NEW PREHEATING FURNACE FOR HARDENING / SOAKING

at Vallourec Belo Horizonte, Brazil

In November 2011, Vallourec Tubos do Brasil placed an order with Danieli Centro Combustion in consortium with the Brazilian company Interfor, to supply, install and commission a pre-heating furnace for austenitizing (PHF), and a soaking furnace for tempering (SF) for their plant at Barreiro (MG). Moreover, an existing hardening furnace (HF) and tempering furnace (TF) will be modified, adapting both to the new operating conditions.
The new facilities will deliver a noticeable improvement to the austenitizing and tempering processes and a marked increase in production for the seamless tube heat-treatment line.

Pre-heating and soaking furnaces are of walking-beam type and include all auxiliary equipment. These are rated for capacities up to 63.8 tph; a piece rate of 60 pipes/hour for 244.5 mm OD x 13.5 mm WT pipe sizes.

A point of particular interest is the electrically driven lifting and travelling mechanism installed in both furnaces.
Also, a set of wheels, levers and tie rods have been fitted to support the lifting and travelling frame.
Each wheel group is connected through a tie rod to an eccentric wheel.
Both the lifting and travelling movement are achieved by an electro-mechanical group consisting of eccentric wheels connected to gear reducers through shafts and a driving group (motors and gear boxes.)


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PH furnace

The proposed configuration for the PHF profile and combustion system will ensure safe and trouble-free pipe processing in all operating conditions, maximizing energy savings and allowing easy access to the main equipment for operation and maintenance purposes.
In this design, waste gas recovered from the existing hardening furnace is blown at high speed into the furnace discharging and lateral walls.
An ejector fan guarantees complete evacuation of the waste gas which, after passing through a new recuperator, is conveyed to a new stack. A set of burners guarantees correct and uniform pipe heating, even at high production rates when heat recovered from waste gas is insufficient for this task.

SF Furnace

To maximize pipe temperature homogeneity in the proposed SF furnace, indirect heating by means of re-circulating air pre-heated in external chambers installed on the furnace roof has been chosen.
The concept of this furnace is to re-circulate a large volume of air/fumes inside the furnace chamber at uniform temperatures in order to equalize and maintain pipe temperature for the entire soaking time. The heating chambers are located on the furnace roof and provided with burners and re-circulation fans to heat and deliver the air/fumes mix into the furnace through distribution boxes.
With the aim of increasing the flow speed and improving heat transfer, the base of the distribution boxes are provided

Technical data for OCTG pipes processed

Outer diameter	114.3 - 370 mm
Wall thickness	5.0 -38 mm
Length	6.0 - 14.3 m

Pipe temperatures at furnace exit

PHF furnace	350 - 450 °C
Hardening	850 - 1,050 °C
Tempering	500 - 750 °C
SF furnace	500 - 800 °C

1 Installation progress at soaking furnace (SF) as of October 15, 2013.
2 Pre-heating furnace (PHF).
3 PHF: Internal view of pipe discharging area during installation.

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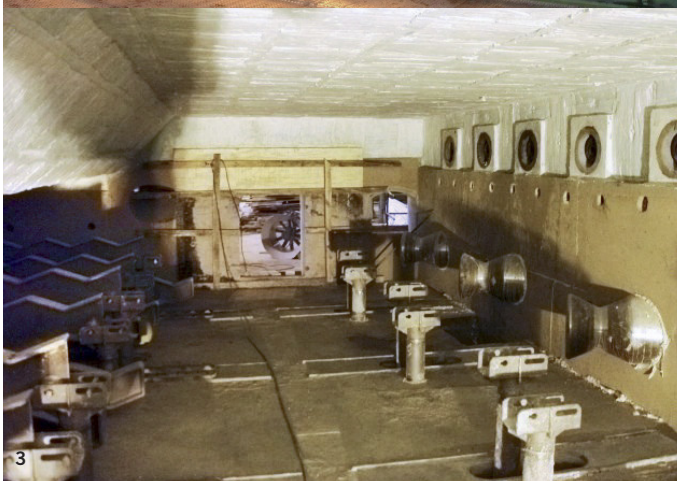
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with nozzles. The same quantity of air/fumes is returned to the chamber through an opening in the furnace roof.

Modifications to existing hardening and tempering furnaces

Several modifications had to be made to the existing hardening and tempering furnaces to adapt them to the new operating conditions:

> Flame patterns have been shortened for the heating zone burners; this was achieved by replacing the old burner heads (hardening and tempering) with new ones that have a different geometry.

> Flame interference between heating and soaking zones has been eliminated by replacing the existing sloped diaphragm with a new, straight vertical-shaped diaphragm to create a more effective barrier between the two zones.

> The hardening furnace waste-gas system was modified to allow the new PHF to use waste gases.

> The charging and discharging door and relevant frames were replaced.

The pre-heating and hardening furnaces were successfully commissioned in April 2013; the soaking furnace is in the installation phase now. Commissioning of both furnaces is expected to be completed by February 2014.

Such a large project is important for Danieli Centro Combustion's scorecard. With Vallourec as a long-standing and esteemed client of our company, with a number of turnkey projects already completed, this new project demonstrates best practices in collaboration, ensuring that final outcomes are properly achieved ■