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● NEWS ● MINIMILLS ● COATING ● TURKEY REPORT ● IISI REPORT

including the 2007 INDEX

# A wide range pickling line at Duferco La Louvière

To increase throughput and broaden the range of material treated, a combined push-pull and semi-continuous pickle line has been successfully started up in Spring 2006 at Duferco La Louvière alongside the existing continuous pickle to treat thicker gauge high C strip.

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Tenova's (Techint Group) experience in pickling lines provides a wide range of solutions, from large continuous pickling lines, such as two lines recently supplied to MMK in Russia, to semi-continuous and push-pull pickling lines, such as the one supplied to Duferco at La Louvière in Belgium, among others.

## PICKLING LINE TYPES

Pickling line designs for carbon steels can be 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.
- Push pull: for medium to high strip thickness and strength ranges. They often include a stitcher joiner for lower pickled gauges and entry and exit looper pits to minimise process stoppage.

There is also a combined push-pull/semi-continuous pickling line which optimises the advantages of the latter two line types, allowing high productivity and pickled quality both for thin and thick gauges. This was the configuration installed at Duferco la Louvière.

The benefits of such plants include early return-on-investment (ROI), short supply time to install the line and quick reaction to market changes.

In Spring 2006, Tenova successfully started-up the new combined push-pull/semi-continuous pickling line at Duferco La Louvière in Belgium.

Duferco la Louvière also has an existing continuous pickling line of 850kt/y capacity in operation in the same building as the push-pull line. This was also revamped by Tenova in August, 2006, five months after the start-up of the new line. Revamping of the continuous line was completed in only 18 days of line stoppage and commissioning. The main changes were: digital drives installed; master analogue cards dismantlement and replacement with

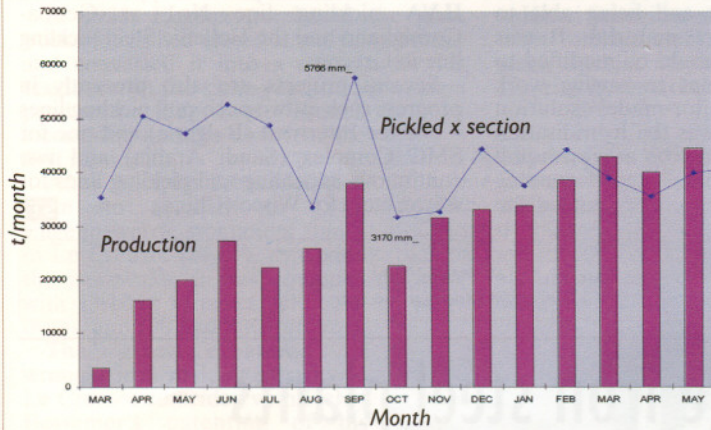
the new PLCs; local control desks replaced with new; motor control centre boards interface with new remote units; line regulation completely renewed and transferred into N° 3 PLC type Siemens S7 400; level 2 control added.

## DUFERCO'S NEW LINE

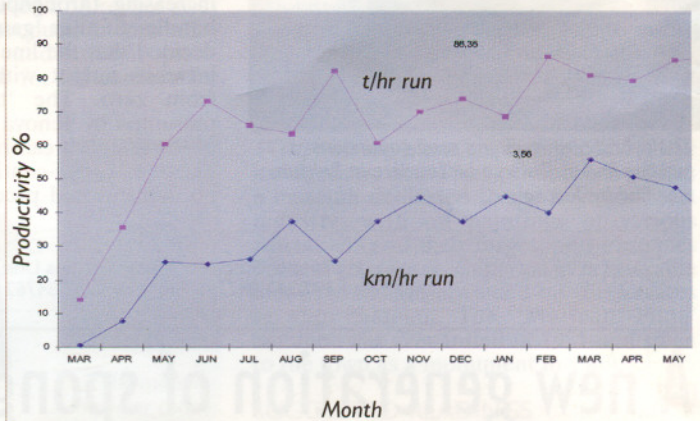
Improving product quality, lowering the impact on the environment, and ensuring the health & safety of the workforce are important reasons for installing modern plant, with all the currently available features for environmental and worker protection, in particular considering the presence of pickling acids. The line also has an external acid regeneration plant (ARP). The lay-out of the new line was chosen to have the 'operator-side' located in the middle of the bay – as is the case for the existing continuous line – so as to optimise the operating synergies between personnel.

The push-pull mode is operated mainly

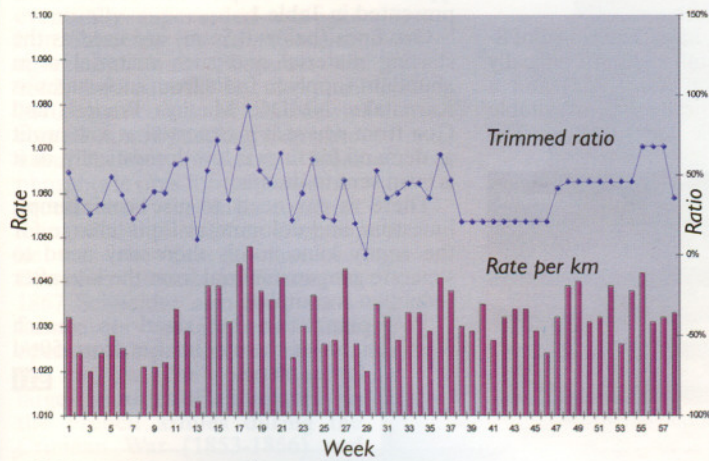
\*Tenova Strip Processing; \*\*Duferco



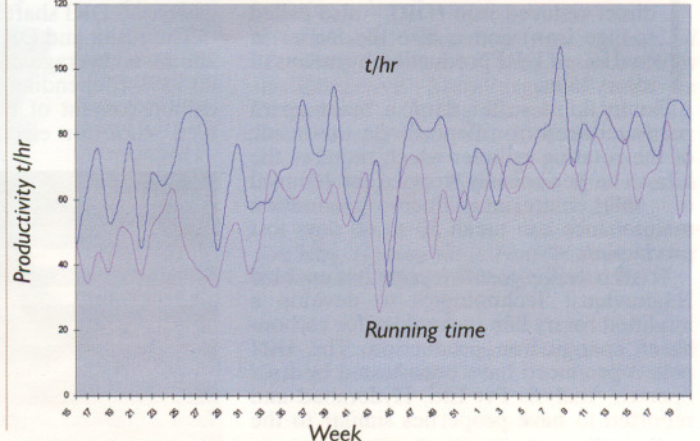
1 Production positive trend for medium pickled gauges (March 06 to May 07)



2 Production progression in tonnes per hour and pickled km per hour



3 Trimmed strip versus line yield (%)



4 High variability - due to the two possible line functioning modes - of weekly productivity and utilisation rate

for high thickness (3 to 8mm gauge) and high C steels, whilst the semi-continuous mode is used for processing thinner gauge material (down to 1.2mm).

## PROCESS DESCRIPTION

In the 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 to the tension reel, without passing through the looper and the relevant bridle, as in a conventional push pull-line.

In semi continuous mode, hydraulically actuated deflecting tables, located just before and just after the process section, deviate the strip to the looper and the relevant bridle 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 up to 5mm thick



The hybrid push-pull and semi continuous pickling line at Dufenco La Louvière in Belgium supplied by Tenova

maximum limit.

The pickling section has the following:

- Pre-rinse section (used for pull back operation);
- Pickling section with four modern shallow poly propylene 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 the strip is chemically dissolved by the acid, the main reactions being:



## DUFERCO'S CHOICE

Duferco decided to increase its pickling capacity to satisfy the demand of the downstream finishing lines.

It initially decided on a 450t/y push-pull pickling line. Then, due to a growing demand for pickled product, in particular for thinner gauges, it wanted to increase the line capacity by a third to 600kt/y. Since engineering work had already started in the push-pull configuration, Duferco asked Tenova if it was possible to engineer a modification to combine the push-pull line with a semi-continuous line, the latter both increasing throughput and being able to handle thinner gauge material. It was decided that the line could be modified to increase output without re-starting work from zero. The 'tailor-made' solution presented by Tenova was the hybridisation of the line so it can run both as a push-pull line or as a semi-continuous line, depending on demand and product. They named the

hybrid, 'WRPL' - (Wide Range Pickling Line).

Semi-continuous' means that the entry and exit sections of the line are connected in terms of strip speed: when the entry section slows down or stops, the exit section follows simultaneously.

At Duferco la Louvière, the push-pull mode is used for thickness gauges over 3mm and for high tensile steels, while the semi-continuous mode is used for thickness below 5mm gauge and for low carbon steels.

High tensile S550 MC coils have actually been processed in push-pull mode with good results.

Figs 1-4 from the Duferco La Louvière production department show the progress of productivity and yield from the line, for 15 months since start up. By May 2007, the line had achieved 88% of its nominal capacity.

The trend shows that, after 15 months operation, the productivity results obtained were notable and still increasing. The WRPL line 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.

The Duferco La Louvière plant is an important example of the capability of Tenova's Strip Processing division, to study tailor-made solutions to suit the customer's needs and is an additional reference in the pickling line field to be added to the experiences of recent years which include two continuous pickling lines for carbon steel at MKK Magnitogorsk in Russia, one hot annealing and pickling line No2 for stainless steel at Thyssen-Krupp AST-Terni, ILVA pickling line No1 at Genoa-Cornigliano and the Hellenic Steel pickling line in Greece.

Several projects are also presently in progress such as two push-pull pickling lines - one for Intertrust (Bulgaria) and one for SMC Complex (Saudi Arabia) and two continuous annealing and pickling lines for stainless steel for Wisco (China).

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