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Regional Activity Centre for Cleaner Production

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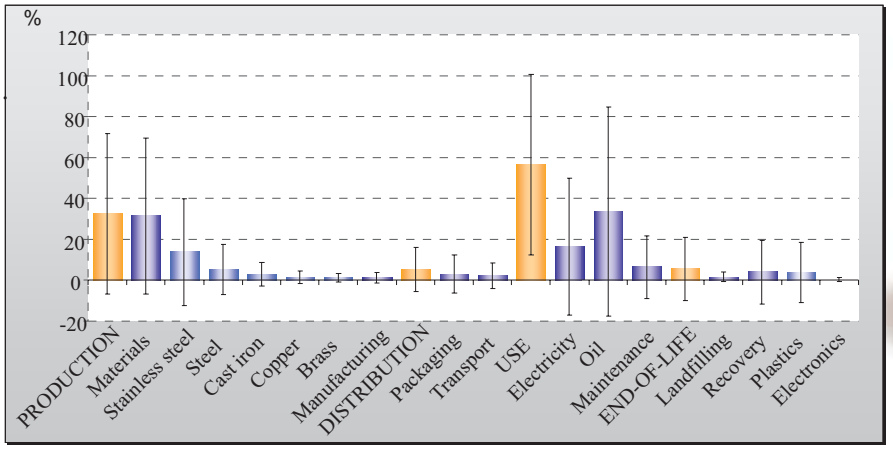
Eco-design of the domestic heating oil boiler EVOLUTION EV 30 FDX

Company	DOMUSA CALEFACCIÓN S. Coop., Errezil (Spain)
Industrial sector	Manufacture of tanks, reservoirs and containers of metal ISIC Rev 4 nº 2512 (*International Standard Industrial Classification of all Economic Activities*)
Environmental considerations	Increasing public awareness about environmental matters, particularly energy saving and efficiency and climate change, the need to remain competitive in a global market and the appearance of the ErP (Energy-related Products) Eco-Design Directive 2009/125 EC (former EuP - Energy-using Products Directive (2005/32/EC), led the company DOMUSA to become involved in this eco-design project.
Company background	DOMUSA decided to take part through this case study in an eco-design pilot project addressed to the electrical and electronic sector and other manufacturers of Energy-using Products, which was supported by Ihobe. This project was carried out between February and July 2009 and it concluded with the publication of an Electrical and Electronic Eco-design Guide by Ihobe in April 2010. The product assessed and eco-designed was the domestic oil boiler EVOLUTION EV 30 FDX (238 kg, 28,7 kW and 97.96% efficiency). This is a condensing sealed heating oil boiler designed for covering domestic heating and warm sanitary water demands of medium or big-sized individual dwellings.
Summary of actions	To identify the main environmental aspects of the product, an environmental assessment - streamlined LCA - was carried out considering the whole product lifecycle (manufacturing, distribution, use and end-of-life) using the software tool EuPmanager®, nowadays updated to a free cost version named EuPeco-profiler® under the LiMaS project (www.limas-eup.eu). This software tool uses the MEEuP methodology developed by VHK for the European Commission for assessing Energy-using Products. The graph below shows the environmental profile of the life cycle of the appliance assuming a lifetime of 15 years. As can be observed, 32% of its overall environmental impact corresponds to the manufacturing stage, 5% to distribution, 57% to actual use and 6% to the end-of-life stage. A more detailed analysis reveals the most significant aspects and thus the priority processes and materials for improvement efforts.



Original model EVOLUTION EV 30 FDX

Summary of actions (cont.)

After identifying the most significant aspects of the product and considering the main company's motivations, there were identified and evaluated potential eco-design strategies for improving the product. Not all the strategies initially drawn up were implemented in the final improved design, as some proved unviable due to technical and/or economical reasons.

The eco-design measures finally applied are summarised below:

Increase of boiler efficiency

A *solar collector and an additional accumulator* were incorporated into the system for producing warm sanitary water through solar energy. It resulted in oil savings of 28% (7,829 litres) and electricity savings of 21% (806 kWh), but also in a weight increasing of 90%.

A *secondary exchanger* for recovering latent heat of steam by condensation and an accumulator container were also incorporated into the system.

Inclusion of a new *pump for pre-heating water of the secondary accumulator* by using solar energy.

Reduction of electricity consumption

Inclusion of a *recirculation water pump* with electronic control for adjusting it power to real demand. This resulted in electricity savings during the use of the appliance.

Use of two pumps in the solar circulation circuit. A timer disconnects one of the pumps when the recirculation solar system gets its stationary stage. This resulted in electricity saving because only one pump works during the stationary stage.

Balances

The table below shows the balances in each of the 16 environmental impact indicators considered, after the implementation of the eco-design measures described above. The inclusion of a solar collector and a new accumulator resulted in oil savings of 28% (7,829 litres) and electricity savings of 21% (806 kWh). In all, it resulted in economic savings of 450 € per year. But also the new system resulted in a weight increasing of 90%, which contributes negatively to those indicators with a high dependency on materials and production processes (e.g. waste production, emission of heavy metals, etc.). In all, environmental "pros" of the new design could be considered more relevant than environmental "cons".

Indicator	Units	Original Model	Improved Model	Balance
Gross energy requirement	MJ primary	1,136,099	835,898	-300,200
Electricity requirement	MJ primary	40,780	34,693	-6,086
Net calorific value of feedstock	MJ primary	315	1,144	+829
Process water	m^3 water	-9.6	-2.2	+7.5
Cooling water	m^3 water	107	88	-19
Hazardous waste	kg waste	4.4	13.9	+9.6
Non-hazardous waste	kg waste	288	553	+265
Global warming potential	kg CO_2 eq.	83,536	61,296	-22,240
Acidification potential	kg SO_2 eq.	116	90	-25
Volatile organic compounds	kg NMVOCs	1.5	1.2	-0.3
Persistent organic compounds	g TCDD eq.	0.003	0.005	+0.002
Heavy metal to air	g Ni eq.	6.1	13.6	+7.5
Polycyclic aromatic hydrocarbons	g Ni eq.	0.8	2.1	+1.3
Particulatte matter	kg	15.5	24.8	+9.3
Heavy metals to water	g Hg/20 eq.	3.1	7.9	+4.8
Eutrophication	kg PO_4 eq.	0.08	0.23	+0.15

Improved model EVOLUTION SOLAR 30 DX

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Conclusions

The main benefits achieved in this eco-design project were the following:

Improvements in the product:

Partial use of renewable energy (solar thermal energy)

28% reduction in oil consumption during the useful lifetime of the appliance (7.829 litres)

21% reduction in electricity consumption during the useful lifetime of the appliance (806 kWh)

Improvements in the company:

Implementation of a practical methodology for environmental assessment and product improvement

Alignment with the future requirements of the ErP Directive (2009/125/EC)

A greater capability for innovation through eco-design

Market position improvement

NOTE: This case study seeks only to illustrate a pollution prevention example and should not be taken as a general recommendation.

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