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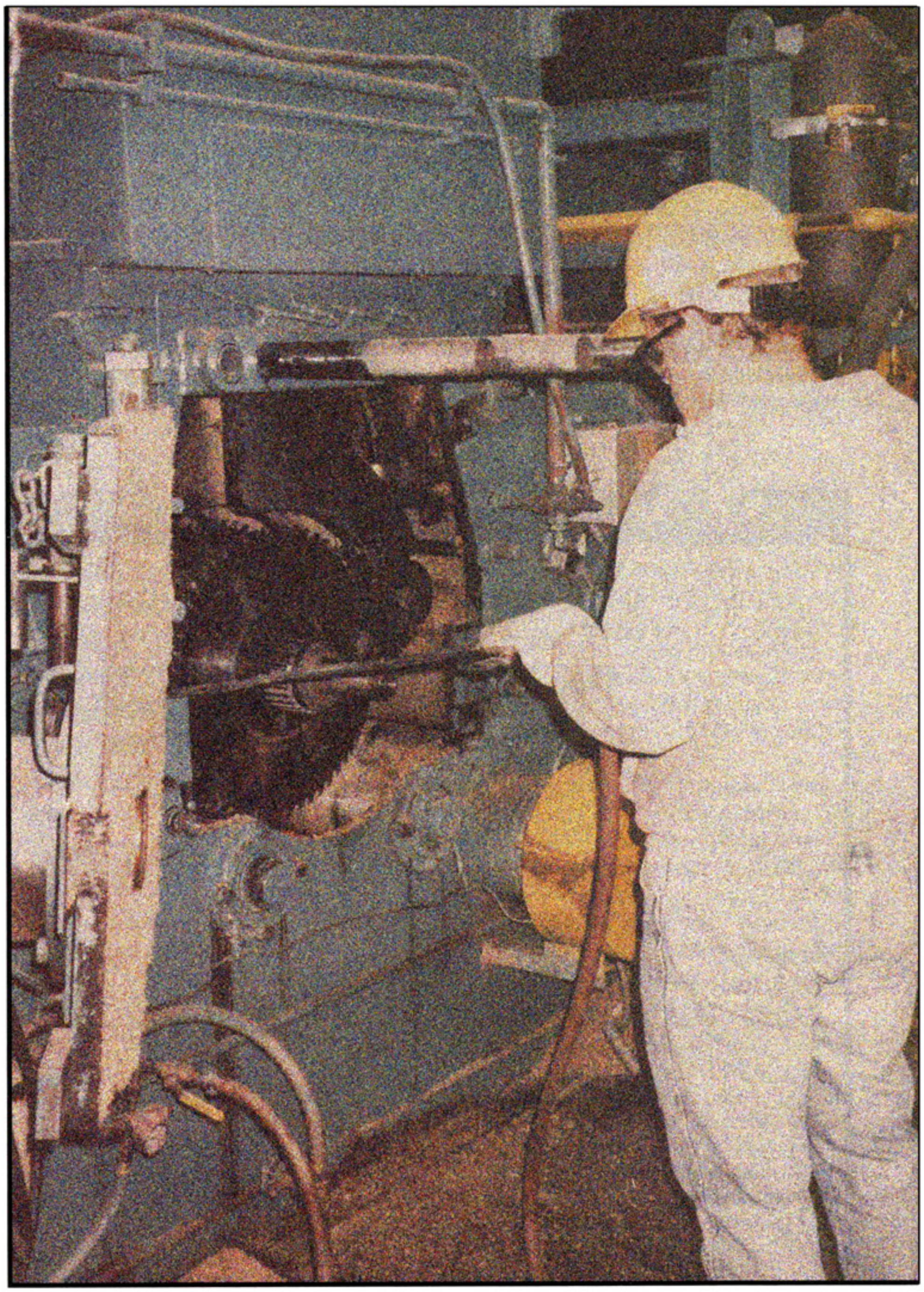
GOING STAINLESS

By **Warren Bird and Sydney Bird**

Stainless steel saws may provide greater accuracy and more revenue.



Stainless steel circular saws came into being in order to combat corrosion, especially the rapid saw plate erosion encountered by mills that cut western red and incense cedar, and to reduce damage from bending. That's not why they're being used today. Overwhelmingly, stainless steel saws are replacing alloy steel saws in gang edgers for a single reason: They cut straighter—a lot straighter. And, because the lumber produced is sawn more accurately, it's worth more money.

The breakthrough occurred three years ago at the current Weyerhaeuser sawmill in Dallas, Ore., when head filer Mike Neveau installed stainless saws in a McGehee-Newnes 12 in. curve-sawing gang, which the then Willamette Industries plant had been operating successfully for three years.

Darrell McMullen, in charge of quality control, measured offset, recorded it, and maintained its history. His L-SIZE reports from the double arbor gang were a surprise (see Table 1).

Even more surprising were the results from the planing mill, where an extra 5% of all the 8, 10 and 12 in. wide boards had been upgraded to Select Structural, the highest grade attainable in green Douglas fir dimension lumber. The number of Select Structural wides had suddenly grown by more than 40%, up to almost 17% of all wide boards. Why? Because the offset range had been cut by 60%, and planer skip had disappeared from more than half of the boards that previously would have been downgraded.

A year later, feed speed was raised by 40%. Kerf remained at .125 in., but saw RPM was increased by 25%, and saw plate thickness was raised from .085 in. to .095 in. According to Neveau, Select Structural inched up to 18%.

Thousands of miles away, the Carter Holt Harvey sawmill in Tokoroa, New Zealand was experiencing problems with its recently installed double arbor gang. Excessive offset was affecting its radiata pine lumber production to the point of threatening the mill's viability. After head saw doctor John Eisenhut replaced the mill's alloy steel saws with stainless steel in 2001, a dramatic turnaround occurred. Eighty-five percent of the boards cut with the new saws had an offset size of less than 1 millimeter, and production targets which had previously never been met were exceeded. Furthermore, the mill's filing team found that production time lost to unscheduled saw changes was reduced tenfold, from 10 hours per week to one.

Filling an unusual combination of roles, John Wardrop is in charge of both saw filing and quality control at the Weldwood of Canada mill at 100 Mile House, BC. Weldwood's top lumber grade, Japanese grade (or J-grade), may command a price double that of the dimension lumber that its boards become if mismatch remains after planing. Looking at production, Wardrop observed that about 16% of his mill's wide boards were being downgraded from J-grade at the planer. Instead of accepting that loss as a normal consequence of high volume production, he identified it as an opportunity for a major revenue increase, and he decided to do something about it. Earlier this year he began to test stainless steel saws in his Ukiah gang, staying focused on his objective until he arrived at a design that met his goals. What he achieved was the almost complete eradication of J-grade downfall due to offset.

At Weyerhauser in Kamloops, BC, head filer Bill Harkies set out to reduce wear in the gullets and on the sides of the saw plates in his 10 in. horizontal double arbor gang and in his 8 in. vertical double arbor Chip-N-Saw line. He achieved his goal by combining stainless steel saws with a system of strict process control, but this accomplishment proved incidental to the 50% drop in the number of unscheduled saw changes due to offset.

According to production supervisor Thomas Ryberg, precision gauges are used to monitor offset over the course of a shift, bringing production to a halt when detected offset reaches the maximum allowable level. This combination of stainless steel saws and effective quality monitoring will help to ensure that grade levels and lumber value are not compromised as the Kamloops mill implements a major increase in production during the last part of 2003.

A detailed confirmation of stainless steel saw cutting accuracy emerged this summer from a series of tests that took place with the assistance of Mill Manager Mike Vinum and filing manager Barry Wilson at Sierra Pacific Industries' Oroville, Calif. mill. The control group of alloy steel saws were 23 in. diameter by .065 in. thick with a kerf of .095 in. and a cut depth of 7.5 in.

In the first test, boards cut by the alloy steel saws and by stainless steel saws of the same thickness, but with a .057 in. reduced rim thickness and a .087 in. kerf, were compared immediately prior to the end of a nine-hour shift. Measurements made along the length of the boards are shown in Figures 1-4. Standard deviations are shown in Tables 2-3. As is typical in guided spline arbor saws, the sawing inaccuracy along the board edges next to the guides is negligible. (Note: It is along the opposing edge, farthest from the guide, that the saw plate is free to deflect by the greatest amount, under the influence of changing tooth forces and the transitory loss of plate stiffness that occurs during each cut as the rapidly warming rim expands.)

The magnitude of the difference prompted a decision to test stainless steel saws that were .007 in. thinner, lowering kerf to .080 in. A test carried out after several runs (and after kerf was reduced to about .075 in.) yielded a top edge standard deviation that was still .010 in. lower than that for the standard alloy steel saws.

That stainless steel saws do cut wood more accurately is the answer to the biggest question. The follow-up secondary question is "why?" There are two anwers:

Table 1

WEYERHAEUSER CO., DALLAS, OREGON
LUMBER SIZE SUMMARY

	Average Offset, in	Avg. Range of Offset, in
December 1999	.050	.088
February 2000	.034	.040
April 2000	.036	.031

from L-SIZE reports, MicroRidge Systems, Inc.

Table 2

SIERRA PACIFIC AT OROVILLE, JUNE 2003 TESTS
STANDARD DEVIATION OF 8-INCH BOARD THICKNESS MEASUREMENTS

	Alloy Steel Saws	Stainless Steel Saws
Top Edge	.087	.010
Bottom Edge	.006	.005

Table 3

SIERRA PACIFIC AT OROVILLE, OCTOBER 2003 TESTS
STANDARD DEVIATION OF 8-INCH BOARD THICKNESS MEASUREMENTS

	Alloy Steel Saws	Stainless Steel Saws
Top Edge	.030	.022
Bottom Edge	.007	.006

Thermal Properties. Compared to alloy saw steel, stainless steel's higher specific heat, lower thermal conductivity, and lower coefficient of thermal expansion all work together to reduce the level of thermal stresses in the outer zone of the saw plate, stresses that arise from the warming of the rim due to the heat generated at the teeth during cutting. In other words, the stainless steel saw exhibits greater stiffness under normal sawing conditions; subjected to the same lateral force, it deflects less. Another result is that the optimal level of tension for a stainless steel saw is lower than that for an alloy steel saw.

Resistance to Deformation. The stainless steel saw plate becomes increasingly difficult to permanently deform as the speed at which the force is applied increases. Relative to alloy saw steel, it is more difficult to "lay over" a stainless steel saw in service. This is actually the result of another set of thermal properties, those which govern the speed at which plastic deformation can progress at different levels of stress and temperature. Filers who use them universally comment that although stainless saws are more difficult to level initially, they are much easier to maintain in the long run.

(Note: The low thermal conductivity is a liability if the gullets are ground too aggressively, or if a severe lubrication interruption occurs between guide pad and saw, because it allows a rapid heat buildup.)

A test was carried out in October to measure how sawing variation changes with run time for both stainless and alloy steel saws. Head filer Dale Burnell at Boise Cascade's Elgin, Ore. stud mill facilitated an extended run-time test involving new carbide tipped saws of both types. The saws were 22 in. diameter by .090 in. thick, with a kerf of .120 in. Six-inch studs of mixed species were cut at 265 FPM. The results, show in Figure 5, are a strong confirmation of stainless steel saws' capacity to deliver greatly enhanced lumber quality.

Stainless steel saws are more expensive. They do not reduce annual saw cost. They do increase revenue. TP

This report is taken from presentations made by Warren Bird during the 8th International Conference on Sawing Technology, SawTech 2003, held in November in Seattle, Wash. Bird is President of California Saw & Knife Works, San Francisco, Calif., 415-861-0644; e-mail: warren@calsaw.com. Bird's daughter, Sydney, is also involved with the company.

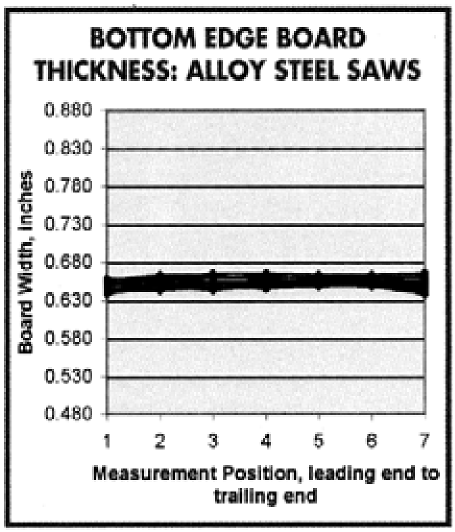


Figure 1

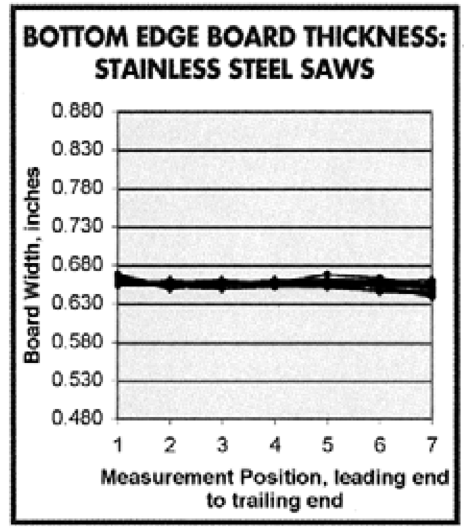


Figure 2

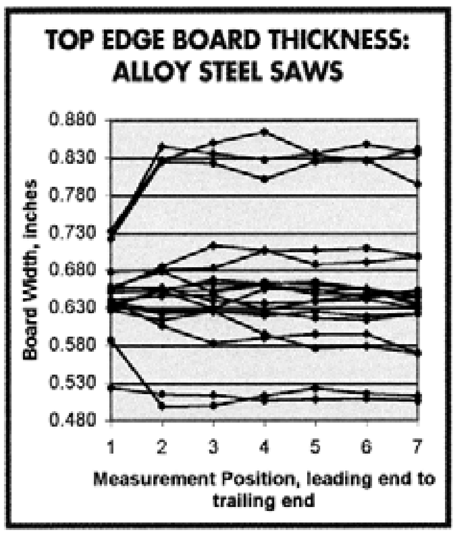


Figure 3

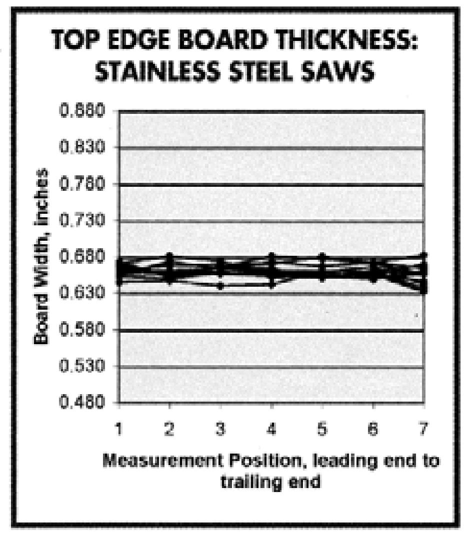


Figure 4

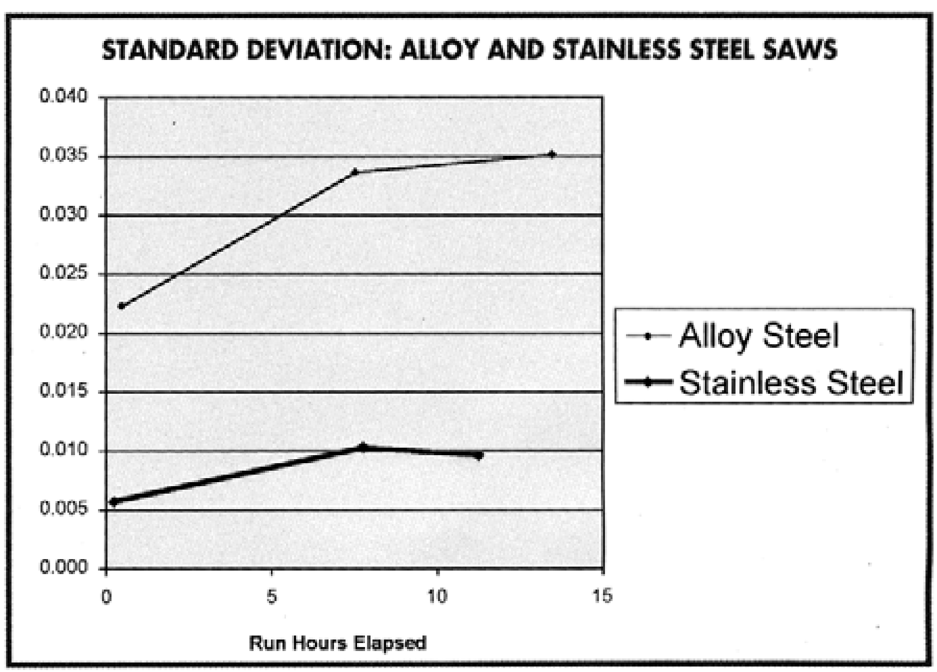


Figure 5