Trouble-Shooting with Saw & Board Patterns

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Outline

1. Limitations of standard Quality Control methods
2. Measurement technology for saws and boards
3. Strategies for Problem Solving
4. Examples

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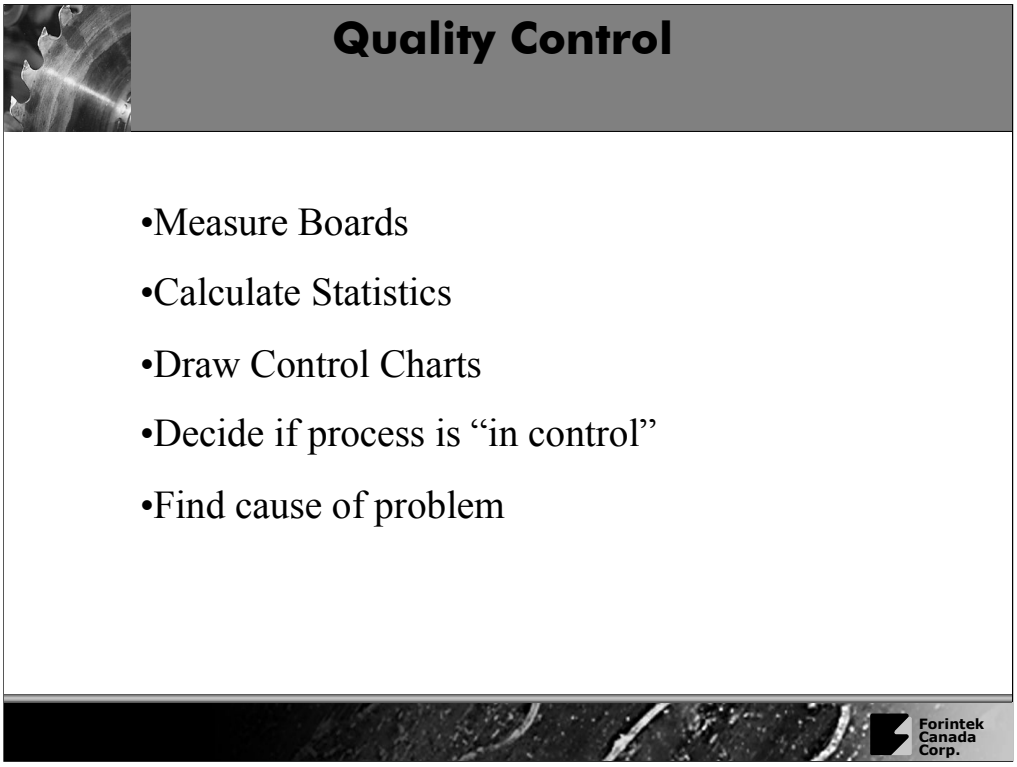
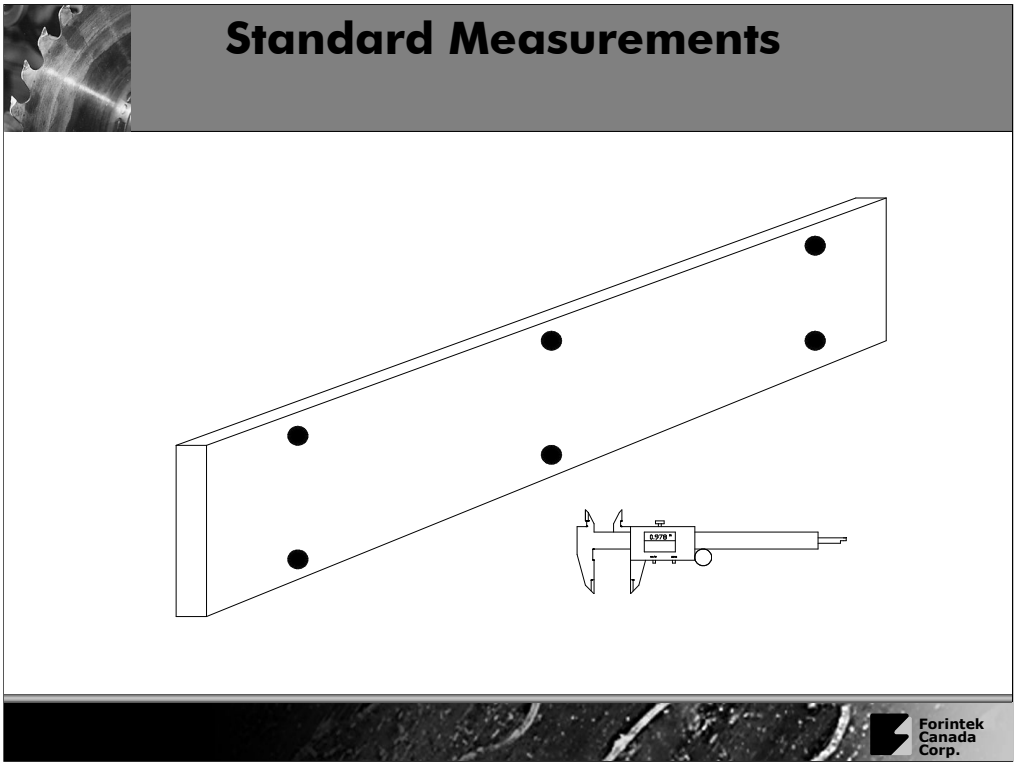


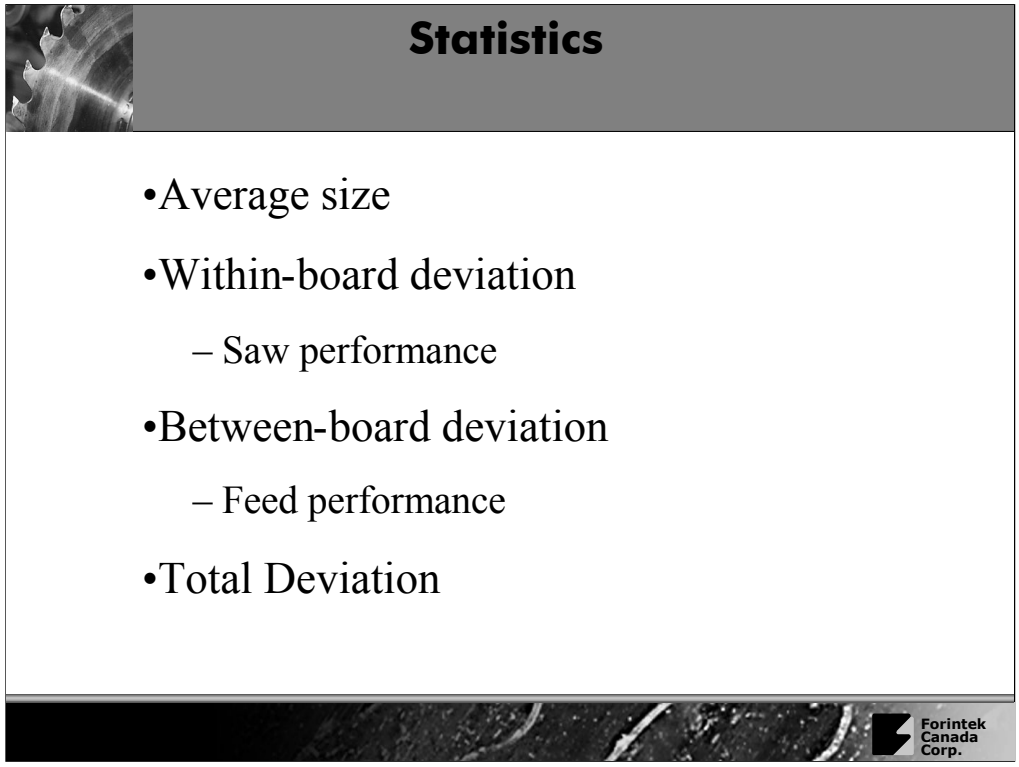
These are the usual steps of quality control. Up to the last point of finding the cause of the problem, the procedures are straightforward.

There are two goals of quality control:

1. Determine if a problem exists based on some proof that something has changed
2. Hopefully, find the problem so it can be fixed.



With only a few points, it is possible to entirely miss a problem.



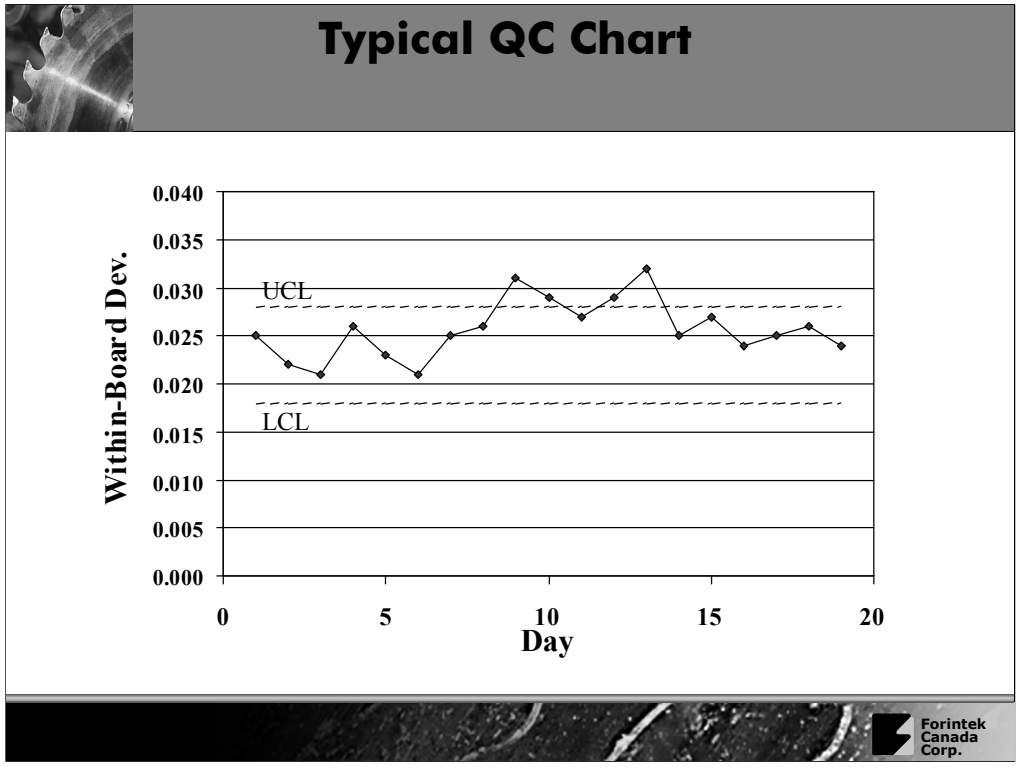
These are the usual statistics calculated

1. Saw performance is assumed to be related to within-board deviation

2. Target size (guide size or setworks) is assumed to be related to between-board deviation

However, this separation rarely applies in practice, as will be explained in another slide

Statistics only point indirectly to the cause.



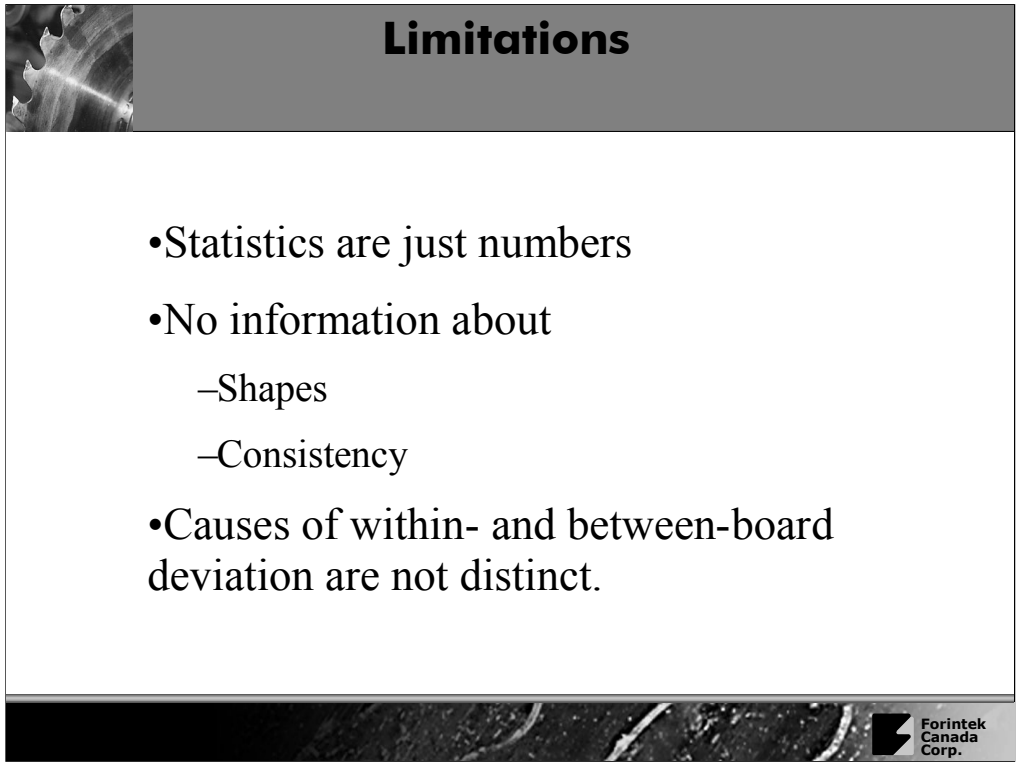
Plot of deviation over time.

Dashed Lines are the Upper and Lower Control Limits (UCL and LCL)

If a point is outside the limit, then usually 99.5% sure that there is a real problem, not a false alarm

Problems are either Common or Special

(See last two pages of this presentation for more information on Common and Special Causes)

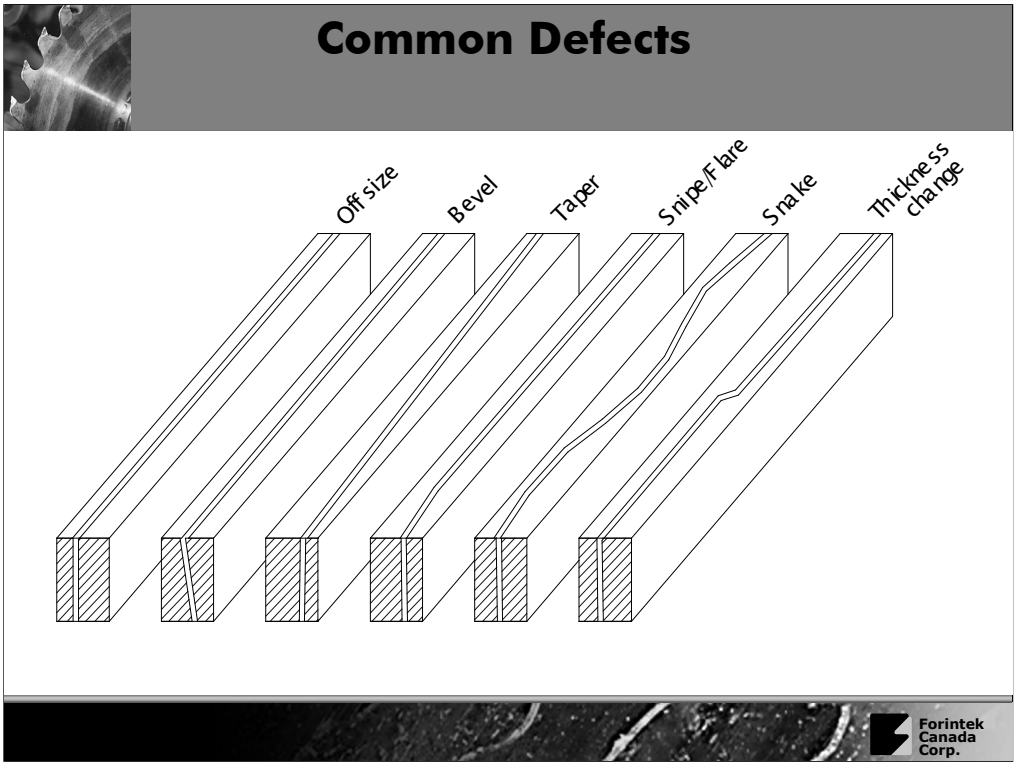


Trouble-shooting requires specific information so you know where to look.

All the statistics say is that you do or do not have a problem.

There are some problems with the usual statistical methods:

1. Between and within-board variations tend to go up or down together. In other words, they are not independent, which limits their use for problem solving.
2. In cases where the saw has a tendency to bias to one side, then the within-board variation also increases. So, differences from target size and within-board deviation are tied together.
3. Often, more than one problem happening at the same time.



This is the information you are looking for.... what does the board look like?

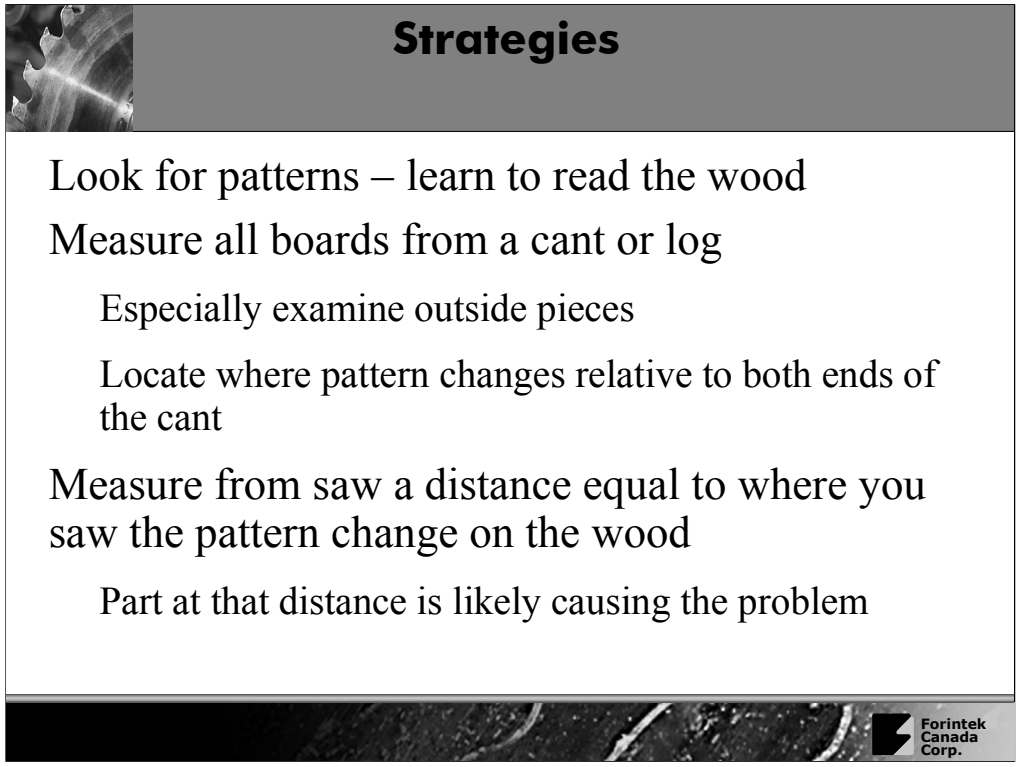
From these shapes, you can begin to look for the cause of the problem.

Except for snaking, which is a random shape, all of these patterns are caused by an alignment or wood control problem that will be repeated in **EVERY** cut.

Once you see one of these patterns in more than two or three boards, you know you have a problem.

- No interpretation of statistics is needed.
- Evidence of the problem is presented directly

The only question is what in causing the shape, BUT, the shape can tell you where to look.



Reading the wood –

All the information you need to discover what happened is recorded in the surfaces of the boards and cants.

Check actual feed speed from tooth or knife mark spacing

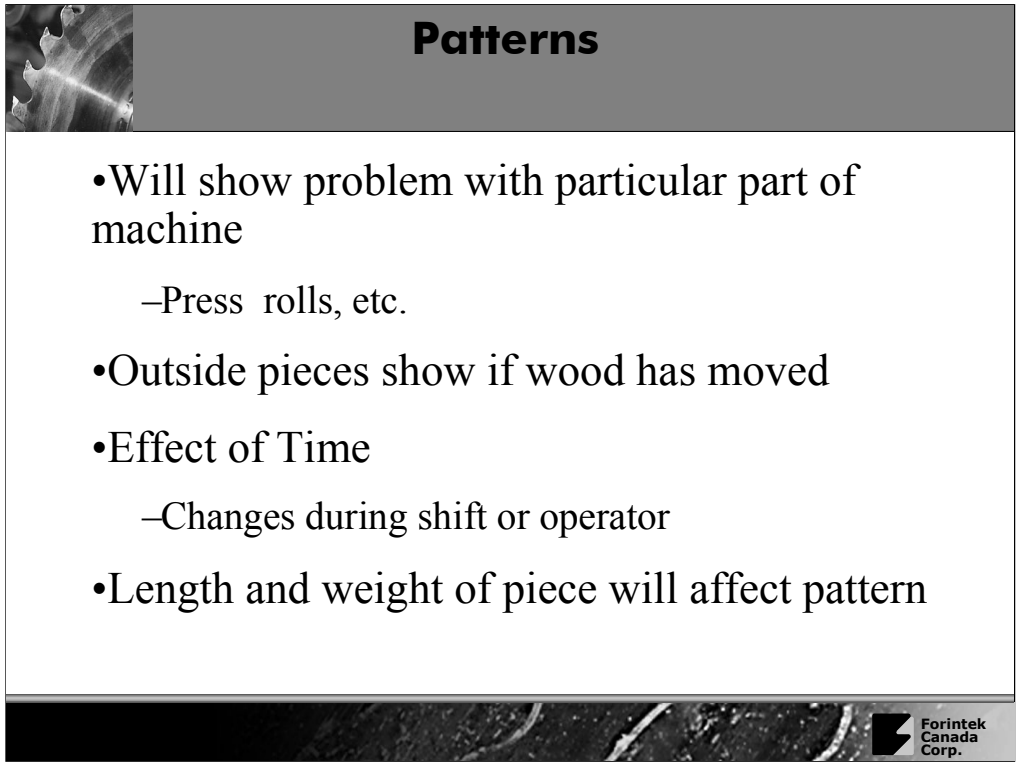
See exactly were thickness or bevel changes

If pattern always starts at the same point from the beginning or end of the cant, go into the machine (or scaled drawing) and see what is at that distance from the saw. More than likely, that part is the problem.

Example:

Measure all boards from a log or cant:

- high deviation on side boards, but low deviation on center cant indicates wood movement

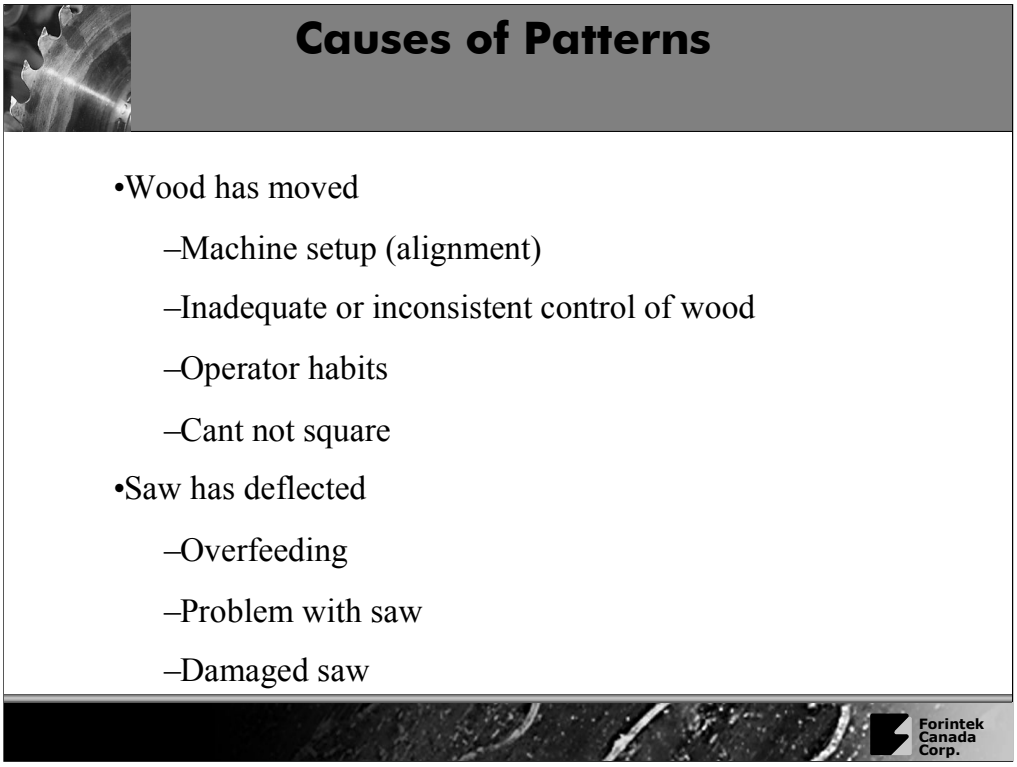


Pattern analysis still being developed, but in the near future it will be done by a computer.

Once a pattern is seen in a few boards, there statistics are only needed for monitoring, which is what they were designed for in the first place.

Piece size and weight can effect how a cant goes through a machine.

- Length can be an issue if the cant isn't fully supported until it has completely left the sawing section
- Heavy wide pieces are unlikely to be pushed up against a linebar by a press roll



For example, a high within-board deviation points to saw deviation, it doesn't say why the saw deflected.

Maybe it is the wood moving against the saws?

Why? – Press roll is leading to one side

Why? – Pivot shaft was bent in a wreck

Why? Press roll timing was off (lost control of wood)

Why? System assumed cant was 8" thick, when it was only 4"

Why? .....

Maybe the saws are being damaged or subjected to too much heat.

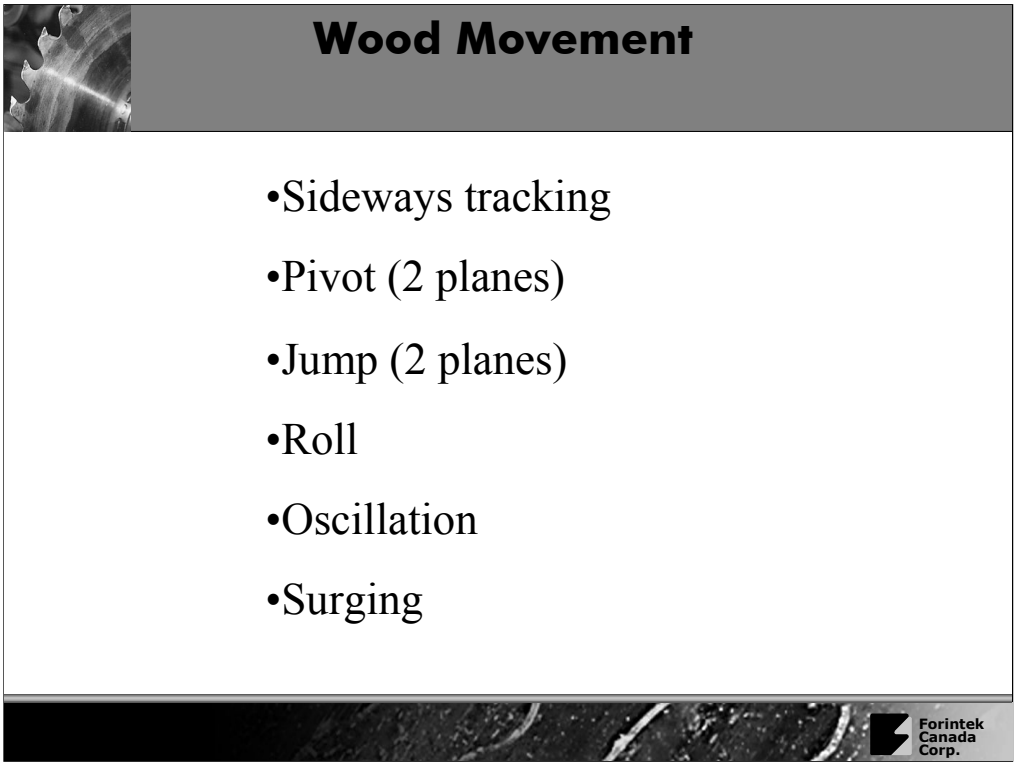
Why? - Log twists as it leaves the canter anvils

Why? – Sharp chain not parallel to the chipping head and anvils

Why? .....

Statistics, by themselves, can't remove the "maybe". Without other information, you can't trouble-shoot effectively.

(Above is example of 5Y's – topic for a whole other topic on production trouble-shooting)

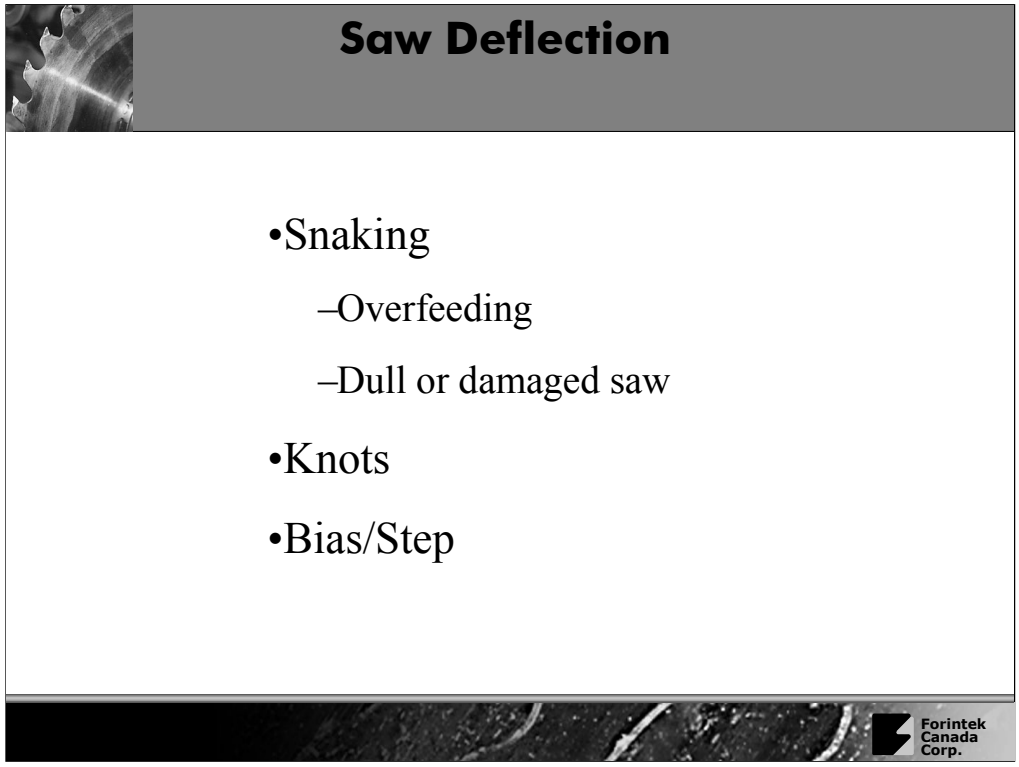


Wood can (and does) move in any direction

Displacement, speed and acceleration

6 Degrees of motion

- Drifting
- Surging
- Bouning
- Yawing
- Heeling
- Pitching



Knots – all saws deviate around knots

- They show up as spikes on the BR plots

Snaking

- Random
- Long pattern (several feet)

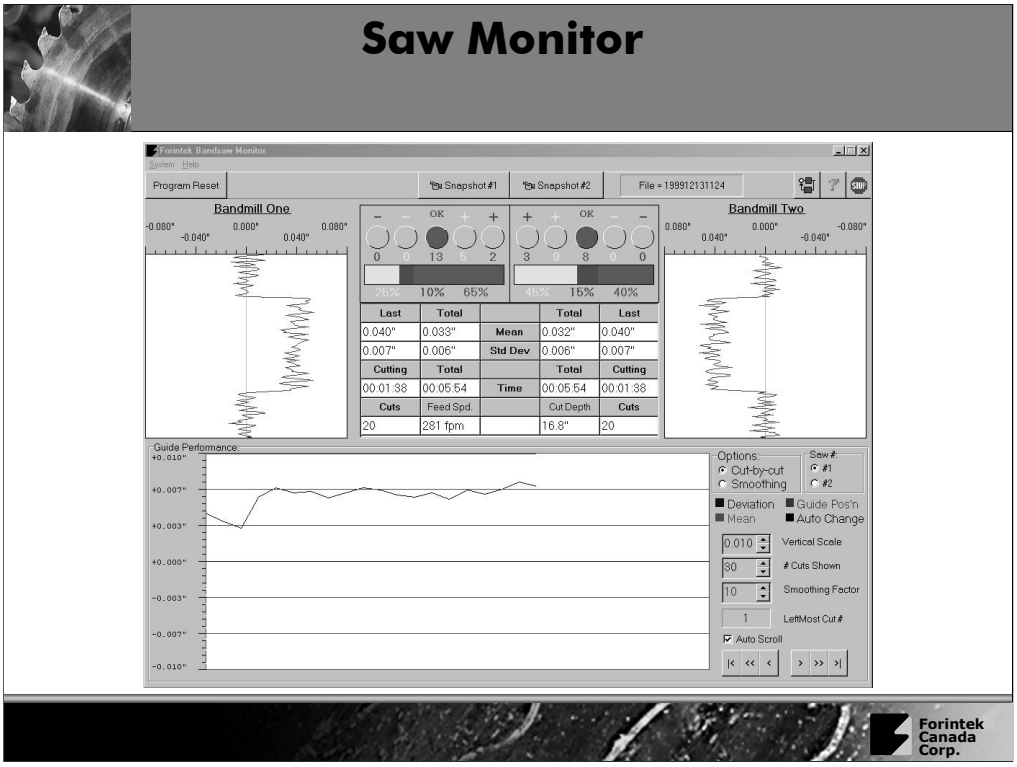
Bias

tooth asymmetry

Guide lead

Shims/packing

heat or dished blade

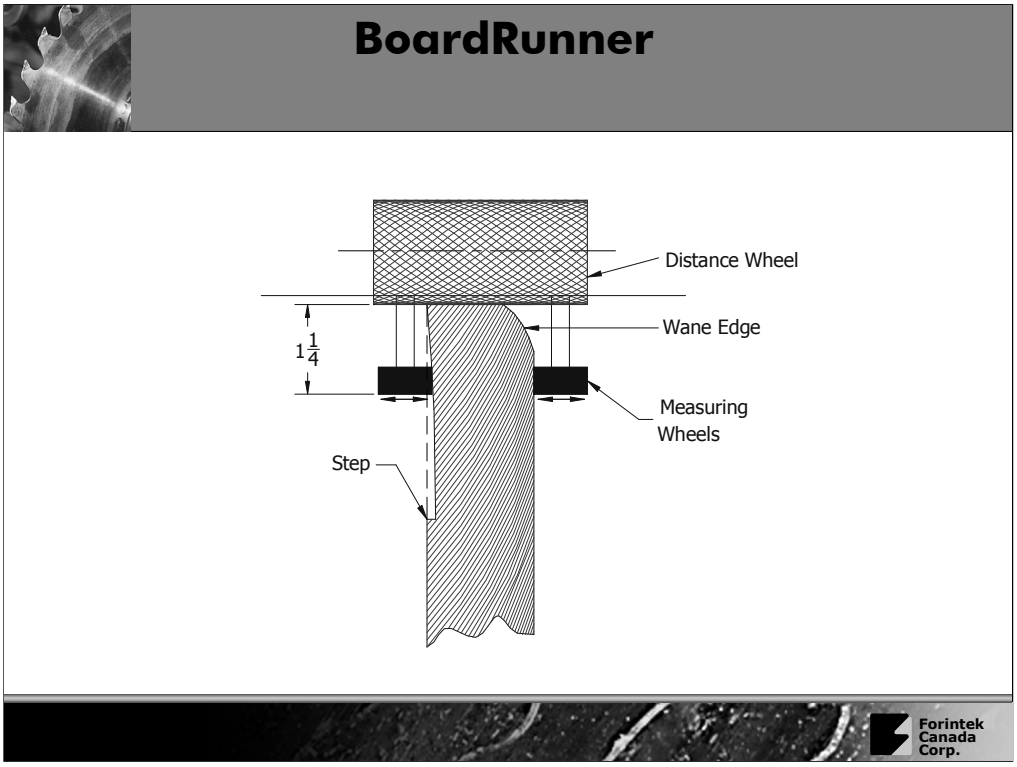


System should show a readable chart of how the blade moved in the cut

Should also show how saw variation and deflection changed over a period of time.

The BoardRunner runs on the edge of aboard taking thickness measurements as it is pushed along. Measurement spacing can be smaller than 1 inch, but typically as spacing of 2” or 3” is adequate.

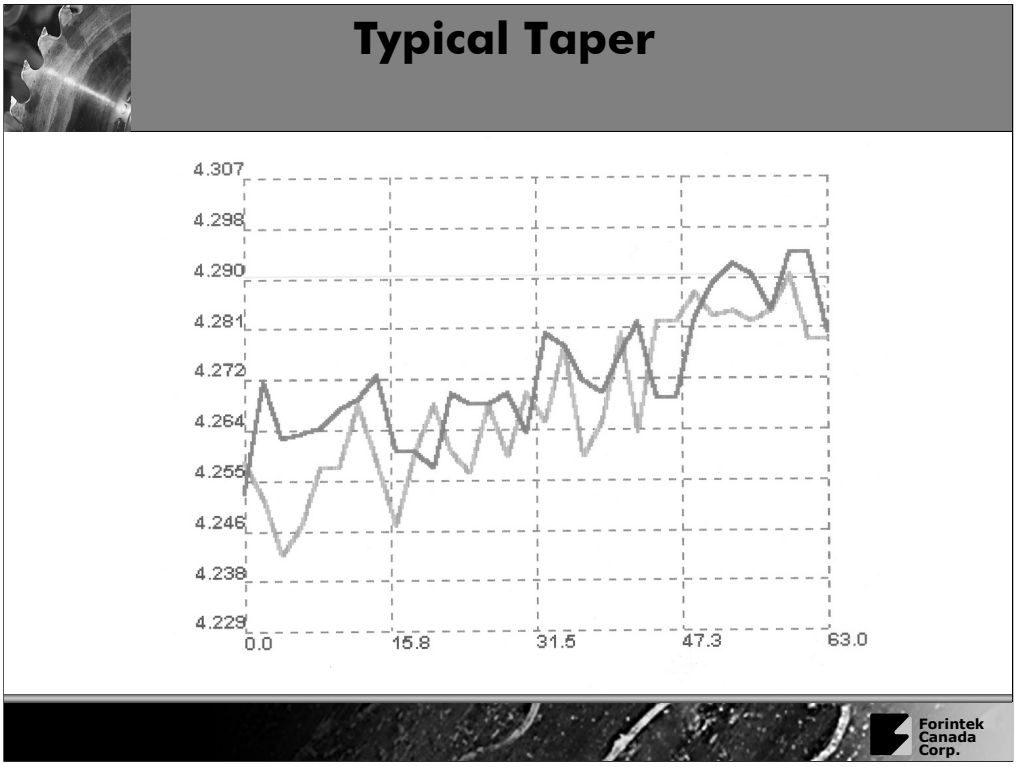
The other edge of the board is measured by turning the board over and repeating the measurement. The measurements from the two edges are stored together for analysis. An on-board screen shows a graph of the two edges.



Measuring wheels down 1.25 inches to avoid wane edge.

- With this arrangement, step can also be seen, even though the measurement is quite close to the edge. There can be 0.030" difference from the measurement wheels to the top edge of the board, where the calipers will be measuring.

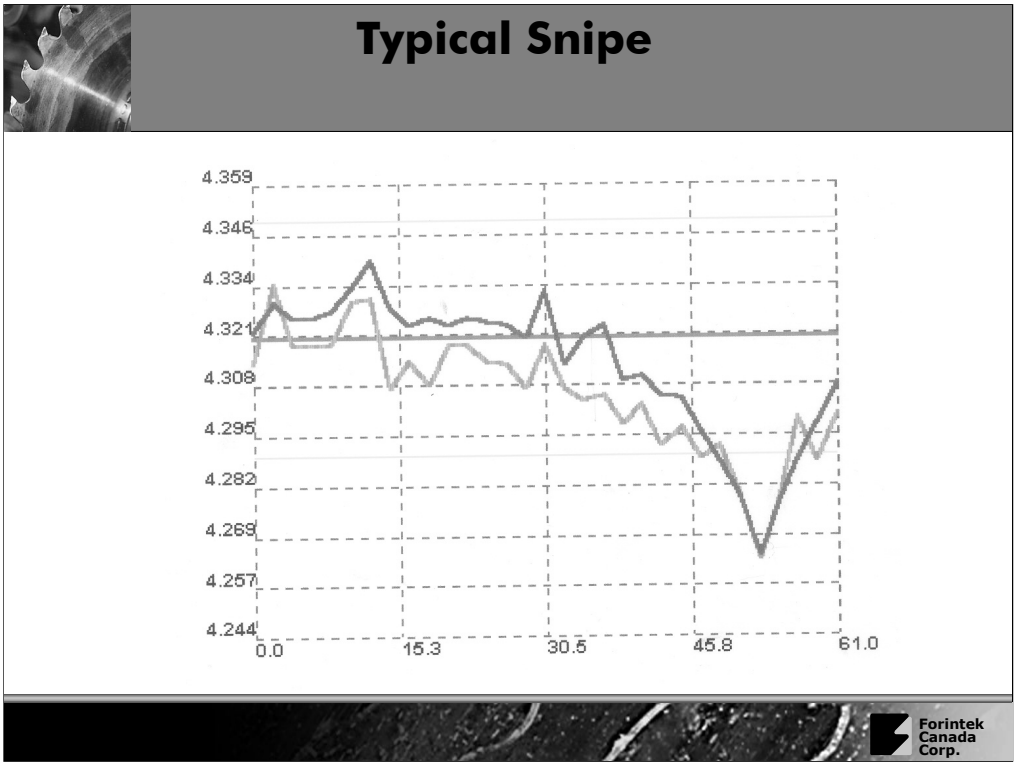
Distance wheel triggers on-board computer to measure thickness. Measurements are usually taken every 2", but interval can be as small as 0.1".



About 0.030” taper over 63”

Top and bottom of the board are the same, so there is no bevel. The cut is also fairly straight.

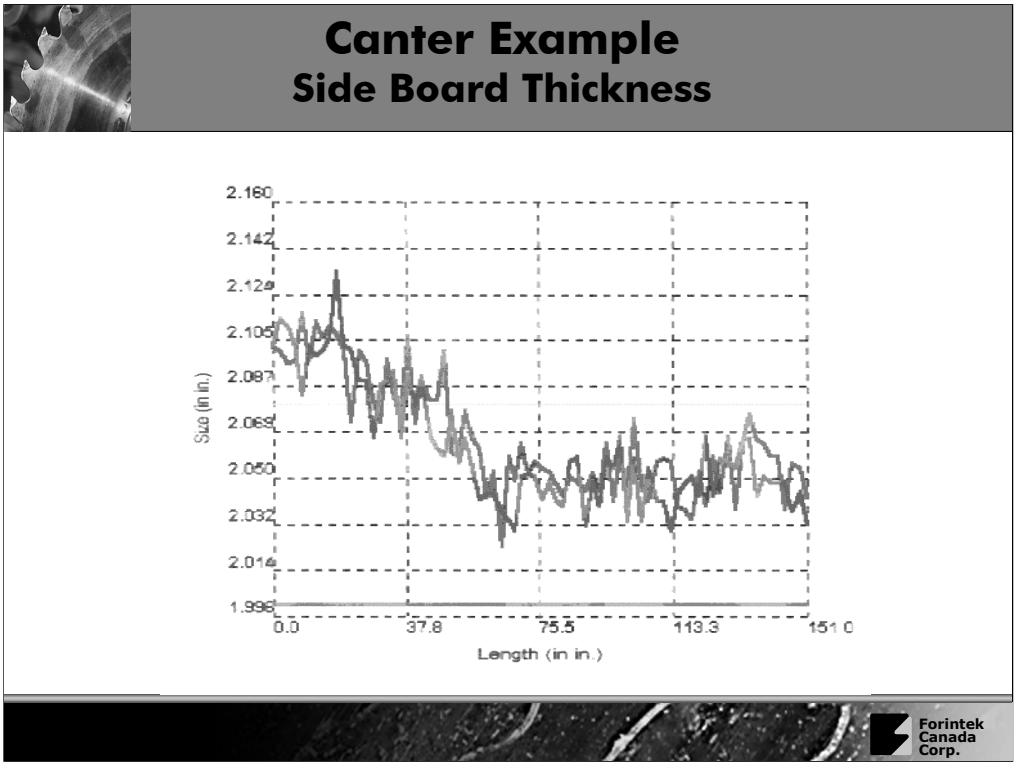
Often seen on side boards were the wood is moving sideways. Not likely to be seen in the middle of a cant (board cut by two saws)



About 1/16” of snipe

Dip is 8” from end, and starts 27” from end

Notice that although the spike is near the end of the cut, the snipe started half way through the cut. Also the sudden return to the target size at the end of the cut indicates that the board moved suddenly. Likely cause is that two parts of the feed system are trying to move the wood in two directions.

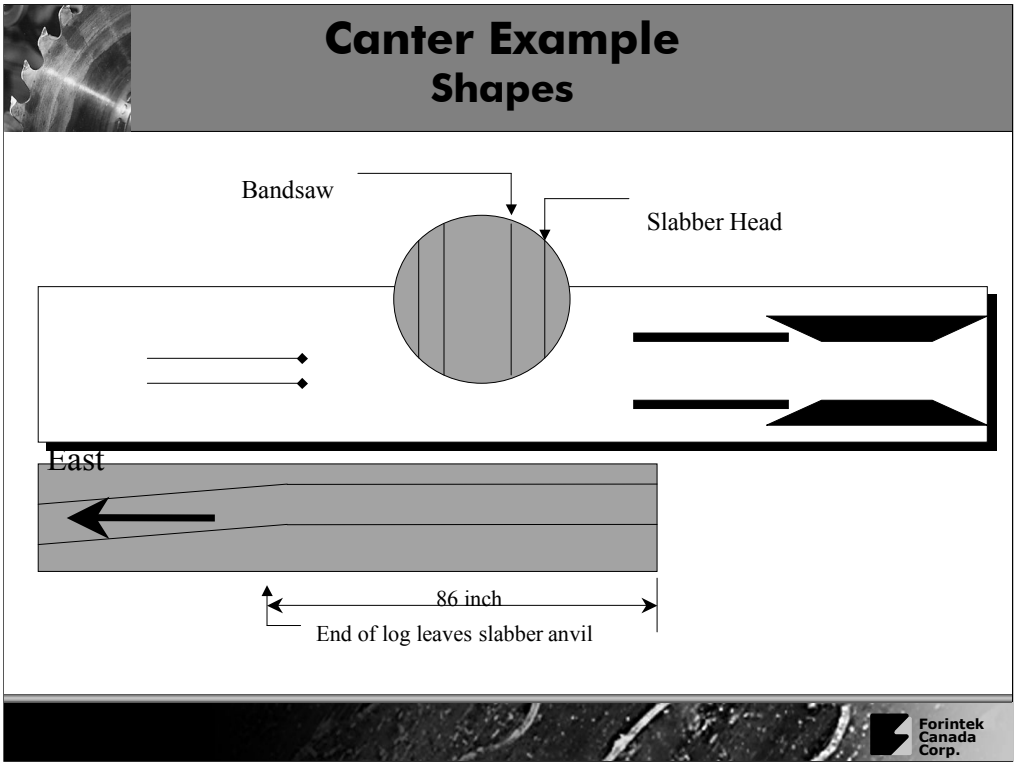


West bandmill plot was mirror image – thin on leading edge.

This is not a short snipe at the beginning of the board, which is the conclusion that would have been reached from 6 caliper readings.

The taper is about 60” long on a 151” long board.

- the cut is straight before and after the 60” point
- the cant basically changed directions



Very common problem with twins and quads.

Cause: Slabber and sawing sections not parallel. Cant was forced to bend, and then "snapped" as it left the anvils.

Canter Example
Conclusion

- These shapes appeared for every log
  - –No statistics required
- Shape showed where the problem was
  - –No guessing
  - –No arguments
- Cause: Slabber and sawing sections not parallel. Cant was forced to bend, and then "snapped" as it left the anvils.

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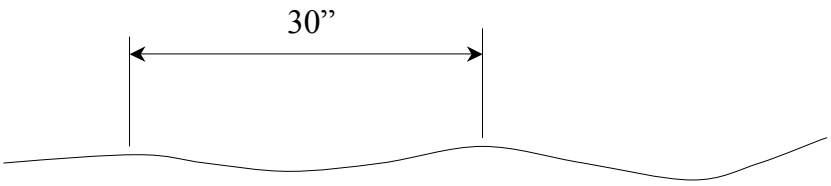
Planer Example

30” wave in thickness of planed board



Cause: 10” roll not round

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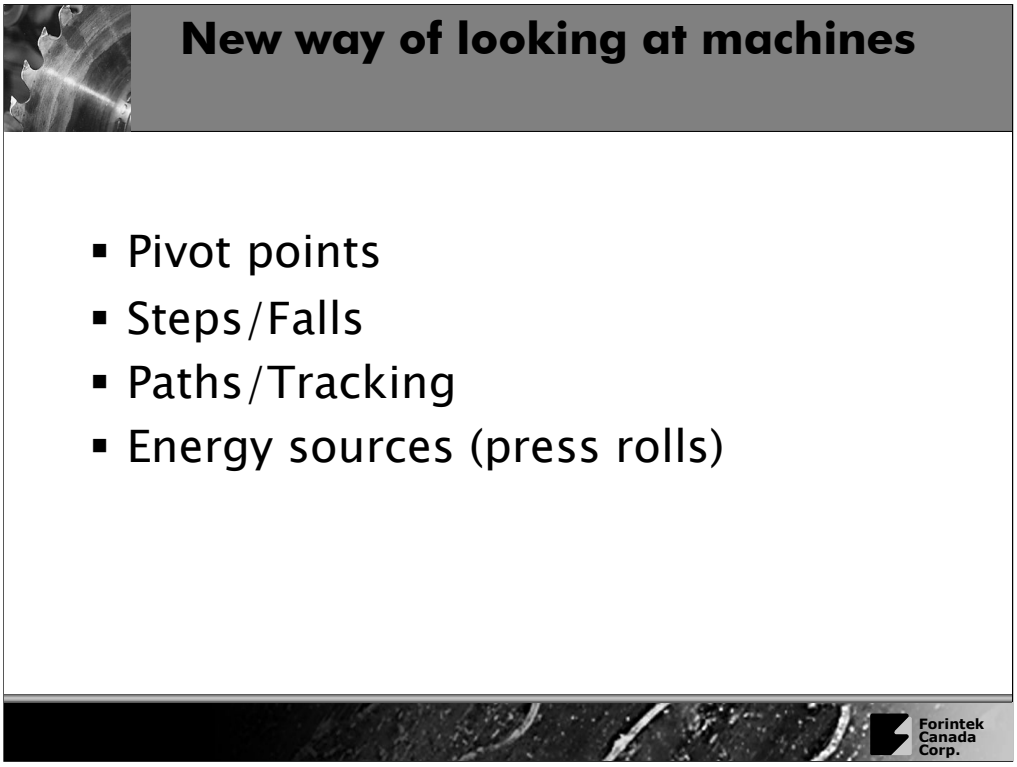
Seen at two mills who wanted to “check the accuracy” of the BoardRunner on planed wood.



Pattern analysis of wood is a new technology, but these are some of the considerations.

Pivots:

- high bed roll
- end of linebar
- the saw
- short anvils

Steps/Falls

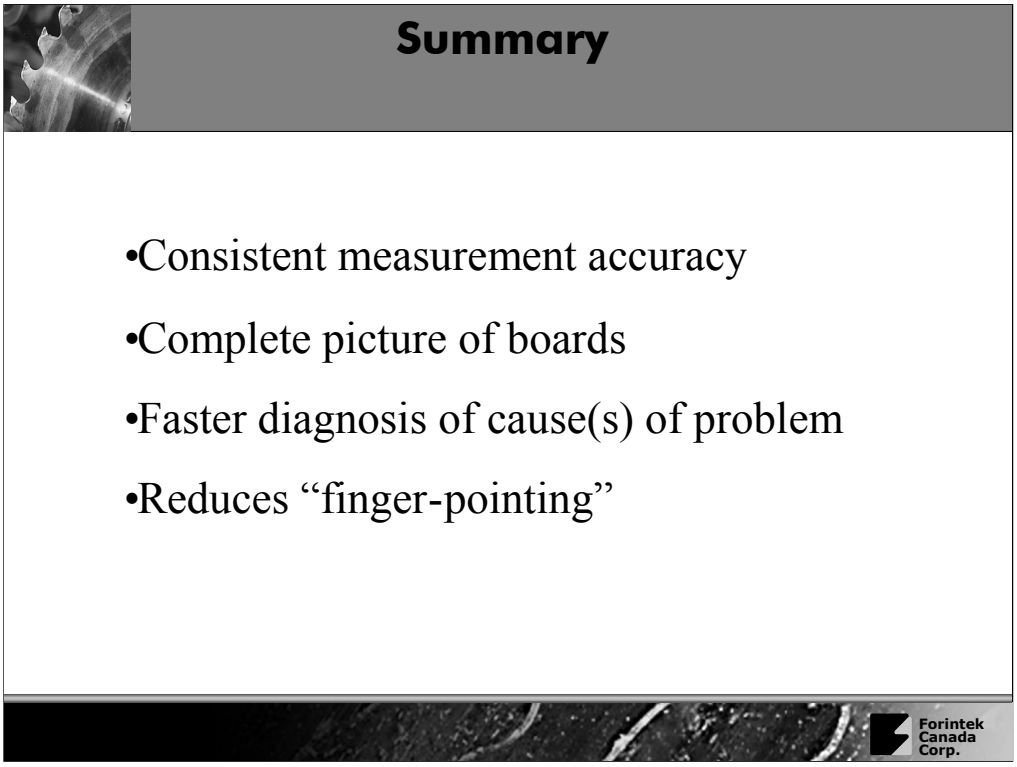
- High relieving roll in linebar
- high bed roll
- Joint in bed plate or linebar

Paths/Tracking

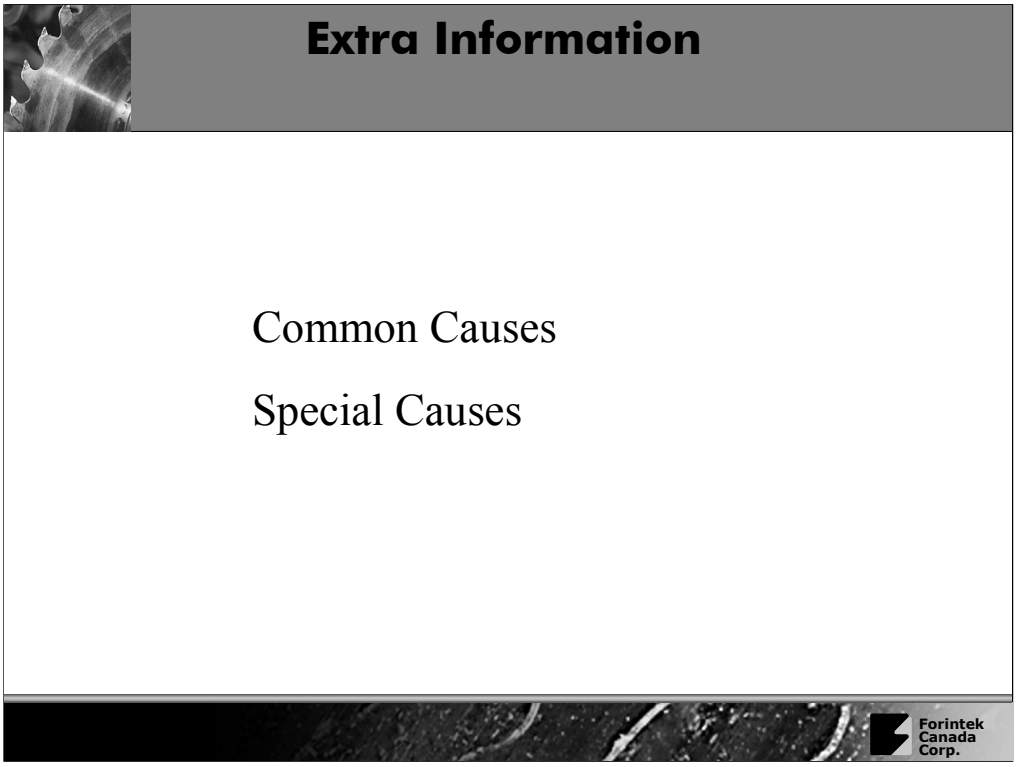
- bed roll or press roll lead
- V-rail or spline straightness
- Chain ways

Energy Sources

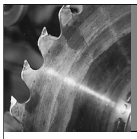
- Press rolls
- Chipping heads
- Out-of-round roll



Pattern analysis is going to be a important part of quality control in the future because it identifies the problem, not just tells you that there is a problem, which is what Control Charts do.



Extra material, not part of presentation.



Common Causes

Assumed to be the result of random variations from the production process

- wood properties
- normal bouncing of the wood through the feed system
- minor differences in saw preparation
- Measurement errors

Desirable to reduce the variation from these causes, but as long as the variation levels stay constant, then the system is “in control” and stable.

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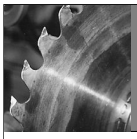

Special Causes

Special causes are something that is out of the ordinary and needs attention.

- gradual wear of an arbour
- bent press roll arm causing wood to crab sideways
- Plugged water line used for guide lubrication
- Clearance of anvil behind chipping not set properly
- Bearing on guide dresser resulting in off-size guides

Usually, a machine has many issues, but they're part of the random variation that is called "normal operation". There is a level that is reached, however, above which the machine performance will immediately suffer.

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