

CONFORMER'S MACHINE IN THE PRODUCTION OF HUBS

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Resumen: Este documento describe el proyecto realizado, con el objetivo de contribuir a la disminución de la contaminación ambiental, causada por los neumáticos desechados en la ciudad de Ibarra. Según su Gobierno Autónomo Descentralizado, se tiene una recolección mensual de 150 neumáticos y son causantes de enfermedades, malestar a la imagen de la sociedad y su incineración contamina el medio ambiente. Mediante el reciclado del caucho empleando la trituración y conformado, se pretende obtener varios productos como: bujes, tejas, planchas anti impacto, contribuyendo con la matriz productiva de la ciudad. Según datos obtenidos en el medio y con normas empleadas en otros proyectos de la misma índole. Se determinó los requisitos para el diseño y construcción de una máquina de conformado. La máquina de conformado que emplea el 60% del polvo triturado, con un área de trabajo de 22400 mm², y obtiene una producción media de 12 elementos diarios.

Palabras claves: reciclado de neumático, granulometría, conformado de caucho, disminución de contaminación ambiental, desarrollo económico.

Abstract:

This document describes the project carried out, with the aim of contributing to the reduction of environmental pollution, caused by discarded tires in the city of Ibarra. According to its Decentralized Autonomous Government, there is a monthly collection of 150 tires and are causing illness, discomfort to the image of society and its incineration pollutes the environment. By recycling the rubber using shredding and shaping, it is intended to obtain various products such as bushings, tiles, plates, contributing to the productive matrix of the city. According to data obtained in the medium and with standards used in other projects of the same nature. The requirements for the design and construction of a forming machine were determined.

The forming machine employs 60% of the crushed powder, with a work area of 22400 mm², and obtains an average production of 12 elements daily.

Keywords: tire recycling, granulomere, rubber forming, reduction of environmental pollution, economic development.

Conformed Machine

Tires are elements that degrade in 500 years, these are foci of diseases if stored in places that are not adequate (CUZCO, 2015). In the city of Ibarra, about 10,000 tires are stored in the municipal garbage dump, without a suitable way to recycle them, they occupy space and cause discomfort (SALAZAR, 2016). An economic amount must be paid in the burning of tires in cement kilns producing CO₂, causing environmental pollution and affecting human health, as well as abandonment and incineration in places not approved by the norms established in the Constitution of the Republic, "Which are found in Article 154 and in accordance with Article 17 of the Statutes of the Administrative Juridical Regime of the Executive Function" (OFFICIAL REGISTRY 937, 2013). The acquisition of equipment for the reuse of rubber is synonymous with high costs since it is manufactured in other countries, generating disinterest in the purchase of this machinery (SALAZAR, 2016).

A forming machine will be built in which beneficial products are made to society, and its construction will be related to the recycling capacity in the city's collection centers, contributing to the reduction of pollution and to the development of the productive matrix.

Importance of the problem

The pollution in the city of Ibarra is a problem for its inhabitants, a cause of this problem is the inadequate recycling of tires, which over the years have been accumulated in collection centers, is intended to cause interest by way of reuse environmental friendly. One method used is the forming to obtain elements such as bushings, tiles, benches, breaks speeds, among others. Generally, these elements are obtained through importation. For the elaboration of these elements it is necessary to have crushing and forming machines, for this it is necessary to determine the forces that intervene in the processes, to relate them with the capacity of production of wastes of the city which are harmful to the health. This process reduces the environmental contamination produced by pneumatic waste by 75%.

Methodology

The design of the forming machine, there are no reference articles that use directly related data, therefore, a research is done with information tailored to the materials to be used, in this case PTC, is considered pressure and temperature, to use in molding with pressure, temperature data was obtained in relation to the process used in rubber vulcanization and thermal properties of vulcanized rubber (3-8)

The melting point of the vulcanized rubber is considered in a range of 140 to 160 ° C depending on the shape and density of the element to be processed, the rubber property determines a minimum time of 15 minutes for the material to be cooked (8), research of the force of closure or pressure required, is directly related to the mechanical properties of the rubber, in the elaboration of elements like bands, road is used forces depending on the area of the element, as mentioned by Mr. Gutiérrez Hernderson in his work "Press Hydraulics for Rubber", the closing force to be used in the vulcanization, may vary, however, the pressure will be the same.

With the above information we proceed to the design.

For the structural design of the machine is considered, the work area that will have the molds, as well as the heating elements and the structure that will delimit each one. For strength structure the construction of L-shaped columns is considered to help withstand the closing force.

With the above, the functional analysis is performed, which determines the most recommendable options according to each element and customer and designer criteria, resulting in the implementation of electrical resistances as a source of heat and a linear electric actuator to exercise the closing force. Taking into account the research projection, both the work area and the closing force are dimensioned for elements with an area of 22400 mm², the actuator selected is the model LA31 of the company LINAK, which generates 6000 N with a speed of 4 mm / s.

After the construction of the forming machine, performance tests will be carried out to evaluate the compatibility of: mechanisms and electrical elements with working conditions.

In order to carry out the quality tests of the shaped elements, the cooking time and the density of the final product in relation to the PTC are taken into account.

The quality tests of the elements were carried out in function of the density that the elements present when leaving the mold and the cooking time that is at melting temperature.

The expected relationship with respect to density states that the more PTC is introduced into the mold, both the finish and the hardness increase, however, for some elements that need to be damped, the proper percentage of the materials must be determined.

As shown in figure 1 there is no defined temperature to melt the PTC, however, a relationship was found between the size and its temperature.

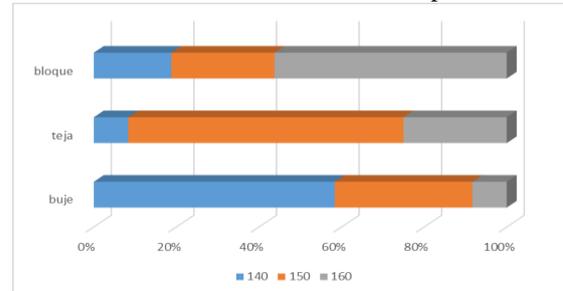


Figure 1: volume ratio and shaped element

The investigation carried out contemplates the incorporation of two machines, in one, the process of compression molding, is used with the heating of the material and its subsequent cooling with a load that helps to shape, however, the design of the machine must support temperature of casting of the rubber and the closing force. In the manufacture of a Road Extruder, polyethylene is used with rubber, however, these machines are not suitable for temperature support, nor does it generate the necessary thrust to mobilize the mixed material. Unlike the forming machine, it uses the PTC in the mold, which compresses the material (5).

At the Salesian Polytechnic University of Quito, Engineer Gutiérrez Hernderson made the thesis of a hydraulic press for rubber vulcanization, which uses a system for hydraulic force, however, the force exerted by the forming machine is of electrical origin, because of the work area, the same one that elaborates elements of smaller volume.

Conclusion

The environmental contamination was reduced since 75% of the tire was entered in the crusher, in addition it was contributed with the society because a correct recycling of the tires will be realized when placing them in an area that does not affect to the image and human health. It was obtained a crushing with two types of granulomere which will collaborate to the productive matrix of the city of Ibarra, in addition the fine granulomere is used in the forming machine which provides different products useful for society.

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