

New Technologies in Sawmilling and Plywood Manufacture

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Introduction

International wood and furniture industry has been going through a heavy recession and it is still affected by it. In that atmosphere, there are no astonishing novelties, but there is a great number of adjustments of the available technology. This paper is an attempt to making general view of the actual situation in the sawmill and veneer and plywood industries.

General view

Wood Processing companies are faced with changes in global wood resources, quality and diameter of logs have been declining for years, there are regulations by Governments concerning logging practices and there is an increasingly stronger environmental pressure. Wood processing industry is more consumer-controlled which demands a certain flexibility and there is a problem of exploiting the available production overcapacity as effectively as possible. It is no longer the solution to compensate for inefficiencies by simply increasing the volume. For instance, in the USA, a fifty percent increase in sliced veneer productin might yield only a six percent offset in cost. Prices of raw material will climb dramatically in the next few years, therefore they will have the greatest impact on the industry in the future. In these circumstances, there are some prominent trends which include

- Advanced electronic technology which usually includes using standard 486 PC configurations in WINDOWS environment, which means easy access even for small companies and widespread availability of customized software.
- Reduction of machine set-up time and increasing manufacturing precision and rationalisation of internal handling.
- Solutions guaranteeing quality parameters to be required by European law (standards of ISO 9000 series) and integration of machines into company total quality management.
- Environmental aspects referring to emissions, noise, both active and passive safety regulations, as well as an extended supplier services such as training, advice and technical assistance.

Trends in the sawmill industry

The main trend is on the valorization and maximum exploitation of some aspect of electronic-based automation focussing on single process stages. Some companies developed powerful analytical software packages for the optimum recovery determination, even before log is bucked, based on the dollar value, volume recovery, priority order management and species. There might be single or multi axis scanning systems, as well as surface mapped scanning systems, usable both for sawmill and plywood industries (Figure 1). These scanners with 3D camera and laser scanner are based on the laser triangulation concept (Figure 2). While old curtain light scanners permit only simply oval approximation of logs, new edge-detection laser scanners measure outside edges for diameter and offset information. Computer model of downstream process based on that information is generated, so there are unlimited data on logging capacity for log optimization. "What if" studies on any wished

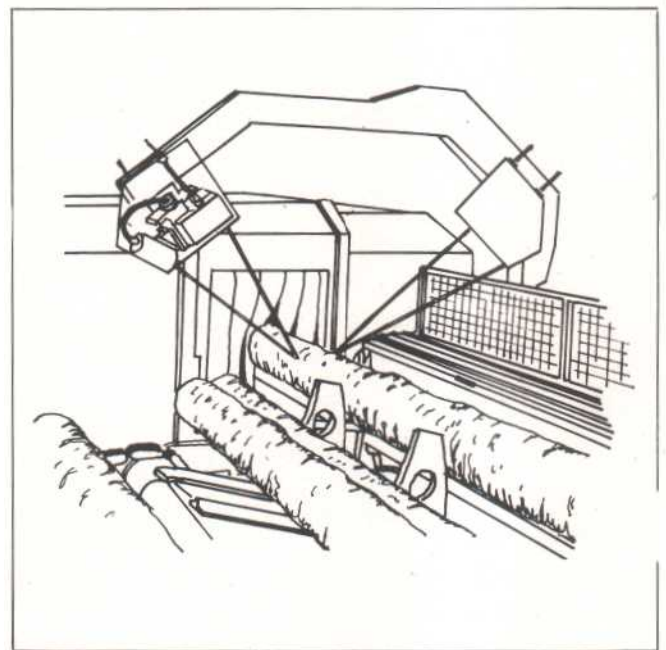


Fig I a. Laser scanning in the sawmill

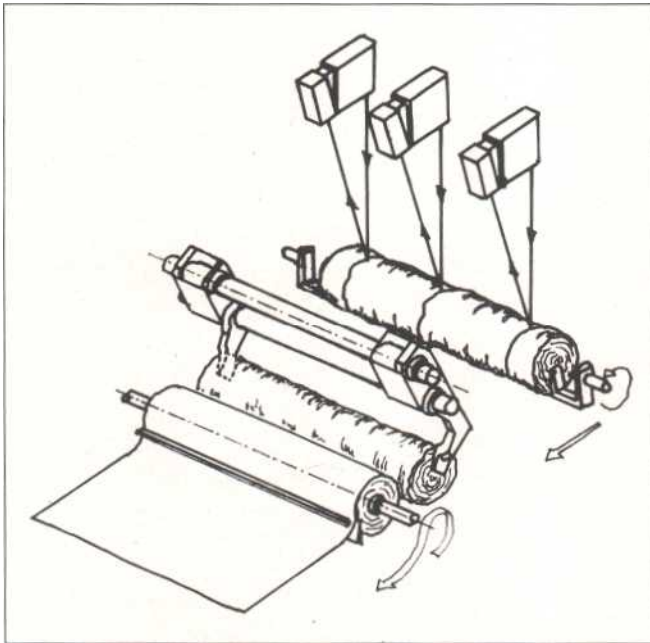


Fig 1 b. Laser scanning in the log centering for veneer peeling

scenario and maintenance monitoring are available. There is color-visualization on the console with all the necessary data.

In the cross-cutting, regarding automatic flow-detection systems with a simultaneous control up to four sides, nowadays the selection is possible according to highly complex criteria in the real time, at a flow speed of 90 m/min. The simulation program can be prepared with different lengths, quality and flows. For the future, some companies are developing color and texture identification control systems.

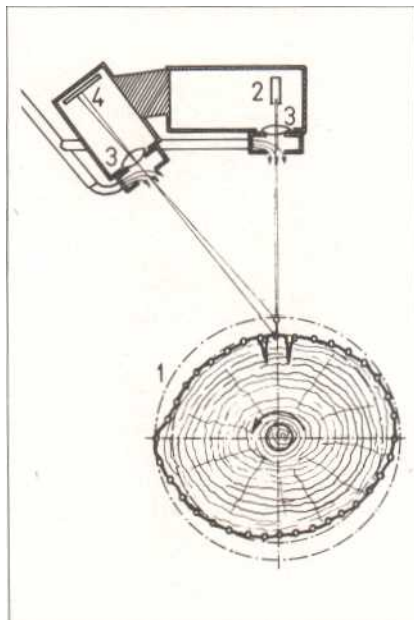


Fig 2. Principle of laser triangulation

- 1 - rotating log, 2 - light source, 3 - lense,
- 4 - photo sensitive cell

In the sawmilling, the greatest novelty is the band-saw blade with variable pitch (Figure 3). A specially designed computer programme makes a series of calculations and the result is a variable geometry of teeth. This improves cutting edge strength, reduce vibration, improves sawdust disposal, reduces noise level. But this blade requests special tensioning, smithing and welding.

There is a trend of using the cheap small-block processing lines with thin-cut band resaws, where the kerf is less than 1/16". This kerf saving gives 60 to 70% less sawdust and up to 25% more boards compared to traditional sawing methods. Multiple-Head systems easily out-produce an average gang-rip and they can produce more than 20,000 BF per hour. Such lines are more accurate and several times cheaper.

Trends in veneer and plywood production

In the sliced veneer production there is a great impact of log cost increasing on final profit. It means that it is important to obtain greater volume of veneer from the same material by decreasing the veneer thicknesses. It is possible with modern computer-controlled veneer knives. Veneer continual type press

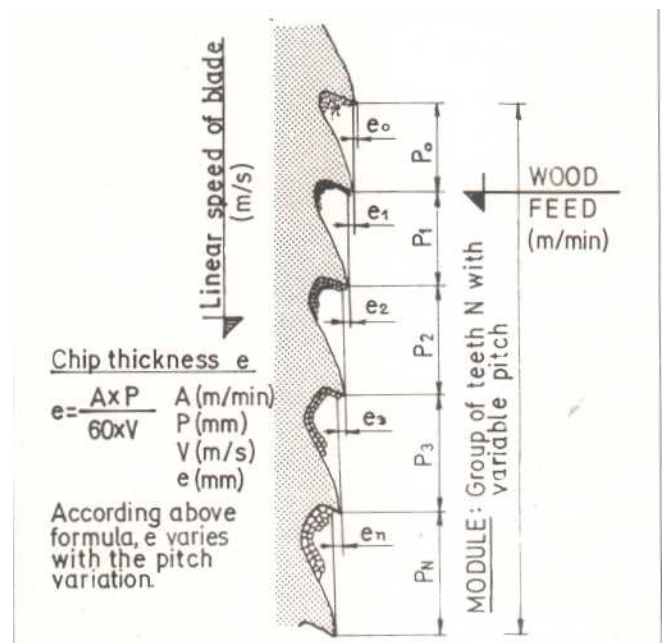


Fig 3. Band-saw blade with variable pitch

dryer is necessary to flatten such thin veneers, and special care should be given in preparing the substrate surface because it is not possible to put the very thin veneer on the rough core. Manufacturers often use double-knife guillotines with laser light to position two knives which cut while veneer is simultaneously compressed. Manufacturers will be facing critical shortages in a number of species in the next few years. Therefore, it is important to change old habits of consumers and architects who have a limited experience with woods, as they are using three or four traditional wood species for the majority of wood products. It is also important to find out whether the end consumer does or does not like the figure of certain species or knots characterising traditional and new species, as well as to incorporate their choice in new standards.

In the peeled veneer production there is great influence of longterm log diameter decreasing. Ten blocks 300 mm in

diameter are needed to produce the same veneer volume yielded from only one 1-meter diameter block. It means that ten times more capacity is required from the machines. Small block shall be peeled down to a small core diameter (up to 50 mm) and the yield should be optimized through computer X-Y centering and laser scanning (Figure 1B). There is a novelty in new lathe of Angelo-Cremona with a constant pitch angle. Instead of ordinary pitch angle control during peeling from log surface down to core-drop diameter, there is new computer-controlled powered back-up rolls with servo positioning according to the exactly computed curve. Instead of usual mechanical spike belt systems, there are new vacuum stackers and vacuum diverters, which could be equipped with IC or HF moisture sensors for veneer selection according to the moisture. There are laser thickness measuring systems and blister and delamination detectors for plywood. Information is available from control monitor for recovery, machining time, trouble-shooting is generally aided by applied diagnostics, which simplifies maintenance.

Parquet flooring

Parquet flooring is important for both sawmill and veneer and plywood industries. There is a clear trend in favour of Do-It-Yourself parquet flooring. It is a finished product lacquered and ready to lay on the floor without additional adhesives. It is usually three-layer with different top layer. To manufacture the face layer of parquet (about 3 to 4mm, but some manufacturers produce surface layer from 0.6mm veneer), different techniques are possible and they yield different results. Either high frequency or hot presses can be used to laminate the

three layers. The core layer is composed of plywood, of pieces of waste lumber or strips. The back layer is usually made of peeled veneer. When manufacturing the surface layer it is necessary to pay a special attention to: control of possible slat movement in the jointer, side and top pressure, compression across the joints. Modified UV-lacquer has proven extremely resistant on parquet surfaces. This enabled some manufacturers to make the surface layer of only 0.6 mm thick veneer. According some tests, swelling and shrinkage resultant from changes in humidity is only 1/6 of that in solid wood floors.

Conclusion

As the consequence of quality log shortage, high raw material costs, great competition of other materials like steel and some kinds of cheaper boards like OSB, for sawmill and plywood industry it is important to abandon the traditional concept. Electronic based automation and software developed on standard 486 PC configuration, lead to introducing relatively cheap high technology even into small companies. This might be the only way for them to survive.

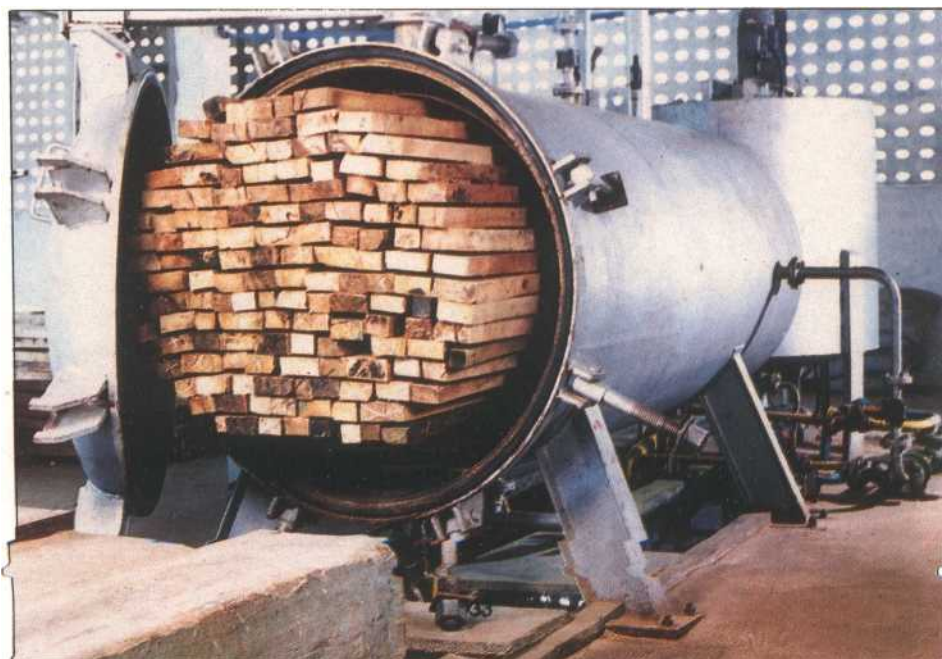
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