THEORETICAL ASPECTS OF THE CONTINUOUSLY VARYING SCHEDULE PROCESS FOR TIMBER DRYING

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INNOVATION OF THESIS

The candidate to the best of his knowledge stipulates that the work presented in this thesis is an original research relating to the Continuously Varying Schedule (CVS) drying process of timber and the development of a circuit layout for air flow measurements. Any information used or derived from other sources has been acknowledged in the text.

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ABSTRACT

Drying of timber increases its durability and strength. Therefore, timber should be dried to a moisture content close to the equilibrium moisture content it will attain in service. The drying of timber from its natural green state to the required moisture content is thus an important part of the production cycle. Hardwood species, due to their macroscopic structures, are more difficult to dry as compared to softwood.

A great deal of research has centred in recent years on developing a fast drying process for softwood; on the other hand, there is a need for a process to dry hardwood rapidly. A new drying technique, called Continuously Varying Schedule (CVS) was recently developed by the author for the purpose of rapidly drying the medium to high density hardwood.

The investigation described herein was carried out to compare the CVS process with the conventional drying process. The factors compared were drying time, quality of timber produced and the energy consumed.

It was found that the CVS process reduced the drying time by 34.5% and saved 30.7% of the energy. It produced also, a competitive dried timber quality. The process achieved highly efficient drying, as the rate of drying (MC%/h x 100) was 80.3% higher than the conventional process and also, the amount of water evaporated per unit of drying time (g/h) was 67.1% higher. The CVS drying performance has achieved a 71.9% increase in the amount of moisture content reduced per unit of energy (MC%/kWh x 100) and a 57.8% increase in the amount of water

evaporated per unit of energy (g/kWh) as compared to the conventional process.

Much emphasis was placed on energy saving in the drying plant and it was suggested that a heat exchanger be used to recover waste energy from the exhausted air of the kiln. A dehumidifier coupled to a solar-powered system, backed up with an electric or wood waste booster, was recommended as a low-cost energy drying plant. An alternative source to the petroleum-based energy was also discussed.

The study of air flow through the timber stack in the kiln was a major part of this investigation as it is one of the principal features of the CVS process. A new technique was developed to measure the air velocity and the turbulence level %. The technique involves the integration of a hot wire anemometer, data logger, computer and computer peripherals. The air velocity profiles for twelve fan speeds, between 400 and 2200 rpm, were drawn by a computer graphical program, using data collected by the above circuit. It was obvious that the boundary layer which exists around the timber surface at the low air velocity protects the timber being processed against the high and continuously increasing temperature during the CVS drying process.

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