

A new heat-treatment furnace will be installed at the Veracruz, Mexico, operation for bright annealing of carbon steel tubes in protective atmosphere.

TENARIS TAMSA DEMONSTRATES ITS NEW BRIGHT IDEAS

In July 2016, Tenaris Tamsa, one of the largest suppliers of tubes to the global energy industry, ordered a Danieli Olivotto Ferré (DFO) roller-hearth furnace to perform different treatments, such as normalizing and tempering, on up to 24,000 tpy of tubes in a wide range of diameters (15 to 120 mm), lengths (3 to 16 m), and steel grades.

Innovative design for low-carbon tube bright annealing

During heat treatment, additional decarburization on the tube surface will be maintained below the minimum values required by international standards in an endothermic controlled atmosphere (40% N₂, 40% H₂, 20% CO), where both CO/CO₂ and H₂/H₂O are monitored continuously. This procedure is essential to guarantee the highest quality atmosphere, considering that at temperatures above 650 °C surface carbon reacts with oxygen or water vapour, forming carbon oxide and compromising the mechanical properties of the material.

Brightness on the tube surface is ensured by the high hydrogen content in the furnace atmosphere. Not only must the plant comply with the requirements of the tube market, but it also must achieve low fuel consumption and have a low environmental impact.

Main features of the line

In addition to the heat-treatment furnace, the scope of



supply for this line (for an overall length of 107 m) also includes automatic loading and unloading tables, normalizing cooling section, and final water jacket cooling chamber, all managed by the latest generation HMI. Using a dedicated automatic loading system, each bundle of tubes is transferred by the workshop crane and charged in single layers onto the charging rollway, which is aligned with the furnace. Tubes pass through the entry vestibule, where silica-based curtains minimize atmosphere loss, and go directly into the furnace for heat treatment.

The indirect-type combustion system is based on SiSiC straight radiant-tube technology, where the tubes are installed above and below the roller pass-line. This solution creates an optimal balance between heating power and thermal uniformity. SiSiC radiant tubes minimize periodic maintenance operations thanks to reduced thermal stress,

ceramic components, and absence of deformation on the radiant tubes themselves. The burners are self-recuperative for increased combustion efficiency (and consequently, decreased consumption) and use flameless type combustion for drastic reduction of nitric oxides (NO_x.)

The intermediate section is an independent module placed just after the furnace to perform cooling through a water-atmosphere heat exchanger, to achieve normalization.

After being heat treated, the tubes pass through a final water-jacket cooling section where they are indirectly cooled down to a final temperature of approximately 80 °C. This is done in a protective atmosphere to prevent oxidation.

As in the entry part of the line, an exit vestibule section with silica-based curtains is installed before the discharging roller table to minimize atmospheric dispersions. Then, the heat-treated tubes

are collected in automatic cradles, ready to be transferred by the workshop crane.

To avoid contamination between the furnace protective atmosphere and the workshop environment, hoods are installed above the loading and unloading rollways and at line entry and exit. This is done to draw the small quantities of atmosphere coming from the vestibules, or escaping from the tubes (when the tube head is inside the furnace and the tail outside or vice versa.) The collected atmosphere will be burned to prevent hazards in the area surrounding the furnace, and to reduce CO emissions significantly.

The entire line will be managed by the HMI, allowing the operator to control the machine in both manual and automatic modes. The PLC will be connected to Level 3 controls by a dedicated Ethernet network, in order to share furnace performances with all the plant production data.

The supply of this heat-treatment line to a major player in the tube market will solidify DFO's experience in this field.

TenarisTamsa selected DFO's solution because of its advanced technology level and the considerable flexibility it offers for covering a wide product mix, as well as the ability to combine high-efficiency performance with minimal environment impact ■