

A wide range pickling line at Duferco la Louvière

To increase throughput and broaden the range of material treated at Duferco la Louvière, Belgium, a wide range pickling line (WRPL) combination push-pull/semi-continuous pickle line was successfully started in spring 2006, alongside the existing continuous pickle line.

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Tenova and Duferco

In order to increase its pickling capacity to satisfy the demand of the downstream finishing lines, Duferco la Louvière contracted Tenova (Techint Group) to build an additional pickling line in the same building as the existing 850kt/yr continuous pickling line facility. Duferco initially decided on a 450kt/yr push-pull pickling line and engineering design work commenced. Then, due to a growing demand for pickled product, they decided to increase the line capacity by 33% and asked Tenova to consider a semi-continuous configuration, preferred to the push-pull for the production of thin strips.

Even though the engineering project had already started on the basis of the initial order, it was decided that the line could be modified to increase output without re-starting design work from zero.

PICKLING LINE TYPES

Tenova provides a wide range of solutions for pickling lines to suit customer needs and product mix. The WRPL is one of the last products developed.

Pickling line designs for carbon steels are of three main types:

- **Continuous:** providing high productivity obtained by the use of looper accumulators.
- **Semi-continuous:** for thinner gauges using a simplified loop car (without winches) which provides higher strip accumulation capacity and higher productivity than push-pull lines. Semi-continuous means that the entry and exit sections of the line are connected in terms of strip speed, thus when the entry section slows down or stops, the exit section follows simultaneously.
- ▶ **Push pull:** for medium to high strip thickness and strength ranges. They often include a stitcher-joiner for thinner pickled gauges and entry and exit looper pits to minimise process stoppage.

LINE CHOICE

In order to meet all the customer and product demands ▶



▶ Figs 1-2 The hybrid push-pull and semi-continuous pickling line at Duferco la Louvière



📌 Fig 3 The hybrid push-pull and semi-continuous pickling line at Duferco la Louvière

Tenova came up with a tailor-made hybrid solution – a combined push-pull/semi-continuous pickling line, the WRPL (see Figures 1-3). This optimises the advantages of the latter two line types, providing high productivity and pickled quality both for thin and thick gauges. It can run as a push-pull line or as a semi-continuous line, depending on demand and product.

At Duferco la Louvière, the push-pull mode is used for thicknesses between 3 and 8mm and for high tensile steels, while the semi-continuous mode is used for thicknesses between 1.2 and 5mm and for low carbon steels.

The layout of the new line was chosen so that the 'operator-side' is located in the middle of the bay (as is the case for the existing continuous line), to optimise the operating synergies between personnel.

In push-pull mode, the strip passes from one of the two uncoiling sections direct to the process tanks and then to the trimming machine and the tension reel, without passing through the looper and the relevant bridles, as in a conventional push-pull line.

In semi-continuous mode, hydraulically actuated deflecting tables located just before and just after the process section direct the strip to the looper and

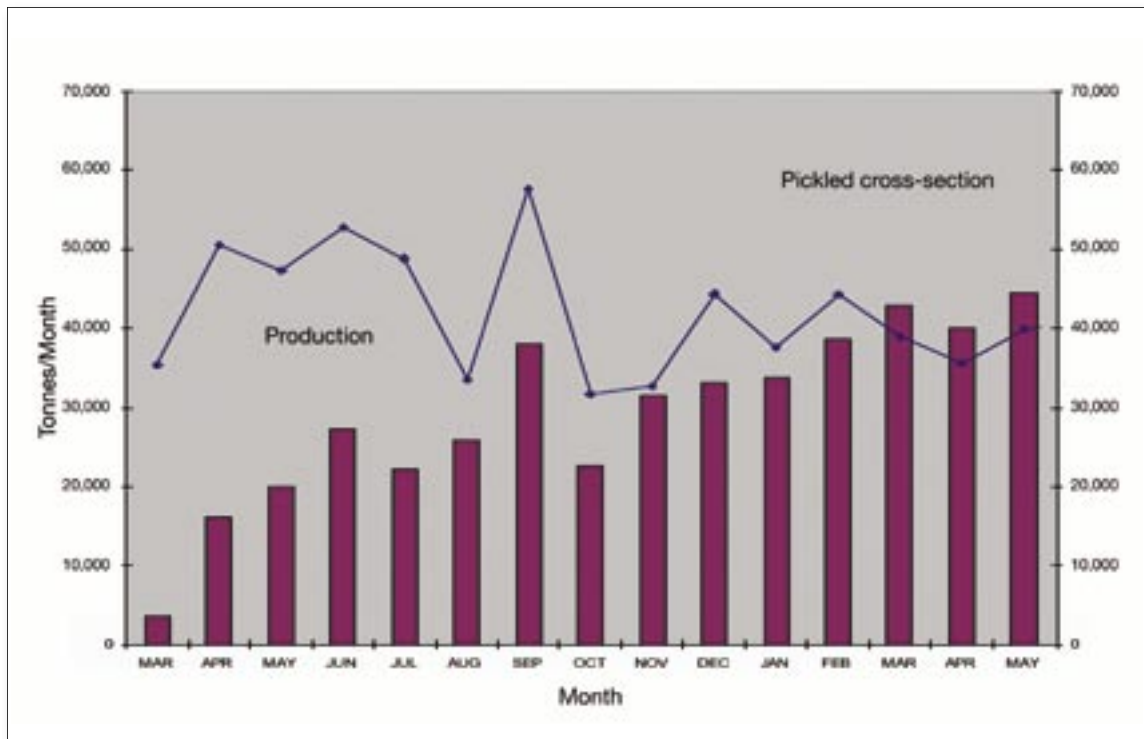
the relevant bridles and steering devices, all of them located below the process section in a double-deck configuration. A stitcher and a notcher are provided to join the head and tail of subsequent strips together.

The looper system is of a simplified design without winches, and with only one looper car which is used for strip accumulation at both entry and exit of the strip. This section of the line, dedicated to semi-continuous operation, is designed to accommodate strip of up to 5mm thickness.

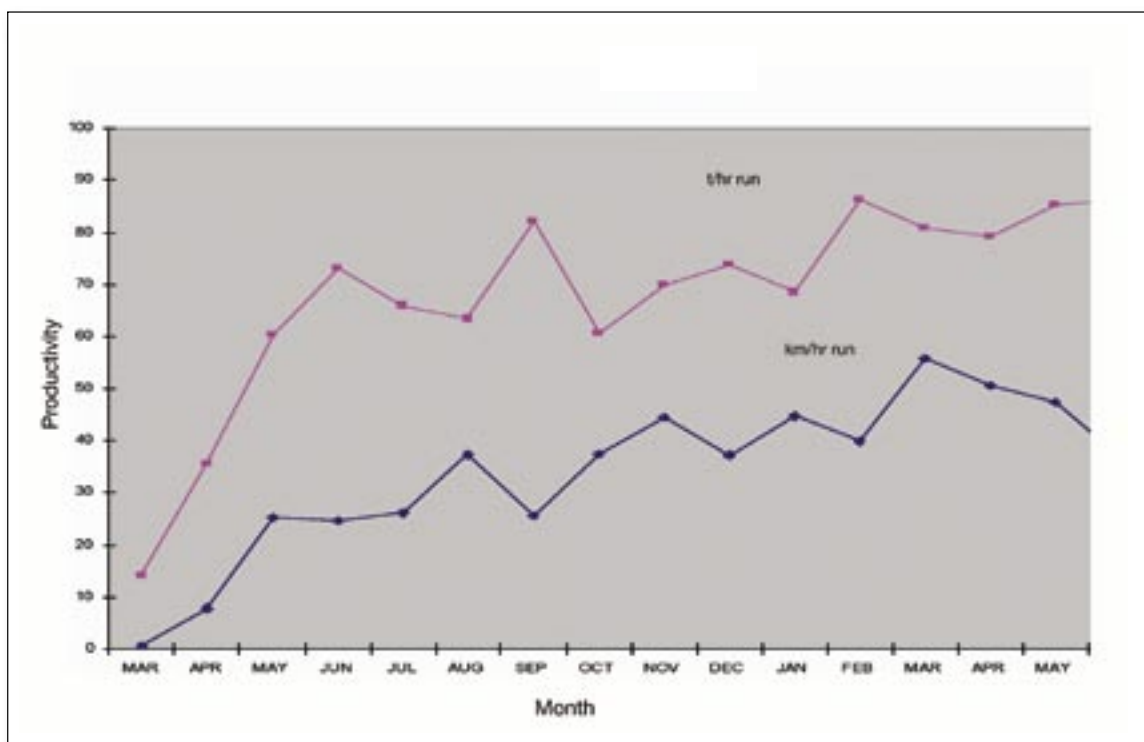
The pickling section has the following equipment:

- Pre-rinse section (used for pull back operation)
- Pickling section with four modern shallow polypropylene tanks
- Pickling tanks with acid heating and circulation system
- Rinse section of the four-stage cascade spray type
- Strip dryer
- Fume treatment system

Pickling takes place using hydrochloric acid (HCl) in four-cascade pickling tanks at 80°C. The scale layer on



ⓐ Fig 4 Production since commissioning



ⓐ Fig 5 Plant productivity

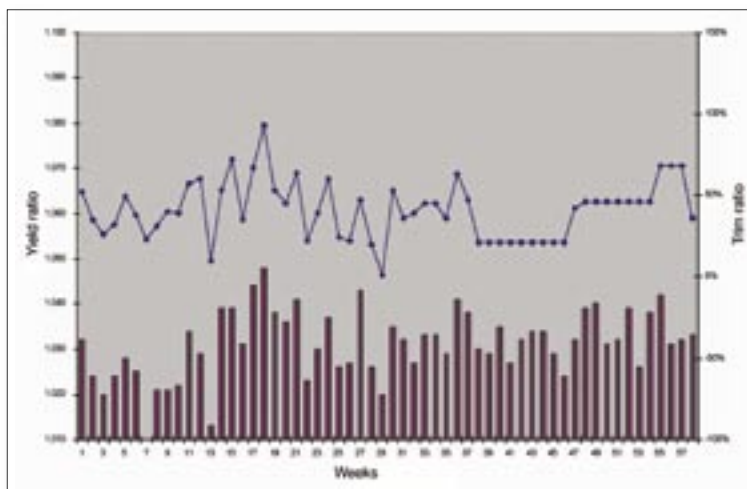


Fig 6 Strip yield ratio (input wt/output wt) and % of strips trimmed

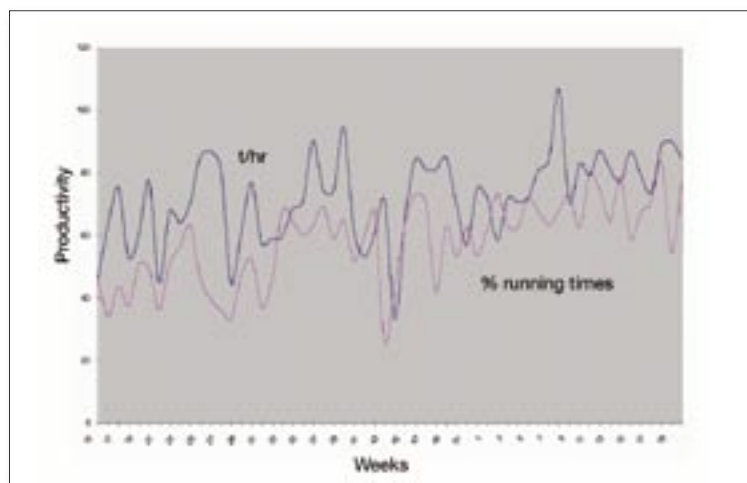
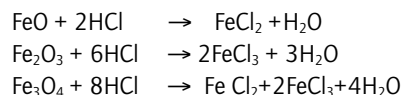


Fig 7 Weekly productivity (t/hr) and running time as % of calendar time

the strip is chemically dissolved by the acid, the main reactions being:



The line also uses an external acid regeneration plant (ARP).

Figures 4-7 from the Duferco la Louvière production department show the progress of productivity and yield from the line for the 15 months since start up in March 2006.

EXISTING LINE REFURBISHMENT

Following successful commissioning of WRPL the pre-existing continuous line was revamped by Tenova in August 2006, with only 18 days of line stoppage and commissioning.

The main changes were:

- Digital drives installed
- Master analogue cards dismantled and replaced with the new PLCs
- New local control desks
- Motor control centre boards; interface with new remote units
- Line regulation completely renewed and transferred into No.3 PLC type Siemens S7 400
- Level 2 process control added

CONCLUSIONS

The WRPL concept has proved to be a valid, cost-effective option for new investments. With a short start-up time and a medium production range and capacity, it is an important example of the ability of Tenova's strip processing division to provide tailor-made solutions to suit customer needs.

The Duferco la Louvière plant is an additional reference plant to be added to recently installed facilities which include two continuous pickling lines for carbon steel at MKK Magnitogorsk, Russia, a hot annealing and pickling line for stainless steel at Thyssen-Krupp AST-Terni, pickling Line No.1 at ILVA Genoa-Cornigliano and the Hellenic steel pickling line in Greece.

Several projects are also in progress including two push-pull pickling lines at Intertrust (Bulgaria) and SMC Complex (Saudi Arabia), and two continuous annealing and pickling lines for silicon steel for Wisco (China). **MS**

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