Jul - Sep 1994

Double-surfaced Nosebar Shape Improving Peeled Veneer Quality

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The paper emphasizes the trend for more material from the same quantity of restricted veneer logs in the point of view of ecology. High quality veneer peeled from low grade small diameter logs can be obtained only by improved peeling technique. In this paper beech veneer quality was comparatively researched in peeling by conventional and double-surfaced nosebars under three temperatures and three pressure rates.
The roughness of veneer surface was 33% lower in veneer peeled by double- surfaced nosebar than in veneer peeled by conventional nosebar.
Key words: Peeled veneer quality, roughness, double-surfaced nosebar.

Introduction

One of the Forest Products Industry's prime considerations has become the environmental impact of its operations because wood has become too precious, both in ecological and commerical senses. The Forest Products Industry must convert its technical framework form large log to small log oriented technologies. Product oriented Forest Products Industry is faced with the most severe competition from mineral based products. The answer to that challenge lies in improving the recovery from the existing raw material base, reducing the amount of labour required and the development of new and superior end products such as Laminated Veneer Lumber (LVL) from new small diameter species. It is necessary to produce as much as possible high quality smooth veneer (from low-grade bolts) and thus to enable lower glue consumption.

In veneer peeling, the conventional solid nosebar (with one grinding angle, mostly 76°, and with a small radius) allows a sudden release of pressure behind the point of maximum compression. To prevent that, based on the theory by Voskresenjskii (1955), the double-surfaced nosebar was constructed, with the second land parallel to the knife face. Leney (1960) added another clearance angle (D = 4°, which reduces the tearing between nosebar and veneer. Besides controlling the release of compresssion, the pressure of the back surface of the double-sided nosebar assists the rotation of the wood structure above the cutting edge. The additional frictional force allows a lower percentage of nosebar compression than it would be needed with a conventional nosebar. The main disadvantage of double-surfaced nosebar is its difficult adjustment. Some experiments with double-surfaced nosebar proceed by Voskresenjskii (1955), Leney (1960), Tochigi and Hayashi (1968) and Palka (1970) introduced the first mathematical model of veneer formation.

In our model, we have made the comparative investigations of the effect of 3 bolt temperatures and 3 nosebar pressures on thickness variation and roughness of veneer peeled by conventional and by double-surfaced nosebars of our own construction, on the industrial lathe.

Materials and Methods

The experiment was carried out with six bolts around 1.5 m in length, from sound beech trees *(Fagus silvatica).* The bolts were first rounded on a conventional lathe to the diameter of cca 0.4 m, and each bolt was cut to six discs, each 0.15 m in length, which were carefully assigned in pairs: A for peeling by conventional nosebar, and B for peeling by double-surfaced nosebar. The cutting diagram (Fig.l) was applied twice, once for veneer thickness of 2.2 mm and once in the second series, for vener thickness of 3.25 mm.

The discs were systematically heated in series of three discs in water bath with precision temperature control, to carefully selected temperatures of 40°C , 60°C and 80°C. Water temperature was electronically controlled by NTC soune, and wood temperature measured in the center of discs by Fe-const thermo pair and Hartman-Braun instrument. Heating regime was achieved experimentally and the temperature flow calculations made by Sokolov's method (1965) accorded well with the measurements.

The experiment was carried out on veneer lathe Kralovopolska- Bmo TYP 2300 with telescopic chucks 250 mm and 90mm in diameter, with automatic pitch angle adjustment, and continual peeling velocity controlled by potentiometer. The knife tip is in the spindle axis. Before the experiment, old spindles and lathe and moving block bearings were replaced.

Two knives and two nosebars were according to the scheme Fig. I where we can see the whole tool geometry and all the constant and variable parameters (Zdravkovic 1991). Small bolts peeling generates very small forces in comparison with the mass of machine support, so that the influence of eventual gaps in knife carriage is minimal.

Veneer thickness was measured by a mechanical comparator with 0-25 mm range and 0.001 mm sensitivity, with flat round surfaces 8 mm in diameter and constant pressure. Variance analysis and F-test did not confirm the significance (F = 2.12), so we concluded that 10 measurements on one veneer sheet were sufficient. Roughness was measured by Buglay's stereo microscope with light cross-sectioning, by Rmax criteria. Checks depth and checks frequency were measured by stereo microscope MBS-9. All data were computer processed.

Results

On every veneer sheet there were 10 measurements of thickness. All the data were divided into three groups, according to the disc diameter from which veneer was obtained, ranging 0.35-0.27 m,0.27-0.19 m and from 0.19 m to core. There were at least 11,880 thickness measurements. The best result was achieved in the first series with double surfaced nosebar (B) at the temperature t3=80 ° C and nosebar pressure A1=20% (6 = 0.028 m). In the second series, it was the conventional nosebar (A), at bolt temperature t1=40° C and nosebar pressure A3=30‰ (0.0022 mm). With the conventional nosebar (A) in both series, the smallest veneer thickness variation was 0.022 mm. The maximum value of veneer thickness varation was determined at 0.04 mm, and all the peeling regimes which resulted in this or lower thickness variations were suitable for further measurements.

Under precisely defined procedure 3240 veneer roughness measurements were made according to Rmax criteria. The lowest roughness in the first series was achieved by the double surfaced nosebar (B) (Rmax=46.75gm) with regime t3=80 ° C A3=30%. In the second series, the lowest roughness was achieved again with the same nosebar and the same regime (Rmax= 46.02 gm).

Discussion

If we examine the whole experiment, all 36 small bolts, average roughness of veneer peeled by conventional nosebar was Rmax = 92.04 gm and by double-surfaced nosebar, it was Rmax = 61.54 gm. It means that, in the same circumstances, only by introducing the double-surfaced nosebar, average veneer roughness decreased 33% in comparison with the roughness of veneer peeled by conventional nosebar. This is of great importance in any kind of veneer gluing (Faust 1986), for example in plywood or LVL production.

It could be concluded that, in peeling greater thicknesses with double-surfaced nosebar , we could use not only lower degree of nosebar compression, but lower temperatures in comparison with the conventional nosebar, but this is a matter of further investigations.

In this experiment excellent veneer roughness results have been achieved. The lowest average veneer roughnes was Rmax = 46.02 gin, which is very acceptable even for sliced veneer and it is close to the structure roughness of beech wood.

For the whole experiment, if we consider all veneer quality indicators together, the most suitable regime in peeling with double-surfaced nosebar in the first series was t2=60°C A3=30% with average veneer thickness X=2.12 mm, thickness variation a=0.032 mm and roughness Rmax=59.58 gm. For the second series it was the regime t2=60° A3=30% with average veneer thickness X=3.13 mm, thickness deviation a=0.034 mm and roughness Rmax=96.86 9m.

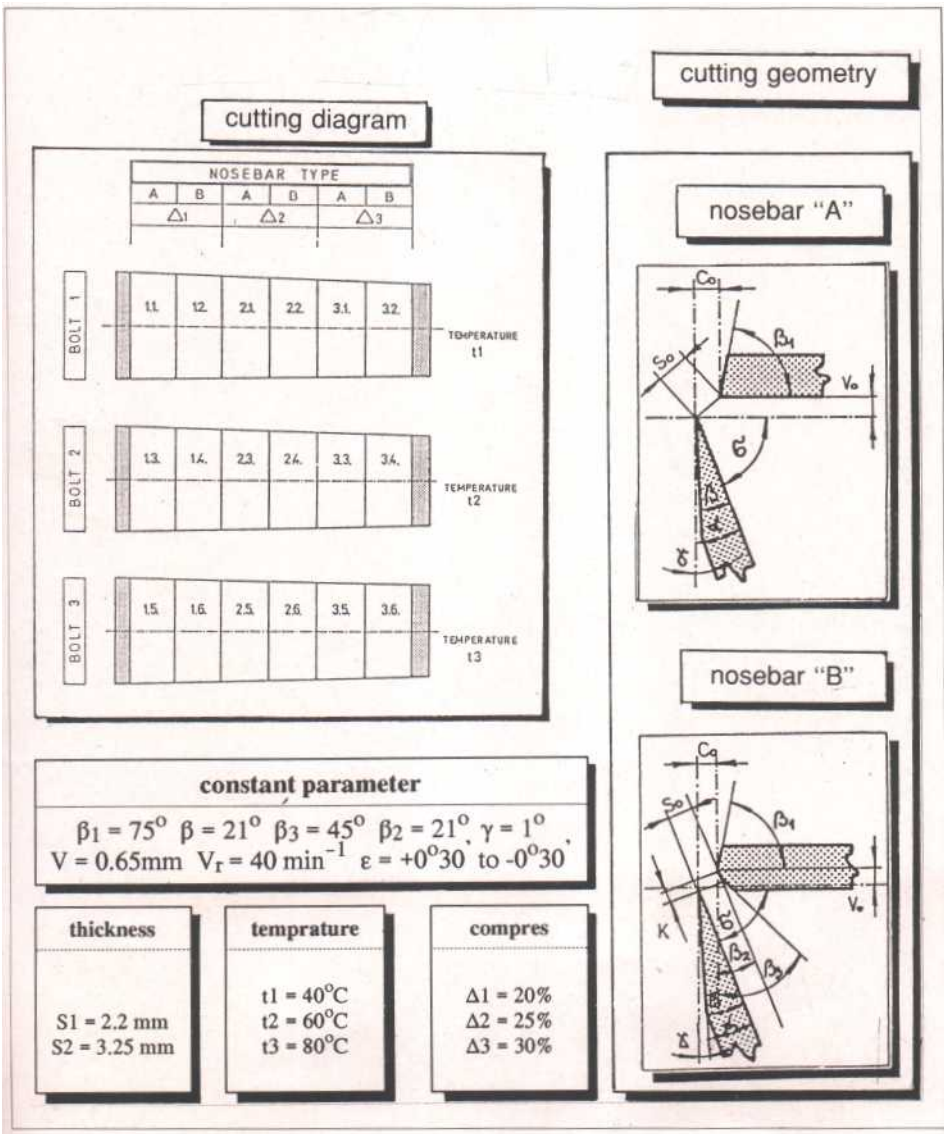

Fig. 1. Cutting diagram and cutting geometry

Conclusions

In this investigation we have achieved good results in veneer peeling by conventional and double-surfaced nosebars, even in peeling at low temperature of 40 °C. Lower heating temperatures might mean lower energy consumption, lower extraction of chemical wood components into the water in the bath. In both series the lowest roughness has been achieved with the same regime: B (Rmax=46.75 9m) t3=80 ° C A3=30% for the first series and B (Rmax-46.02 9m) t3=80° C A3=30%, for the second series. Smoother veneer gives better gluebond quality and lower glue consumption per cubic unit of plywood. And finally, we have achieved lower thickness variations than average (0.03 mm) which enables more veneer from the same quantity of material.

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