

**LCA methodology in the evaluation of building intervention. Application to the comparison among two typology of glazed surface**

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The tight takes in consideration the glass, that wrap part of the building that allows the passage of the light and of the solar energy.

It study of this material results then fundamental for a correct environmental planning.

Leaving from this consideration is unrolled a study, in the first place of the whole cycle life and of the casting off of two double glazing solutions, of which an innovative and a traditional and, in an accordance with moment, am analysed the energetic consumption environmental, consequent on the adoption of a solution rather than the other, in a project of building situated in three hypothetical places, Turin, Rome and Trapani.

The first analysis has been effected through the new LCA methodology (Life Cycle Assessment) known in Italy as analysis of the life cycle, recognized currently to level international ( ISO 14040 and following ) as orchestrate it more accredited to study the energetic-environmental scenery of a productive process or of a product.

The objectify of the analysis is the elaboration of a eco-profile of two glass products among the more in use:

1. the traditional insulating glass door, or a constituted glass door from two colourless panes of glass, with both the level faces, gotten from a float manufacturing process, for casting on bathe metallic in controlled atmosphere, of 4mm thickness each, separate from a glued metallic spacer with long continuity the perimeter, that gives rise to an air interspace of 12mm.
2. a low-emission insulating glass door, that is a constituted glass door from two panes of glass, of which one of float glass colourless and the other of re-cooked glass emission low pay by deposit of metallic oxide and metals for cathode pulverization under void inclined and in brings into relief electromagnetic of elevated intensity, of thickness 4 mm each, separate from a glued metallic spacer with long continuity the perimeter, that gives rise to an air interspace of 12mm.

To pass to the layout of the eco-profiles of the two produced, is necessary identify and quantify the resource consumption and of energy and the release in the environment, creditable to the production process of the two glazed ( LCA phase definite Inventory ) and, subsequently, proceed to a qualitative and quantitative characterization of the environmental consequences and to a they evaluation ( LCA phase definite Analysis of the impact ), reporting the result to a functional unity, in this case 1 M<sup>2</sup> of product.

After have examined the gotten result had possible perform a comparison among the two typology product, is in finishes energetic, that environmental.

A first meaningful give is the value of the energy of total consumption, creditable to the production process of an unity of the two typology glass door, in particular:

1. for the classical insulating glass door had calculated a protect value to 350, 75 MJ;

2. for the low-emission insulating glass door had calculated a protect value to 357, 70 MJ. The difference of energetic consumption is to attribute to the different type production of the two glazed, in particular for the production of the low glass emission comes employee a natural gas of greater quantity. This glass door, besides, has to effect, before come in glassworks to be assembled in double glazing, a greater transport in comparison with the classical insulating glass door. For when concerns the consumption of raw materials in the two process production, the comparison is happened in finishes quantities. The differences among the quantity of the raw materials are to attribute to the metal deposition and to the transport that suffers the low glass emission, before come in glassworks.

In the analysis phase of the impact, it is has to perform the classification and the standardization, in such way to convert the result of the inventory in opportune impact of indicators, that are able be used directly or as basic for possible optional environmental evaluations. To this elements are been able add evaluation methods of the impact, that using grouping formality and weighing, they conduct to the layout of a global index, pertaining to the product in examination.

In this optics is are analysed the principal environmental effects:

- greenhouse effect;
- thinning of the band of ozone;
- acidification;
- eutrophication;
- formation of photochemical smog;

and had calculated the values of potential on the considered effects, I expressed in the opportune unit of measurement.

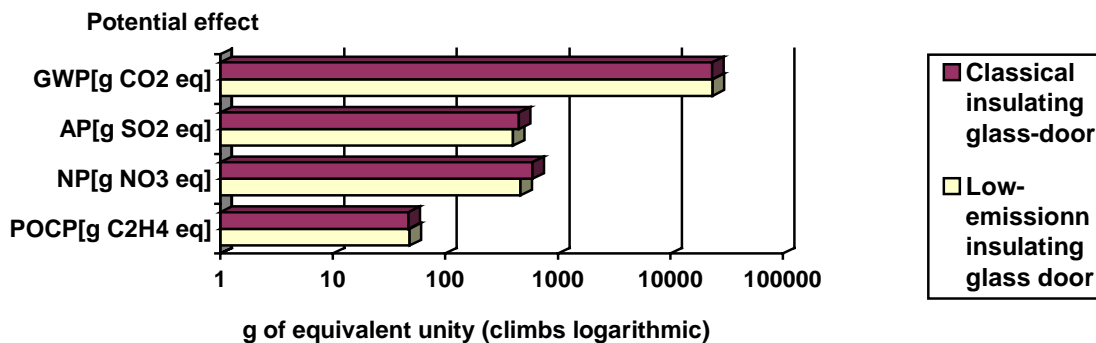


Figure 1: Potential effects for 1 M² of product

In the standardization phase uses as evaluation criterion to adopt, that of the less is better. That, in other words, it wants say that is not held in consideration the effect type, and then their intrinsic degree of risk, but only its quantitative value. From the analysis is not deduced that of the two produced is environmentally better because the differences among the index are least.

Passes then to the phase of evaluation across which is are reached to an impact of global index for each evaluation method used, pertaining to the product in examination. From that had possible perform a comparison among the products:

Ecopoint for 1 M² of product		
Value	Traditional insulating glass door	Low-emission insulating glass door
	21767	18954
EPS for 1 M² of product		
Value (ELU or EURO)	Traditional insulating glass door	Low-emission insulating glass door
	12,56	27,1
Ecoindicator '99 for 1 M² of product		
Value Millipoint at kg	Traditional insulating glass door	Low-emission insulating glass door
	3715	3771

Chart 1: Values of the impact of global index

From the moment that the indicators had formulated in accordance with principle of valuation/weighting different the information is reversed applying an or the other method. In particular the approach on which the indicators are founded, she/he/it/you is for the Ecoindicator'99 scientific, for the economic EPS environmental, and for the Ecopoint political.

It will point out that in the LCA study of the classical insulating glass products and of the low-emission insulating glass, in the tight provost, not is considered neither recycles interns, neither recycles expresses.

The second analysis concerns the management phase of the two produced and, allows to calculate the energetic consumption environmental, consequent on the adoption of a solution rather than the other, in a project of building situated in three hypothetical places, Turin, Rome and Trapani.

From here the tight is proposed to analyse a study case of a building to use tertiary, put to Turin, to Rome and to Trapani of which comes calculated:

1. the quantity of in demand energy for the heating of the building with the employment of low-emission insulating glass door;
2. the quantity of in demand energy for the heating of the building with the employment of classical insulating glass door.

To perform this calculation had use the method of calculate FEN (energetic requirement normalized) suitable in the law 10/91.

In relationship to the products in examination are performed calculates, in management phase of the products, tie to the winter energetic requirement in a building to officiate, with structures principal in steel, and with express wrap in tile and glass.

The gotten result, for the analysis of the whole useful life, they go multiplied by the year of useful life of the transparent component, esteemed middly of 10 years.

Pointing out the two formality heating system, traditional boiler or pomp of electric heat, will have, respectively, or a methane of energetic saving, or a saving of electricity.

In both cases, a calculated time the value of the consumption of the energy, has been done an analysis in finishes environmental.

To do that is used the Boustead software, that considers besides the production of the energetic source, even its use and its distribution. From the calculation, that constitutes the inventory phase of a LCA application integrated in the data banks, had possible go up again to all the issues and the refusal relating to the product.

The gotten energetic-environmental result reported, as previously, to a glass door square metre, at three analysis place, and to the type of use heating system makes oneself conspicuous as the phase of production is strongly more important is in finishes energetic that environmental of that of management.

How to last evaluation am formulated a global index of the energetic saving and of each potential effect, consequent from the use of low-emission insulating glass doors.

The values are reported, as previously, to a glass door square metre, at three analysis place, and to the type of use heating system.

Heating system type	Analysis city	Oil type	Saving of total energy [MJ]
Traditional boiler	Turin	Methane	2550,3
	Rome	Methane	971,8
	Trapani	Methane	318,3
Pomp	Turin	Electricity	1986,05
	Rome	Electricity	762,05
	Trapani	Electricity	242,05

Heating system type	Analysis city	Oil type	Greenhouse effect saving [g of CO2 [eq].]
Traditional boiler	Turin	Methane	135361,2
	Rome	Methane	51651,5
	Trapani	Methane	16991
Pomp	Turin	Electricity	103832,9
	Rome	Electricity	39902,9
	Trapani	Electricity	12774,9

Heating system type	Analysis city	Oil type	Acidification saving [g of SO2 [eq].]
Traditional boiler	Turin	Methane	1401
	Rome	Methane	569
	Trapani	Methane	224
Pomp	Turin	Electricity	2118
	Rome	Electricity	850
	Trapani	Electricity	312

Heating system type	Analysis city	Oil type	Eutrophication saving [g of NO3- [eq].]
Traditional boiler	Turin	Methane	3995
	Rome	Methane	1608
	Trapani	Methane	621
Pomp	Turin	Electricity	1611
	Rome	Electricity	702
	Trapani	Electricity	316

Heating system type	Analysis city	Oil type	Formation saving of photochemical smog [g of C2H4eq.]
Traditional boiler	Turin	Methane	33,5
	Rome	Methane	13,4
	Drill	Methane	7,5
Pomp [of]	Turin	Electricity	675,5
	Rome	Electricity	261,5
	Drill	Electricity	76,5

In conclusion across the analysis of the phase of production of the insulating glass door is classical that low emission, I am appeared evident as the environmental and greater energetic load is to attribute to production of the float glass, to this intention is would be able look for to improve or plan part of the productive process.

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