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Timber modification by radio wave technology

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1 Abstract

The following paper describes how radio wave thermal modification at temperatures above 160°C can improve the durability of timber. It also broadens possible applications in areas where the timber decays faster under natural conditions. During the process, cellulose areas are modified to absorb less water. The treated timber is more resistant to decaying fungi. The heat required for this process is generated by polarization at a molecular level, similar to a microwave oven. However, the frequency of the radio and microwaves are different. (The frequency of radio and microwave are 13.56MHz and 2.45GHz respectively.) Radio waves have an advantage of higher permeability by several meters whereas microwaves can only heat a few centimeters. It is also possible to generate temperatures greater than 100°C, due to the frequency of radio waves polarizing water molecules and achieving ionic polarization. Therefore, it is possible to heat dry materials. The modified timber samples are analyzed for mechanical und hygric properties. The results show a positive influence on hydrologic properties by improving durability.

Keywords: thermally modified timber, timber preservation, Radio wave technology

2 Introduction

Timber is a natural and ecological building material. Unfortunately it can be infested by timber-destroying organisms.

This is prevented by using chemical timber preservatives. However, the duration of protection is limited by erosion, and these agents pollute the environment. Centuries ago timber piles were charred in a fire in order to protect them from destruction of moisture in damp building environments. Over time various technical processes for the thermal modification of timber are developed. This process usually takes place in a closed system, such as an autoclave. In this process, the thermal energy is transmitted using the thermal conductivity of timber. Therefore, the production of Thermally Modified Timber (TMT) is limited to smaller timber cross-sections. The method described here represents a possibility of thermal modification by applying an alternating electromagnetic field. The advantage of this process lies in the homogeneous temperature distribution within the material cross-section.

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