

National Steel's Midwest Division Features Electrolytic Tinning & Tin-Free-Steel Lines

Coil produced on Midwest Division's chromium line is used primarily as container stock.

ational Steel Corporation's Midwest Division, Portage, IN, has a reputation for innovation and producing high-quality products. The plant started up

in 1961, and a year later received the coveted "Top Ten" award from *Factory* magazine. The facility produces custom materials for a wide range of applications, and continues to be a leader in the continuous still strip plating industry.

At the Midwest Division, all raw steel product is received in the form of hotrolled coils from sister plants in Detroit, MI, and Granite City, IL. All of the raw product is processed through the 80 in. continuous pickle line, and either the 52 in. or 80 in. five-stand cold reduction mills. Coils then go to one of three channels according to its intended use—tinplated and chrome-plated steel, galvanized, or cold-rolled products.

Electrolytic Tin Line

Midwest's halogen electrolytic tinning line was pioneered by National Steel Corporation and is used by other major steel producers. The 680-ft line is designed to handle a variety of widths, base weights and coating specifications.

At the entry end, the uncoiled, annealed, double-reduced and/or temper-rolled steel strip is fed into a welder where the head of the new coil is welded to the tail of the previous strip. After welding, the strip enters the entry looping tower, which provides about 1,200 ft of reserve strip for a stop-start time during welding.

Following the tower and tension units is an electrolytic cleaning tank to remove dirt, grease and oil from the strip. In line with the cleaning tank, a scrubber tank is used to remove residue on the strip from the cleaning operation. The strip then enters the pickling tank to clean oxides from it, and is then rinsed with a hot water/ steam spray to prepare the surface for electrolytic plating.

The strip passes through the horizontal plater unit, which includes pretreating and electroplating the bottom of the strip in 18 horizontal cells on the first tier. The strip then reverses direction for electroplating on the top of the strip in 14 horizontal cells on the second tier. Reclaiming, washing, rinsing and drying are completed on the third tier. The halogen solution temperature is maintained between 135 °F and 155 °F. Plating current is supplied by 32 silicon-diode rectifiers—one rectifier (9,000 A at 20 V) per cell. This amounts to 162,000 A for the first tier and 126,000 A for the second tier. The strip passes through an nondestructive system coating weight gauge for continuous monitoring of coating weight.

Following the plating section is the reflow tower that gives the coated strip the shiny finish preferred by most customers. The molten tin on the strip is solidified in water in the quench tank directly under the tower. The strip then passes through rubberlined steel tanks equipped with full sized grids for the electrolytic application of a cathodic dichromate chemical treatment. The final step is a coating from an electrostatic oiler before being coiled on one of two delivery tension reels.

Tin-Free-Steel Line

The chromium line product was pioneered by National Steel as a substitute for tin coating. The chromium coated material is used primarily as container stock.

Following the looping tower are two electrolytic cleaning tanks to remove dirt, grease and oil from the strip. In line, and after each cleaning tank, is a scrubber tank which is used to remove residue on the strip after the cleaning operation. Following the second scrubber is a pickling tank for cleaning oxides from the strip. In line with the pickling tank, a third scrubber tank is used to remove residue from the strip. After cleaning and pickling, the strip passes through five vertical rinse tanks and two vertical electgrolytic chemical treatment tanks, a chem-treat washer and strip dryer. Plating current is supplied by seven silicon diode rectifiers capable of delivering a total of 56,000 A at 36 V. The chemical treatment rectifier will deliver 8,000 amps at 24 volts.

The coated strip passes through an electrostatic oiler, is inspected, and gauged before being coiled. The plant also has these features:

- An 80-in. continuous pickle line for removing from the steel surface oxide that was deposited during the hot rolling operation.
- An 80-in. five-stand cold reduction mill designed to produce cold-reduced, low-carbon, high-strength steel.
- A 52-in. cold reduction mill.
- A batch annealing section with 19 portable box-type furnaces and three single-stack furnaces.
- An 80-in. sheet temper mill to impart flatness, surface properties and temper to full, hard material from the cold reduction mills, or soft material from the batch anneal.
- A combination line that incorporates into one processing unit the functions of recoil inspection, sidetrimming, simple cleaning and stretch leveling.
- An electrolytic cleaning line to remove residual oils and greases deposited during the cold-rolling process.

- A continuous annealing line for cleaning and heat treating to relieve the stresses created in the strip during the cold rolling operation.
- Two-stand temper mills, numbers one and two.
- Two tin recoil lines are units designed to recoil, side trip, split or combine coils prior to tinning or chromium processes.
- 48-in. and 72-in. continuous galvanize lines.

Pollution Control

Pollution control at Midwest Division was included in the design and construction of its facilities, many years before the passage of the Clean Air Act of 1970 and the Federal Water Pollution Control Act. Water treatment facilities were installed as an integral part of the total plan, and have been in full operation since the plant started up. After proper treatment, the flows are discharged to the industrial wastes sewer, or to sludge disposal pipelines. The oily wastes sewer terminates at the mixing tank of the chemical treatment plant, and is given final treatment at the plant. Sludges are disposed of in holding lagoons. Sanitary sewage is sent to the sewage treatment plant. P&SF

No basic steel is produced at Midwest Division. All raw products is received as hot-rolled coils from sister plants in Michigan and Illinois.