LIFE CYCLE ANALYSIS AND EUROPEAN ECO-LABEL IN THE CERAMIC TILE MANUFACTURING PROCESS

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1. INTRODUCTION

The European eco-label is the official common labelling system for all EU Member States, which identifies products that are respectful of the environment. To be awarded the European eco-label, rigid ceramic tiles for flooring must comply with European Commission decision 2002/272/EC, dated 25/03/2002, establishing the ecological criteria for the award of the EU eco-label.

Before being awarded the European eco-label, a rigorous analysis is made of the environmental impact of the product's entire life cycle. This analysis starts with the extraction of the raw materials, and follows the product's ecological route through manufacture, distribution (including packaging), use by the consumer and finally, disposal. One of the tools most widely accepted by the scientific community to evaluate environmental impact is the Life Cycle Assessment (LCA), an analytical procedure that evaluates the complete life cycle of a process or product. This methodology plays a key role in identifying possible "black spots" in the product or service production chain, as well as identifying the most suitable set of ecological criteria available to meet the ecological criteria defined.

The main objective of this study was to show the possibilities of ceramic tile manufacturing industries of adapting to the criteria established to be awarded the European eco-label. In order to do this, values were taken from an LCA study carried out of several ceramic floor and wall tile manufacturing companies in Castellón province (Spain).

2. RESULTS

Figure 1 shows the normalised eco-profile of the 10 companies studied with the LCA categories by process stage. Figure 2 presents the details of the impact of each process stage of two companies in the sector, one of which used red clay bodies and the other white clay bodies. Analysis of the set of values of the inventory shows that the ceramic sector can put itself firmly on the road to complying with the principles of sustainability. With respect to compliance with the criteria for award of the European eco-label, figures 2, 3 and 4 show the following status of the companies with regard to air pollutants and energy consumption in the firing process (in the case of SO_2 emissions, all the companies complied with the requirement not to exceed the 1500 mg per square metre limit).

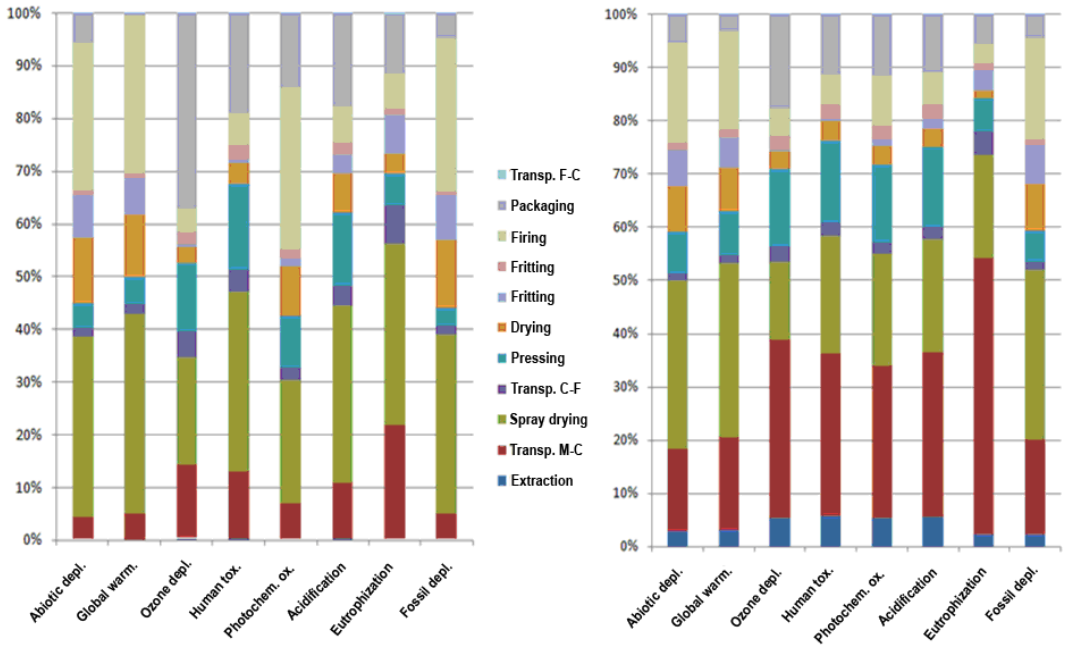

Figure 1. Percentage impact of each process stage for two companies (red clay to the left and white clay to the right).

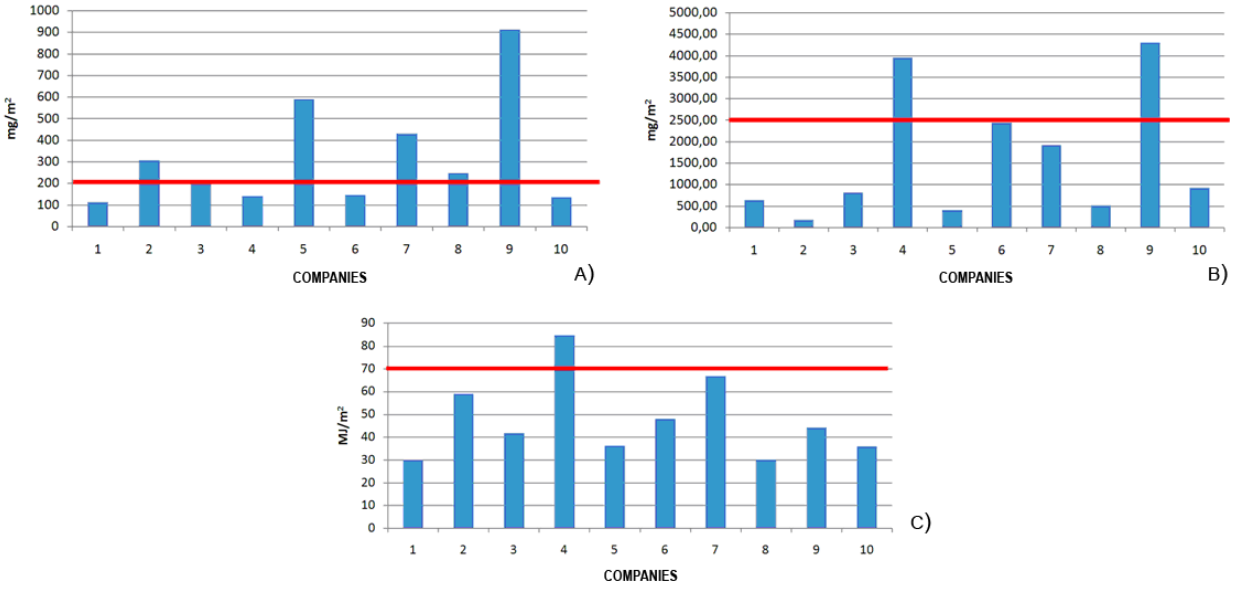

Figure 2. A) Particle emissions in firing. B) NOx emissions in firing. C) Energy consumption in firing.

3. DISCUSSION AND CONCLUSIONS

Almost all the companies can comply with all the sustainability criteria required for obtaining the European eco-label. If these values are exceeded, as is the case of some companies, they can be achieved by applying the minimum best available techniques (BATs), thus improving kiln design or recovering excess heat from kilns

to save energy, using bag filters for PM emissions, or minimizing the use of nitrogen compounds as raw materials and additives to reduce nitrogen oxides.

When comparing tile manufacturing according to the clay body, it was observed that the tiles with a white clay body had a higher environmental impact, primarily due to the greater energy consumption in extracting the raw materials and the distance of the mines from the ceramic companies.

The results of the LCA inventory analysis highlight the fact that many companies in the ceramic sector are able to comply with the sustainability criteria defined for award of the European eco-label.