

# Marcegaglia – Europe's largest steel processor

Operating worldwide with 7500 employees, Italian based Marcegaglia makes no steel but processes up to 5Mt/y to serve more than 15000 customers with hot rolled, cold rolled, coated steel, plate, tube and cold-drawn bar products both in carbon and stainless steel.

FAMILY owned Marcegaglia, established in 1959, is headquartered in Gazoldo degli Ippoliti, Mantova northern Italy, but its largest plant – and the subject of this profile – is at Ravenna on Italy's northern Adriatic coast where it owns a dedicated port handling up to 360 ships a year of maximum size 40000DWT.

Marcegaglia is Europe's largest service centre processing globally some 5500km of steel every day, mainly in carbon steels but also stainless steel.

Processing steel accounts for 90% of the Company's €4.3bn annual turnover (2011), the remaining 10% being generated from six other business areas: building, home products, engineering, energy, tourism and services.

Turnover has grown at a CAGR of 11% from 2002-2011, with an inevitable fall during the global financial crisis in 2009, but the company is well on its way to recovering this growth rate in 2012 when projected turnover is expected to reach €5.0bn (2013 estimate).

There are 22 processing centres dedicated to the steel division scattered around the world, 16 in Italy, with the remainder in UK, Russia, USA, Brazil and China. There is also a joint venture company in Bremen, Germany and a network of sales offices worldwide.

About 46% of turnover is generated within Italy, 37% in the rest of Europe and 17% outside Europe. The profile of industries supplied is diverse, but building predominates at 19% of turnover followed at 9% equally by Trading, Automotive and food & dairy.

A worldwide network of partnership agreements ensures the supply of steel for processing which arrives largely in the form of hot rolled coil, but also as slab for the plate mill and bar for cold drawing.

## Marcegaglia Ravenna

Marcegaglia's processing plant at Ravenna, Italy is one of the largest steel processing site in Europe capable of processing over 2.5Mt of coil products a year as well as being the main import port for the group from where it distributes steel for further processing to other Marcegaglia plants within Italy.

Ravenna specialises in cold rolling and coating strip from hot rolled coil. For this it operates:

- Two continuous pickling lines (2.5Mt/y);
- One continuous 5-stand tandem mill (1.5Mt/y);
- One two-stand cold reversing mill (0.7Mt/y);
- One single-stand cold reversing mill (0.1Mt/y)
- Batch annealing stands using H<sub>2</sub> atmosphere (1Mt/y);
- Skin pass mill;
- Hot dip galvanising line HDGL 1 for heavy gauge (0.5Mt/y);
- HDGL 2 galvanising line for thin gauge (0.35Mt/y);
- HDGL 3 combined with pre-paint line (0.35Mt/y – 50% pre-painted);
- HDGL 4 Heavy gauge strip (0.6Mt/y);
- Colour Coating line (0.2Mt/y).



Marcegaglia uses its own photovoltaic coated coil to generate around 1MWh at Ravenna

The HDGL lines 4 and 3 are more recent additions made in 2010 and 2011 respectively and the 2-stand cold reversing mill was also commissioned in 2011. These were all supplied by Danieli & Co (as was HDGL 2). As is usual for modern HDGL, each incorporates a continuous annealing and cooling section prior to galvanising, this section being supplied by Danieli Centro Combustion.

## Cold reversing mill

The design capacity of the 2-stand 4-hi cold reversing mill is 600kt/y. To improve yield, the operators feed the initial coil into the mill with the roll bite closed, this requiring careful control of the entry speed of the strip. They say they have experienced few cobbles and no extra work-roll damage by adopting this procedure. Also, yield is improved by keeping tension on the strip during tail out from the pay-off reel, this reducing the length of out of tolerance strip at the tail. Yield loss has fallen from 2.5% to 1.5% using these procedures generating some €300k/y additional revenue. Transformation costs at €22/kg are far better than the €30 manufacture's guarantee and are even below the €25 of the tandem mill.

Strip flatness has also exceeded the guaranteed value of 9-12 I units, achieving 6-7 I units, a value close to the 6-8 I-units achieved on the 4-high tandem mill.

Ramp up of the new mill was achieved within 25 weeks, an improvement on the 33 week period when the tandem mill was started. In short, the 2-stand reversing mill largely matches the performance of the tandem mill, the latter only exceeding it in terms of capacity (1Mt/y) and excellent surface quality.

The cold reversing mill is equipped with tension reels on the entry and exit sides of the mill so that once the strip passes through the roll bite on initial entry it enters the coiler from which it is later discharged on the reverse pass. Typically four passes are required depending on entry thickness (2.0 – 4.5mm) and required

final gauge (0.25 – 1.5mm). The width range that can be rolled is 900 – 1550mm and the maximum coil weight 35t.

The mill has a maximum roll force of 2000t and is equipped with positive and negative work roll bending (600kN each) and a segmented shape meter on the exit side.

The mill is fitted with hydraulic Automatic Gauge Control (AGC) with a response time better than 22ms for a 50 step or 10ms for a 10 step. This is a 44% improvement on a 10 step compared with the former design and a 4% improvement for a 50 step. Response time is sufficient to compensate for any roll eccentricity on back-up or work rolls.

To avoid excess rolling emulsion being carried through the mill on reversing the strip a 'window' type design has been adopted for the stand with splash curtains and an air jet seals the exit gap to prevent nebulised emulsion reaching the strip.

## Galvanising lines

Hot dip galvanising line (HDGL) No 3 of capacity 350kt/y is a combination line incorporating a painting section after the galvanising pot. It can be used either to galvanise strip alone or to galvanise and pre-paint the strip. It can process strip in the thickness range 0.25-1.5mm in low C and HLSA grades with up to a yield strength of 1000N/mm<sup>2</sup>.

The continuous annealing section (CAL) has two control zones, the first gas fired with long-flame burners and the second using W type radiant tube electric elements.

At the galvanising pot, melting of the zinc and temperature retention is achieved by two 500kW air cooled inductors which have a melting capacity of 6t/h. Automatic zinc ingot charging is employed and a robotic skimmer removes dross. Generation 3 Kohler air knives control the thickness of the zinc coating on exiting the pot, differential coating weights can be applied on the top and bottom surfaces of the strip in the range 60 – 450g/m<sup>2</sup>.



Marcegaglia Ravenna operates four hot dip continuous galvanising lines, one a combi line for organic coating



Strip pre-painted on the combi galv+paint line is rapidly cured using near infra-red technology

On completion of galvanising, strip to be pre-painted passes through a Cr3+ passivation treatment which imparts a 1µm thick passivated layer, this is followed by a 1µm thick anti-finger-print coating and a 1µm thick pre-treatment.

The painting section has a maximum capacity of 75t/h (the curing furnace limit) and incorporates an incinerator to burn off volatiles emanating from the paint (solvent removal burning – RTO). Heating in the vertical DFF curing furnace is by means of newly developed NIR (near infra-red) electric radiant elements which operate in the wavelength range 0.8 – 1.3µm. This provides rapid curing by applying very high energy densities to the substrate. (NIR technology is a spin-off from the space programme where it was used to simulate the heat shock on re-entry of orbital gliders to the earth atmosphere). This accelerated method of curing has been approved by all major paint suppliers. In the in-line process, a primer thickness of 5-7µm is followed after drying by a top coat of 20-30µm and a finish back coat 5-7µm thick. Primer paints can be polyester, epoxy, polyurethane or acrylic and the top coat polyester, polyurethane, polyamide, PVC or fluorocarbon. The finish back coat can be polyester, epoxy, polyurethane or PVC.

Unlike the other lines which have separate galvanising and coating lines, HDGL 3 integrates the two processes. This was possible following the development of rapid NIR curing so that the speed of the paint coating section can match that of the galvanising section. A speed of 180m/min is achieved. By combining both



Coil on the cold reversing mill

galvanising and painting operations in a single line, handling of the product – with its potential for damage – is reduced as well as manpower requirements lowered and throughput can be increased. If necessary, the galvanising section can be used independent of the painting section via a by-pass section.

#### HDGL No 4

The annealing furnace of HDGL No 4 was revamped in November 2012 in order for it to be

able to treat higher strength dual phase steels.

This 600kt/y line can process both cold rolled and hot rolled strip of thickness 0.6-2.5mm and 1.0 – 4.0mm respectively in widths of 900-1550mm. Maximum coil weight is 35t. Coating weights of 80 – 450g/m<sup>2</sup> are possible at speeds up to 180m/min.

#### Finishing equipment

To supply customers with the dimensions and quantities demanded, Marcegaglia Ravenna has 11 slitting lines and seven cut-to-length lines. Product is strapped and packed for onwards delivery to customers.

On energy conservation, Marcegaglia Ravenna benefits from one of the Group's own products, photovoltaic cells incorporated in roofing panels.

Produced by the Building Division using steel from Ravenna, unlike domestic housing panels which rely on a framework of aluminium extrusions (and hence high initial energy in production) the integrated photovoltaic solution can be incorporated in flat or formed roofing panels.

At Marcegaglia Ravenna, some 1MWh of power is generated in this way, a significant contribution to the site's energy requirements. ■

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## Electric heavy-duty furnace

A HEAVY-duty electrically heated box furnace capable of attaining temperatures of 1090°C (2000°F) can be used for various heat treatments.

The footprint of the furnace measures 600W x 1200D x 600H mm (24"W x 48"D x 24"H) and it has a power input of 34kW. The heating elements are nickel chrome wire coils, supported by vacuum-formed ceramic fibre. A heating element in the furnace door provides improved temperature uniformity.

The unit features 190mm (7") thick insulated walls, comprising 125mm (5") of ceramic fibre capable of withstanding temperatures up to 1260°C (2300°F) and 50mm (2") of ceramic fibre rated to 926°C (1700°F). The floor consists of 112mm (4.5") firebrick blocks rated to

1260°C (2300°F) and 50mm (2") firebrick rated to 1038°C (1900°F).

The furnace construction consists of a 4.6mm (3/16") steel plate reinforced shell with a 12mm (1/2") steel front plate.

Designated Grieve 'No 921' the furnace includes a motor-operated vertical lift door, as well as a digital programming temperature controller and manual reset excess temperature controller with separate contactors, for improved efficiency and safety. ■

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The Grieve 921 electric box furnace has a maximum temperature of 1090°C

