PRODUCTION OF BRIQUETTES FOR ENERGY RECOVERY OF FURNITURE WASTE WITH POLYURETHANE FOAMS

PATENTED TECHNOLOGY

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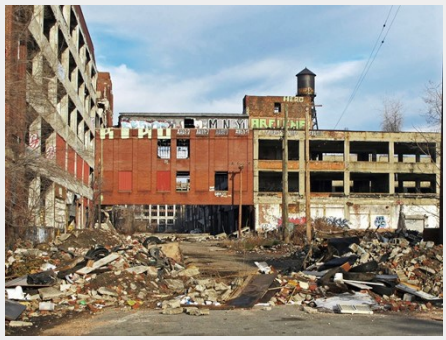
ABSTRACT

The Research Group "Waste, energy, environment and nanotechnology" (WEEN) from the University of Alicante has developed a new compact material and a **production process of briquettes of furniture waste**. This process makes it possible to carry out the management and the energy recovery of this waste, avoiding the environmental problems associated with its landfilling and also making it easier to transport, handle and store.

The **briquettes** obtained, show physicochemical characteristics similar to the conventional and they have a **high energy density** being able to be used as **fuel for thermal power plants or industrial boilers**.

Companies in the waste treatment sector and the furniture industry that are interested in commercial exploitation of this technology through licensing agreements and / or technical cooperation are sought.



INTRODUCTION

Lignocellulosic wastes, such as wood, are being widely used as a renewable energy due to the significant reduction in the emission of acid gases and greenhouse, as well as improved management of natural resources. However, one of the main disadvantages of this waste is that energy is limited because of their low density.

On the other hand, current European legislation does not allow the burning of chemically treated wood (such as furniture waste, demolition wood, etc.) for domestic use. Likewise, landfilling of these wastes should be avoided because of their high energy content, low density and environmental problems they cause.

Alternatively, these wastes can be energy recovered in power plants and industrial boilers through direct combustion or co-firing with coal, the latter having great environmental benefits.

A common problem in the municipal solid waste treatment plants is the management of bulky waste such as furniture waste, and it does not currently exist an appropriate solution to this problem. Furniture waste is mainly composed of wood and upholstery foam, which show a high calorific value (the Net Calorific Value of wood and polyurethane foams are 16 and 24 MJ/kg, respectively), even though foams having a low density.

The main technical drawback of co-firing is the density difference between the fuels used, being able to cause problems of feed fuel to the boiler. In this regard, densification of biomass into pellets or briquettes with high energy density appears as a solution, while reducing costs in transportation, handling and storage.

TECHNICAL DESCRIPTION

The Research Group "Waste, energy, environment and nanotechnology" (WEEN) from the University of Alicante has developed a new compact material and a production process of briquettes with high energetic content, in order to carry out a proper and viable treatment and energy recovery from waste from the furniture industry (wood and upholstery foams mainly).

Due to the flexible character of polyurethane foams, a densification of separate foam is not simple. The solution provided in the present invention uses a mixture of the two components (wood and polyurethane foams) for briquettes.

The compacted material developed is formed mainly by biomass and foam (Figure 1). Whereas biomass (lignocellulosic) consists of waste wood or timber products, the foam is composed of polyurethane foam or similar from sofas, cushions, pillows, chairs, mattresses, etc.

Figure 1.- Initial mixture of furniture waste with polyurethane foam

The method for producing briquettes of the present invention comprises the following steps:

1) Crushing of wood waste and foam to a certain size.

2) Compacting of the material obtained into the shape of briquettes by a hydraulic piston press briquette machine.

In the different laboratory assays, the research group has studied and defined the process parameters, which are the most influential on the physicochemical characteristics of the briquette such as: percentage of mixture of materials, the size of crushing, appropriate humidity and compaction pressure.

As a result of this research, we have obtained briquettes with physicochemical characteristics similar to conventional briquettes (made of wood) in terms of resistance to fragmentation and abrasion, durability (DU - according to European standard CEN-TS 14588: 2003), density and calorific value, appropriate for use as industrial fuel (Figure 2).

Figure 2.- Briquette obtained with a mixture of furniture waste and polyurethane foam

Through this procedure can, briquettes of 53 mm diameter and variable height between 20 and 60 cm be obtained, although the process is applicable to any size briquettes. Furthermore, the briquette can have any shape, either in brick, cylindrical, tablet-shaped, square or the like.

ADVANTAGES AND INNOVATIVE ASPECTS

- The new briquetting process from waste furniture **solves the current problem of management of this waste**.
- The process allows **energy recovery and treatment** of this waste in a **simple and feasible way** to **avoid the environmental problems** associated with disposal in landfills.
- The **densification of the material** in the shape of briquettes makes the **transportation, handling and storage** of this waste **easier and cheaper**.
- The **briquettes** produced have **high energy density** and have **physicochemical characteristics** (resistance to fragmentation and abrasion, durability, density, etc.) **similar to conventional ones**.
- The briquettes can be used as **fuel in thermal power plants or industrial boilers, solving the drawbacks** of low density, uniformity of size and shape, as well as the feeding problems in these combustion plants associated with these materials.
- This process can be **applied to briquettes of any size and shape**.

CURRENT STATE OF DEVELOPMENT

The manufacturing process has been successfully tested in the laboratory and a pre-industrial scale. The research group has made various studies in which various parameters have been studied, among others: the size of crushed material, amount of foam mix (5-35%) moisture and compaction pressure (30-100 MPa).

As a result of this research, we have obtained **briquettes with similar physical-chemical characteristics to the conventional briquettes** (fragmentation resistance, abrasion, durability, density and calorific value) fully appropriate for **use as fuel for thermal power plants or industrial boilers conventional briquettes**.

For these tests, a hydraulic piston press briquette machine has been used (Figure 3) to obtain briquettes with 53 mm diameter and a variable height between 20 and 60 cm, although the process is applicable to any size and briquette shape (brick, cylindrical, tablet-shaped, square or similar).

Figure 3.- Hydraulic piston press briquette machine used

MARKET APPLICATIONS

Municipal solid waste treatment plants or furniture industries interested in the energy recovery of this waste.

COLLABORATION SOUGHT

Companies interested in acquiring this technology for use and / or commercial exploitation, through the following:

- License agreements to transfer the patent rights to use, manufacture or marketing of the technology to third parties.
- Agreement R & D project (technical cooperation) for the use or application of technology in other waste or in other sectors.

- Subcontracting agreement for technical assistance, training, etc.

INTELLECTUAL PROPERTY RIGHTS

This technology is protected by granted patent.

- Patent title: “Procedimiento para la fabricación de briquetas para la valorización energética de residuos de muebles”
- Application number: 201530678
- Application date: 18/05/2015

MARKET APPLICATION (4)

Construction and Architecture
Pollution and Environmental Impact
Wood and Furniture
Materials and Nanotechnology