EPD®

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preinsulated panels systems

ENVIRONMENTAL PRODUCT DECLARATION FOR THE PIRAL HD HYDROTEC 15HP21 PANEL MADE OF RIGID EXPANDED POLYURETHANE FOAM AND ALUMINIUM FOR USE IN THE CONSTRUCTION OF DUCTS FOR HVAC

Certified Environmental Product Declaration

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CPC code 36950

PCR 2012:12 version 1.2

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PRESENTATION OF THE COMPANY AND ITS PRODUCT

THE COMPANY AND ITS PRODUCTION

For more than three generations, P3 has operated in the field of ducts systems for air conditioning.

In the year 1989, what had originated as an adventure takes its definitive shape with the creation of P3. Today, P3 is part of an international group, whose mission is the promotion of the preinsulated aluminium duct P3ductal, with the aim of turning it into a more and more prominent reality on the market of ducts for HVAC.

Following a trail of constant development from both the technical and commercial viewpoints, P3 has contributed its novel ideas to the construction systems of traditional sheet metal ducts made of galvanised steel. Indeed, the company created the P3ductal technology, which uses preinsulated aluminium panels and also produces the accessories, the machines and the equipment intended for the construction and installation of ductworks. The production facility, located in Ronchi di Campanile, a suburb of Villafranca Padovana, can guarantee an output capacity of over 5 million square metres of panels per year. The panels are then stored in a covered warehouse of over 3,000 m^2. The plant extends over another covered area of 7,000 m^2 and over more than 20,000 m^2 of uncovered surface.

The P3ductal system is distributed in over 40 countries and counts on a sales network capable of providing support for both clients and designers in the choice and application of the product; specifically the panel Piral HD Hydrotec 15HP21 is sold in Italy and overseas.
The strengths of P3 lies in the constant research for innovation and in the excellent quality standards of its products, which is attained by a continuous engagement in the studies conducted in its own laboratories which also operate in collaboration with University and Research centres.

Since 1996, P3 has operated in compliance with a quality system based on the standards UNI EN ISO 9001-2008, and it has also obtained the environmental certification UNI EN ISO 14001-2004 as well as OHSAS 18001-99; recently the company has also obtained the energetic certification according to UNI EN ISO 50001-2011 as well as a certified attestation of the economical/financial management following UNI ISO 10014-2007 principles.

DESCRIPTION OF THE PRODUCT

- ### THE HYDROTEC TECHNOLOGY

In compliance with both national and international standards for the safeguard of the ozone layer, P3 has eliminated the use of CFCs and HCFCs from its production cycle.
Applying its exclusive **international patent EP 1115771 B1**, the company set up an innovative production process where the expansion of the polyurethane foam is obtained only with water, in substitution for fluorinated gases with greenhouse effect (CFC, HFC, HCFC) and hydrocarbons (HC).

THE PIRAL HD HYDROTEC 15HP21 PANEL

The Piral HD Hydrotec panel 15HP21 is a *sandwich* panel, made up of an insulating core in rigid polyurethane foam covered on both sides with an 80 µm sheet of embossed aluminium. This panel is particularly suitable for the construction of ductworks intended for use in HVAC.
The thickness is 20,5 mm ± 0,5 mm. The rigid polyurethane foam is the result of a chemical reaction between specifically formulated polyols and isocyanates and the expansion of the foam is achieved by using only water as blowing agent.
The density of the PU foam is 52 kg/m^3, with a tolerance of ± 2 kg/m^3; the overall density of the panel is about 73 kg/m^3.
Thanks to the high content of closed cells (more than 95%), the foam in the panel shows an initial thermal conductivity λ_i, as measured according to the standard ISO 8302, of 0,022 W/(mK) at a mean temperature of 10 °C, which is equivalent to a thermal resistance R of 0,93 (m^{2}K)/W. The special sandwich structure makes it possible to achieve high mechanical performance, represented by a flexural rigidity of 200,000 Nmm^2, declared according to the standards established by UNI EN 13403.
The use of aluminium for facings ensures a high level of hygiene and cleanliness, thus eliminating the problem related to the ageing of the insulating element and the release of particles. In addition, it guarantees the prevention of the proliferation of mould and bacteria. Indeed, as demonstrated by the testing conducted according to UNI EN 13403 (paragraph 7.4 “Microbial growth”), no significant growth of microorganisms takes place in the area surrounding the inoculation.
The panel may be used for the construction of ductworks within an air temperature range of -30 °C and +65 °C operating on a continuous basis. The panel underwent different national and international tests aimed at assessing its features of reaction to fire and obtained, amongst others, the Class 0-1 reaction to fire according to the “Decreto Ministeriale del 26/06/84” and a classification in class B-s3-d0 according to EN 13501-1 (SBI).
In 2014 , P3 dismissed the old production site (Via Don G. Cortese 3 , Ronchi Campanile) in favor of the new plant built in 2013 (Via Salvo D'Acquisto 5 , Ronchi Campanile), currently the only one active; the panels production considered in this study was therefore divided between the two sites according to the production volume.
Table 1 contains all the information about both the company and the product considered in this EPD.
According to the internal quality system, the panels produced can be divided into first, second and third choice; the study was carried out considering first and second choice panels, excluding therefore third choice ones, whose technical characteristics prevent their use for the intended use (ie realization of the HVAC ductworks).

Table 1 – Company data and product characteristics

Company Data	
Company	P3 s.r.l.
Production Facility	Via Salvo D'Acquisto, 5 - 35010 Ronchi di Campanile
Contact Person	Mela Ing. Nicola
Product Characteristics	
Product Description	Piral HD Hydrotec 15HP21 Preinsulated sandwich panel made of rigid PU foam with aluminium metallic facings
Application area	Construction of ductworks for HVAC
Principal sale area	HVAC ductworks for service sector and civil applications and industrial plants
Principal geographical sale areas	Italy and Western Europe
Service Temperatures [C°]	-30°C - +65°C
Functional Unit	1 m^2 of panel
Thickness of each component [mm]	aluminium facing : 0,08 mm PU rigid foam: 20,5 mm aluminium facing : 0,08 mm
Weight percentage of each single component [%]	See Table 2 for the technical specifications of the panel
Mass per unit area [kg/m^2]	See Table 2 for the technical specifications of the panel
Panel overall density [kg/m^3]	73
Blowing agent	Water
Thermal resistance [m^2K/W]	0,93
Reaction to fire behaviour	Class 0-1 according to D.M. 26/06/84 B-s3-d0 according to EN 13501-1
Flexural rigidity [Nmm^2]	200.000 according to UNI EN 13403
Microbial growth	No bacteria and mold proliferation according to UNI EN 13403
Fibrous material release	Not applicable
Hazardous substances content	Not applicable

Table 2 – Technical specifications of the panel for 1 m^2 ready for sale. Details are limited due to the degree of confidentiality of the specific formula

Material		Quantity (net)	Units	Percentage content
Overall mass of the panel[1]		**1,526**	**kg**	**100 %**
Embossed sheet of aluminium 80 µm 100% primary (alloy number 8079)		0,460	kg	30 %
Polyurethane foam Piral HD Hydrotec formula		1,066	kg kg	70 %
Of which:	Isocyanate + Polyols	0,895	kg	59 %
	Flame retardants, catalysts, dyes, surfactants	0,158	kg	10 %
	Water	0,013	kg	1 %
Overall mass of the packaging		0,027	kg	
PE		0,015	kg	
Multiball PE		0,012	kg	

[1]Excluding packaging and materials used for production processes only.

DECLARATION OF ENVIRONMENTAL PERFORMANCE

This section includes the main features as well as the results of the assessment of the environmental aspects carried out on the basis of a life cycle using the LCA methodology.

METHODOLOGY

The environmental performance was worked out as established by the General Programme Instructions of the International EPD System® and in accordance with the specific PCR 20012:12 *Air ducts - substantial materials*, version 1.2. The assessment methodology LCA makes it possible to establish the degree of environmental impacts caused by a product or service in terms of the consumption of resources and emissions in the environment, as well as the production of waste, as seen from a life cycle perspective ("from cradle to grave", as it were).
The UNI EN 15804 rules has not been aimed for the document reduction as a reference standard, since the air ducts are not considered as construction materials.
The data used, collected at both P3 production sites active during 2014, refer to the production of sandwich-type panels made of expanded polyurethane/aluminium used for HVAC and especially to the Piral HD Hydrotec 15HP21 panel (panel thickness 20,5 mm). Besides, the study also relied on the support of the database of Ecoinvent[2] and Plastics Europe[3].
The unit to which the results refer to (**functional unit**) is the ***production of 1 m^2 of panel***.

SYSTEM BOUDARIES AND MAIN HYPOTHESIS

The analysis considered the whole production system and was based on each single operation starting from the raw materials production phase, including the production and transportation of energy vectors, to the intermediate and the final product transport.
A preliminary outline of the considered system is illustrated in Figure 1, which shows three different levels related to specific life stage of the product:

- Upstream processes: production of raw materials, ancillary and packaging materials, the processing activities they undergo at chemical companies or different semifinished products companies facilities;
- Core process: raw and ancillary materials as well as packaging materials transportation to the production site, the realization of the specific liquid blend and the following PU formulation, the production of the panel itself and wastes production during process activities;
- Downstream processes: the final product distribution and end of life scenario of the panel and the relative packaging materials.

End of life scenario has been considered in a qualitative way.

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[2] www.ecoinvent.org
[3] www.plasticseurope.org

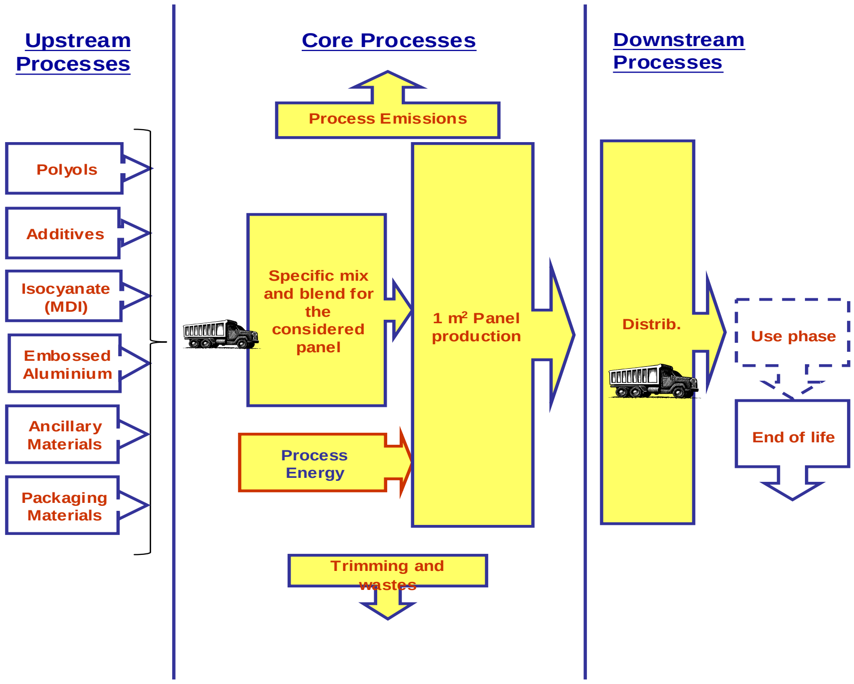

Figure 1 – Preliminary outline of the process considered. The yellow areas showthe operations carried out in **P3**. The dotted lines mark phases as viewed in qualitative way

As far as certain technical aspects are concerned, the following hypotheses may be underlined:

- Upstream processes:
  - the **production system of materials used** (raw materials and packaging) in the construction of the panel, includes all the phases from obtaining the raw materials from the subsoil up to their production and use;
  - the **quantities** of the above-mentioned materials and of the packaging materials are set in the product technical specifications;
- Core processes:
  - as for **raw materials transports**, the study considered the those necessary for the stock-up of semi finished products and of packaging materials;
  - concerning the **energies involved in the process** as for the **waste production** are quantified according to the overall volume produced;
  - the **activities carried out on the production site** (heating, lighting, consumption materials, etc.) are included within the system boundaries considering its overall production;
- Downstream processes:
  - **delivery mode** regards the transport of the product both in Italy and abroad. The parameters considered for the distances covered are 1,000 km abroad, while in Italy they are based on average distances within the three areas in which the country was divided for this purpose: north, centre and south;
  - the **product disposal** (as well as for its relative packaging materials) considers the landfill scenario

The data concerning energy issues refer to either the Italian or European energy mix, or to the specific energetic mix of the country in which the production process takes place.

ENVIRONMENTAL PERFORMANCES

In compliance with the General Programme Instructions of the International EPD System® and the specific Product Category Rule, below is a table illustrating the environmental performances of the Piral HD Hydrotec 15HP21 panel showing details of the natural resources consumption (with or without energy content) as well as the emission of pollutant substances and the production of waste.

Table 3 - Total consumption of non renewable resources related to the production of Piral HD Hydrotec 15HP21 panels. The data refer to a unit of 1 m^2 of panel

NON RENEWABLE RESOURCES 1 m^2 of 15HP21		Upstream Processes	Core Processes	Downstream Processes	TOTAL
Material Resources [unit data = grams]	Inert materials	2 674,43	<0,01	<0,01	2 674,43
	Aluminium	600,41	<0,01	<0,01	600,41
	Sodium Chloride	405,71	0,03	0,01	405,75
	Calcium Carbonate	189,86	1,17	1,21	192,24
	Oil	820,59	<0,01	<0,01	820,59
	Gas	594,28	<0,01	<0,01	594,28
	Other material resources	153,29	0,04	0,46	153,79
Total consumption of material resources in grams		5 438,57	1,24	1,68	5441,49
Energetic resources [unit data = grams]	Coal	2 015,89	40,20	1,80	2 057,89
	Oil	534,88	33,25	29,81	597,94
	Gas	320,12	77,58	2,23	399,93
	Other energetic resources	0,27	<0,01	4,46	4,73
Total consumption of energetic resources in grams		2 871,15	151,03	38,30	3 060,48

Table 4 -. Total consumption of renewable resources related to the production of Piral HD Hydrotec 15HP21 panels. The data refer to a unit of 1 m^2 of panel

RENEWABLE RESOURCES 1 m^2 of 15HP21		Upstream Processes	Core Processes	Downstream Processes	TOTALE
Total renewable resources in grams (biomass)		42,05	0,86	0,09	43,00
Energetic resources [MJ]	Hydroelectric	16,45	0,33	0,02	16,80
	Wind	0,52	0,01	<0,01	0,53
	Solar	1,11	<0,01	<0,01	1,11
Total consumption of energetic resources [MJ]		18,08	0,34	0,02	18,44

In the analyzed system no secondary, both material and energetic, resources are used; neither recovered energy flows are present.

Table 5 - Water consumption related to the production of Piral HD Hydrotec 15HP21 panels. The data refer to a unit of 1 m^2 of panel

Water consumption [kg]	Upstream Processes	Core Processes	Downstream Processes	TOTALE
Total water consumption	985,36	0,94	0,20	986,50
Water consumption directly involved in the core process		0,01		

The emissions released in water and in air are presented in an “aggregated” manner, providing the indicators established by the General Programme Instructions of the International EPD System® and by the specific Product Category Rule.
The results of this classification are listed in Table 6 below.

Table 6 – Potential contribution to the main environmental effects of the production process of Piral HD Hydrotec 15HP21 panels. The data refer to a unit of 1 m^2 of panel

Indicator	Units	Upstream Processes	Core Processes	Downstream Processes	TOTAL
Global Warming Potential (GWP_{100})	g CO_2 eq.	8 996,42	509,55	205,67	9 711,64
Photochemical Ozone Creation Potential (POCP)	g C_2H_4 eq.	2,87	0,09	0,03	2,99
Acidification Potential (AP)	g SO_2 eq.	33,16	1,67	0,83	35,66
Eutrophication Potential (EP)	g PO_4^{3-} eq	5,96	0,28	0,70	6,94

Other significant data related to the description of the environmental impacts of the system is the information connected with the production of waste, the overall energetic consumption and toxic emissions: numbers are shown in Table 7.

Table 7 – Other environmental indicators. The data refer to a unit of 1 m^2 of panel

Indicator	Units	Upstream Processes	Core Processes	Downstream Processes	TOTAL
Hazardous wastes	g	<0,01	2,78	<0,01	2,78
Other (non hazardous) wastes	g	11,65	180,17	<0,01	194,82
Non hazardous wastes adressed to recycling	g	-	16,32	-	16,32
Gross Energy Requirements	MJ	173,83	6,77	1,65	182,25
Of which Feedstock Energy (within the product)	MJ	37,10	-	-	37,10
Polluting/toxic substances emissions					
Isocyanate	*g/h*	-	*<1*[4]	-	*<1*
Volatile Organic Substances	*g/h*	-	*<115*[5]	-	*<115*
Dust	*mg/Nm*^{3}	-	*<5*[6]	-	*<5*

Data concerning the waste production are just relative to primary waste mass production values; secondary data, referring to wastes issue, have been included in the evaluation of the environmental impacts, but since they have already been considered in advance, their contribution has not been taken into account for what concerns the quantity of wastes directly generated by the panel production activities.

Concerning polluting/toxic substances air emissions, the possible organic substances coming out from the chimneys, whose concentrations are considerably below the relative thresholds, might be isocyanate, acetone, toluene, methyl ethyl ketone or other solvents.

[4] 1 g/h is the threshold established by the authorization provision 6066/EM for the air emissions of isocyanate containing compounds
[5] 115 g/h is the threshold established by the authorization provision 6066/EM for the air emissions of COV
[6] 5 mg/Nm^3 is the threshold established by the authorization provision 6066/EM for the air emissions of dust

USE PHASE AND END OF LIFE

As far as the use phase is concerned, the following considerations may be mentioned:

- Aluminium is not particularly degradable while polyurethane foam is non-putrefying, resistant to mould and stable from a dimensional point of view;
- The closed cells structure reduces remarkably the penetration of water, that within the space of a few years may, both in its liquid form and as steam, originate degradation processes by hydrolysis;
- Like all the foams having closed cells, also this one is subject to "ageing" effect, by which term we mean a decrease in its insulating properties due to the process which tends to equilibrate the gas contained in the cells with the gas in the atmosphere.

As for its disposal, it is possible to re-utilise the elements obtained from the ducts for insulation purposes in the building construction (floor or wall cavities). For other parts, as an alternative, it is possible to grind and separate (and possibly retrieve) the metal from the foam. Starting from the foam, once this has been separated from facings, a chemical process may be applied (glycolysis) which makes it possible to obtain a liquid reactive product to be mixed with a new polyol. Another hypothetical procedure is that of mixing the powder obtained by fine grinding of the foam with the polyol mixture intended for use in the production of insulating panels, at a proportional percentage of up to 10% by weight. As an alternative, on account of the high calorific power of the foam in spite of the flame retardants contained in it, the combustion process of the mixture with other waste, performed in special incinerators at very high temperatures makes it possible to “valorise” (waste-to-energy incineration) the "feedstock" energy available in the material.
Finally, sending the waste to the landfill after the grinding and compacting processes have been completed, should be seen as the last solution.
Since the performance in terms of thermal insulation ensured by Piral HD Hydrotec 15HP21 panels is strategic in evaluating the saving in energy related to the choice of preinsulated ducts, it was desired to go deeper into that aspect by examining the performances derived from the application of different types of technologies to a standard HVAC model.

For the sake of concreteness, below is an example of calculation used for a theoretical evaluation of the energy consumption associated with a standard HVAC model. Below are the data related to the project:

- HVAC system with a surface of 500 m^2 of ducts capable of supplying 8500 - 9000 m^3/h of treated air in a block of offices of about 600 – 650 m^2;
- Ductworks made of preinsulated panels Piral HD Hydrotec 15HP21, λ_u[7] = 0,024 W/(m K) (evaluated at a mean temperature of 10 °C) installed on a double ceiling or, as usual, not in the same room where the treated air is distributed;
- Operation of the system in summer: cooling of the workplace, estimated for an average time of 10 hours a day, for 5 days a week and for a total of 4 months (an overall total of 850 hours);
- The difference in temperature between internal air (about 17 °C) and external air (about 32 °C) is equivalent to 15°C.

7 The value for thermal conductivity mentioned refers to a value of λ_u used in the project, i.e. a value declared by the manufacturer which may be used by the designer for calculation purposes. This figure is also attributable to the same property during a period of time regarded as economically reasonable in normal conditions allowing for any possible ageing or statistical corrections.

Considering that the above value for thermal conductivity refers to a mean temperature of 10 °C, in order to calculate the actual performance of the ducts system in terms of energy it will be necessary to consider the value of λ_u at a mean working temperature of 25 °C. To calculate this conversion (Table 5) we must use the rules listed in EN ISO 10456 – 2007 (*Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values*):

$$\lambda_2 = \lambda_1 * F_t$$

where **Ft** is the correctional factor for the working temperature, while the starting value for thermal conductivity is the figure declared by the manufacturer at 10 °C.

$$F_t = \exp[f_T*(T2-T1)]$$

with f_T being equivalent to the conversion coefficient for the fixed temperature established by the standard EN ISO 10456, which is 0,0055 for polyurethane foams with a thermal conductivity value of up to 0,025 W/(mK).

Table 8 – conversion of the values for thermal conductivity

Solution	λ_1 [W/(m K)]	f_T [1/K]	T2-T1 [K]	F_t	λ_2 [(W/(mK)]
Polyurethane	0,024	0,0055	15	1,086	0,0261

The energy consumption was worked out through an evaluation of the thermal power Q_d (kW) lost through the walls of the HVAC system by applying the following formula:

$$Q_d = U * \Delta T * S$$

where **U** is the thermal transmittance of the ducts' walls, **ΔT** the difference in temperature between external and internal air and **S** the total surface of the ducts system. Table 9 shows the above-mentioned calculations:

Table 9 – Physical/thermal evaluation of energy dispersion in the standard model

	Units	Piral HD Hydrotec 15HP21 panel
Thickness	m	0,0205 (insulating material 0,020)
Thermal conductivity λ_u	W/(m K)	0,0261
Resist. of insulating material	$(m^2 K)/W$	0,766
Internal liminar resist.	$(m^2 K)/W$	0,043
External liminar resist.	$(m^2 K)/W$	0,0122
Total resistance	$(m^2 K)/W$	0,93
Thermal transmittance U	$W/(m^2 K)$	1,07
ΔT	K	15
Lost thermal power Q_d	kW	8,05

Having hypothesised an operating time of 850 hours/year, the amount of thermal energy lost is about 6845 kWh (just for the summer period) which, expressed in a different unit of measure, is equivalent to 24642 MJ.

ADDITIONAL INFORMATION AND REFERENCES

This section of the declaration includes additional information connected with company management and with the validation procedure of the document.

TECHNICAL PERFORMANCES OF THE PRODUCT

To complete the description of the product being analysed, here is a brief illustration of other features offered by the Piral HD Hydrotec 15HP21 panel:

- **Low weight:** the extreme lightness of the panel makes it possible to reduce the weight of the load supported by the bearing structures, by the bracketing points and to reduce the labour force and the amount of materials needed for the final installation of the duct;
- **Low noise level:** the sandwich-type structure of the panel (aluminium-insulating material-aluminium) guarantees good acoustical behaviour;
- **Durability:** the external aluminium sheets coupled with the insulating material impart sturdiness, rigidity and good resistance to corrosion, to erosion and to deformation, even when the panel is used in particular applications;
- **Safety:** the Piral HD Hydrotec 15HP21 panel shows a limited degree of participation in case of fire accidents, it does not drip and the fumes produced have low degrees of opacity and toxicity, thus meeting the criteria established by the most stringent international standards.

ENVIRONMENTAL PHILOSOPHY OF THE COMPANY

Since the year 1996 P3 has operated according to the UNI EN ISO 9001-2008 standards, and later achieved the environmental certification UNI EN ISO 14001-2004 and OHSAS 18001-99; recently the company has also obtained the energetic certification according to UNI EN ISO 50001-2011 as well as a certified attestation of the economical/financial management following UNI ISO 10014-2007 principles.

For broader diffusion of the outstanding environmental performance of its products, P3 has published this environmental product declaration in compliance with the General Programme Instructions of the International EPD System® and the specific PCR.

Among the actions aimed at perfecting its efforts in environmental matters, P3 would like to mention the following:

- increase in the stock-up of raw materials in re-usable 1000 kg small tanks, thus reducing the number of metal containers (drums) used and the scrap produced;
- introduction of a coefficient to express the waste/m^2 ratio of produced panels. This makes it possible to evaluate this parameter and to decide what actions should be taken in order to improve on it;
- constant monitoring of the panels density in order to identify sensitive parameters and thus improve productivity while still using the same raw materials for production;

- sensitising the supplier of aluminium sheets to the possibility of using alloys, which may be obtained from recycled material and offer the same level of performance;
- reduction in energy consumption, by enacting a policy aimed at minimising waste (e.g. turning the PC off during the lunch break or while not in use, lowering the heating temperature by 2 °C during the winter season, etc.).
- the company has recently obtained the energetic certification according to UNI EN ISO 50001-2011, in order to improve its integrated approach to quality management, specifically operating a continuous monitoring strategy on a key issue represented by the energetic consumptions;
- the recent renovation gave the chance to deeply modify the stock up logistic of the chemicals, increasing consistently the overall tanks storage capacity and using a full automatic dosing system controlled by a programmable PLC, for the blending operations.

CONTRIBUTION OF GENERIC DATA

The employment in this study of generic data characterised only the production of the mixture for the construction of the panel. When verification took place, it was calculated that the influence of generic data is inferior to 10%.

DIFFERENCES WITH THE PREVIOUS EPD VERSIONS

Analyzing the environmental performances, and comparing these ones with those reported in the previous EPD versions, it is possible to note a variation that involves all the indicators. The main causes can be identified in: databases updating process, new formula for the PU foam and the new production plant realization.

Table 10 – Environmental performances comparison with previous EPD versions

Environmental performance	Percentage variation compared to year 2012 data (EPD 2013)	Causes
Total non renewable material resources in grams	40,8%	databases updating process
Total non renewable energetic resources in grams	-11,2%	databases updating process
Total renewable material resources in grams	-62,8%	databases updating process
Total renewable energetic resources in MJ	7,1%	databases updating process
Water consumption – data in kg	781,9%	databases updating process
Hazardous wastes	-86,7%	databases updating process and new plant realization
Non hazardous wastes	-49,1%	databases updating process and new plant realization
Global Warming Potential (GWP_{100})	-13,7%	databases updating process and new formula for PU foam
Photochemical Ozone Creation Potential (POCP)	-24,9%	databases updating process and new formula for PU foam
Acidification Potential	-14,4%	databases updating process and new formula for PU foam
Eutrophication Potential	-85,2%	databases updating process and new formula for PU foam

The considerable increase in water consumption can be mainly explained with the isocyanate ecoprofile updating: the new numbers have a bad impact on the final results of this study.

CONTACTS

For further information about the activities undertaken by P3 or about this environmental declaration, please contact Mr Nicola Mela, Tel. 0499070301, e-mail n.mela @p3italy.it (Via Salvo D'Acquisto, 5 – 35010 Ronchi di Campanile, suburb of Villafranca Padovana).
As an alternative, you may visit our site http://www.p3italy.it/.
Technical support was offered to P3 by the Study Life Cycle Engineering in Turin (www.studiolce.it - info@studiolce.it).

REFERENCES

- International EPD Consortium; General Programme Instructions (EPD); ver 2.01, 2013 (www.environdec.com);
- PCR 2012:12; CPC 36950: Air ducts, substantial materials; ver1.2 of 29/04/2014, (www.environdec.com);
- Life Cycle Assessment with the intent of obtaining the EPD for the Pyral HD 15HP21 panel (panel thickness 20,5 mm) made of rigid PU foam – renewal, Final Report 2015 November 30th (Life Cycle Engineering, www.studiolce.it);
- P3 technical data sheets (http://www.p3italy.it/);
- Ecoinvent Database, www.wcoinvent.ch;
- Euopean Aluminium Association database; http://www.alueurope.eu ;
- Plastics Europe database; www.plasticseurope.com.

INFORMATION ABOUT THE CERTIFYING BODY AND ABOUT THE PCR

Product category rules (PCR) review was conducted by: *The technical Committee of the International EPD System , Chair: Claudia A. Peña* *Contact via info@environdec.com*
Independent verification of the declaration and data, according to ISO 14025:2006 □ *EPD process certification* *x EPD verification*
Third party verifier: *RINA Services S.p.A.* Certification Body (www.rina.org) *Accredited or approved by:* *ACCREDIA, certificate number N.001H*

This EPD is available at www.environdec.com. Please note that EPDs obtained with different programs may not be comparable

GLOSSARY

Categories of environmental impact taken into consideration:

- Acidification Potential(AP): phenomenon by which atmospheric rainfall has a pH which is lower than average. This may cause damage in forests and cultivated fields, as well as in water ecosystems and objects in general. This phenomenon is due to the emissions of SO_2, of NO_x, and NH_3, which are included in the Acidification Potential (AP) index expressed in masses of H^+ produced.

- Global Warming Potential (GWP): phenomenon by which the infrared rays emitted by the earth's surface are absorbed by the molecules in the atmosphere as a result of solar warming and then re-emitted in the form of heat, thus giving rise to a process of global warming of the atmosphere. The indicator used for this purpose is GWP (Global Warming Potential). This mainly includes the emissions of carbon dioxide, the main greenhouse gas, as well as other gases with a lower degree of absorption of infrared rays, such as methane (CH_4), nitrogen protoxide (N_2O), chlorofluorocarbons (CFC), which are expressed according to the degree of absorption of CO_2 (g CO_2).

- Eutrophication Potential (EP): enrichment of the watercourses by the addition of nutrients. This causes imbalance in water ecosystems due to the overdevelopment encouraged by the excessive presence of nourishing substances. In particular, the Eutrophication Potential (EP) includes phosphorous and nitrogen salts and it is expressed in grams of oxygen (g O_2).

- Photochemical Ozone Creation Potential (POCP): production of compounds which by the action of light are capable of encouraging an oxidising reaction leading to the production of ozone in the troposphere. The indicator POCP (Photochemical Ozone Creation Potential) includes especially VOC (volatile organic compounds) and is expressed in grams of ethylene (g C_2H_4).