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RECYCLED WOODEN RAILROAD TIES

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ABSTRACT

Currently, due to environmental concern over high deforestation rates and the high cost of railroad ties, railroad companies have drastically reduced the use of these native wood elements in railroads. Thus, other materials such as steel, plastic and wood from reforestation (Eucalyptus) are being used in the manufacture of railroad ties. For the purpose of reducing environmental impact, a recycling process was proposed in which scrap wooden railroad ties, which are discarded or sold at low prices by the authorized railroad company, are transformed into glued laminated wooden railroad ties. This study presents the manufacturing stages of recycled glued laminated wooden railroad ties and the procedure for determination of elasticity modulus through the ultrasound method for the purpose of classifying the wooden pieces to optimize the mechanical behavior of the railroad tie. As a main conclusion, it was found that it is possible to obtain one wooden railroad tie from recycling of five scrap railroad ties, thus significantly reducing environmental impact.

Keywords: railroad ties, glued laminated wood, recycling, ultrasound.

INTRODUCTION

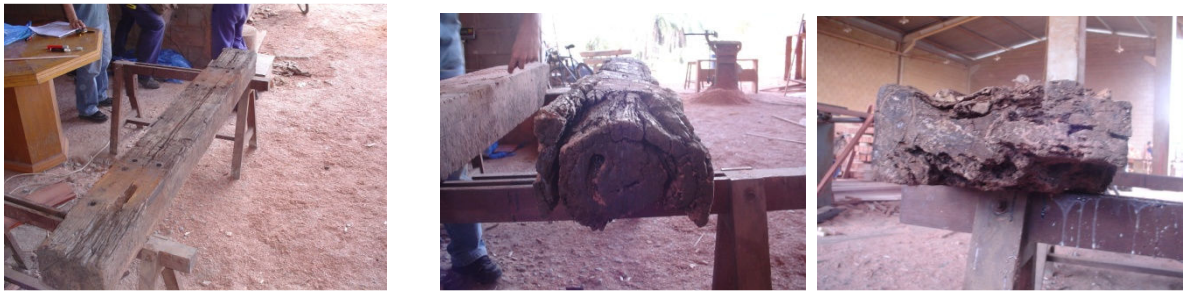
As of the 1990s, various changes in natural systems directly related to human activity have led the planet to environmental collapse that threatens not only biodiversity, but also the quality of life for human beings. Various species have already been driven to extinction, natural cycles have been changed and the earth's climate itself has undergone significant variations due to a combination of atmospheric pollution and deforestation (Primack, 2006). Recycling is an alternative for minimizing these effects. Glass, paper and plastic are currently the most recycled products. Wood may also be recycled or reused.

In regard to use of wood in railroad ties, Heebink e Superjeky, 1977 and Geimer, 1982 studied railroad ties composed of laminated particles (manufactured from scrap railroad ties ground into small flakes of 0.508 mm thickness and 50.8 mm length). According to FPL (Howe, 1976), in the 1970s, railroad ties were manufactured by the process of pressing of fine laminas, in which Red Oak wood logs were cut up into laminas, dried and glued into bars in a continuous process.

Therefore, with a view toward reuse of wood, recycling of scrap railroad ties was considered for meter gauge railways, transforming the scrap ties into recycled railroad ties made of glued laminated wood (RT-GLULAM). The railroad ties were cut up into laminas and they were put together laterally and longitudinally. Before making the new railroad tie, the laminas were classified through the use of ultrasound techniques and then glued in a juxtaposed fashion forming the new railroad tie.

RESULTS AND CONCLUSIONS

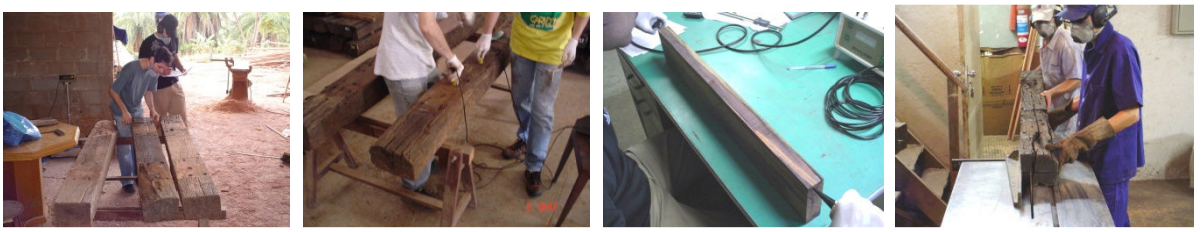
The types of wooden railroad ties used in the production of RT-GLULAM are shown in Fig. 1



(a) (b) (c)

Fig. 1 - Classification of scrap railroad ties

The manufacturing stages of the RT-GLULAM are shown in Fig. 2.



(a) (b) (c)

(d) (e) (f)

Fig. 2 - (a) classification and measurement of the scrap railroad tie, (b) ultrasound test, railroad tie and lamina, (c) cutting up the railroad tie, (d) preparation of the laminas, (e) gluing and pressing of the RT-GLULAM, (f) railroad ties (RT-GLULAM).

The study showed that it is possible to obtain one wooden railroad tie (RT-GLULAM) from recycling of five scrap railroad ties, thus significantly reducing environmental impact.

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