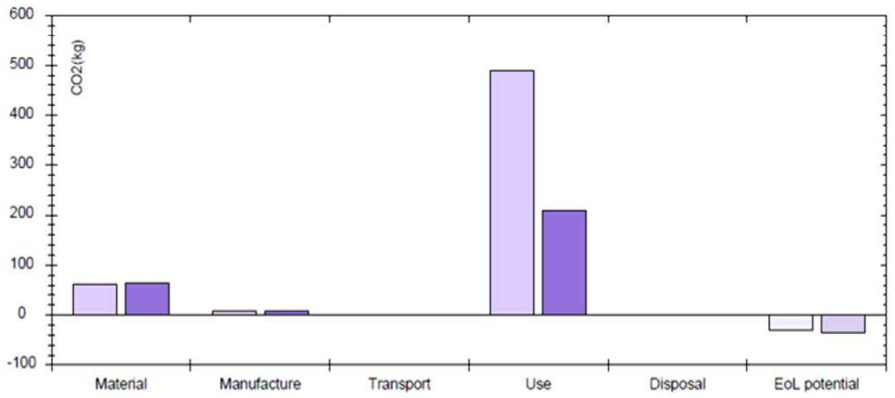


Environmental benefits

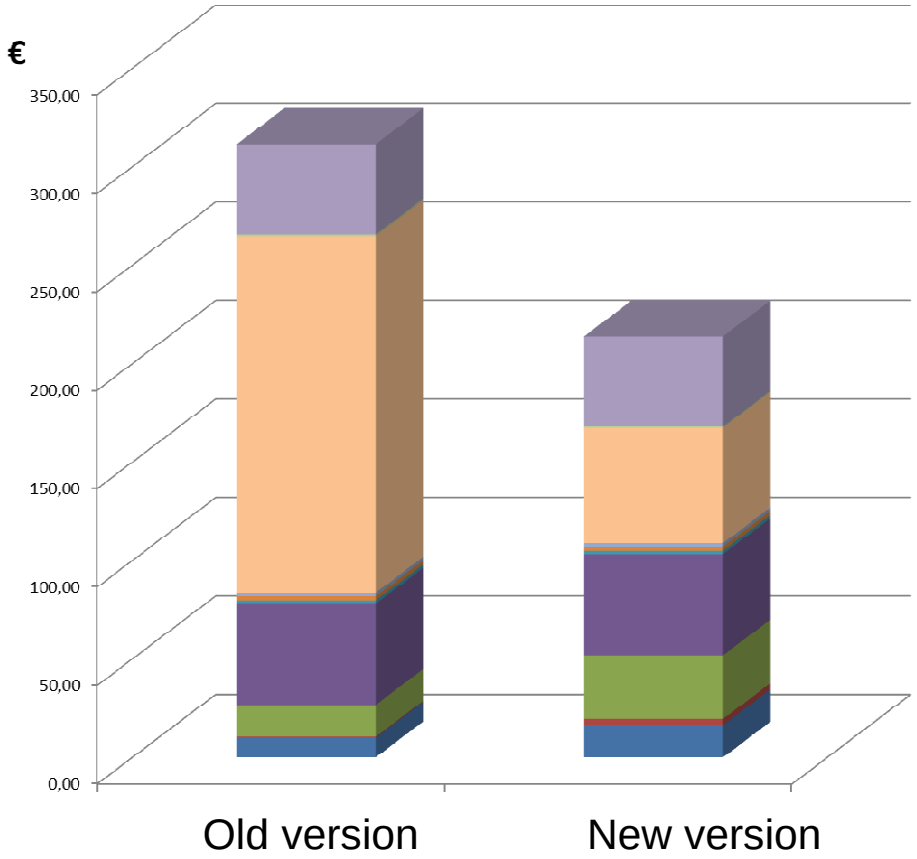


CO_2 reduction

- 53%



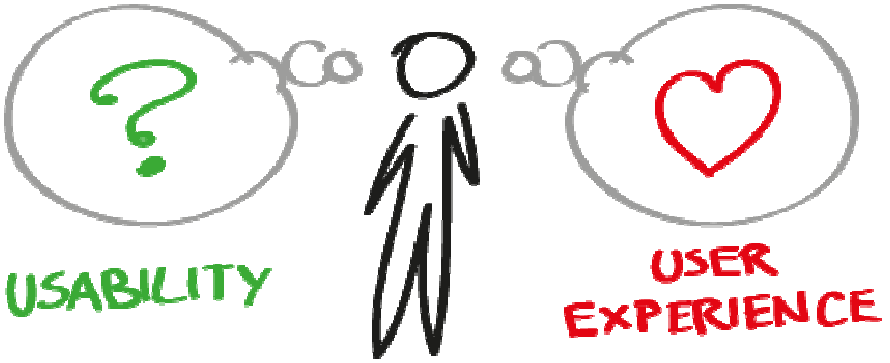
Economic benefits



Life Cycle Cost reduction

- 31%

Software usability



	E1	*E1*	*E2*	*E3*	*E4*	*E5*	*E6*	*Mean value*
MI Materials Gateway	**N/A**	9	**N/A**	9	8.6	**N/A**	**N/A**	**8,9**
CBR	7.6	9	**N/A**	9	9	**N/A**	**N/A**	**8,7**
DfEE	7.3	8.8	7.3	9	8.8	8.9	**N/A**	**8,4**
LeanDfD	7.1	8.9	6.9	9	8.7	**N/A**	**8.6**	**8,2**
Web BOM Analyzer	8.1	9	7.1	9	8.7	8.9	**N/A**	**8,5**
EverdeEE	8.5	9	6.7	9	**N/A**	**N/A**	**N/A**	**8,3**
Integration within company	**N/A**	8.8	7.6	8.8	8.1	**N/A**	**N/A**	**8,3**

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Thank you for your attention

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Date: 23/01/2015

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