GLASS FIBRE FROM SUSTAINABLE RECYCLING OF USELESS WIND POWERED GENERATOR BLADES

F.V. González[1], A.A. Pesquera1,C.D. Vega[1]

[1]CARTIF Centro Tecnológico, Boecillo, Valladolid, 47151, España
Presenting author email: fraver@cartif.es

The continuos growth of the waste from eolic industry is consecuence of two factors. The first of it, is the continuos develop of this industry during the first decade of the century XX and, in second time, come from the antiquity of the wind farms installed. Taking into account a decomision period of wind farms of 20 years, the expected amount of waste from useless wind powered blades to 2027 will be of 12.000 ton in Spain and about 30.000 ton in Europe (AEE, 2017), figure 1.

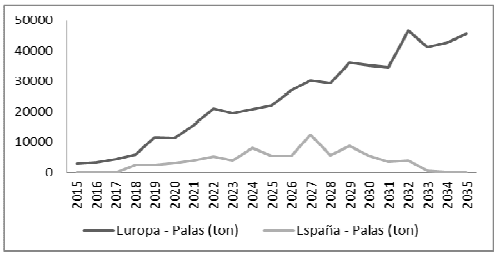

Figure 1.Evolution of waste from useleswind power blades (fte. Elaboración propia).

Regarding the environmental problem caused from this kind of structures once reach their useful life, is consecuence of diferents aspects. In first time, as we said before, is the large amount of this kind of waste expected, as well as, the high volume of the wind powered blades which causes important problems when this wastes are landfilled. And in the other hand, the material which are manufactured de wind powered blades, around a 60-70% (Wind Europe, 2017), in weight of glass fibre reinforced plastics, cause thar the management of useless wind powered blades by others treatments, chemical or thermal, generate polluting emission to atmosphere, in addition to, this processes need more energy consumption for their management (Composites UK, 2016).

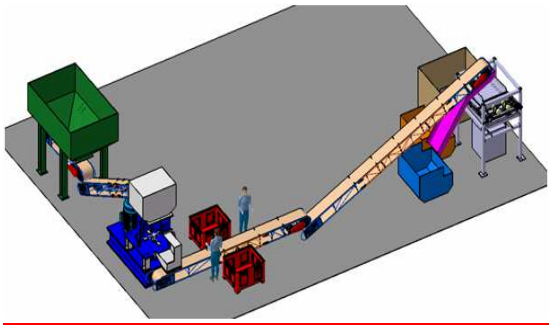

Figure 2. Mechanical prototype plan designed in LIFE REFIBRE project

This is why, the LIFE REFIBRE Project (ENV/ES/000192), have designed and built an innovative prototype to recycle the useless wind powered blades, figure 2. There are two principal elements which compound the prototype plant, the milling and the separation-classification system, both work in a two stages process to get the final objective of the prototype plant, gets the optimum size of recycled glass fibre.

The process designed for the mechanical recycling of useless wind powered blades is executed in two steps. In the first step, the pre-treatment wind powered blades are crushed in a continuous process in order to break the structure and, at a later stage, get the separation of the material through the separation system designed. After the components separation, the glass fibre is submitted to a second milling process. It second milling process is a batch process in which we can monitor the time working of the milling system in order to reduce the glass fibre size. Finally, the glass fibre obtained is classified according his size in order to get the optimum size for the asphalt mixtures.

This actuation will allow the sustainable recycling of the glass fibre reinforced plastics (GFRP), as well as, deal with the final management of the useless wind powered blades complying with environmental policies and priorities of the European Union through the implementation of Directive 2008/98/EC on waste management, reduction of landfill and increasing recycling in a more environmentally sustainable way.

Finally, through these processes, it is possible to close the life cycle of this waste, giving a high added value to both residue and the new fibre application. These fibres will be introduced in asphalt mixes for road pavement construction showing great improvement on road pavement mechanical properties (e.g. increasing durability and reducing maintenance requirements).

As a resume, within LIFE REFIBRE project framework, the implementation tasks will be carried out:

- Optimization of the logistic method and of the collection and management of waste.
- Construction of a prototype by which damaged blades or blades that are at the end of its useful life will be mechanically recycled.
- Production of glass fibres, which are characterized to verify that they are optimal for their incorporation into asphalt mixtures.
- Construction of 1500 meters of asphalt pavement and continuing analysis of the variation of its mechanical properties, to demonstrate the beneficial contribution of these fibres to the pavement.
- Environmental, social and economic evaluation of the Project.
- Dissemination of its results and collaboration in its implementation in other urban areas.