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Tenova Strip Processing

Eight continuous annealing and pre-treatment lines in operation

A. Casella, Tenova Strip Processing

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Continuous annealing line from Tenova

In the past few years Tenova Strip Processing has benefited from the global demand for automotive strip production lines. The company experienced a boom of sales in continuous annealing and surface pre-treatment lines from noted aluminium producers in Europe, North America and Asia to cover not only automotive but also aviation, architectural and various other market demands. This order boom and the overall technological aspects of these new processing lines were reported in ALUMINIUM 4/2014.

Below, the operational results of these lines are presented as well as the continual improvements of this technology through the development of new equipment able to reduce maintenance downtimes and loss of production. Among the ten continuous annealing lines sold by Tenova in the last few years, eight are now in operation, while the remaining two are being erected. Commissioning of these last two lines is scheduled for 2016.

These lines usually treat aluminium strip within a thickness range between 0.2 and 6 mm and width range from 700 up to 2,800 mm. The annual output varies from 40,000 to 120,000 tonnes; the process speed is under 120 mpm, usually in the range between 60 and 90 mpm. Special attention is paid to the speed regulation, also taking into consideration the very low values.

In 2015 Tenova was awarded a new order from a customer in Taiwan for the extension of a continuous annealing line for strip widths up to 2,150 mm. The order relates to the integration of a new chemical section into the existing line. The process line started production in June 2014 and produces aluminium strip for general market demands. The commissioning of the chemical section is scheduled for April 2016: it consists of acidic etching followed by spray conversion with no rinsing stage and a special squeegee roll coater for Silane application. In this way, the new chemical section will allow the customer to produce pre-treated automotive strips as well in future.

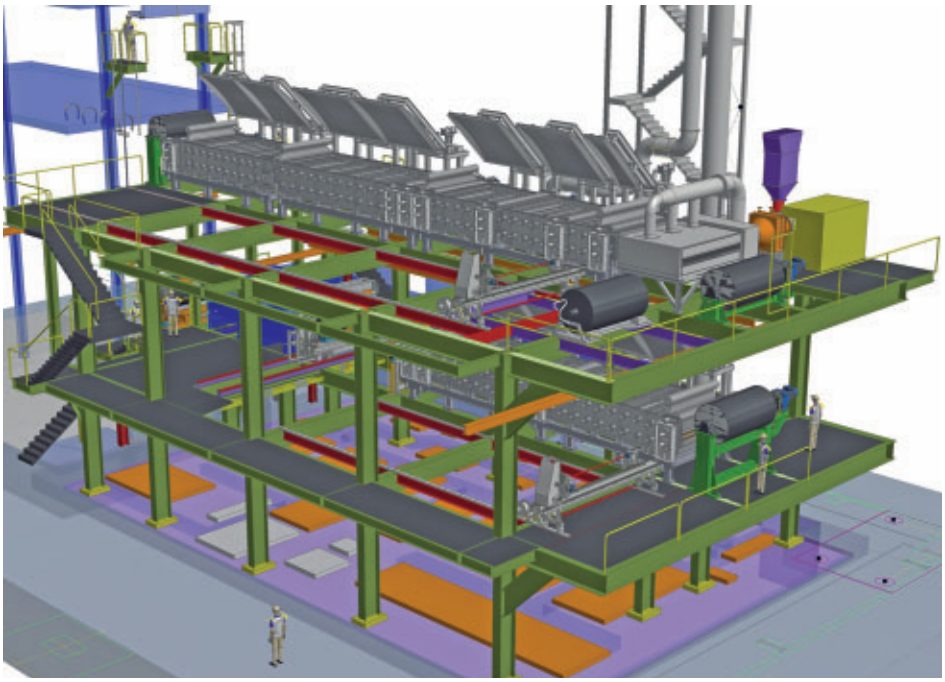
For this project and more generally for new projects, Tenova usually provides 3D drawings which help to reduce the installation work on site and ensure efficient assembly, operation and serviceability, avoiding rework, delays and extra costs. As a result, a clean and linear system, which meets the most restrictive requirements and standards, is obtained.

Tenova's objective today is to maximize line availability by reducing downtime and possible causes of stoppages due to failures and operation, while maintaining the high level of quality that the automotive market requires.

Every new line benefits from the heritage of the previously installed ones and this indeed gives real benefits for the final quality of the end product. With the highest number of references in today's market, Tenova has the majority of the market share with the highest reliability level.

Tenova's new proposals are made by considering higher availability, reliability and maintainability according to the following criteria:

- Redundancy of equipment with higher maintenance needs



New chemical section: 3D drawing

High-pressure demi water degreasing section

- Maximizing the reliability of automatic sequences
- Maximizing of monitoring for preventive maintenance with on-line equipment diagnostics including vibration and temperature sensing
- Correct choice of reliable components
- Strong and reliable mechanical equipment.

Below is a list of the main changes and improvements derived as the heritage from lines currently in operation:

Entry side

- Layout optimization to ease the threading operation and improve accessibility for maintenance and for scrap handling
- Better line control using direct coil diameter measurement with in-line lasers mounted on all reels
- Coil set elimination by considering flattener roll positioning controlled by inverters
- Belt conveyors on all the treading tables for easy threading operations
- Notching machine able to cut up to 500 mm to avoid the installation of additional taper shears
- New, reliable stitcher machine with minimization of flitter onset. Lubrication of die. Integrated shifting base frame and integrated clamping and tensioning devices. No punching element as stitch is detected by laser.
- Tension control and strip centring control of the thermal section (before and after the floating furnace)
- Tension control during the transient passage of the stitch on all rolls of the line
- Double winch motorization on loopers and independent motorization on dolly cars
- Maximization of centring and steering actions with implementation on commercial steering equipment.
- Automatic cleaning devices on contact rolls, with fines collected in bins

Chemical part

- Increased pre-cleaning section to treat EDT strips with a higher oil content
- Squeegee roll with independent motorization on both rolls
- New design of squeegee roll with external sealing to avoid leakage or vapours

Tension leveller

- Improved tension control of the bridles
- Additional functional mode (besides pure tension mode and bending mode), with the possibility of soft bending using rubber-coated rolls.

Exit side

- Coil strip set elimination with the additional installation of a multi-roll bending unit
- Movable offline pinch roll before rotary shear to allow easy maintenance of the shear
- Double belt conveyor at the exit of the rotary shear
- Viton coatings on rolls on the exit side, permitting higher coiling strip temperatures
- 4 strand loopers, maximizing extension to have more spare time in exit sequences
- Tension reel mandrel of a new design to avoid strip surface marks and quality defects.

New equipment and technologies

Besides the improvements mentioned within these lines, Tenova has also developed new machines which help to further improve the performance of such lines.

Laser welder: In close cooperation with R&D institutes and operating partners, Tenova has developed a new welder able to join the terminal ends of aluminium coils. This avoids the use of the stitcher that generates metallic particles which adhere to the rolls and dam-

Entry section

age the strip surface.

This welder is a fibre laser source type. The terminal ends are aligned by means of a 4-point centring system. The compact design also allows the possibility to revamp existing lines by replacing the stitcher with this laser welder.

Contrary to other welder types this laser has the great advantage that does not require tools for its operation, as is the case with the friction welder types. This enables the customer to save money for the normal operation of the line.

Another great advantage is that the laser can be used for the complete range of thicknesses demanded by the market, while other types of welders have limitation especially for thin material.

Squeege roll coater: Tenova has developed a new chemical unit capable of providing Silane pretreatment passivation on the aluminium strip surface. This machine is a squeegee roll coater: a special coater able to control the amount of passivation to be applied on both sides of the strip with a very uniform and precise layer.

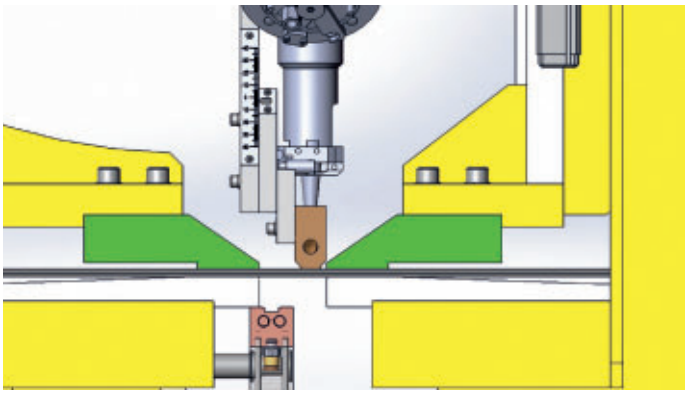
The coater consists mainly of two spreading rolls made of tubular steel and covered with hypalon, and two spray headers equipped with nozzles to distribute the coating on both sides of the strip.

One set of load cells is mounted below the pillow blocks of the lower spreading rolls. The pressure of the lower roll against the upper one serves to control the amount of spray solution deposited on both strip surfaces. Air blades are installed to prevent water from being carried out at the strip edges

A preparation tank, recirculation tank and waste tank with all ancillary materials form the recirculation system, an integral part of the coater.

Some lines have been revamped by adding this special equipment in line, thus giving benefits in terms of operation and consumable saving cost.

Skinpass: There is a new trend under development considering an inline skinpass installed on these lines. The skinpass is able to impart a specific roughness transfer on the strip for further improvement on adhesion painting and deep drawing capability. Whereas traditional operating methods consider skinpassing with a cold rolling mill by replacing the work roll set on the last pass of cold reduction, the skinpass installed inline permits to improve the cold reduction production yield itself as no more skinpassing is required in the cold reduction mill and therefore no work roll changing is required. For roughness transfer a 2-high skinpass mill is the most advantageous solution. This mill is equipped with external chocks for the bending correction. A roughness measurement sensor is able to work in a closed loop with the skinpass mill to determine the right elongation to be given.



The laser welder head

Conclusion

Each continuous annealing and pre-treatment line from Tenova is tailored to the customer's specific requests. Higher flexibility is achieved by various technical solutions. Due to the stringent market requirements and the broad variety of specific references, Tenova implements the design and manufacture of all the equipment, and claims to be the right choice for all the mechanical, chemical, fluid, electrical and automation equipment supplied for continuous annealing lines for present and future automotive markets.

Author

Alessandro Casella is proposal and sales manager, Tenova Strip Processing, at Tenova Metals in Milan, Italy.

Squeegee roll coater during pre-assembly test in Tenova's workshop