

The partnership of Nucor and Danieli teams will bring the Gallatin casting and rolling plant to the next level of high-quality production and competitiveness.

This is the first time that a classical compact thin slab casting and rolling plant is fully reconfigured into an ultra-modern QSP® (Quality Strip Production) plant. Both Nucor and Danieli teams are committed to set a new benchmark in Casting and Rolling Technology.

Formerly known as the Gallatin Steel Company, the thin slab rolling plant located in Ghent, KY has a name plate capacity of 1.6 million shTPY of hot rolled coils having a thickness range from 1.4 to 12.7 mm, widths up to 1,625 mm and maximum coil weight of 35 shTon.

The existing plant operates a 185 t twin shell DC EAF, a single LMF, a vertical caster, 206 m tunnel furnace, a six-stand close-coupled rolling mill, traditional laminar cooling and one down coiler.

The current capabilities of the steel plant are mostly structural steel, micro-alloyed grades and thin line pipe grades.

Like similar compact plants, Gallatin was originally designed for doubling the annual capacity by means of a second meltshop, second vertical caster and tunnel furnace connected by a swivel ferry system to the in-line HSM. The new equipment was originally meant to be a copy of the existing one.

In October 2014, Nucor became the owner of the Gallatin Steel Company and has recently approved an investment to advance the technological capabilities and competitiveness of the Nucor Steel Gallatin Sheet Mill. Danieli is the selected technology supplier for the complete equipment and automation system, from raw materials to hot rolled coil.

In full partnership spirit, the Nucor and Danieli team of specialists agreed to re-engineer the plant by changing the original concept into an advanced QSP® plant having improved thermomechanical rolling capabilities thereby expanding production of AHSS grades, API line pipe steel grades and a number of other value added grades.

The revamped plant includes a high performance DC EAF and Twin LMF, and future provision for vacuum degassing.

Being equipped with state of the art technology, the new meltshop will make use of the most recent process management tools, including Q-MELT, which is a key aspect to optimizing the transformation costs. After the upgrade, the complete production will be delivered by a single strand vertical curved caster having a total capacity of up to 3.0 million shTPY.

The new caster represents the 5th generation of Danieli high production slab casting machines. The slab will be delivered to the rolling mill by a new tunnel furnace via a swivel-type ferry system. The layout allows for the installation of the new caster and first portion of the tunnel furnace and swivel system without affecting the mill's production. Furthermore, two new roughing mills will be added to expand rolling capabilities.

The six-stands finishing mill will be retained but will be widened and upgraded with new interstand guides, loopers and new bending and shifting system. This will enable rolling strips as wide as 1,870 mm

(73.5 in). To further enhance the performance of the finishing mill, the first three rolling stands will be reinforced to withstand higher rolling forces.

Two new powerful roughing stands and a vertical edger will be installed ahead of the finishing mill. The powerful edger, with a total draft of 100 mm, allows the full recrystallization of the slab edges and extends the capacity of the plant when producing narrow products. The separation of the roughing stands from the finishing stands and the use of a thicker slab is the distinctive concept of Danieli's QSP®. It is the result of more than 25 years of experience and R&D.

The first plant ever installed with this configuration is the North Star BlueScope QSP in operation at Delta (OH) since 1997. It was followed by Algoma Steel (Canada) in same year. Afterwards: Ezz Flat Steel (Egypt), OMK (Russia), MMK (Turkey), NMDC (India), SGJT (China) and Hoa Phat (Vietnam).

The independent high-speed roughing, intermediate transfer bar cooling and final finishing rolling introduces the ability to perform a thermo-mechanical rolling process typical of conventional hot strip mills. This leads to a complete replacement of the existing tunnel furnace, widening of the finishing mill equipment, a new run-out table with advanced combined intensive and laminar cooling, and two new downcoilers with coil handling.

The vertical-curved caster will be equipped with a complete suite of advanced technological packages, including Danieli's latest design of multi-mode electromagnetic brake (MM-EMB) to ensure the control fluid dynamics within the mold, enabling high throughput of quality thin slabs.

The tunnel furnace and the heated transfer table installed between the roughing stands and finishing stands will be supplied by Danieli Centro Combustion.

The complete process control from melting to finished hot-rolled coils will be developed by Danieli Automation. The challenge is to optimize the operation between the existing and the new meltshop, while controlling the quality of the Caster and QSP. As part of the implementation strategy, the new automation system will shadow and parallel the current automation systems to allow seamless switchover to the new automation. The automation system will be designed for integrating the industry 4.0 concept.

The project will be implemented over a sequence of three carefully planned mill shutdowns. The strategy takes maximum advantage of the annual maintenance outages already planned by the plant.

During the last shutdown the complete roughing mill group, previously preassembled off-line, will be moved in line via a lift-shift system. The foundations of the mills will be prepared under the existing tunnel furnace without interfering with the production.

With this compact mill into QSP® conversion project at Nucor Steel Gallatin, together with a high performance meltshop, the Nucor and Danieli teams are determined to establish a new benchmark casting and rolling plant throughout the world.

