Steel Products Keep Getting Better At Bethlehem Steel's Sparrows Point Plant

Bethlehem Steel Corporation's Sparrows Point Plant in Maryland is the largest steel producer on the East Coast. Founded about 100 years ago, the facility was the first integrated steelmaker in the U.S. to become certified under ISO 9000 quality standards.

There have been many upgrades in the facilities, and changes in product emphasis during the life of the plant, which continues to be a leader in the science of steelmaking. Sparrows Point mills produce steel that is inches-thick and strong enough to become the backbone of a mighty bridge, or hair-thin and flexible enough to become a household steel can.

Flat-rolled steel accounts for the greatest tonnage of shipments leaving Sparrows Point. These deliveries include hot-rolled sheet and strip; cold-rolled sheet; galvanized and Galvalume™ sheet, and tin mill products.

Tin Mill Products

Tin mill products, which can be used plated or unplated, are produced similarly to cold-rolled sheet, but rolled to lighter gauges.

Unplated sheet, called black plate, has good formability and is used to fabricate a wide range of products that will be painted. Typical applications include decorative canisters, venetian blinds, toys and housewares.

Plated tin mill products include tinplate and electrolytic chromium-coated sheet. Examples of tinplate applications include can ends and drawn can bodies for sanitary food containers, and beverage cans. About 18 percent of Sparrows Point steel goes into tin mill products.

The Tin Mill

The 42-inch tin mill has the capability of making a full range of products, including black plate, unplated steel sheet, tinplate and tin-free-steel (electrolytic chromium-coated sheet [ECCS]).

Most of the tin mill equipment began operation in the late 1950s and 1960s. The equipment has been subjected to various upgrades in the past 15 years.

Hot band enters the tin mill through the modernized tin mill pickler that removes all oxides and prepares the steel band for reduction in thickness with the 48-inch tandem mill. The tandem mill reduces the incoming 0.085 in. gauge hot band to 0.0315–0.0075 in. The mill, running at speeds up to 5000 ft/min, is controlled by an automatic gauge control system to ensure that the sheet gauge and flatness tolerances are met.

The coils of steel move into the alkaline washer line to be cleaned prior to batch anneal. Coils are cleaned continuously by welding the tail of one coil to the head of the next. They are electrolytically cleaned and brushed to remove oils at speeds of up to 2,000 ft/min. Cleaned coils are annealed in coil form in stacks of two–three, to soften the steel before further processing. Tandem coils also go to the continuous annealing line where they are cleaned and annealed in one continuous operation in minutes, rather than taking days by the batch anneal process.

Cans for the food industry are produced from Sparrows Point tinplate.

After annealing, the coils go to the skin pass mill, or duo mill, to roll the steel for obtaining the desired mechanical properties. The skin pass mill reduces the the thickness slightly to produce tempers ST-0 to R5-CA, with gauges ranging from 0.006 to 0.030 in. The duo mill reduces the steel thickness 28–45 percent, to a minimum gauge of 0.0055 in., with an automatic gauge control system and roll-bending features. At the point, the steel can be sold as black plate or processed further in one of three plating lines.

The number one halogen line was modernized in 1992. The line plates tin on both sides of the strip as it is processed through two tiers of horizontal plating cells, at speeds of up to 1800 ft/min. The first tier has 18 cells, and the second tier has 14. All cells are 9,000-A. On the third tier the strip is rinsed, fluxed for reflow, dried and the coating weight is continuously measured. Coating weight range is 0.05–1.5 lb/BB (0.56–17 g/m^2). The products include regular, differential, bright, matte, chromate-treated, dry, and oiled tin plate.

The number-two halogen line is a sister to the number-one line. The major difference is that number-two has six 9,000-A cells on the first tier and the second tier.

The third plating line in the tin mill is the chromium line, where steel is plated with chromium by a two-step process that controls the coating weight of metallic chromium, and oxides of chromium, to produce tin-free steel.

High-speed Hot Mill

The high-speed continuous hot mill rolls sheet and strip from preheated slabs. The half-mile long hot mill produces coils of sheet steel as thin as .061 in. in an operation that takes only a few minutes to complete. It has a production capacity of 260,000 tons annually. Hot-rolled sheets have a wide variety of formed applications, including automobile frames, machinery, tubing and various other fabricated products.

Cold-rolled sheet steel is produced by cold-reducing, specially-prepared, hot-rolled pickled coils. After the cold-reducing operation, which alters the mechanical properties of the metal, the sheets are annealed in various ways to impart special qualities desired by the customer. The coils are then ready for skin passing, shearing, slitting, coating, and other finishing processes. An automatic gauge control system is used to ensure quality cold-rolled sheet products within specified tolerances.

Cold-rolled sheet applications include truck and auto parts, furniture, drums, appliances, tubing and many other fabricated products. Some cold-rolled sheets are hot-dip galvanized and used in auto under-bodies, ductwork, roofing, siding, metal studs and roof truss fasteners.

Galvalume™ sheet has an aluminum-zinc alloy coating invented by Bethlehem that offers superior resistance to atmospheric corrosion. It is used in the construction market for pre-engineered metal buildings and as components for architecturally-designed buildings.

Pollution Control

Bethlehem has committed more than $300-million in capital expenditures for controlling air and water pollution at Sparrows Point. It costs the company $40 million each year to operate these facilities.

Air pollution control devices collect the particulate matter created by iron- and steel-making processes, preventing its discharge into the atmosphere. High-energy wet scrubbers are used to remove particulate matter from the gases collected at the basic oxygen furnaces. Additional wet scrubbers are used at other facilities throughout the plant.

The Humphreys Creek Waste Water Treatment Plant handles wastewater from several finishing mills at Sparrows Point. The water is treated to achieve the desired acid-alkaline ratio, aerated, and sent to one of three settling basins. The clean water, which is tested continuously, is discharged. Settled solids are collected and pumped to centrifuges that "whirl out" most of the remaining moisture.

Thickeners have been installed for cleaning and to allow the re-use of water used to scrub the exit gases emitted by blast furnaces and basic oxygen furnaces. Other water pollution control equipment includes a chromium-removal plant, high-density sludge facilities, oil skimmers, vacuum filters and cooling towers. Cleaned water is often recycled instead of being discharged.

Customer requirements, competition and new technologies will likely cause tougher requirements for steel products in the future. As the turn of the century approaches, Bethlehem Steel's Sparrows Point Plant is positioned to accept the challenges. P&SF

The Sparrows Point plant features two halogen tinplating lines.