



All photographs courtesy of The Material Works Ltd.

The 74-inch-wide SCS coil processing line at The Material Works', Red Bud, Ill., toll processing plant runs thicknesses from 0.030 inch through 0.250 inch. An edge trim section for metal up to 0.157-inch thick removes from 0.1875 inch to 3 inches per side with a tolerance of ± 0.005 inch. SCS has recently patented both stamping and tube mill trials.

Hot band cleaning process now runs coil-to-coil

The dry surface and corrosion resistance of The Material Works' SCS technology is no longer limited to blanks

BY NEILAND PENNINGTON

Two years ago *Modern Metals* published details of a surface treatment for hot-rolled steel that provided the cleanliness and appearance of cold rolling and inhibited rust without oil. Marketed as an alternative to pickled metal and hot-rolled black, the technology was developed and patented by The Material Works Ltd., a full-service toll processor in Red Bud, Ill. The company trade-named its method SCS for stretched cold-rolled surface.



Tim Voss, lead technician at TMW, inspects the cleaning section of the SCS coil line. Three pairs of brushes are flooded with water at 180 gallons per minute, and the closed-loop system eliminates municipal sewer discharge.

There was one significant limitation, however. The process we reported in the July 2003 issue was for cut-to-size blanks only. SCS cleans the surface of hot band with Scotchbrite rolls and high-volume water, and the metal must be flat within 1 I-unit for the hard-backed rolls to make full contact with the material. The SCS blanks were processed in one of TMW's two stretcher levelers, so the metal was both flat and without shape memory.

Laser customers liked it

"Within a year of introduction, we had success with SCS blanks," says Kevin C. Voges, president of TMW. "It was particularly popular with customers that did laser fabrication. They wanted material that would

remain flat under the laser head, and they wanted a clean, dry surface that resisted corrosion and didn't pose the problems associated with oil. But the question we got repeatedly was, 'when will you produce SCS in coil form?'"

TMW has it now. Early in August the company commissioned its first coil line for SCS, an installation that processes strip widths from 24 inches to 74 inches and thicknesses from 0.030 inch to 0.250 inch. The maximum coil diameter is 84 inches and the highest weight is 60,000 pounds.

Material flatness was the most formidable technical barrier to adapting SCS for coil processing, an obstacle that fell to the ingenious engineering by TMW and nearby

equipment builder Red Bud Industries. They combined a precision roller leveler with high tension from the recoiler, and the result was flatness within 1 I-unit.

The line includes a Butech cassette-type hydraulic leveler (see "Leveler is all-hydraulic" sidebar, page 32), plus a back-tension stand and a purpose-built uncoiler and recoiler. The recoiler initially exerts up to 40,000 pounds of tension on the strip with an empty mandrel, and tension climbs as the coil diameter grows and the mechanical advantage increases. The uncoiler includes an oversized brake for added back tension.

Getting to flat

TMW's engineers had a con-



tingency plan in the event their technology didn't flatten sufficiently for Scotchbrite rolls. They collaborated on developing a resilient bristle brush that would maintain full surface contact at up to 100 I-units. With the success of leveling plus tension, they now have the option of running either cleaning medium.

The engineers also received an unanticipated but welcomed bonus. The combination of roller leveling and back tension removes coil breaks on light-gauge steel. "The result was a huge and wonderful surprise," Voges recalls.

"We must be getting some stretching effect with the tension, or we wouldn't be removing coil breaks," he continues. "We can't claim that there's enough stretching effect to relieve internal stress and erase shape memory, like the stretcher levelers on our cut-to-length and multi-blank SCS lines. To make consistent laser-quality steel, we need stretcher leveling. But the coil line applies enough tension to remove breaks."

The cleaning section of the SCS coil line uses three pairs of brushes contacting both sides of the strip, along with a 180 gallon-per-minute water flow that circulates in a closed loop. Three pairs of air knives dry the strip just ahead of the

recoiler.

"In our original cleaner design, we filtered the water but discharged it into the municipal sewer," Voges explains. "With the coil line, no wash water is discharged, and we add water only to compensate for evaporation.

"We filter 100 percent of the effluent, and we augment the filtration with a magnet to remove scale from the water and reduce the load on the filters. The filter cake has been identified as nonhazardous waste, and it is removed in a scrap cart and hauled to a landfill."

Second line in the works

The SCS coil line currently runs 10-gauge strip at 150 feet per minute and 7-gauge metal at 140 feet per minute, and output capacity is estimated at more than 18,000 tons per month. That could be raised to at least 30,000 tons per month by adding a second brushing unit.

As with SCS for sheet and plate, TMW is developing coil SCS by licensing the technology and is building lines in North America through joint ventures. Coil line No. 1 at TMW is a partnership with Heidtman Steel Products, based in Toledo, Ohio, and TMW has received a commitment

LEVELER IS ALL-HYDRAULIC

Hydraulics replace screw jacks and wedges to provide work roll pressure on the leveler installed in The Material Works' first SCS coil-to-coil surface finishing line. Built by Butech Inc., Salem, Ohio, the four-high cassette leveler contains seven pairs of hydraulic cylinders that bear against the lower backup rolls.

Operation of the leveler is largely hands-off. According to Ray Dombrowsky, Butech's sales manager, hydraulic controls at the entry and exit compensate for deflection of the leveler frame and maintain constant roll penetration. Linear transducers monitor the work roll positions. If the separating force deflects the work rolls, the cylinders return the rolls to the preset gap.

TMW's leveler has two cassettes, with 17 and 23 work rolls. The 17-roll unit is for thicknesses 0.100 inch through 0.250 inch at 80 ksi yield strength and runs roll diameters of 3½ inches. The 23-roll cassette accommodates thicknesses from 0.030 inch through

0.125 inch, with roll diameters of 1¹⁵/₁₆ inches. Cassettes are inserted and removed by two battery-powered self-propelled carts, and work rolls can be exchanged in 10 minutes. The carts also remove and replace the upper and lower backup rolls.

An automatic system establishes the zero point for the work rolls when the cassettes are changed. The operator does not calibrate the roll position.

The leveler is a pull-through design; the hydraulic drive is only for threading. The drive disconnects hydraulically for production, eliminating clutches. To engage the hydraulic threading drive when changing cassettes, the drive spindles are automatically aligned with the incoming work rolls by a vision system.

The operator determines roll penetration for each new job, using a touchscreen controller. But once the program is entered, it can be recalled for subsequent runs and the leveling profile is set automatically.

Eric Fritsche, TMW's vice president of operations, displays the difference between SCS metal and unprocessed hot band. SCS technology also protects against corrosion by removing high-oxygen magnetite and hematite (Fe_2O_3 and Fe_3O_4), leaving a more stable layer of wustite (FeO).



repertoire rather than cannibalizing the pickling business," says Voges. "It isn't about to abandon its pickling lines."

SCS coil technology may also go overseas. TMW has a verbal agreement for an outright license sale to build a line in the United Kingdom. According to Voges, company shareholders have given approval and the bankers have blessed the project.

Voges expects to license six or seven SCS coil lines in the next year, and he predicts that the number of coil lines will soon exceed the sheet installations. "Although the SCS sheet

from another organization for the second coil line, scheduled to begin operation in mid-2006.

Heidtman is also partnering with TMW to build an SCS installation for blanks at its Butler, Ind., operation, with the stretcher leveler slated for installation by the end of November. At first glance, Heidtman seems to be an unlikely partner in a process that competes with pickled metal. It operates seven pickling lines and would be expected to champion that process. But Heidtman's customers demanded SCS, both in sheet and coil form, and the two new projects are its response.

"I believe that Heidtman views SCS as expanding its

process was developed first and has a head start on coil lines, we estimate that 60 percent of our licenses will be for coil lines and 40 percent for sheet. We anticipate the SCS coil process to overtake sheet within three years." ■

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