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EVALUATION OF MILLING EQUIPMENT SUITABLE FOR PRODUCTION OF VALWOOD FEEDSTOCK

D. J. Donnelly

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SUMMARY

The author visited Linck HVT Gmbh in West Germany and Ledinek Lestro in Yugoslavia in October 1989. The objective was to assess essential machinery for the commercial production of thin boards for the VALWOOD® process developed at the Wood Utilisation Research Centre.

The Linck K45 gang saw was considered to have most potential because it is a robust machine which accepts both round and flitch material, and it has the capacity to process up to 10 000 m^3/year round volume of regrowth eucalypt logs into 10 mm boards for VALWOOD® production.

The Linck HMK20 double arbour multiple saw was less suitable because it is a resawing unit, and requires a minimum log length of 1.8 m. However, the machine is a robust high capacity machine suited to resawing pre-sized flitches into boards and scantling.

The Linck SSP20 slicing machine is unsuitable at this stage because of the high incidence of induced checks and splits. However, it could have application in the softwood industry and possibly in the production of green pallet and packaging materials from young eucalypts.

The Rotoles P.600 horizontal planer needs further development because it can dress only one face at a time, although the finish is of very high standard.

INTRODUCTION

In October 1989 I visited two machinery manufacturing plants in Europe to assess various machines considered suitable for processing Western Australian grown hardwoods into VALWOOD products, using the process developed at the Wood Utilisation Research Centre at Harvey.

The two companies visited were Linck, located in Oberkirch, West Germany, and Ledinek Lestro, located in Maribor, Yugoslavia.

Linck is a well established and proven manufacturer of sawmilling equipment. They specialize in a wide range of machines designed for the production of sawn boards and scantlings from round logs, and have recently developed slicing equipment. There were three machines in their range of particular interest for the conversion of small regrowth or new growth logs into boards suitable for the VALWOOD® process:

1) K45 gang saw reciprocating frame.

2) HMK20 double arbor multiple blade circular saw.

3) SSP20 slicing machine.

Ledinek Lestro is also a well established manufacturer of wood processing equipment. They specialize in the manufacture of purpose-built machines designed to meet customer requirements. The machine of particular interest was a Rotoles P.600 horizontal rotary surfacer.

An important constraint was the need for the sawing pattern to match the VALWOOD® pattern developed at Harvey to minimise the effects of stress in boards sawn from young eucalypt logs. In brief, this pattern involves the removal of thin boards from two sides of the log in the one pass. The remaining centre cant is then sawn in a second operation involving the conversion of the whole cant into thin boards again in the one pass. The result is that boards are back sawn and growth stresses are displayed as bow rather than spring. This system has advantages in appearance of features and quality of boards. This ultimately improves recoveries.

Sample flitches of both jarrah (*Eucalyptus marginata*) and karri (*E. diversicolor*) were sent to Europe for processing by these Linck and Ledinek Lestro machines listed above.

ASSESSMENT OF MILLING EQUIPMENT

Five jarrah and five karri flitches (250 mm x 120 mm x 3 m) arrived at the Linck factory in very good condition. They were taken to a nearby sawmill and sawn longitudinally into three pieces, using a **Linck HMK20 double arbor multiple saw**. One piece from each flitch was then resawn into 12 mm thick boards on this machine. The machine carried out the sawing task adequately but has limitations that affect its suitability for the production of VALWOOD boards. The major limitations are:

1) it is strictly a resaw and needs flitches or profiled cants to operate;

2) it cannot be used for the total VALWOOD® sawing pattern although it could be used in conjunction with other equipment preparing flitches for resaw;

3) circular saws are inefficient due to kerf size (3.8 mm). There were also some problems with mismatch in saw cuts between the top and bottom arbour, requiring the removal of more material when preparing boards for face gluing;

4) minimum individual feedstock length is 1.8 m;

5) a feed system to reduce bow or spring would be required to maximize sawn recovery.

The remaining flitches were divided into two parcels, one for resawing on the K45 gang saw and the other for slicing on the SSP20.

The **Linck K45 gang saw** used for the sawing test was located in a small case factory on the outskirts of Oberkirch. The machine is used to cut small round logs into boards for case production. In this factory the feed system is manual with the logs being rolled onto a chain feed system and aligned by hand prior to sawing.

Both jarrah and karri flitches were sawn into 10 mm boards using this machine. There was some waste due to spring in the flitches, however, the machine performed admirably. Features that make this machine suitable for the VALWOOD® process are:

1) both round logs and sawn flitches can be processed (logs up to 400 mm diameter, flitches up to 450 mm wide);

2) multiple saw cuts in the one pass with thin blades (3 mm kerf from a 2 mm plate blade);

3) minimum log length of 0.9 m;

4) feed speed up to 10 m/min, which will adequately process 10 000 m^3 of logs per year using a double pass to meet the requirements of the VALWOOD cutting pattern commercially;

5) relatively low power consumption;

6) simple blade sharpening, fitting and tensioning;

7) reduced noise levels and increased operator safety compared with circular and band saws.

The remainder of the flitches were passed through the **Linck SSP20 slicing machine**, located in the Linck factory. This machine is the result of 10 years research and development, and will play a positive role in softwood board production in the future.

The machine has a big advantage over other board production systems as it produces no sawdust waste and has high accuracy in thickness of boards produced. It is relatively quiet, is capable of high feed rates (up to 130 m/min), and has a low power consumption (60 kW). It is restricted to production of minimum lengths of 1.6 m, maximum width of board 200 mm, thickness of boards 2 mm up to 10 mm. Wood must be above fibre saturation point when processed.

Unfortunately the trial indicated that the machine cannot produce a satisfactory finishing grade board product from jarrah or karri. The flitches were all passed through the machine, which had little trouble in slicing off the boards.

However, the board quality was unsuitable for seasoning and subsequent use in value-added products, because of induced checking and splitting.

The Linck slicing machine SSP20 has a good future. It is currently used in a number of countries, and is successfully producing 12 mm thick boards from spruce, pine, larch, birch and poplar. It has been tested on *Pinus radiata* flitches supplied by C.S.R. Australia with excellent results. However,

tests on *E. grandis* grown in South Africa resulted in a product similar to the jarrah and karri, with multiple splitting and checking in both 4 mm and 10 mm slices.

This machine needs further development before it could be used successfully on young eucalypts to produce high value boards. However, it could be used to produce low value green hardwood board products such as pallet or packaging boards. There may be better results if the wood could be heated prior to slicing, as for veneer peeling and slicing.

The **Rotoles P.600 horizontal rotary surfacer** was demonstrated in the Ledinek-Lestro factory, using small dry jarrah and karri samples. The samples were approximately 300 mm long, 100 mm wide and 12 mm thick rough sawn. This length of material is too short to surface in most conventional planing machines.

There are two features of this machine that are unique and place it in a category of its own. They are:

1) the feed system is an overhead multiple point wide chaintransporter with pressure fingers attached. These hold the stock down on the bed as the stock is moved through the machine, and allow small pieces of wood such as parquetry to be passed over the cutter for surfacing;

2) the cutter system is also a departure from conventional drum type systems. It has a large number of cup-shaped cutters fitted in fully adjustable holders set around the periphery of a 700 mm diameter cutter block positioned horizontally in the table bed. The feed stock is passed over this cutter and is contacted by the cutters twice on the way through the machine.

The machine is powered by a 15 kW motor, and it has a table width of 600 mm. The feed speed can be varied between 7 and 14 m/min. The cutter block runs at 800 r.p.m. Stock thickness between 10 mm and 200 mm can be accommodated, with a maximum depth of cut of 5 mm. The surface finish achieved by this machine is similar to that of a high quality tungsten-tipped saw cut. It is considered suitable for use as a gluing surface.

The horizontal rotary planer is an innovative machine and with further development intended by Ledinek Lestro, could be a useful tool in the VALWOOD® system. Its major drawback at present is its inability to dress more than one face at a time. This does not give the evenly thicknessed piece required for face gluing.

In conclusion, the machine best suited to the production of VALWOOD® boards from young eucalypts is the Linck K45 gang saw. This machine has the capacity and the quality to adequately process 10 000 m^3 of round log volume per year. Logs larger than 400 mm would require splitting before processing in the K45 gang saw. With suitable infeed and outfeed systems the machine could be operated efficiently by one person. It is a robust machine which could confidently be expected to operate commercially for more than 20 years.

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