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Improving Rough Mill Yield by Fingerjointing

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Fingerjointing (FJ) is the process of joining short pieces of stock (FJ blocks) of the same width into longer pieces (FJ blanks). The hardwood industry uses FJ blanks to produce mouldings, interior furniture parts, substrates, and flooring. Fingerjointing can potentially help a manufacturer increase rough mill yield by allowing chop saw operators to cut random lengths along with the fixed lengths they may already be cutting. Cutting only fixed lengths dramatically reduces the chop saw operator's ability to utilize the entire amount of clear wood between defects. Several manufacturers that have begun fingerjointing have reported as much as a 10% improvement in yield. However, before buying a fingerjointer a manufacturer should consider markets, production levels, and the quality of the blocks needed for the fingerjointing process.

Fingerjointed Product Markets

Currently (in 2001), the strongest FJ product market in the hardwood industry is for poplar moulding blanks. Unfortunately, the FJ market for other species is extremely limited. Fingerjointed oak is beginning to be used for flooring and occasionally used in mouldings and exterior furniture parts. Hard maple is sometimes used for stools, bench tops, and bowling alleys. The rest of the FJ market is comprised mostly of interior furniture parts using species such as soft maple, sycamore, and aspen. This part of the market is small and growing very slowly, primarily because the industry is fearful that the FJ material is not as strong as solid material. There is also a very small market for exterior furniture parts made form FJ stock. This market is small because consumers have been slow to accept the aesthetic value of the material for exposed parts.

Fingerjointing Production Considerations

Production planning should be considered before a company purchases a fingerjointer to increase yield. Some of these machines can run as much as 50,000 to 60,000 lineal feet of product per 8-hour shift, while others may only run 3,000 or 4,000 lineal feet per shift. Assuming the average width of the blocks are three inches, a FJ machine that produces 60,000 lineal feet per 8-hour shift will consume 15,000 board feet of blocks. If the fingerjoint blocks produced results in a yield increase from 55 percent to 65 percent, for a rough mill that produces 30,000 bf of net parts per day would gain an additional 5400 bf of net material for FJ production. This would be much less than what would be required for a 60,000lf FJ machine to produce at full volume, causing the utilization rate for this machine to be only 36 percent. To fully utilize a high production FJ machine, the rough mill would need to supplement their own FJ blocks with outside FJ blocks or move some of the production from current products to FJ products. This situation could represent a significant shift in the company's production and marketing scheme. The solution could be to buy a machine that has lower production levels. These machines generally cost less and would better fit the capital investment budgets of most manufacturers.

Fingerjointers are made in a variety of configurations - some machine the joint across the tangential surface of the stock while others machine the joint across the radial surface. Each design is used for different finish criteria and one design may be more acceptable based on aesthetics in different parts of the world than the other one.

The design of the FJ tooling needs to be considered as well. Tooling can be purchased to pro-

duce joints that range from as short as a 1/4" to as long as 3/4". The blocks being fed into the fingerjointer are trimmed in order to square them before the finger is cut in each end. The amount of stock removed for the squaring process and the length of the joint will determine how much loss occurs during machining. The amount of loss can be calculated:

*FJ yield loss = [(trim allowance * 2 ends) + joint length] / average block length*

For example:
removing 3/16" from both ends in blocks, that have a 3/8" joint length, with an average block length of 16 inches, the yield loss due to fingerjoint machining would be calculated as:
*FJ yield loss = [(3/16" * 2) + 3/8"] / 16" = 4.7% loss*

Some manufacturers find it difficult to change to a smaller joint length and hold the same quality specifications. Generally, the longer the joint length the easier it becomes to properly joint the pieces together.

There are several companies that are selling their shorts (generally stock that is less than 12") to FJ manufacturers. This benefits both companies. The seller can improve yield while not having to deal with the overhead of a new machine or developing new markets. On the other hand, the buyer generally pays less for the stock than it would cost for him to produce it himself. There are even a few companies that are hiring other manufacturers to fingerjoint their own blocks together so they do not have to make a large capital investment for a machine and still have the yield benefit from cutting random length stock at the chop saws. These companies then incorporate the material into their own products.

Fingerjoint Block Requirements

The edges of the blocks that are to be fingerjointed must be parallel and the same width at each end. Fingerjointing blocks that do not have parallel edges will result in offsets from one piece to the next when they are fingerjointed together. Offsets make machining the FJ blanks through other machines (e.g., moulders) difficult to do without generating rejects. A company interested in producing fingerjoint blocks should consider that straight-line ripsaws do not do as good a job ripping stock parallel as do gang ripsaw. If the stock is going to be straight-line ripped, great care must be given to make sure these blocks are ripped correctly. Thickness also is a concern. Most fingerjointers only have a thickness tolerance of about 1/16 inch (.0625 inch). Any FJ blocks (a.k.a. shorts) outside this tolerance are very difficult if not impossible to fingerjoint correctly. In order to meet thickness requirements, a manufacturer must have a rough surfacer capable of controlling stock thickness within a 1/16" allowance. Thickness and width requirements are critical enough that a company with a newly installed FJ operation might have to change its entire production line and equipment if not able to meet these standards.

Fingerjointing can certainly increase the yield of most rough mills but before purchasing a fingerjointer a great deal of planning and research needs to be done to make sure that the FJ investment achieves the desired result.

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