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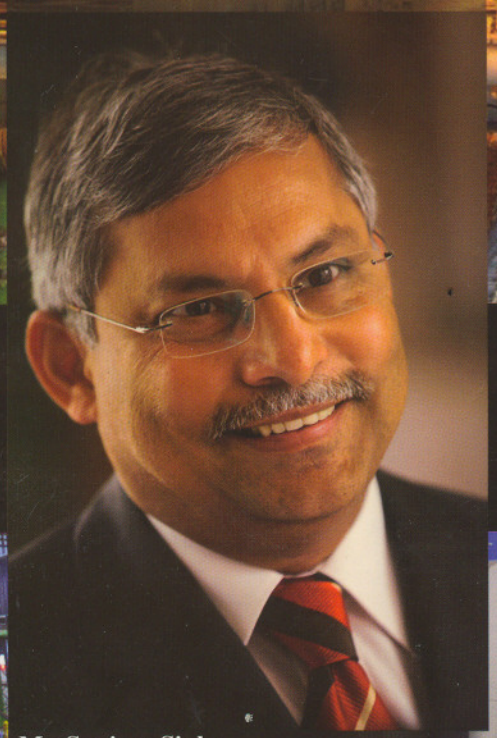

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Trendsetting technologies in rolling and strip processing

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Arcelor-Aceralia (Spain): Tenova fastest tinning line

Solving the insoluble

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Tenova proposes an innovative technology for the new generation of tin plating line. Recently Tenova has been awarded a contract for a new electrolytic tinning line with insoluble anodes, 250.000 ton/year, in China. Developments in the technology have been made in the existing tinning line at Ternium Siderar.

While a number of the drawbacks of conventional tinplating processes can be overcome by using insoluble anodes, their use can have some other disadvantages. Tenova, in cooperation with CSM Centro Sviluppo Materiali in Rome, has overcome those to create a modern insoluble-anode tinplating process.

Already proven on the industrial line at Ternium Siderar in San Nicolas, Argentina, owned by the Techint Group, the process, able to achieve a real very low tin loss (4%), was further assessed with a new equipment configuration over an extensive operational period. Since the plant was run continuously, important results were obtained for the design and operation of a tinning line.

Particularly important, it has been possible to check new anode and edge mask designs, and confirm the dissolution plant efficiency and productivity of over 30 kg/h for each plating cell.

Insoluble anodes

Inert titanium-based anodes with an active precious metal coating were used .

The insoluble anodes were positioned vertically in the cell, and spaced from the passing strip by a distance of less than 50 mm. Owing to the very high speed of the strip, and the small strip-to-anode distance, the fluid dynamics of the cell tended to create a Venturi effect in the region between the strip and the anode. That promoted undesirable contact between the anodes and the strip and therefore created defects on the strip.

Following studies to analyse the velocity distribution of the electrolyte within the cell as a consequence of the movement of the strip – as well as the effect of oxygen generation at the anode surface – anodes were designed with a regular array of large holes. While reducing the level gap between ascending and descending zone of the plating cell, the hole distribution was also conceived to maintain a transverse uniformity in current density distribution.

No defects to the strip that could be related to the use of insoluble anodes have occurred. The optimisation of the anode design, as well as the material selection, was confirmed

to fully satisfy process and strip quality requirements.

Edge masks

Insoluble anodes are of fixed width so, to process strips of different widths, electrically insulating plates (edge masks) are used to prevent "white border defects" due to tin overcoating at the edge.

The strip edges engage in U-shaped sections arranged at the end faces of the masks. The degree of edge coating depends on the insertion depth of the strip edges into the U-shaped sections. It is therefore essential that the U-shaped sections always follow the strip travel precisely – the expected accuracy being less than 1 mm.

At Ternium Siderar, the edge mask system was mounted on a cell and comprised two pairs of epoxy-glass edge masks, held from the top and guided at the bottom by the anode guides. Each pair was equipped with an inductive sensor, developed internally to detect strip penetration, and driven by one servo-cylinder with a linear transducer. Tenova edge mask design guarantees an ease inspection and access to the cell.

Edge mask control was also developed, through a local PLC communicating with the line PLC, mainly to track the position of the weld and allow information about strip width to be sent to the local PLC. Though redundant, the system was conceived with two edge sensors to improve system reliability in case of failure of one of the sensors.

The sensors and the control system have performed well and the overall system has proved very stable and accurate.

Dissolution plant

The plant was designed for a dissolution capacity of 30 kg/h, although a higher capacity of over 35kg/h could be achieved.

The plant's main components are a chemical reactor, a pressurising pump, four oxygen feeders, a recirculating and a tin charging system.

dissolved more than 50 tonnes of and approximately the same amount of tin has been plated out. The most recent industrial campaign also confirmed previous results, such as low tin loss, less than 4%, and high oxygen efficiency, over 90%. The electrolyte produced fully complies with the requirements of the tinning line and important operational and maintenance practices have been defined.

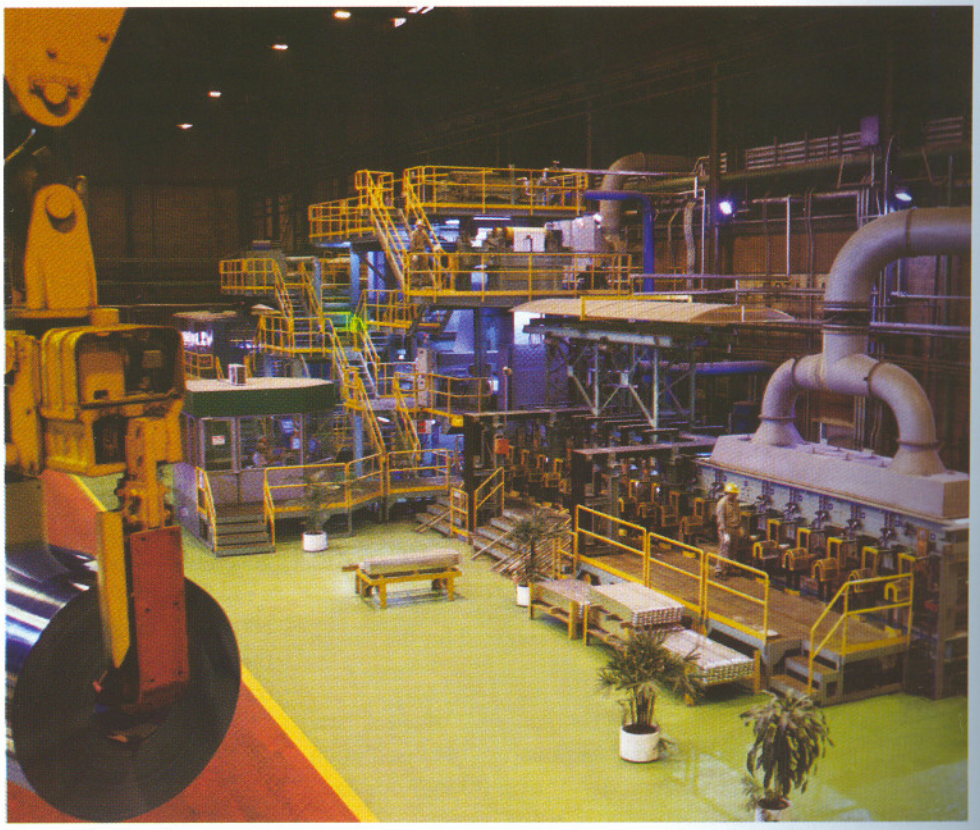
Advantages

Firstly, for tin consumption point of view, with Tenova process itself is really possible to achieve a very low tin loss in the sludges (4%), which has also positive aspects for environmental aspects.

According to Ternium Siderar, , the most promising aspects of using a system of insoluble anodes are: improved strip quality, through the elimination of defects like white edges and anode marks; no more anode handling permitting more safety in the operations; and more flexible campaigns in terms of strip width programming, since the edge masks can adapt to all strip widths. In addition, the dissolution plant allows tin concentration in the electrolytic solution of the line to be controlled, reducing the electrolyte in the discharge.

Tenova has been awarded a contract from Jiangsu Sunshine Group Co., in China, for a 250,000 tpy fast tinning line (550 m/min), fully equipped with insoluble anodes and edge masks with associated tin dissolution plant. The plant will be put into operation at the end of 2008.

Besides, a future upgrading of the electro-tinning line has been contemplated as a possible future investment by Ternium Siderar. ■



Siderar (Argentina): Tinning line where further technology improvements have been validated