

LCA and EPD of Arper's chairs

Leo Breedveld (breedveld@to-be.it)¹, Michela Possagno², Vincenzo Rivizzigno²

¹ 2B Consulenza Ambientale, Mogliano Veneto (TV), ² Arper SpA

Summary

In March 2008, Arper obtained the EPD certification (Environmental Product Declaration) for two of its products: Catifa 53 and Catifa 46, following the Norwegian EPD scheme, an ecolabel type III (ISO 14025). The EPD guarantees the transparency and correctness of the provided environmental information, thanks to the third party certification. LCA (Life Cycle Assessment) allows the assessment of the environmental impact of the chairs along their entire life cycle. The results are expressed in six impact categories, as indicated in the PCR seating (Product Category Rules). Arper aims at using the instruments LCA and EPD for continuous improvement and ecodesign purposes.

Riassunto

Nel marzo 2008 Arper ha ottenuto l'EPD (Environmental Product Declaration), l'etichetta ecologica di tipo III secondo il sistema norvegese NHO (ISO 14025), per due delle sue sedie: Catifa 53 e Catifa 46 (versione trespolo e quattro gambe, monocolore e bicolore). L'EPD garantisce la trasparenza e la correttezza delle informazioni grazie alla certificazione di una parte terza. La scelta dell'ente norvegese è stata dettata dall'esperienza dell'ente nel settore delle sedute. La LCA (Life Cycle Assessment) ha permesso di valutare l'impatto ambientale lungo l'intero ciclo di vita, analizzando ogni fase del processo, ovvero: materie prime, materiali, trasporto, assemblaggio, imballaggio, distribuzione, fase d'uso e fine vita. I risultati LCA sono espressi nelle sei categorie d'impatto indicate nelle PCR (Product Category Rules) delle sedie (effetto serra, assottigliamento dello strato di ozono, formazione di smog fotochimico, acidificazione, eutrofizzazione e metalli pesanti). Gli studi LCA condotti hanno permesso di ottenere un inquadramento dell'impatto ambientale dei prodotti valutati. Questa conoscenza permette lo sviluppo di nuovi prodotti secondo un approccio ecocompatibile favorendo un processo di miglioramento continuo. Nello specifico Arper vuole far diventare l'LCA e la conseguente EPD degli utili strumenti operativi per valutare e proporre opzioni di miglioramento in fase di progettazione delle proprie sedute.

1. Introduction

The goal of Arper is to provide high quality, safe and sustainable products. For this reason, the company has implemented the international Environmental Management System UNI EN ISO 14001 (CERT N.-1772-2006, obtained on 6-9-2006) and is actively working on its product stewardship programme. This programme comprises actions on eco-design (material and waste minimisation, energy efficiency, disassembly of components, recycling of materials), product take back at the end of life (take back experimented by the local distributor in Australia and reuse by donation of the product to charity or non-profit organisations) and environmental communication.

In March 2008, the company obtained the EPD certification (Environmental Product Declaration) for two of its products: Catifa 53 and Catifa 46, following the Norwegian EPD scheme, an ecolabel type III (ISO 14025). Both the LCA study [1] and the EPD [2] have been performed by 2B, according to the Product Category Rules (PCR) for seating (NPCR003) [3]. Independent verification of LCA data and other environmental information in the declaration has been performed by an Norwegian verification body (Global & Local), according to ISO14025 [4], § 8.1.3 and based on the 14001 certification.

The EPD guarantees the transparency and correctness of the provided environmental information, thanks to the third party certification. The LCA (Life Cycle Assessment) allows the assessment of the environmental impact of the chairs along their entire life cycle. The results are expressed in six impact categories, as indicated in the PCR seating. The aim is to use the instruments LCA and EPD for continuous improvement and ecodesign purposes. In this paper the LCA methodology and results of the EPD of the Catifa 53 chair are outlined (Catifa 53, in single colour and two-tone PP with 4-leg steel base). Table 1 provides the product specifications of the Catifa chair.

Material composition, including packaging	Mass (kg)	Fraction (%)	Recycled materials (%)	Suppliers with EMS (%)	Suppliers with Ecolabel (%)
Polypropylene (PP)	2,724	37,9	0	0	0
Steel	2,381	33,2	65	0	0
Cardboard	1,969	27,4	80	0	0
LDPE	0,093	1,3	0	0	0
Copper	0,009	0,1	0	0	0
Paper	0,005	0,1	0	0	0
Total	7,181	100%	30%	0%	0%

Tab. 1: product specifications of the Catifa 53, PP (black/white) and 4-leg structure in steel.

2. LCA methodology

The functional unit of the LCA is: *One seating solution provided and maintained for a period of 15 years*. The system boundaries are chosen from “cradle to grave”, covering the entire life cycle from raw material extraction to disposal. The lifetime of the seating solution is estimated to be 15 years. This is the average lifetime that the product is in possession of the first consumer. The seating solution has usually a longer technical lifetime.

The entire product system is modelled by means of the flow diagram, containing all 79 processes of the Catifa 53 with 4 leg steel base. 41 out of the 79 processes are selected from the LCA database ecoinvent [5] and represent generic data, while all other processes are based on specific information obtained through the main suppliers.

Specific data are used to describe transport, production and use phase, while generic data are used to describe upstream phases (materials and processing) and downstream phases (recycling, disposal). Specific data originate from the producer and two main suppliers (2006), while generic data have been selected from the ecoinvent v1.3 LCA

database (2002-2005). The data assumptions in the disposal phase have been justified by the recycling properties of the materials and by generic data on disposal. The LCA modelling has been performed with the LCA software SimaPro 7.1 [6].

Other relevant assumptions of the LCA study are:

- Cut-off criteria: no specific cut-off criteria has been applied. Due to an insignificant contribution, secondary packaging has been excluded from the analysis;
- Use phase: the use phase of the seating solution consists of cleaning the chair with a soft cloth and a solution of lukewarm water and neutral soap. The calculation is based on 600 cleanings in 15 years, corresponding to 40 cleanings per year;
- Disposal phase: disposal is based on the current European situation. Due to the assumed lifetime of 15 years, which can be seen as a defensive scenario, the environmental burden is probably overestimated. The product stewardship programme of the company stimulates the design of products that can be easily reused, disassembled and recycled. None of the components can be viewed as hazardous waste;
- Allocation rules: raw materials and production processes are included for virgin resources. No allocation is made for materials subject to recycling. The recycling process is included for input of recycled resources. Outputs subject to recycling are regarded as outputs to the following life cycle.

3. Inventory results

The PCR requires that the following inventory results are specified in the EPD:

- Energy resources: 536 MJ in total and specified per energy carrier and life cycle stage (Fig. 1);
- Materials resources: consumption of materials during the entire life cycle of the seating solution, specified for virgin/recycled and renewable/non-renewable materials (Tab. 2).
- Emissions and waste: the production of waste and all emissions to air and water during the entire life cycle of the seating solution (Tab. 3).

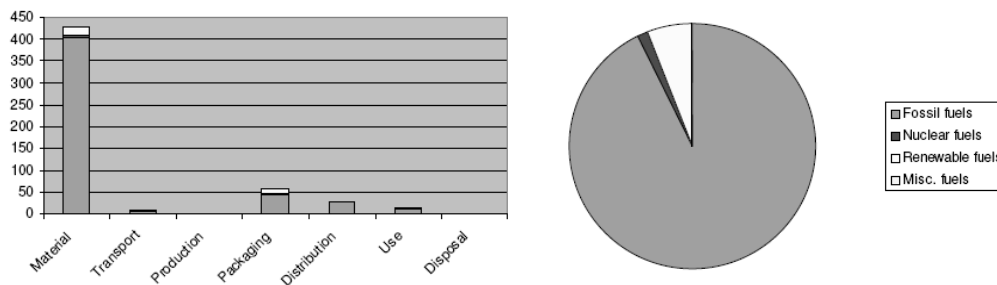


Fig. 1: Specification of the energy consumption per energy carrier and life cycle stage (MJ).

	Name	Materials	Transport	Packaging	Distribution	Use	Disposal	Total (kg)
Virgin renewable	Water	621	4,06	67,2	13,2	71,8	1,17	778
	Biomass	0,25	0,00	0,45	0,00	0,00	0,00	0,70
Virgin non-renewables	Coal	4,49	0,03	0,33	0,09	0,03	0,00	4,97
	Oil	3,37	0,17	0,25	0,51	0,01	0,01	4,31
	Natural gas	2,35	0,01	0,45	0,03	0,21	0,00	3,05
	Clay, sand	1,28	0,44	0,47	1,46	0,06	0,14	3,85
	Iron	3,31	0,01	0,02	0,04	0,00	0,00	3,39
	Calcite	0,70	0,01	0,05	0,03	0,01	0,00	0,81
	Salt	0,09	0,00	0,02	0,00	0,01	0,00	0,12
	Copper	0,01	0,00	0,00	0,00	0,00	0,00	0,01
	Nickel	0,04	0,00	0,00	0,00	0,00	0,00	0,04
	Chromium	0,03	0,00	0,00	0,00	0,00	0,00	0,03
	Recycled renewable	Cardboard	1,97	0,00	0,00	0,00	0,00	0,00
Paper		0,01	0,00	0,00	0,00	0,00	0,00	0,01
Unspecified		0,07	0,00	0,03	0,01	0,00	0,00	0,11
Total		79,7%	0,6%	8,6%	1,9%	9,0%	0,2%	802 kg

Tab. 2: Material resources consumed during the entire life cycle of the seating solution.

Emissions and wastes	Name	Amount	Unit
Emissions to air	Carbon dioxide	21,0	kg.
Emissions to air	Carbon monoxide	0,11	g.
Emissions to air	Methane	0,00	g.
Emissions to air	Nitrous oxide	0,00	g.
Emissions to air	Nitrogen oxides	0,07	g.
Emissions to air	Sulphur oxides	0,09	g.
Emissions to air	NM VOC	0,02	g.
Emissions to air	Dioxines, air	0,00	ng.
Emissions to water	Phosphates	0,01	g.
Emissions to water	Nitrates	0,01	g.
Emissions to water	Dioxines, water	0,00	g.
Waste	Waste to recycling	2,02	kg.
Waste	Waste to incineration	0,69	kg.
Waste	Waste to landfill	0,73	kg.
Waste	Hazardous waste	0,00	kg.

Tab. 3: Emissions and waste during the entire life cycle of the seating solution.

4. LCA results

The impact assessment has been performed applying the LCIA method as specified in the PCR Seating, quantifying respectively the following impact categories: global warming, ozone layer depletion, photochemical oxidation, acidification, eutrophication and heavy metals (EI95). Figure 2 lists the LCA results and illustrates the significance of each life cycle stage.

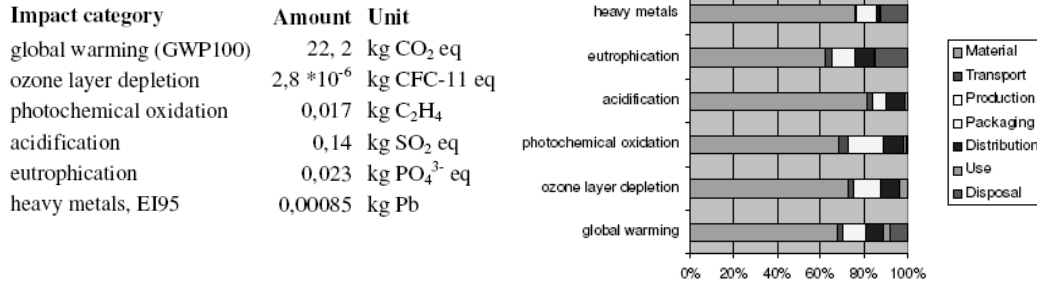


Fig. 2: Environmental impacts, expressed in the 6 impact categories of the PCR method and indicating the significance of each life-cycle phase.

5. Final remarks

With the LCA and EPD of the Catifa 53, Arper has gained essential know-how in order to further develop and implement ecodesign in the company philosophy. The internal LCA study and the LCA databases documented in SimaPro are able to provide the essential information needed for an Environmental Product Declaration, which has been registered under the Norwegian EPD scheme. The EPD has appeared to be not only a useful tool for environmental communication, but also an incentive to promote ecodesign and to strive for continuous improvement.

References

- [1] Arper, 2008. Internal LCA study of the Catifa 53, 4-leg base. 2B - Leo Breedveld, January 2008.
- [2] NEPD104, 2008. Norwegian Environmental Product Declaration of the Catifa 53,4-leg base (Arper SpA). Approved 15-3-2008 according to ISO14025 and valid until 15-3-2011 (www.epd-norge.no).
- [3] NPCR003, 2005. PCR Seating, published on 15-10-2005 under the Norwegian EPD scheme (www.epd-norge.no).
- [4] ISO 14025, 2006. Environmental labels and declarations, type III environmental declarations, principles and procedures.
- [5] Ecoinvent, 2007. The LCA database Ecoinvent version 2 (v2), December 2007 (www.ecoinvent.ch).
- [6] SimaPro 7.1, 2008. The LCA software SimaPro, version 7.1. PRé Consultants, the Netherlands.