

SANDING LUMBER

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Today my presentation is on the subject of sanding lumber. We will address the question of why lumber sanding over knife planing? We'll also explore the current state of the art as it relates to the batch method of sanding rough lumber, and the incline concept of a single board at a time plus where lumber sanding is heading.

When comparing lumber sanding to knife planing the most important thing to remember is that a knife has a tendency to lift the board during cutting so that the lumber must be held down with excessive pressure which is one of the main contributing factors of roller splitting. Also because of this fact at the present time to oppose knife cutterheads presents the problem of knife chatter showing up on the surfaces of the board, and without opposing the cutting heads you don't take equal stock removal.

Lumber sanding on the other hand represents a significant advancement for the lumber industry since it can handle all types of softwoods and hardwoods. Proven benefits in improved utilization and increased yield are achieved where the concept of lumber sanding is used in place of knife planing for surfacing lumber.

When sanding lumber with an abrasive belt the cutting forces want to push the lumber away, hence when running lumber through a set of opposed sanding heads the forces tend to flatten cupped lumber and take equal stock removal from each side of the board without roller splitting.

Through the use of lumber sanding, the following benefits are achieved.

1. Elimination of roller split. Roller split is eliminated because lumber sanding utilizes a different approach for feeding lumber than the conventional method of air or hydraulic loaded rolls and chip breakers. Our method features a special patented infeed section for feeding narrow to wide pieces of varying thickness of material to the opposed sanding heads. The infeed section utilizes a heavy duty infeed chain drive system consisting of roller chains driven both top and bottom. Each infeed chain is individually supported by a wear strip that is backed up by air-loaded pistons. Air loading of infeed chains centers material for obtaining equal stock removal from both sides and because they conform to the shape of the individual piece instead of trying to straighten it while feeding, roller split is eliminated.

2. Reduction of green target size. Since the lumber sander has the ability to take equal stock off of each face of the lumber, a substantial reduction in the green target size can be made. One mill was able to reduce its rough green target size from .950 inch to .860 inch or .090 inch which according to data supplied by the U.S. Forest Service, amounts to an eight percent

increase in recoverable green lumber scale for 4/4 lumber. Another mill was able to reduce its green target size by 1/16" for a recovery improvement of five percent.

3. Increased production. Because the batch type lumber sander can process batches up to 50 inches wide through all thickness ranges with feed speeds up to 200 f.p.m., high production rates are achieved. Take, for example, if you are running 4/4 - 4" lumber at 200 f.p.m., you would process 13 pieces at a time for 338,000 board feet or 1,014,000 lineal feet single board at a time at 2600 f.p.m. If you were running 4/4 - 12" lumber you would process four pieces at a time for 312,000 board feet or 312,000 lineal feet single board at a time at 800 f.p.m.

4. Increase yield. The lumber sander, because of the patented infeed section and equal stock removal capability will effectively process and clean up warped, twisted, bowed, cupped and skip on scant lumber.

5. Decrease in down time of operations. A lumber sander does not require the operator skills that a conventional knife planer demands in order to produce a suitable surface. Also, sharpening and changing knives require more time compared to changing belts. Also, nails, wire, bullets and other foreign material in the lumber won't effect the machine's performance because of the cutting characteristics of the belts.

Whether you process less than 20,000 or over 200,000 bf per shift a day on green or kiln dried stock, most likely there is a lumber sander system specifically designed for your needs and product application.

At the present time there are two methods of lumber sanding: the batch method (multiple pieces being surfaced simultaneously) and the in-line method (single piece being surfaced at a time). At this time let's explore the features of the two methods.

Batch Method

The batch method is offered from a two-head through to an eight-head machine (16" up to 50" wide in capacity) for surfacing S2S with feed speeds up to 200 f.p.m.

We installed our first batch type lumber sander in 1971 for sanding alder and big leaf maple. It was a four head X 38" wide machine with opposed contact rolls each powered by 100 H.P. motors and a feed speed of 70 f.p.m.

During 1977 some major design changes to our lumber sanders were made which allowed us to run at 200 f.p.m. continuously. I would like to list a few just to give you an idea of how lumber sanders differ from panel sanders.

1. We use faster abrasive belt surface speeds, 9500 s.f.p.m. is common (12,000 s.f.p.m. one customer) than on panel sanders.

2. We power the abrasive belt with higher H.P. motors, 250 H.P. (300 H.P. one customer) each on first set of opposed heads.

3. We found in order to hold a $\pm .005$ thickness tolerance for the finished lumber at 200 f.p.m. feed speed, we had to change the frame construction of the machine. Where we used 5/8" and 7/8" thick steel plate, we had to go to 1" and 1-1/2".

4. Due to the heavy stock removal capabilities of the abrasive belts, we had to design special belt tension systems to eliminate slippage while allowing us to utilize higher H.P. motors.

At this time I would like to cite four actual case histories of plants that are using batch type lumber sanders.

Actual Case History #1

General Operating Information:

Wood species - Western alder and big leaf maple
Thickness - 4/4 to 12/4
Markets - Sold primarily to furniture industry
Production - 4/4 lumber average 85,000 bf per eight hour shift
Normally run two shifts/day

General Machine Information:

Machine configuration - 4 heads - all opposed
Feed system - batch feed
Feed rate - 75 fpm
Horsepower per head - 200, 200, 150, 150 HP

Advantages:

1. 5% increase in yield - Are now able to saw 1/16" closer to finished thickness and still clean up.
2. Higher production rate - 1 shift now handles production previously requiring 2 shifts on a 32" double surface knife planer.
3. Grade improvement - Are able to maintain rough sawn grade. No grain tear out around knots, no chipping, or chatter.
4. Product uniformity - Customers prefer abrasive planed stock due to $\pm .005$ thickness control, uniform surface, ease of finish sanding in final product.

Actual Case History #2

General Operating Information:

Wood species - Ponderosa and sugar pine
Thickness - 4/4 through 6/4
Markets - Shop lumber, box lumber, moulding stock
Production - Shop lumber - 180,000 bf in 8 hours
Box lumber - 125,000 bf in 8 hours
Normally run 1-1/2 shifts per day

General Machine Information:

Machine configuration - 4 heads - all opposed
Feed system - Batch feed
Feed rate - 170 fpm
Horsepower per head - 200 HP, 200 HP, 200 HP

Advantages:

1. Higher production rate - 1-1/2 shifts now handle production previously requiring 3 shifts on double surface knife planers. Are saving 1.250 hours of labor per 1000 bf in processing abrasive planed lumber.

2. Grade improvement - Have cut fall down on box lumber by 50%. Are saving \$30 per 1000 bf on roller splits. 15% of box lumber sold into a higher return product. No grain tear out or loosening of knots.
3. Product uniformity - Close thickness control ($\pm .005$), uniform finished surface, no chatter or tear out.

Actual Case History #3

General Operating Information:

Wood species - Ponderosa pine
 Thickness - 4/4 through 6/4
 Markets - 55% shop, 45% common
 Production - 400 mbf per day (2 shift basis)

General Machine Information:

Machine configuration - 8 heads (first 4 heads opposed, last 4 heads staggered)
 Feed system - (13 - 4" boards, 4 - 12" boards)
 Feed speed - 200 fpm
 Horsepower per head - (4) 250 HP, (2) 250 HP, (2) 125 HP
 Feed horsepower - 75 HP D.C.

Advantages

1. Increase in yield - Have reduced green target size up to 1/16".
2. Increased yield through a reduction in trim ends - 6% gain.
3. Grade improvement - The rough sawn grade is maintained through elimination of grain tear out around knots, chipping, sniping or chatter.
4. High production rate - One lumber sander handles production of 400 mbf on a 2 shift basis.
5. Product uniformity - Close thickness control ($\pm .003$), uniform finished surface, no chatter marks or grain tear out, less fall down in remanufacturing plants.

Actual Case History #4

General Operating Information:

Wood species - #1 common white oak and #2 mixed hardwoods
 Thickness - 4/4, 5/4, 6/4, 8/4
 Production - 40-50 mbf per shift

Advantages:

1. Increase in yield - 7.68% at the cutoff and rip saw operations. 5.5% in finished parts or 10.6% overall less lumber required for the same quantity of finished goods.

2. Increased production - One lumber sander replaced three knife planers and a labor savings of 3 people.
3. Grade improvement - Lumber sander cleans up 90-95% of all boards on both sides at 15/16" setting. Knife planer cleaned up only 50-55% at the same setting. This has increased efficiency at the cutoff saws and substantially increased longer lengths per cutting.
4. Product uniformity - Better surface quality ($\pm .005$), no knot tearout or roller splits. Reduced mismatch with glued stock. Able to use two pieces of 4/4 instead of one piece 5/4 and one piece 4/4 for 8/4 applications.
5. Less down time - Lumber sander will handle low grade, badly twisted, bowed, cupped, and warped boards without jamming. Belts can be changed in minutes compared to time spent for sharpening or cleaning knives.

The benefits of lumber sanding are now available to medium and small plants, 20,000 bf per shift a day and under through smaller lumber sanders that utilize less horsepower, slower feed speeds and shorter length abrasive belts.

In-Line Method

The in-line method is offered from a two-head through to an eight-head (14" and 26" wide) for surfacing S4S with feed speeds up to 1,000 f.p.m.

We installed our first in-line type lumber sander in 1972 for sanding finger jointed redwood. It was a four head X 14" wide machine with staggered contact rolls each powered by 100 HP motors and with a top feed speed of 400 f.p.m.

At the present time a proposed in-line system consists of:

1. A feed table which features an adjustable straight-edge so as to centerline feed the lumber into the pre-sanding blanker.
2. A pre-sanding blanker and powered bridge which is designed to handle the oversized boards and centerline feed the lumber into the in-line sander.
3. An in-line lumber sander which features multiple sets of opposed contact rolls and a set of heads which are offset combination heads, consisting of contact rolls and smoothing platens for the final finish.
4. A side head unit which features knife cutterheads and designed for in and out adjustment for centerline feeding of different lumber widths.

This brings us to the question of where is lumber sanding heading in the future?

At Kimwood we see the in-line method as the coming thing.

1. There aren't a lot of mills that have the capacity to justify an eight-head batch type lumber sander.
2. You don't need the capital expense for an in-line system.

3. You can S4S with an in-line system.

4. You have less power requirements with an in-line system.

In closing I'd just like to say that you are going to see lots of new developments in lumber sanding in the immediate future. With the high cost of raw material, energy, and labor we, the machinery manufacturers, must do everything possible to maximize your recovery.

Speaking for Kimwood, we accept this challenge. This past year we purchased the Stetson-Ross knife planer line which exposes us to 75 years of knife planer technology so don't be surprised when you see a hybrid machine.