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New Thin-Kerf Technology In The Sawmill Production

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Bandsaws have potentially the narrowest kerf, compared with circular saws and frame saws. In the conventional wide handsaw technology, a narrower kerf can be achieved by reducing the feed rate, by using more expensive saws, and by using more expensive maintenance procedures (Mc Kenzie,

Any way, nowadays, when quality, quantity and raw material diameter have been lowered, when profit margins are small, controlling costs and the improving of production are critical.

In thin sense, small-log technologies become very important and, in the past few decades, several manufacturers have developed horizontal narrow-bladed machines, with a very thin kerf of 1.4 to 1.5 mm, either in mobile version or as stabile multi-head machine.

Narrow blade technology gives many advantages over conventional technology: sawdust waste is significantly reduced and sawn timber volume is correspondingly increased, the production rate is very high, as each pass does work single head resaw (the capacity depends on the number of heads), overall blade costs are reduced, as no skilled sawdoctoring is needed, power consumption is lower, and a better finish is produced.

The purpose of this paper is to show the state of the art in the narrow-blade technology, discussing the advantages and disadvantages, with no intention to promote certain manufacturers.

The advantages of narrow-blade technology

The horizontal narrow-blade saws (with blade widths of 2.5 or 3.2 mm) are designred as mobile or stabile constructions.

The mobile version, supplied on its own trailer, can be driven on the highway and over rough terrain, and it can be quickly set-up for on-site sawing (Fig 1). Some manufacturers offer hydraulic log loading, turning, squaring, and dogging, and some offer both hydraulic and manual log manipulated machines in the cheaper versions.

T Fig 2a.One-head stabile construction of thin-kerf machine

The static versions can be a very simple but effective one head construction (Fig 2a) or a high capacity multi-head construction (Fig 2b).

The static versions of these machines need only simple

Fig 1. Mobile construction of thin-kerf machine.

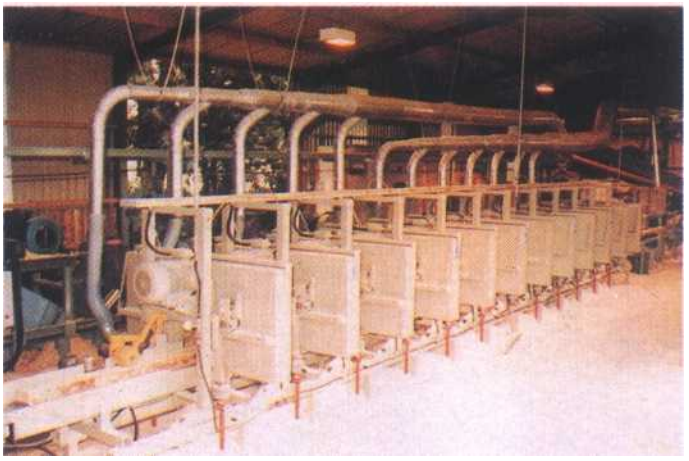


Fig 2 b. Multi-head stabile construction of thin-kerf machine

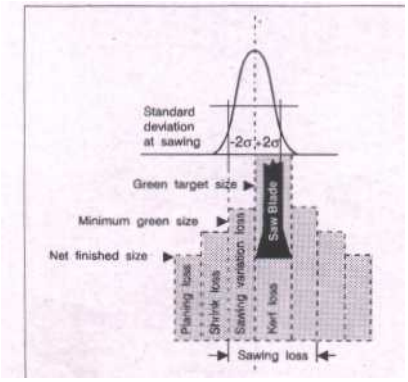
foundations, or only a flat surface. They are mainly designed as narrow-kerf machines with sawblade width 25 mm or 32 mm.

The narrow-blade technology has several advantages over conventional wide bandsaw technology. Although there is a certain initial resistance to narrow blades, they have some benefits, specially in the low-diameter short log processing.

The main advantages are

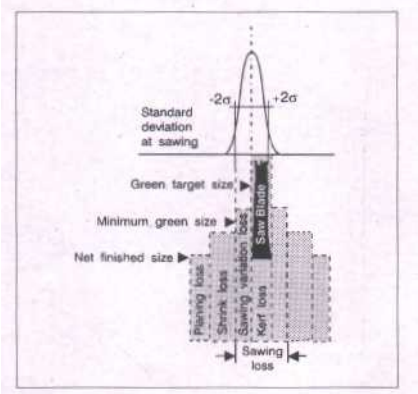
l. Thin kerf

To produce the intended net finished size of dry, dressed lumber, sawing must be carried out with an oversize, depending on the losses due to sawing variations, shrinkage loss and planing loss. Almost all these oversizes depend on kerf loss and saw blade stability. There is a greater kerf loss in the conventional wide bandsaw with the corresponding greater sawing variations (Fig 3a) than in the thin-kerf bandsaw (Fig 3b). With decreasing kerf loss and improving blade stability, sawing variations become smaller. Also, smoother surfaces of the sawn product can cut down the planing loss, while shrinkage loss remains the same. While in case of wide-bladed machine, the kerf is typically 2.5 mm or more, in narrow-blade machine, the kerf loss is only 1.4-1.5 mm.



T **Fig 3 a. Sawing l b s s i n conventional thin-kerf machine**

When a lot of thin boards have to be produced, the saving of 0.4 mm or 0.5 mm on each cut is quite a lot, compared to conventional wide-blade resaw, every five or six cuts give an extra board. It also means 60-70% less sawdust, or 25% more lumber, compred to the conventional methods.



T Fig 3b. Sawing loss in the thin-kerf technology

The difference is the greater the thinner boards have to be produced.

According to Baker's mill study, when 16 mm thick boards were produced from small logs (average diameter of 20 cm), average recovery was 68.6%. The most efficient log sizes regarding recovery were 25 cm to 28 cm.

2. Low blade costs

According to the simple calcuation by UDEHOLM', only by using a thinner blade, spring-setting or swaging more accurately, or by improving blade stability, it is easy to increase the yield by 1 % and it corresponds to a sawmill total cost for the purchase and maintenance of tools. .

In case of thin-kerf bandsaws, according to ForestorAs analysis, the capital cost of 100 mm wide blade with average life of 6 months or 960 hours is about 50 pounds. This blade has to be maintained and resharpened every four hours at the cost of between 6.60 pounds to 10.80 pounds a time, and it gives the total overall blade cost of between 1.70 and 2.74 pounds per hour.

On the contrary, the thin-kerf narrow blades used on the Forestor cost 13 pounds each. They can be resharpened up to six times, but ForestorAs calculation is based on 4 sharpenings and the total blade life of 20 hours. On this basis, by an operator earning 5 pounds/hour, total overall blade cost works out at 82p per hour.

Narrow blades can be sharpened on an automatic grinder costing under 3000 pounds (compared to 20,000-40,000 pounds needed to set up a sawdoctoring show to maintain wide blades).

3. Accuracy of cut

Accuracy of cut is determined by several factors: one is certainly the stability of log during cutting, regarding the stabile basis of steel or rubber infeed conveyor, another factor is the advantage provided by the narrow blades. In case of narrow sawblades, generated heat dissipates evenly, so the blades do not lose their stiffness. Consequently, these blades do not need tensioning and their constant accuracy is not dependent on individual sawdoctoring skills.

At the same time, thin-kerf narrow blades, with their hard tipped or spring-set accurately ground smaller teeth, produce a smoother finish on the sawn face of timber, than wide blades. The surface is so smooth, that it gives a completely new meaning to the term "rough-sawn".

Narrow blades are very thin and sensitive, and they need various types of special guides to stabilize them, so all

manufactures of narrow-blade machines have paid special attention to this point.

4. Low power cost

A very thin narrow blade produces less sawdust and needs less power to drag it through the timber than the conventional bandsaws. On the other hand, they are constructed. for operating with smaller widths of timber (corresponding to height of cut in conventional bandsaw), up to 300 mm, and they need less power, but it is at the same time the main limitation of the machine.

Depending on the construction, the conveyor system and synchronized top pressure rollers are electrically or hydraulically driven. The automatic lifting and lowering of the top pressure rollers is pneumatically powered.

In the mobile versions, log loading, turning, taper set, squaring and dogging can be done hydraulically or in the cheaper versions of some manufacturers, by manual winch.

Generally all these machines have up to 22.5 kW three-phase motor (mainly from 11 to 22kW per head), or up to 22 kW diesel motor, mainly in the mobile versions. According to the Forestor, three conventional resaws consume 198 kVA, but a four-head thin-blade saw consumes only 155 kVA, which means that, for the same production rate, electricity costs drop by over 20%.

5. High volume production

Cutting speeds depend on the species and the width of timber, and can be up to 45 m/min. For instance, ***theoretically, 100*** mm wide oak can be sawn at feed speed of 30 m/min per head, which on a six-head machine equates to a conventional single-head resaw operating at 180 m/min. ***Pratically,*** it means that, compared to conventional resaw, a two-head thin-kerf machine doubles the production, in case of small log processing.

6. Versatility in cutting

This type of machines can be used for resawing of cants, flitches, quarter and half rounds. Both mobile and stabile resaws have the possibility for angled cutting, because heads can be tilted.

7. Low labor costs

Both in the mobile and especially in multi-head configuration, labor costs are low because no matter how many heads are fitted, it still only needs two people. For instance, ForestorAs 12 head Multi-Cut machine still needs two persons.

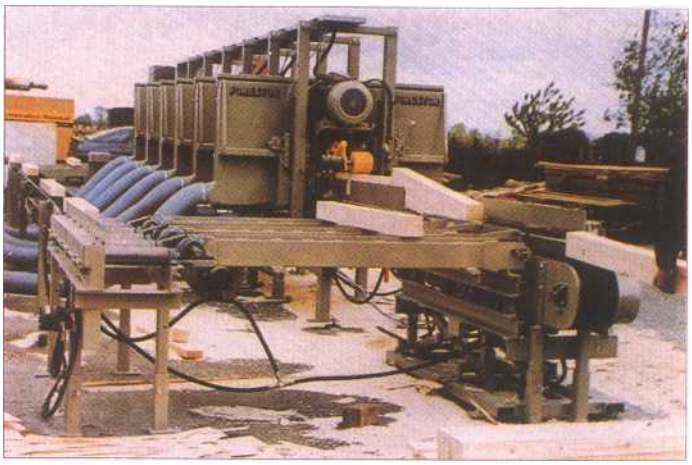


Fig 4. Multi-head thin-kerf machine with feed back system

8. Low capital cost

The mobile versions of thin kerf machines cost between 25,000$ and 30,000$, with automatic saw,blade grinder and additional equipment, while a complete four-head costs 148,000$, with automatic system for separating and returning unsawn timber to the infeed to be fed through again (Fig 4).

9. Low installation cost

Thin-kerf machine is a free-standing machine and does not need pit foundations, so there are no hidden installation costs. It also means that it is very easy to move the machine to a new position or location, in contrast to a conventional wide-band resaw.

Other options

Some manufacturers offer the computer controlled depth of cut setting, so the operator can set the thickness of cut for each head from his working position. Up to 99 programs can be pre-set and recalled at any time. Settings can be adjusted by 0.1 mm increments.

Conclusions

Although many manufacturers of thin-kerf machines compare their machines with conventional wide bandsaws, there are significant differences in capacity, power, and costs. Thin-kerf machines cannot replace conventional wide bandsaws, but for small and medium capacities, small diameter logs, especially short logs, and flexible production, thin-kerf machines have certain advantages. They are much cheaper, with smaller labor costs, with no hidden costs, they give a much higher recovery in small log processing, smoother cut, and greater accuracy.

They need very little maintenance compared with the output, and they are specially interesting in the small and medium workshops.

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