Official opening ceremony for the new aluminum Hot Rolling mill at AMAG, Austria.

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Innovative "Quarto-type" Cold Pilger Mill for tubes and bars at NFC, India.

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Drive the Future: Danieli Transmissions Drivetrain Technology.

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N.171 MARCH 2015
DANIELI GROUP

DaNews 171

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DANIELI'S GREEN STEEL VISION

New steel production frontiers for Danieli Environment.

In a "mature" market like steelmaking, external factors are driving the innovation, in particular in the environmental applications. The new frontiers of the environmental controls can be focused in: water as a resource to be safeguarded, decreasing levels of emissions in the atmosphere, increasing reduction in CO_2 equivalents and energy-saving processes. The competitiveness of Danieli Environment in Total Recycling Economy is ensured by: Energy assessment services focused on the evaluation of energy wasted to identify the most efficient recovery technology to be applied; Clean Heat Recovery plant (CHR™), unique in the world for its technical solutions, to produce electric power directly from the heat wasted in EAF primary fumes and RHF; ECOGRAVEL® plants that convert slag into industrial aggregate, recovering the trapped scrap; INDUTEC® plants that eliminate the needs of treating dust as hazardous waste and allow recovery of zinc and inert slag as saleable products and pig iron to feed back to the EAF. On the top of this, Danieli Environment supplied more than 180 Fume Treatment Plants all over the world.
Based on this vision, Danieli Environment is working with its stakeholders to innovate the existing processes and implement new technologies. > Page 10

Innovative and reliable slab casting technology featuring the patented INMO mould with hydraulic oscillator, dynamic soft reduction, and Optimum segment with split-roll design, to guarantee top quality carbon and stainless steel slab production.

DANIELI DAVY DISTINGTON SLAB CASTING TECNOLOGY IS CONSISTENTLY CHOSEN TO CAST THE HIGHEST STEEL GRADE QUALITIES

DANIELI

Since 1951 Danieli Davy Distington designed and built

126 Conventional slab casters

DANIELI DAVY DISTINGTON
Slab and bloom casters

DANIELI TEAM
A CENTURY
OF PARTNERSHIP
EXPERIENCE

DANIELI THE RELIABLE
INNOVATIVE PARTNER
TO BE FRONT RUNNERS

DaNews

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MINIMILLS

IRON & STEELMAKING

ALUMINIUM

FLAT PRODUCTS

LONG PRODUCTS

TUBE PROCESSING

HEATING SYSTEMS

HOT & COLD PROCESSING

FORGING & EXTRUSION

CUSTOMER SERVICE

INSERT:

Highlights **AUTOMATION**

Danieli's answer to the dominating trend in the aluminium industry

Nearly all the projects under development now in the aluminum industry involve processing lines for automotive and aerospace products. In fact a "super cycle" of investments has begun for aluminum mill products for these two market segments, taking advantage of the lightweight but high resistance of aluminum, material characteristics that will make it possible to reduce energy consumption and consequently reduce emissions for lightweight cars, as well as for aircrafts. On a global scale the trend is a response to government regulations that aim to increase future vehicles' fuel efficiency and reduce their carbon emissions, which has prompted the associated industries to consider available and future technologies on a major (or, we can even say now mass-production) scale. It may also be seen as a positive example of how continuously reducing targets can lead to new investments, thereby driving the industries forward and in this way stimulating new investments, resulting in job creation worldwide with positive effects on employment, social costs, etc. Danieli's answer to this trend has been to develop, design, manufacture, install, and commission some of the world's most advanced aluminum production lines. These new designs have been launched at full production, confirming the innovative approach Danieli has in its corporate DNA. Major recent examples of this have been the new AMAG plate hot rolling mill, the Aleris Diamond cold rolling mill, and the new plate stretcher for AMAG, with an innovative and dedicated design adapted to the customer's special needs, both of which serve the commercial trends highlighted here.
Additionally, Innoval Technology Ltd., an aluminum process and product know-how company –and part of Danieli Group– is growing with these trends, too: with many new customers entering into new areas of production and therefore requiring special process and production know-how, Innoval has been available to supply their requirements due to its long experience working not only in aluminum plants but moreover working directly with the customers as well as at its own research center.
Danieli's commitment to innovation already has resulted in various new applications, such as a new Quench model for hot rolling mills, new designs for EDT automotive rolling mills (the DiamondFlex mill) with special features, and further concepts already in advanced stages of research and development. The positive feedback from our customers serves as further incentive to continue our efforts to be your innovative and flexible supplier, developing future production capabilities, and consequently allowing you, our esteemed customers, to be the quality and cost winner for the present and near-future demands, but remaining flexible enough to adapt to future market changes as well.
Following Danieli's commitment to the aluminum industry, in the near future we may expect further major developments in the Danieli Aluminium Division and would like to invite our customers to share their challenges for the future with us. Thus, in a spirit of partnership, we can work together to find the right solution for our common future success.

GEORGIOS XIMERIS
Executive Vice President
Danieli Wean United

JÖRG SCHROEDER
Managing Director
Danieli Fröhling

With almost 2.0 Mtpy of high-quality DRI available, SSC can be completely independent from the scrap market, feeding the EAF with 100% home-made hot DRI. Consequently, the cost reduction associated with the pure liquid steel production results ultimately in rebars, wire rods, and spooled bars that are more competitive in the market.

PLANT PERFORMANCE TEST COMPLETED SUCCESSFULLY

Suez Steel's integrated minimill: from iron ore to finished product

Currently, the Middle East and North Africa (MENA) region is considered to be a critical markets for the steel industry, due to the fast-expanding construction and fabrication sectors there. Focusing on North Africa, the Egyptian steel industry, thanks to its numerous links to other industries that promote economic expansion, is one of the cornerstones of Egypt's economic growth and development. Egypt is by far the largest producer and consumer of steel in North Africa and the domestic demand is expected to increase by 2.5 Mtpy over the next five years.
In this regard, the announcement that both Suez Steel Company (SSC) Energiron Direct Reduction Plant (1.95 Mtpy capacity) and the corresponding integrated meltshop (1.28 Mtpy of liquid steel capacity) passed the Performance Tests successfully in November 2014, marked a new starting point for steelmaking in North Africa.

Energiron ZR Direct Reduction Plant

Suez DRP is the world's largest module producing hot DRI. This plant is based on the innovative Energiron Zero Reformer technology, jointly developed by Tenova and Danieli, and is equipped with a dual reactor designed to discharge either hot or cold DRI. Due to the module's high process flexibility it is possible to schedule production according to the particular requirements of any actual final user. The Energiron DRP converts iron ore into metallic iron by means of hot (>1080 °C) reducing gases that flow in the direction opposite to the solid material inside the moving bed shaft furnace (reactor), operated at a pressure of approximately 6 barg on the top. In the Zero Reformer configuration, the natural gas, used as a reducing agent make-up, is fed directly into the reactor where it is converted into reformed gas simply by exploiting the catalytic power of the DRI. Since the reducing gases are generated in the reduction section, the overall energy efficiency of the direct reduction is optimized and most of the energy supplied to the process is taken by the product with minimal energy losses to the environment. This arrangement ultimately turns into very low natural gas consumption, even lower than 2.35 Gcal/t.

A brief summary of the process configuration is as follows. Oxygen is removed from the iron ore by chemical reactions based on hydrogen (H_2) and carbon monoxide (CO) for the production of highly metallized DRI. The exhaust reducing gas (top gas) leaves the reactor at about 400-450 °C and subsequently is treated in order to clean it and remove the oxidant elements (H_2O and CO_2) generated by the reduction reactions. In particular, the top gas passes through the top gas heat recuperator (heat exchanger), where its energy is recovered to produce steam, before passing through the quenching/scrubbing system. In these units, water is condensed and easily removed from the gas stream together with some dust carried by the gas. Subsequently, after it is compressed, the scrubbed gas is treated in the CO_2 removal unit, where CO_2, a by-product of reduction reactions, is selectively removed. Because of the presence of such a CO_2 removal system, intrinsically included in the basic reduction circuit, Energiron DRP has the lowest carbon footprint of any ironmaking technology, with the further advantage that selectively removed CO_2 can be sold for subsequent further profits.

Regarding its environmental impact, the selective elimination of both by-products generated by the reduction process, namely water (H_2O) and carbon dioxide (CO_2), which are eliminated through the top gas scrubbing and the CO_2 removal system, respectively, is one of the inherent and most important features of the Energiron process. The upgraded gas is finally mixed with the natural gas make-up before passing first through a humidifier, where water content in the gas is regulated, and later through a heater to increase the temperature to 950 °C, thus closing the reducing gas circuit (Figure 1). Finally, direct internal combustion of the reducing gas by means of oxygen injection finally tunes the gas temperature to the desired value at reactor inlet.

The continuous gravity flow of the material through the reduction furnace is regulated by a rotary valve located at the bottom of the vessel. Specially designed flow feeders ensure the uniform flow of solids within the shaft. DRI is finally discharged, hot or cold, by automated mechanisms, consisting of pressurized bins and special valves.

If cold DRI is selected as reactor product, cooling gas is fed to the conical, lower part of the furnace at about 40 °C, flowing upward countercurrent to the DRI moving bed. Natural gas is injected as make-up to the cooling gas circuit for optimal efficiency and control of the cooling and carburization processes.

If, instead, hot DRI is selected for immediate use in the nearby EAF, the cooling gas flow is diverted from the reactor cone to an external cooling vessel, which is used only in case of short pause of the meltshop or to cool the extra output not consumed immediately by the EAF. Thanks to the HYTEMP pneumatic transport system, the hot discharged DRI reaches the EAF at temperatures above 600 °C, with carbon content controllable between 2 and 4.5%, depending on final user's request. In this way all the thermal energy of the hot DRI is recovered with immediate benefits recorded at the meltshop, both in terms of reduced electrical consumption and tap-to-tap time, as well as lower refractory and electrodes consumption.

A further unique benefit of the ZR process is the product quality characterized by a high degree of metallization (above 94%) reached in combination with a high carbon content (around 4%), in the form of combined carbon (the level of carbon is adjusted simply by controlling the reducing gas composition and humidity): this results in a DRI that is more stable than the one typically obtained in other DR process schemes.

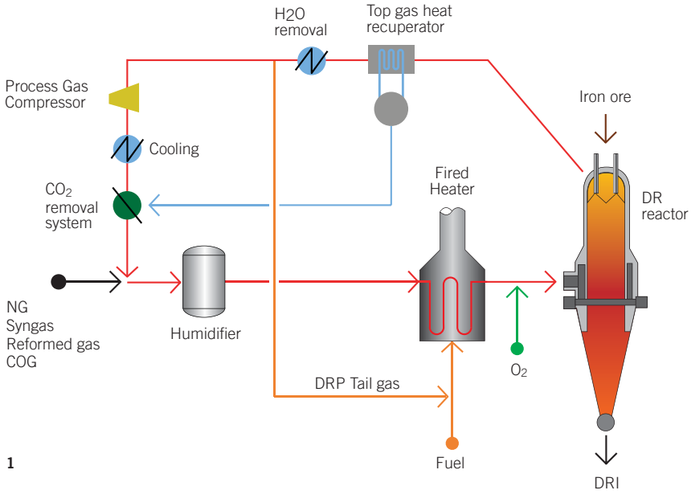

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Table 1

	Unit	Achieved results	Target
Production	tons	29,262	29,250 min.
Avg. metallization	%	94.28	94 min.
Avg. carbon content	%	3.52	3.5 min.
Avg. natural gas consumption	Net Gcal/t of DRI	2.40	2.42 max.
Avg. electricity consumption	Net Gcal/t of DRI	93.17	95 max.
Avg. hot DRI temperature	°C	600	600 min.
Avg. iron oxide pellets (on dry basis and screened)	t of iron ore/t of DRI	1.38	1.40 max.

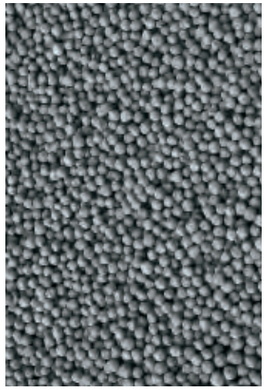
Table 2

100% hot DRI	54 min.
75% cold DRI +25% scrap	56 min.
100% cold DRI	58 min.
100% scrap	58 min.

Table 3

	Unit	Heats	Contract
		100% hot DRI	
Tap to tap	min	52.3	54
Elec. energy consumption	kWh/tls	379	395
Electrode consumption	kg/tls	N/A	1.34
Oxygen consumption	Nm^3/tls	30.2	39.5
EAF process yield	%	86.7	87.3

From iron ore to finished product



1 Energiron Direct Reduction process for production of hot DRI.

Table 1 Energiron DRP Performance Guarantee Test.

Table 2 Tap-to-tap time at different EAF feed mix.

Table 3 EAF performance tests parameters.

DRP performance guarantee test

As announced by Mr. Rafic Daou (Vice Chairman & Managing Director of SCC) during the 18th Middle East Iron & Steel Conference in Dubai (8-10 December 2014), the SSC Energiron DRP successfully passed the performance guarantee test conducted over five days, from October 30 to November 4, 2014. The hot DRI produced was sent mainly to the meltshop or to the external cooler, depending on meltshop requirements.


1


2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The data collected during the test, shown in the Table 1, demonstrated that plant capacity has been reached whereas all consumption parameters, being always within the target, confirmed the excellent performances of this Energiron plant.

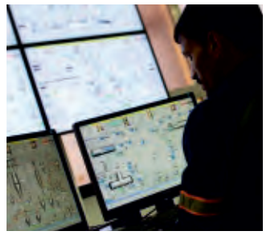
SSC Meltshop

The meltshop is equipped with a 160-ton tapping weight EAF, based on Danarc technology, a ladle refining station with two cars, and a twin-tank VD. The continuous casting machine is of the new and innovative multi-section type, capable of casting billets, round blooms, and beam blanks of different sections. The EAF is designed to operate with different charge mixes varying from 100% scrap, 75% DRI - 25% scrap, and 100% hot DRI or 100% cold DRI, allowing EAF to operate with maximum flexibility with various available raw materials.
Data shown in Table 2 confirms that charging 100% hot DRI increases the liquid steel productivity due to minimized tap-to-tap time.
Ultimately, the benefits of continuous charging of 100% hot DRI in the EAF has been confirmed as well with the EAF performance test carried out on 19 and 20 November 2014, when the achieved parameters, shown in Table 3, remained always within the targets.

Conclusions

Suez Steel's integrated plant was supplied entirely by Danieli on a turnkey basis. The completion of plant commissioning -which was the result of a continuous, tight collaboration and joint efforts of both SSC and Danieli- establishes another milestone for the global steel industry. Thanks to the innovative Energiron ZR technology and its perfect integration with a suitably designed EAF, a single DRI module is continuously producing the highest volume of hot DRI in the world, minimizing the environmental impact and optimizing the energy consumption.
"*Is a Zero Reformer Energiron a good technology? I would like to report that if there will be another chance to make a new plant I will go on with a zero reformer*", said Mr. Rafic Daou during the 18th Middle East Iron & Steel Conference. Mr. Daou explained that SSC DRP is an extremely flexible plant, able to guarantee very good product quality even despite the highly fluctuating gas availability: tests have shown that this technology is capable of varying the capacity from 50% up to 100% without any drawback.
For Danieli, which oversees every project step from basic design to the end of commissioning, final client satisfaction is imperative. Danieli is therefore highly honored to report the deep appreciation expressed by Mr. Daou at the conclusion of the speech to his technology partners Danieli and HYL, who supported SSC throughout the whole project and finally handed over to SSC a plant with remarkable performances.
To conclude, he said that "*with Danieli you will always know that you have a partner with you and you can be stronger in providing a good service*" ■

From iron ore to finished product



Partnership: (from right) Jamal El Garhy, Chairman, SSC; Rafic Daou, Vice Chairman and Managing Director, SSC; Renato Pezzano, VP Key Account Management, Danieli.

Left page:
1 160-ton tapping weight Danarc-AC EAF, designed to operate flexibly with different charge mixes based on technology.
2 Twin-tank Vacuum Degasser.
3 Innovative multi-section type conticaster, capable of casting billets, round blooms, and beam blanks of different sections.

"Is a Zero Reformer Energiron a good technology?
I would like to tell that if there will be another chance to make a new plant I will go on with a Zero Reformer".

Rafic Daou, Vice Chairman
and Managing Director, SSC

DANIELI'S GREEN STEEL VISION

AN ENVIRONMENTALLY SUSTAINABLE APPROACH FOR STEEL INDUSTRY DEVELOPMENT

Even if iron and steel production is not the most "environmental impacting" human activity, it is undeniable that this sector is subject to increasing pressure to reduce its impact in several areas, such as containing resources consumption, controlling harmful emissions, and mitigating plants' impact on the surrounding environment.

Increased environmental awareness is, rightly, not only a constant "mantra" in advanced countries but has become a cornerstone of sustainable development worldwide, reflected in increasingly stringent regulations and practices that have to be respected.
Danieli has contributed to this trend, continually developing more efficient processes in all areas of iron and steel making, from the development of the minimill concept for both long and flat products, to innovative technologies in DRI production, and to original flexible thin-slab casting and rolling process, just to name some. It has to be noted that Danieli not only is a leading supplier of technology and equipment but also a steel producer, thanks to the inclusion of ABS, Acciaierie Bertoli Safau, in the Danieli Group. This gives us direct experience with the challenges that arise by managing complicated environmental regulations, as well as the social responsibilities each steelmaker has in making its own plants fully compliant with the standards of the communities where they operate, making them perceived as valuable sources of income and development and not as an unpleasant intrusion.
This is the experience that guides us during development of two basic concepts that are the backbone of the Danieli Green Steel vision:

Environmental sustainability

Plants must be conceived in an holistic way, in the context of the existing environment and not as a neutral, productive unit; and, this involves both the selection of the best available production process and the overall mitigation measures, including layout minimization, with landscaping and architectural solutions designed around the process.

Environmental profitability

An environmentally concerned approach to the steel industry has to be seen not only as a mandatory cost imposed by the laws but mainly as a new profit opportunity for the entrepreneur.
As an additional challenge, we mention that the present approach by statutory authorities in the European Union to gain relevant authorizations in the do not rely only on adhering to clearly fixed limits, for example on emissions; rather, they rely increasingly on the concept of applying the BAT (Best Available Technology) in the selection of the particular technology to be adopted, the least impactful one must be adopted. In concrete terms, the Danieli Green Steel approach is realized by innovations in the following areas:

DANIELI GREEN STEEL

Since the 1970s Danieli has maintained a division that specializes in environmental protection. Today Danieli Environment offers a full range of proprietary technologies for air pollution control, water treatment, energy saving, solid waste recovery, and noise reduction.

> Reduction in plant emissions via air and water pollution control;

> Reduction of valuable raw material consumption, particularly in water conservation;

> Reduction of noise emissions, both inside the working areas of the plant and at the borders of the facility;

> Reduction of energy consumption and overall process carbon footprint; and

> Promotion of efficient recycling, particularly via optimized scrap processing.

One area in which Danieli is making a considerable investment with new products and technologies is the "Zero Waste" approach.
This concept aims to use waste materials/ media from the process as valuable raw materials to be transformed into added-value by-products, as a source of additional income. This generates two positive effects:

> **Overall production cost is reduced** because waste emission is reduced, mitigating, if not avoiding, disposal costs or taxation on emissions (such as carbon taxes, costs for waste water discharge, etc. …)

> **Overall plant profitability is increased** because new, saleable products are introduced at marginal cost from "free" wastes.

Thanks to its network of centers of competence covering all the salient technologies in iron and steelmaking, from raw material processing to finished product, Danieli covers all the areas of concern relevant to environmental challenges:

> Danieli Environment, in charge of fume plants and waste material and energy recovery systems;

> Danieli Centro Combustion, with expertise in low-emission/ high-efficiency burners and combustion technologies;

> Danieli Engineering, for the development of non-impact auxiliary plants, covering for instance the full water cycle for the plant;

> Danieli Corus and Danieli Linz for primary ironmaking and BOF steelmaking technologies, and for low-impact BF plants.

All these teams are supported by the constant innovation trend promoted by the Danieli R&D Center. In the following, we briefly mention some of the concrete applications of new products and new processes of these guidelines.

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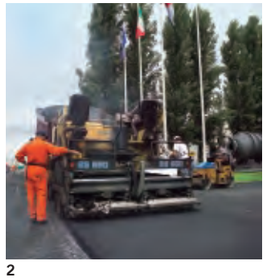

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From waste materials to economical resource

> Ecogravel process to transform BOF, EAF and LF slag into a saleable, certified material for the civil and road construction sector.
Steelmaking generates significant volumes of slag that at present are considered a "regulated waste" in most countries, subject to controlled disposal.
It is not unusual to see steel plants literally surrounded by mountains of unused slag representing a misuse of space, a source of potential harmful emissions for the dissolved materials, including heavy metals, and in some cases a source of unused raw material, with a significant quantity of steel (up to 4%) that can be recovered.
The Ecogravel process, in operation at the ABS plant since 2007, transforms meltshop slag into a CE-certified aggregate, substitutable for expensive natural stones and gravel, with significant and tested applications in production of prefabricated concrete elements and conglomerates, and with associated applications as a bituminous conglomerate for road construction.
Moreover, the Ecogravel process allows automatic recovery of about 90 to 95% of the steel still present in the slag, with important increase of overall plant yield.

> Indutec process for EAF dust processing.
Scrap-based EAF dust represents a harmful material subject to controlled disposal, and rich in zinc content, in some cased up to 25%.
The Indutec process makes it possible to transform this waste into a saleable commodity with a significant market, the crude zinc oxide used in the paint industry, base chemical industry, and even cosmetics and pharmaceutics. The efficiency of the process, based on pyrolitic reactions in a dedicated induction furnace, makes the plant economically sustainable also for limited size meltshops, so that it's possible to process all the dust within the plant, avoiding the necessity to transport the harmful EAF dust in large centralized plants, as commonly done at present.
Additional further refinements of this Crude Zinc Oxide-CZO are possible, for the production of high-grade metallic zinc, than can be used immediately, for example, in galvanizing lines.
The return on investment of such plants, depending on the cost presently paid for the disposal of EAF dust, can be as short as just a few years.

1 Global Blue plant to process BOF, EAF, and LF slag.
2 Ecogravel application in bituminous conglomerates.
3 Ecogravel application in cement mixes.
4 High-grade metallic zinc can be obtained from the Crude Zinc Oxide-CZO produced through the Indutec process.
5 CO2 selective removal plant area in an ENERGIRON Direct Reduction plant.
6 CHR power generation plant from waste fumes, combining hot water and ORC technology.

DANIELI'S GREEN STEEL VISION

Steelmaking carbon footprint reduction ENERGIRON DRI process

Taxation based on carbon dioxide emissions is a reality. Steelmaking with gas-based DRI already represents a significant improvement compared to conventional BF-based process route. Danieli ENERGIRON DRI process, with gas preheating technology, with its intrinsic CO_2 absorption capacity as well as the possibility of coupling it with a dedicated CO_2 selected absorber to segregate up to 70% of original carbon input, with a savings of approx. 258 kg CO_2/ ton DRI compared to other available technologies.
This recovered CO_2 can be either segregated or commercialized as process gas; references exist even for food processing, for the production of carbonated drinks.

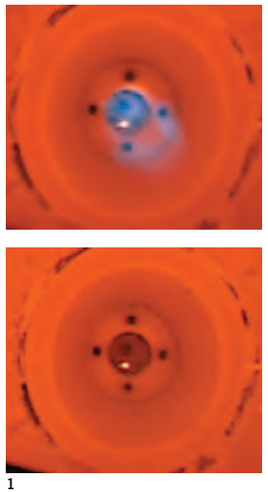
Energy Consumption optimization, promoting self-generation of electric power: CHR, power generation from waste fumes

It is well known that, even in most advanced EAF processes, a significant amount of energy is irretrievably lost as thermal energy in the fumes.
Such waste accounts for about 25 to 30% of the total energy potential actually consumed

5

6

1 Ultra-low NOx emission flat MAB flameless burner.
2 Lindarc real-time, laser-based EAF off-gas analyzer.
3 ZLD-Zero Liquid Discharge water treatment plant in a 1.2-Mtpy steel meltshop.
4 Fume plant for shredder units in order to cut down the values of total dust (PTS) and VOC content.



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by the process. This has to be seen as a free of-charge source of energy.
Unfortunately, this energy is not generated continuously, as it follows the EAF melting profile, so that to date recovery and transformation of usable sources of power has been problematic.
Danieli overcame these limitations by developing the CHR-Clean Heat Recovery system that makes it possible to convert such massive quantities of energy into power, by adopting a highly automatized ORC-based turbine. The first industrial application will be put in operation by June 2015 at the ABS plant, generating as a first application about 1 MW of power from a 90-ton EAF.
For a standard 120-ton EAF, 3.5 MW can be generated with a recovery of 15-20 kWh/ton liquid steel and a savings of 10,000 tpy of emitted CO_2.
It has to be noted that the recovered energy can be either internally consumed by the plant or sold to the power grid authorities, at market price.
The system has no impact, neither on the EAF melting process nor on the fume plant. It should be noted that this energy recovery system from exhausted fumes is free from problematic aspects implied by scrap preheating technologies, such as maintenance and availability costs, or generation of volatile toxic wastes that further complicates the fume plant.

Combustion process optimization for toxic emission control: new generation of burners

The heart of every combustion system, either for reheating furnaces or for treatment furnaces, is the burner. Danieli Centro Combustion developed a full set of new burners to be used for either rich fuels an lean ones, in compliance with stringent NOx and SOx emissions, yet guaranteeing an optimal exploitation of the available thermal potential. Long flame or radiant-roof type, according to the applications, "flameless" burner designs allow NOx reductions of up to 70% compared to conventional "flame mode" burners.

EAF process enhancement for energy /emission optimization: Lindarc technology

The dream of the automatic furnace becomes a reality with the introduction of Lindarc: the real-time, laser-based EAF off-gas analyzer that makes it possible to adapt automatically all EAF energy inputs (power, fuel, carbon, oxygen) according to the chemical

DANIELI'S GREEN STEEL VISION

2

composition of the fumes, measured life in real time.
This maintenance-free tool makes available in real time, compared to extractive technologies, the content of CO_2, CO, O_2 and water in the fumes, and automatically optimizes the post-combustion profile in the furnace. Cuts in consumed power, oxygen, carbon, and fuel are quantifiable, making the return on investment in the range of few months.

Water cycle optimization: Advanced water-treatment plants with "zero" liquid discharge.

Water is one of the most valuable resources on which a steel plant's impact is seen, either because a significant amount of water is required as input or because water treatment plant blow down is a significant waste, depleting the properties of the water where it is discharged in (rivers, sea, dwells, etc …). With this concept in mind, Danieli developed an advanced concept in water treatment that allows the possibility of complete recovery of the plant blow downs, and use of the further treated water

3

4

as an alternative make-up source. The final concentrated brine, reach with salts, is still not discharged in the environment but used to hydrate the EAF slag and thus evaporated: hence a full " zero" liquid discharge is obtained.
An example of this concept is given by the DneproSteel plant in Ukraine, where a 1.2-Mtpy steel plant would generate a blow down flow rate of abt. 60 m^3/h, but where actually not a single liter of liquid waste is discharged.
Instead of being discarded in the Dnepr river, requiring dedicated authorizations and discharge costs, 51 m^3/h are recovered as make-up water, and 9 m^3/h are evaporated on the slag hydration process.
The blow down is fully processed via clarifloculation, neutralization and oxidation, filtration and double-pass reverse osmosis. Water pumping is reduced, discharge in the river is eliminated, and no liquid discharge costs are considered.

Scrap processing and recycling: Emission-free shredding process.

Proper scrap processing guarantees recycling even poor quality scrap, making the EAF a suitable waste processor with reduced restrictions in scrap sourcing.
As is well known, the scrap recycling process is limited sometimes by the quantity of dust, oil, heavy metals, and organic compounds included in the scrap.
In fact, during the shredding process the quite high temperatures generated promotes the production of significant amounts of VOC (Volatile Organic Compounds), dust, PCBs, etc., that complicate the use of such scraps, even if abundant.
Danieli patented a specific design for a fume plant for shredder units, in order to cut down such harmful compounds, as well as dust, via thermal treatment of the fumes and active carbon beds.
The efficiency of the system is testified by the values of total dust content (PTS), lower that 5 mg/m^3, and VOC content, lower than 5 mg/m^3, measured at stack.

Conclusion

Environment-oriented technologies, if fully embodied in process and plant concealment, can establish not only a full compliance of the steel industry with increasingly stringent regulations, but also can convert sources of costs and problems, such as wastes, into valuable sources of income, thereby turning a "problem" into a " business opportunity" ■

DANIELI'S GREEN STEEL VISION

STEELMAKING PROCESS STARTS FROM THE TIGHT CONTROL OF THE RAW MATERIALS

UK metals firm invests in Danieli Centro Recycling equipment to buck trends and double capacity

While global markets stalled in the last decade, UK scrap firm EnableLink accelerated exponentially, doubling capacity in just one year with the help of a brand new Danieli Henschel shear.

The company cites investment in new equipment, old-fashioned values and a unique product as its recipe for success.
General Manager Charlie Penn explained: "*In 2013, we invested in a Danieli Henschel shear, which has changed the face of the business. As well as saving on running costs it gives us a product that is denser, cleaner and easier to melt. The extra density means we can load an extra 10% into containers, which increases the margin for all concerned, and has led to real interest from the international marketplace. The team has a wealth of experience -with a long and illustrious trading history!*"
Based in the West Midlands, EnableLink has 20 staffers on the books and is in its sixth year of trading. The company processes up to 600 mt per day, of all ferrous and non-ferrous materials, with a core focus on heavy steel works melting grades, OA and HMS 1&2.
Penn said: "*Most of our trade is done with agents who are working to very fine margins. When you can fit an extra couple of tonnes in the box, freight costs are reduced dramatically.*" The cost impact also benefits the end buyer -material is compacted to such a degree that air space is destroyed, resulting in cleaner cut grades of higher density and quality. UK Sales Manager at Danieli Centro Recycling, Giovanni Scarcelli, described EnableLink's growth as evidence of its commitment to compete effectively within a global marketplace.
"*EnableLink and Danieli Henschel worked closely to develop a specific blend of speed and processing power, which has ultimately resulted in an extremely high density, sought after product.*
"*Danieli Centro Recycling already has a history of supplying the largest players in the industry, such as major customers in Russia and Germany. It is very encouraging to see EnableLink shift UK standards up a gear, and so quickly reap the rewards.*"
The new shear, which replaced two lower capacity models, has helped EnableLink to manage stockpiles more effectively and reduced running costs.
Penn explained: "*The Danieli Henschel machine is producing more than our two previous shears combined and obviously also requires just one man instead of two, and one feeding machine instead of two. We are now producing more scrap for less money, and a better grade of scrap into the bargain.*
"*It has changed the dynamic of the company,*" he added, "*It is faster, quieter, and we are now running one generator where previously we relied on two.*"
The CIB 1250-10 Danieli Henschel shear features six 90-kW motors. Steel of all types is fed into an 8-m box where it is hammered into a 900-cm by 800-cm log with a length variable up to 8 meters. Then, this compacted material is struck with a clamp before the product is cut to length.
Bringing the machine online has increased production from 250-300 mt to up to 600 mt per day and changed the face of the yard.
Penn said: "*The machine is pivotal; the machine now is the yard, it is the operation. It gives us total control of the feedstock coming in; as fast as it comes in it is cut. We know that if we get five days' production, the machine will kick out 2-3,000 mt of scrap, so it has raised the game and given us the strength to compete at a higher level.*"

Looking to the future, EnableLink is so convinced by its new acquisition that it plans to invest in a larger machine. When asked what differentiates the company from its competitors, Penn replies: "*The difference is people, and the fact that we've got a fabulous new machine to back us up. We like old-fashioned quality and standards –old-fashioned values, modern machinery.*" ■

Steel master Danieli Centro Recycling forges historic route to China

With a factory and service department already established in Shanghai, the sale of the DCR 6290 to the Valuda Group marks a new phase for the company, bringing 25 years of experience and high-quality European engineering to the emerging Chinese scrap-processing industry. Engineering Group Leader Terry Keyworth said the deal demonstrated Danieli Centro Recycling's commitment to offering the highest manufacturing standard on the market.
"*With over 50 machines in operation throughout the world, we were keen to apply our expertise to Chinese operations. Although aspects of the industry differ to our more traditional home market, the machine we have supplied works to the same basic principles of precision manufacturing with wear parts designed for optimal life and minimal downtime.*"
The DCR 6290 is an entry-level machine designed to process relatively small volumes of up to 30 tph. Based in Guangzhou, the Valuda Group will use the machine to handle end-of-life vehicles (ELVs).
In common with Danieli Centro Recycling, it has ambitious plans to expand across China and recently won a contract to process municipal waste in Shanghai. The arrival of the new shredder coincides with the company's plans to take scrap processing a step further, from manual sorting of non-ferrous materials to an automated ELV processing operation.
Keyworth said the Danieli Lynxs shredding machine offers a range of features that help it to stand out from the competition, one that will ensure longevity with low-cost maintenance.
Perhaps the key point is Danieli Centro Recycling's approach to wear parts. Instead of treating the hard-working, fully machined rotor as a consumable, it is considered an integral part of the machine, with wear parts such as caps added to help balance the rotor, reduce the cost of replacing parts, and reducing power consumption with a design that provides more inertia.
Keyworth added: "*Our rotor is a very highly precision-made piece of equipment with spider arms and end disks heated and shrink-fitted to the shaft. Similarly, I believe we are alone in supplying welded radial stiffeners, which support the grids at four points of contact. These provide extra stiffness to castings and bracing to the machine itself.*"
In addition, the shredder features independent hydraulic cylinders for the kick-out door, allowing the door to operate independently of the machine in an emergency, and single-shaft compression feed roller that helps to regulate the feed flow.
Keyworth said: "*The feeding system is linked to a completely automated HMI (Human Machine Interface) system that monitors rotor RPM, motor amps, and the compression feed roller motor, and adjusts the settings by the second.*" With the plant currently undergoing installation, the aim is to be up and running by end of 2014. Keyworth concluded: "*This is the first plant of its kind in China and we are looking forward to bringing a new level of design and operation to the market. We have a large factory with 3,000 people working in Shanghai and are fully equipped to supply complete support to the Valuda Group. "We fully expect to be an integral driver in Valuda's plan to both increase and improve ELV processing capability, and to offer China the benefit of our specialized know-how and manufacturing expertise.*" ■

STEELMAKING PROCESS STARTS FROM
THE TIGHT CONTROL OF THE RAW MATERIALS

DANIELI'S GREEN STEEL VISION

Tosyali and Danieli team up to install the first scrap shredding plant in Algeria

Signing of the Contract at Tosyali HQ. From left: D. Braga, Executive Manager, Technical & Sales, DCR; K. Tugcu, Finance Manager, Tosyali; M. Gezgin, Project and Investment Manager, Tosyali; A. Diasparro, VP, Key Account Management, Danieli; M. Lerz, Director Contracting & Financing, Danieli.

Two of the steel industry's most influential players combine their forces to capture new markets.

The sale of Danieli Lynxs' DCR 2227 shredder to Turkish giant Tosyali's plant in Oran, Algeria, marks the first partnership between recycling equipment manufacturer and steelmaker Danieli Centro Recycling and Turkey's largest private iron and steelmaker. The Oran site produces over 1 Mtpy of liquid steel from its electrical furnace. The arrival of the shredder is expected to improve profit yields through greater flexibility on the purchasing market and to reduce furnace transformation costs, resulting in a higher-density product that will command a greater price.
Davide Braga, Executive Manager, Technical Sales at Danieli Centro Recycling described the company's experience as a steelmaker as crucial to the sale: *"As steelmakers ourselves, we know exactly what a steelmaker is looking for in a product. We are not only selling recycling equipment, we also provide added value in terms of know-how."*
The DCR 2227 – a 4,000-HP machine celebrated for its output of up to 100 tph, with a yearly capacity of up to 40,000 tons of shredded scrap. It includes, as standard, features such as a high-inertia, long-life, enclosed and capped rotor; heavy-duty rotor bearing housings; and a unitary base to solidify the structure in the vicinity of the anvil. The shredder offers the lowest kWh power consumption per ton available in this product category and, in order to cut maintenance time and the need to replace expensive parts, Danieli Lynxs has developed an innovative hammer pin puller. However, Braga says that flexibility in terms of feedstock purchasing is the greatest benefit.
"When a customer invests, they want to know how soon they can recover outlay costs. In general, when producing one ton of steel with an electrical furnace, 80 per cent of the price comes from material costs. Sourcing less expensive scrap, and raising the density of your final product therefore impact enormously on profitability. "In Algeria, standard scrap tends to be of low yield and density, so investing in a shredder gives the opportunity to source cheaper feedstocks and produce fresh scrap compared with imported material, which may have lost one per cent of its yield through oxidization during storage or transport. Our technical team recommends a density of between 0.9 and 1.1. If the material becomes too dense, it can lead to inclusions within the scrap. A more open feedstock will have a higher heat exchange, which results in a shorter melting time."
Braga concludes: *"These considerations are very important to the final material, and therefore very important factors in the design of the mill – and in the design of the grids and hammers. Our dedicated research and development team has produced a range of grids and hammers to suit all applications, and thanks to our subsidiary Riverside Products, which supplies spare parts, Danieli Centro Recycling is able to apply its experience in shredder consumables to each sale."*
Danieli Centro Recycling already operates four shredders across Africa and three in the Middle East. However, the deal with Tosyali is a first. Braga concludes: *"The choice of Danieli Centro Recycling for Algeria confirms us as the first choice in that market. Turkey, meanwhile, produces in the region of 40 Mtpy of liquid steel, making it one of the highest producing countries in the world. We are extremely keen to build on our relationship with Tosyali Holding, using our knowledge and experience to support such a major player"* ■

ZERO WASTE CONCEPT

DANIELI'S GREEN STEEL VISION

Ecogravel® process to Al Ezz Steel, Egypt

On March 18, 2014 Ezz Steel Group assigned an order to Danieli for an Ecogravel® plant to be installed at Al Ezz Dekheila Steel Company (EZDK) facilities in Alexandria, to transform the slag produced in the meltshop into a CE-certified material, making it available for profitable sale for various applications in substitution of natural stone.

From the EAF to the road

In keeping with international commitments to encourage the recycling of alternative materials and reduce the exploitation of natural resources, Danieli has developed a reliable solution to transform slag into a high-quality industrial aggregate: Ecogravel. This industrial gravel is intended for civil concrete construction and bituminous conglomerates and road foundations. Certifications prove that Ecogravel-based final products are an excellent substitute for natural materials and have greater strength and longer life compared to natural aggregates.

Green Steel

Every ton of steel produced generates 250 kg of waste (slag, dust, exhaust refractory and other residues); it is a real problem for today's steelmaking industry. In this context, already in 2007, Danieli perfected the Ecogravel: a process for producing an industrial aggregate with high mechanical properties, turning a problem into a business opportunity. The basis of the process is crushing, screening, and magnetic deferritization of furnace slag, and all of these steps completely automated; the operating personnel required are involved only to feed the processing line and to collect the end products. The final product, sorted into size ranges determined by European standards, has a marketable value and finds various applications in civil and road construction.

A GREEN partnership

The Ecogravel plant to be installed at EZDK (the largest steel manufacturing facility in Egypt, with a capacity of 3.5 Mtpy) is sized to treat in a single shift the whole volume of the EAF and LF slag and exhaust refractory generated at the meltshop (approx. 600,000 tpy), and to recover scrap metal that is then recycled back to the EAF, accounting for approximately 3-4% of the processed material. The plant is scheduled to start production during Q2 2015.

Environment

The Danieli team is proud to be a partner of EZZ Steel Group in introducing these new concepts in environmental sustainable steel production at EZZ Steel. Investing in sustainable development is as much a priority as investing in steel production improvements. The company's environmental management system is ISO 14001-accredited and its safety management system is OHSAS 18001-certified – both recognized as among the highest certification standards in the world. EZZ Steel's efforts to educate and communicate its environmental policies and issues to employees is an everyday process ■

A pioneering application of the Danieli Green Steel concept in the Middle East will transform an environmentally sensitive issue, namely the production and storage of slag in meltshop, into a valuable resource.

EZDK Ezz Dikheila

Ecogravel Industrial aggregate

Partnership. From right: Nabil El-Khatib, Director of Procurement, Al Ezz Steel; Carlo Piemonte. EVP Danieli Environment; Mohamed Habib, Chairman & Managing Director of Contra-Steel Co. (Ezz Steel Group); Dario Zimolo, Manager, Proposal, Danieli Environment.

DANIELI'S GREEN STEEL VISION

LOWER CONSUMPTION AND HIGHER PRODUCTIVITY

Startup of Q-Melt process control system at ABS, Italy

The expected results are a 15-kWh/t reduction in electric energy consumption and 1.5 min in power-on time, with a payback of less than 10 months. Additional benefits will be obtained from carbon credits by the reduction of the environmental footprint.

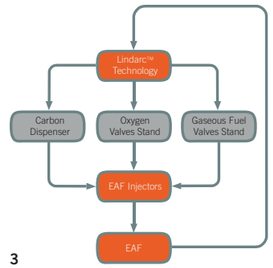
1

In September 2014, ABS successfully installed Danieli's innovative Q-Melt process control system.
Q-Melt is based on Danieli Automation Q3-Intelligence and More Lindarc™ real-time, laser-based EAF off-gas analysis system integrated in a complete package.
ABS produces one of the widest ranges of engineering special steels in Europe, in terms of both quality and sizes. The plant is equipped with two melting lines, each based on a 100-t EAF, AC and DC respectively. Downstream of the EAFs, different process cycles include either a ladle furnace or a vacuum degassing stage in order to guarantee particularly low hydrogen content in the heat. The 100-t AC EAF is equipped with a 75-MVA transformer and, since 2007, with More's Module Technology chemical energy package (burners, oxygen, carbon and lime injection system) has been in operation with highly satisfactory results.
In order to improve the efficiency of the post-combustion treatment, optimize the melting process and have in operation a reliable and accurate detection system for any water leakages inside the shell, ABS decided to award Danieli and More the supply of an integrated process control based on Lindarc™ off-gas analysis system.
This well-proven technology, with lasers installed on the movable duct just after the roof elbow, uses the "Tunable Diode Laser Absorption Spectroscopy" (TDLAS) technique to perform real-time measurements for the furnace off-gas atmosphere, tracking CO, CO_2, H_2O and off-gas temperature.
The laser measurement technique guarantees precise and quick response time (less than 2 seconds) even with a very high dust content and high off-gas temperature. The measurements are made on the real off-gas volume: no sampling, drying, or filtering are needed as per conventional extractive systems. The sturdy design and the high-quality manufacturing equipment allow for a highly accurate and reliable off-gas monitoring system over time.
So far, the Lindarc™ system has proven its reliability, resulting in maintenance-free operation and the optimization of carbonaceous fuels combustion, with subsequent reduction of electric energy, oxygen, and natural gas consumption.
Real-time, water-gas concentration tracking is processed by a smart and self-learning adaptive detection system that warns the operator in case of undesirable and harmful water leaks in the furnace. This unique feature improves the safety level.
A closed-loop control system operates as the dynamic control of the chemical energy package. The same system also will control dedicated post-combustors, which are to be installed in the future to perform CO, H_2, and CH_4 combustion into the EAF furnace shell.
An intelligent process supervisor has been integrated in the system by Danieli Automation, based on its Q3-Intelligence technology. The system is a self-learning and adaptive optimizer. It is currently under training and in a short time it will evolve the static melting profiles to dynamic profiles that will adapt to every different metallic charge mix.

1 Lindarc™ system installation on the 100-t AC Danieli EAF at ABS, Italy.
2 Comparison of performances between conventional extraction system and Lindarc™.
3 Closed-loop operation with dynamic control of the chemical energy practice during the EAF cycle.
4 Closed-loop control scheme.

2	Extraction system	Lindarc™ system
H_2O, CO and CO_2 analysis	Yes	Yes
Direct H_2O measurement	No	Yes
Direct offgas temperature measurement	No	Yes
Measurement off real volume	No	Yes
Reaction time	> 30 sec	< 2 sec
Filter units for gas sample	Needed	Not needed
Maintenance	Weekly	Every four months
Annual maintenance costs for spares	> 100,000 USD	0

It also will dynamically adjust the carbon boil through the decarburization oxygen modulation to obtain the target steel grade with the minimum iron loss.
The expected results are a reduction in electric energy consumption of 15 kWh/t and 1.5 min in power-on time, with a payback of less than 10 months. Additional benefits will be obtained from carbon credits by the reduction of the environmental footprint. Furthermore, Danieli, More Danieli Automation, and ABS technological teams are cooperating to develop additional furnace control process modules to improve the dynamic control of all the melting phases, as well as improving operational safety and reducing transformation costs ■



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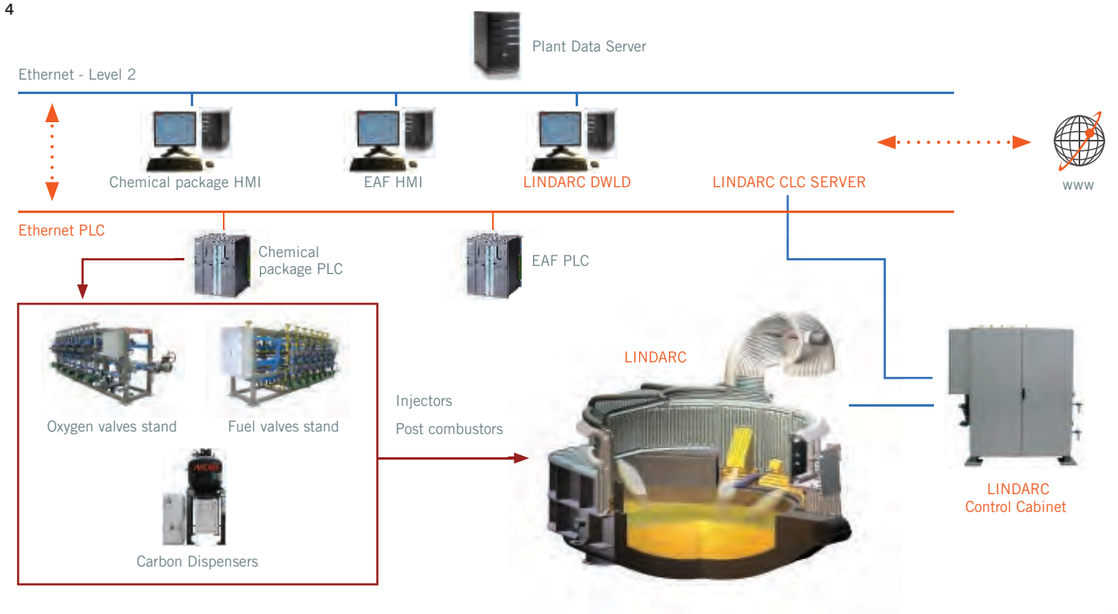
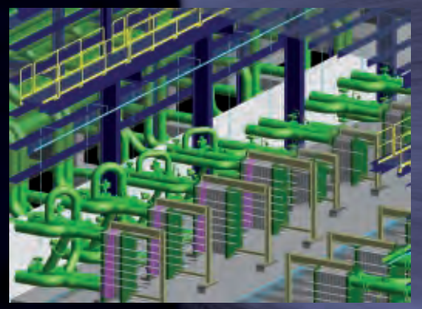




DANIELI WATER TREATMENT PLANTS

PLANTS THAT PROPERLY TREAT AND COOL PROCESS AND EFFLUENT WATER ENSURE A SUCCESSFUL PRODUCTION PROCESS AND PROTECT THE PLANT ITSELF, AS WELL AS THE SURROUNDING ENVIRONMENT

WATER TREATMENT PLANT FOR THE NEW MELTSHOP

of Gerdau at Santa Fè, Argentina

DANIELI'S GREEN STEEL VISION

After having been awarded the order for a high-tech meltshop to produce up to 650,000 tpy of billets in September 2014, Danieli won the separate tender issued for the design and supply of the water treatment plant (WTP), including the makeup water production plant.

GERDAU

The WTP is comprised of proper water cooling circuits, both no-contact and contact, for Electric Arc Furnace, Ladle Furnace, Fume Treatment Plant, and Conticaster. Danieli will design and supply:

> Closed-loop circuits for the conticaster molds, EAF/LF electrical copper parts and EAF transformer terminals;
> N_2 pressurized closed-loop circuit for FTP, located in FTP area;
> Open, no-contact circuits for the secondary side of the plate heat exchangers, for hydraulic units, for EAF and transformers, FTP, LF, and transformers;
> Contact circuits for the spray cooling and tertiary cooling of the conticaster. A scale pit is provided, and after duly 100% filtration by patented DANfilters© (high filtering rate combined with high performances in suspended solids and oil/grease removal and long-life efficiency), the water is cooled. Finally, a sludge thickener and the dewatering section with a centrifugal decanter are provided;
> Softening system by ion exchange technology is provided for the raw water treatment in order to reduce the high hardness; the raw water supply is assured by the customer, taking it from proper wells.
> Final blowdown water for cooling circuits is pumped to the quench tower of the fume treatment plant and to the slag area; eventually, excess blowdown water is discharged, in full compliance to the local environmental standards.

The cooling water temperature is designed for the maximum temperature accepted by the system, in order to avoid wasting power not strictly necessary to the process.
The new water treatment plant will be designed by applying Process Hazard Analysis to prevent any safety issues, and the process/equipment fulfilled with the most recent worldwide BAT (Best Available Technology) prescriptions. The WTP will be designed, built, and installed ready for commissioning within one year of the contract's effective date, thanks to plant development and engineering by 3D models and the pre-assembled modular concept, minimizing construction on the site.
The long and wide experience of Danieli WTP Department, with more than 150 project references, is a guarantee of the best process optimization and effectiveness in any boundary conditions, ensuring lower costs of installation (CapEx) and of management-maintenance (OpEx) ■

Maximum performance *in blast furnace ironmaking*

ONGOING MODERNIZATION AT SAIL RSP STEEL PLANT, INDIA

In 2013, Danieli Corus completed the greenfield construction of Blast Furnace No. 5 at the Rourkela Steel Plant, operated by the Steel Authority of India Limited (SAIL). The furnace was blown in successfully in August 2013 and currently is the largest blast furnace operating in India. This new furnace is the key element of an expansion plan that doubles the plant's capacity. With much of the plant's existing ironmaking capacity reaching the end of its technical and economic life span, the new furnace enables RSP to meet the existing as well as future demand for its products. In order to modernize the existing upstream capacity, SAIL awarded a contract to a consortium of Danieli Corus and Essar Projects for the rebuild of Blast Furnace No. 1. This furnace is the oldest operated at Rourkela, dating back to 1959. Its inner volume will increase from 995 m³ to 1,700 m³, allowing RSP to take Blast Furnace No. 2 out of operation. Blast Furnace No. 1 will be rebuilt according to the Danieli Corus proprietary technology and know-how, similar to the greenfield 4,060 m³ Blast Furnace No. 5 completed earlier. The main feature of the furnace will be the integrated, high-conductivity cooling and lining design based on a high-density plate cooler pattern and graphite refractories. This is the only system capable of a proven campaign life of over 20 years when operating at high productivity and elevated levels of Pulverized Coal Injection. These two modern furnaces will make the Rourkela Steel Plant fit for the future: production targets will be met at maximum health and safety performance and strongly reduced environmental emissions ■

PULVERIZED COAL INJECTION SYSTEM FOR BF NO. 9 AT ARCELORMITTAL KRIVIY RIH, UKRAINE

Danieli Corus has received an order from ArcelorMittal to design, supply and supervise installation of a Pulverized Coal Injection system for Blast Furnace No. 9 at their integrated steel plant in Kriviy Rih, Ukraine. The project scope includes the coal grinding and preparation section as well as the injection system. This 5,000 m³ furnace is one of the largest in Europe. The system to be supplied to ArcelorMittal Kriviy Rih is based on the principle of equal pressure drop over the injection lines, which has the advantage of achieving equal coal/gas ratios at all tuyeres based on simple physical principles and without installing superfluous measurement and control equipment.
The design of the system is laid out for injection rates above 150 kg/tHM at a minimum utility consumption ■

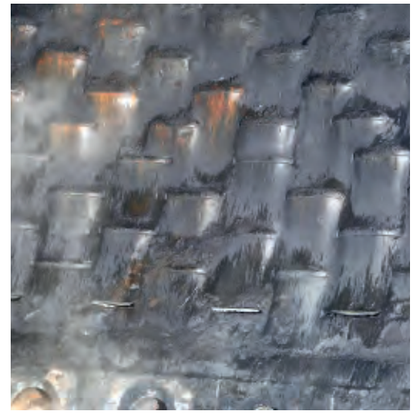
CUTTING EDGE TECHNOLOGY FOR FLAGSHIP FURNACES

High-conductivity plate-cooled design selected for tomorrow's ironmaking plants

For many steel producers, the possibility of using excellent raw materials to achieve stable, high-productivity operations belongs to the past. Plant managers are faced with a wider range of raw material qualities and a need to focus on robust operational practices to remain competitive. A major challenge will be to accommodate higher slag volumes while operating at sufficiently high productivity levels and high rates of fuel injection. In many situations, achieving long campaign life will become increasingly difficult. As the limitations of other, competing systems are becoming ever more apparent for blast furnace operators, more and more leading steel producers are turning to the high-conductivity plate-cooled design promoted by Danieli Corus. As demonstrated clearly in the picture above, showing the excellent condition of such a lining design after 16 years of high productivity operations, these steel producers are making the right decisions. Danieli Corus is currently executing projects in all continents, some of which set new industry benchmarks.

POSCO rebuilds 6,095 m³ Gwangyang No. 1 and 2,978 m³ Pohang No. 2 based on Danieli Corus Blast Furnace technology

Recently, Korean steel producer POSCO rebuilt the blast furnace No. 1 at their Gwangyang plant, converting the furnace from stave cooling to the Danieli Corus design based on a dense copper plate cooler pattern and high conductivity graphite refractory. The conversion was motivated by POSCO's desire to achieve the longest possible campaigns while continuing to accommodate demand. After completing the rebuild of Gwangyang No. 1, POSCO contracted Danieli Corus for the design, supply and installation supervision for the refractory lining for their Pohang No. 2 furnace. Gwangyang No. 1 was rebuilt with a **6,095 m³** volume, making it the world's largest furnace. Danieli Corus is proud to have been part of this project. The project in Pohang will be executed this year ■



HOT BLAST STOVE TECHNOLOGY

Continued success in repair projects

Hot Blast System Technology has matured to such an extent that Hot Blast Stoves can be built now with a projected service life in excess of 30 years, with only repairs to components such as the burner having to be executed during that lifetime.

Order for Hot Blast Stove repairs and rebuild from JSW Steel, India

Danieli Corus has received an order from JSW Steel for the repair and rebuild of Hot Blast Stoves at its Bellary plant in Toranagallu, India. Given the precarious state of the existing Hot Blast Stoves of a competing European design at Blast Furnace Nos. 3 and 4, Danieli Corus was asked to carry out emergency repairs on four of the stoves (two from each blast furnace) so that the furnaces are able to continue operation in the short term. Danieli Corus also will completely rebuild two stoves (one from each blast furnace) where all internal systems of the stoves will be replaced. The final two stoves will be repaired in 2015 ■

DANIELI LINZ TECHNOLOGY

With the establishment of Danieli Linz Technology (Austria) in 2011, Danieli has created a new steelmaking center of competence, where proven oxygen converter specialists interact with Danieli Corus experts on sublance systems, process models, and technological packages, as well as with the pioneering Danieli R&D researchers based at Danieli HQ in Italy. Innovative features have been developed already, aiming for a maintenance-free concept along with lower CapEx and OpEx.

Danieli Group is capable of supplying all components for a complete BOF shop, either as single units or on a turnkey basis with fully owned core technologies thanks to its several business units (Danieli Centro Cranes, Danieli Environment, Danieli Automation, Danieli Construction), and with its renowned in-house manufacturing capability.

DANIELI LINZ TECHNOLOGY A FULL-SERVICE SUPPLIER IN THE WORLD OF OXYGEN STEELMAKING CONVERTER TECHNOLOGIES

80-t MRP-L converter to Aperam Timoteo, Brazil

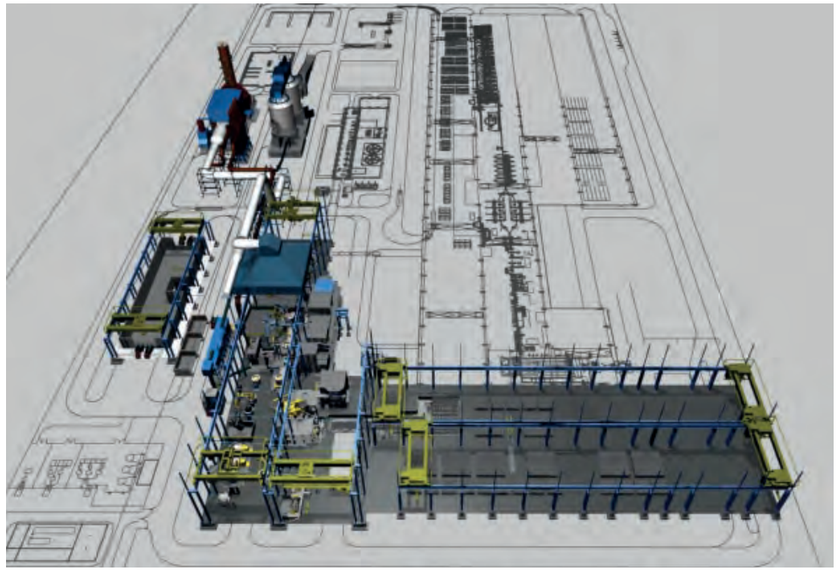
ANOTHER IMPORTANT MILESTONE FOR DANIELI LINZ TECHNOLOGY, AFTER THE RECENT SUCCESSFUL INSTALLATION OF THE 350-T CONVERTER AT ARCELORMITTAL POLAND IN KATOWICE

Aperam is the main supplier of stainless steel (AOD converter) and special steel grades (MRP-L converter) in South America.
Danieli had the honor of replacing an existing MRP-L converter with a new one of larger volume, and equipped with Danieli's maintenance-free suspension system.
By changing the design of the trunnion ring from bolted to welded it was possible to increase the internal volume of the vessel by approximately 20%, resulting in higher production thanks to less slopping and increased yield. The new suspension system is based on horizontal Dani-ella elements and the classical vertical lamella elements.
Danieli will complete the project in only 11 months after the contract comes into effect. This very short execution time will be made possible thanks to an in-house pressure vessel workshop and the excellent planning of logistics, which led to scheduling the supply of a completely assembled converter, thus eliminating the need for on-site pre-assembly activities and minimizing installation work ■

Marcos Savio da Silva, Technical Project Manager of Aperam (right) and Claudio Trungadi, Sales Manager of Danieli Linz Technology, signing the contract for the new converter.
Bottom: Souvenir photo at the kick-off meeting.

FIVE ORDERS
FOR MELTSHOPS AND MINIMILLS FOR LONG PRODUCTS

This impressive score confirms Danieli's leadership in the field of long products electric steelmaking, casting and rolling.



Contract Signature. From left: P. Amico, EVP Danieli Finance & Contracting; E. Mammadov, Director Inter Steel FZC; T. Narholz, EVP Danieli.

Inter Steel FZE / Fujairah, UAE:
Greenfield 700,000-tpy steel meltshop, supplied on a full turnkey basis.

Inter Steel FZE is setting up a new turnkey meltshop consisting of a 70-t FastArc™ EAF, a 70-t LF and a 3-strand high-speed FastCast™ continuous casting machine, with all the necessary auxiliary plants to feed high-quality billets to an existing rolling mill, currently in start-up phase.
The new melting equipment will use mainly DRI and scrap as a melting feedstock. Therefore, the plant is equipped with a system for direct DRI feeding to the EAF. Being committed to the environmental considerations for such plants, this project also includes the supply of a Danieli Ecogravel plant to treat the slag coming from the process, to transform it into a commercially profitable, high-quality industrial aggregate intended for civil

concrete construction and bituminous conglomerates and foundations for roads, in substitution of natural stone. One of the decisive aspects for the investor also has been the fact that Danieli is the world's only supplier to be organized in a way to handle LSTK-Lump Sum TurnKey projects, and therefore to ensure the timely and technical correct implementation of the plant. In the past decade Danieli has executed 12 LSTK meltshop projects out of the total of more than 50 LSTK projects in general ■

The contract signing ceremony was held during the St. Petersburg International Economic Forum 2014, in the presence of H.E. Cesare Maria Ragaglini, Ambassador of Italy in Russia, and top management of both Mera Stal and Danieli. From left: Y. V. Lukanin, Executive Director, Mera Stal; F. Alzetta, Danieli COO and Member of the Board; G.S. Poltavchenko, Saint Petersburg Governor.

Mera Stal Ltd. / Russia:
Greenfield MI.DA.-Micromill Danieli for 350,000 tpy of rebars, the first endless mill in Russia

Mera-M, the main scrap dealer of the Saint Petersburg region, decided to enlarge its business by selling billets and rebars for domestic and foreign markets, establishing Mera Stal Ltd. and investing in the new generation of Danieli continuous casting-rolling, compact micromill technology (whose brand name is MI.DA.®). The plant, will have a rated capacity of 350,000 tpy for 10 to 40-mm rebars. MI.DA. is characterized by single strand Continuous Casting-Rolling process featuring ultra-high speed FCC® PowerMould caster, in-line bar quenching and tempering (QTB), and a DRB® -Direct Rolling Bundling system, all arranged in an extremely compact layout; the most competitive solution for regional markets. All this, along with the continuous uninterrupted production cycle from raw material to finished product, and with the extreme compactness of the technological area, will make Mera Stal Ltd., one of the most cost-efficient plants in the world. The operation will be basically comprised of:
> Steelmaking section: scrap charging; 40-ton heat size EAF/LF, complete with primary and secondary fume treatment plant system and associated auxiliaries. SmarTEC® and Q-Panels technological packages has been foreseen.
> Conticasting section, featuring a single-strand, high-speed conticaster connected directly to the rolling mill for an uninterrupted production cycle.
> Direct link to the rolling mill, including

insulated conveyors and induction heater for billet temperature equalization.
> Rolling mill section:12-stand ultra-compact rolling mill, made up of cantilever stands and six housingless stand SHS^{PLUS} type. The finishing end features the innovative DRB system for production of superior quality bar bundles without the use of the traditional, long cooling bed for bar multiples. The mill also includes the Quenching and Tempering process for Bar products (QTB), which allows for the production of low-cost billets with considerable savings of alloys used in the meltshop.
> Auxiliary plants (water treatment plant, scale pit, compressor air plant, roll shop and laboratories, overhead cranes for technological and auxiliary equipment).
> Electricals, automation, and process control (L1-L2) systems by Danieli Automation, including the Q-Drive, the state-of-the-art in LV multi-drives for demanding rolling mill applications.

Also included in the contract are the works installation, advisory services, and training of operators. Plant startup is scheduled within Q2 of 2017 ■

MMZ-Monchegorsk Mechanical Plant, Russia:
Greenfield, 150,000-tpy Nano Mill for rounds and rebars

Y.A. Gushchin, MMZ General Director, and L. Tambosco, EVP Danieli, signing the contract at Danieli Representative Office in Moscow. Attending the event were A. Londero, Danieli Area Manager Sales, D. N. Trifonov, MMZ Shareholder; A. I. Eremin, Danieli Marketing Manager.

MMZ, a steel structures manufacturer based in Monchegorsk (Murmansk Region), decided to expand its business selling crushing balls for mining applications in Arctic and North Russian regions, investing in the latest generation of Danieli Nano Mill technology. The plant will produce round bars from 30 to 120 mm for crushing balls, and rebars from 10 to 32 mm. Specifically, the comprehensive process know-how necessary for such a steel plant, the ability to supply all the involved equipment from a single source, and running references have been the driving factors for MMZ's decision to work with Danieli to realize this project.

The plant will be basically comprised of:

> Steelmaking section, scrap-fed 20-t heat size Electric Arc Furnace and Ladle Furnace, complete with primary and secondary fume treatment plant systems, and associated auxiliaries.
> Conticasting section, featuring a single-strand machine, directly connected to the rolling mill for hot charging (construction grades) or billet discharging into slow cooling boxes (balls application).
> Pusher-type reheating furnace for billets.
> Rolling mill section, over a shiftable-type reversible stand, and 10 housingless stands SHS type. The finishing end features dedicated cooling beds for rebars and rounds, considering the different process flows.
The mill also includes the Quenching and Tempering process for Bar products (QTB), which allows for production of low-cost billets with considerable savings of alloys used in the meltshop.
> Auxiliary plants (water treatment plant, scale pit, compressor air plant, roll shop and laboratories).
> Electricals, automation, and process control (L1-L2) systems by Danieli Automation, including the Q-Drive, the state-of-the-art in LV multi-drives for demanding rolling mill applications.

Plant startup is scheduled within Q3 of 2016 ■

ZMZ-Zlatoust Metallurgical Plant, Russia:
Process equipment for a brownfield 300,000 tpy special steel meltshop

Souvenir photo after the contract signature. From left: F. Giancristofaro, Sales Manager Danieli Environment; D. Grigoletto, Sales Manager Danieli Centro Met; D. Gerasimenko, Managing Director of Red October; T. Narholz, EVP Danieli; P. Burin, Executive Manager Danieli Centro Met.

ZMZ, part of the Red October Group, has placed an order for the supply of a new special steel meltshop with a production capacity of around 300,000 tpy of liquid steel. The project targets the improvement of the operation of the existing special steel meltshop of ZMZ. The basic plant layout will include a scrap-charging, 40-t AC Electric Arc Furnace, Ladle Furnace, and a VD-VOD degassing station, complete with primary and secondary fume treatment plant system, and associated auxiliaries.
Liquid steel coming for the new plant will feed an ingot casting facility to produce high-quality steel grades. The installation of Danieli's most modern process equipment will result in both significantly lower conversion cost and highly improved product quality. Plant startup is scheduled within Q3 of 2016 ■

SMC-Standard Metallurgical Company, Nigeria:
Greenfield 260,000-tpy steelmaking plant

Souvenir photo at the contract signing. From left: G. Arbogast, Executive Manager Danieli; M. Saade, Managing Director SMC; F. De Martino, VP Key Accounting Danieli; A.Saade, Chairman SMC; T. Narholz, EVP Danieli; T. Klein, Executive Manager Danieli.

Having already installed and operating a rebar and wire rod rolling mill, SMC has taken the decision to invest in a new greenfield meltshop as well, and has awarded Danieli the contract to supply a new 40-t DC Electric Arc Furnace, 40-t Ladle Furnace, 2-strand conticaster for billets, and the related fume treatment plant.
The plant site will be close to the Nigerian capital of Lagos, and will secure the billet supply to the existing rolling mill.
Completion of the project is expected within a time frame of 24 months. This new order in Africa underlines Danieli's undisputed leadership in the region and, after earlier orders from Angola, Ethiopia, and Namibia, represents the next landmark in Africa for Danieli. Plant startup is scheduled within Q3 of 2016 ■

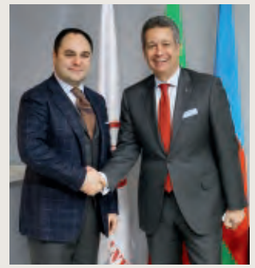
MELTSHOP UPGRADING AND NEW HIGH-SPEED 3-STRAND CONTICASTER
at Baku Steel, Azerbaijan

**This new order is the first important step in a complete, technological upgrade of the existing plant.
Baku Steel Company(BSC)is the leading producer of high-quality long products in Azerbaijan. Operating two electric steel meltshops in Baku, the company is carrying out a continuous update of its facilities. Having analyzed the actual performance of the equipment (even parts that are quite new, supplied by others) BSC decided to order from Danieli a series of technology packages to improve the level of plant performance.
To this end Danieli will supply:**

**> A new material handling and DRI feeding system to improve the charge mix to the EAF and decrease the costs for alloys due to automatic and defined feeding process.
> A new three-strand high-speed billet conticaster, equipped with PowerMould; FCC-FastCast Cube and HyPower technologies.
This will be the most modern continuous casting machine operating in the region.
> A new Q-Robot system to perform the sampling and temperature measurement processes at the EAF economically and safely.
> An upgrade to the existing ladle furnace, where a Danieli HiReg electrode regulation system will replace a competitor product just recently installed.
> A new temperature and sampling lance at the existing ladle furnace.**

These investments will completely reshape the plant performance. The clear advantages of the technologies on order versus competitors' products, and the experience recorded from similar Danieli equipment started up recently, are the basis for BSC's decision to appoint Danieli for the supply of this project.

Moreover, a mutual approach was agreed to define the needs of the plants, in terms of potential further upgrading, and to plan the necessary steps in a very close partnership ■

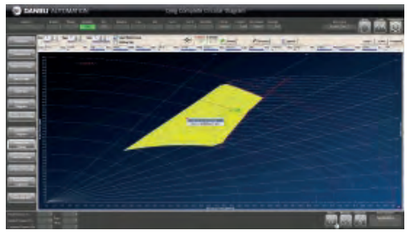


Handshake between Rasim Mammedo, CEO and Owner of BSC (left) and Thomas Narholz, EVP Danieli.

NEW EAF FOR SPECIAL STEELS

for Villares Metals (voestalpine Group), Brazil

The semi-integrated steel plant operated in Sumarè is equipped with two electric arc furnaces, ladle furnaces, VD and VOD degassing units, VAR, ESR, and VIM refining furnaces; conventional and continuous casting; forging shops; rolling mills; and complete thermal treatment, cold finishing, and inspection facilities.
In order to address actual market demand by improving significantly the competitiveness of the melting operation, Villares selected Danieli to replace one of the EAFs with up-to-date technology, representing the state-of-the- art for specialty steel melting.



The new EAF will be of full platform design with enlarged shell, separated into upper and lower shell. The upper shell will be water-cooled, whereas the lower shell is refractory-lined, so that overall the result is to maximize charging volume. The full platform concept ensures the most reliable operation for the roof lifting system; making it permanently attached to the tilting platform results in improved EAF operations, such as:

> EAF speed during Power Off, as the lifting system does not need to be engaged all speeds can be adjusted with overlaps, making the overall process as short as possible;
> Properly lining up the electrode/roof lifting system and shell during installation and operation;
> Having the roof and electrode lifting and rotation system part of the tilt platform, all moment loads applied during roof / electrode lifting are managed inside the tilt platform structure;
> EAF foundation changes are not so severe.

Villares Metals and Danieli teams during the kickoff meeting.
Left: Circular diagram of electric network characteristics of the Danieli Automation's HiREG electrode regulator.

Villares Metals

For more than 70 years, Villares Metals has been producing steel and special alloys destined to industry segments that require high technology and high performance, such as automotive, tooling, energy, capital goods, among others. The company is considered the largest producer of specialty steel long products in Latin America. Villares Metals produces special alloys, including high-speed, tool, stainless, and valve steel grades in two complexes, located in the city of Sumaré (SP) and in Joinville (SC).

Accurate electrode movement will be ensured by Danieli Automation's HiREG system, the state-of-the-art in electrode positioning and control.
All this will reduce dramatically the power-off time, electric energy and electrodes consumption, and also the maintenance requirements.
The costs savings related to this improvement -and the consequent short ROI- were already enough to make feasible the installation of the new EAF, even without taking into account the increase in production.
Danieli will take care of all the necessary engineering for the modification of the existing foundations. Optimization of the installation activities to shorten the shutdown period will benefit from supplying the main equipment pre-assembled and pre-tested, thus facilitating the transport to the site.
Danieli specialists will give complete advisory services during the installation and startup period.
Installation of the new equipment will take place by the end of 2015 ■

VILLARES METALS

Final Acceptance of a 75-t FastArc™ EAF achieved *at Sohar Steel, Oman*

The successful startup led to signing the PAC within only five days after the first heat, a solid acknowledgement for Danieli's strategy for revamping projects and ability to execute projects within the specified time and scope.

In 2012 Sohar Steel awarded Danieli Centro Met the contract for engineering, delivery and advisory services for an all new 75-t FastArc™ EAF facility, and a new 140-t teeming crane to be installed in their existing melt shop in Port of Sohar, as part of the upgrading and modernization project aiming to produce 700,000 tpy of liquid steel for rebars. The contract was subsequently expanded to include a Danieli More injection technology package and an Integrated Scrap Automatic Charging system (ISAC), as well as a complete fleet of buckets and ladles.
On May 15, 2014, the first heat was successfully processed by the new EAF.

Engineering and Procurement

As for all revamping projects offered by Danieli, a continuous analysis of the existing facilities and operational practices was performed, and the new installation is the result of an intensive and fruitful teamwork by Sohar Steel along with Danieli's Technology and Engineering expertise, all coordinated by project management teams on both sides. The FastArc EAF is of the most modern mechanical design, and is equipped with the necessary layout to establish the greatest flexibility for raw materials selection and charge, to increase productivity while lowering production costs.
The furnace can charge single buckets in batch and continuous modes for hot and cold DRI -and shredded scrap with the ISAC system in the near future.
The greatest customer satisfaction was expressed for all the mechanical and hydraulic equipment supplied from Danieli Thailand workshops.
Danieli Automation supplied all the electrical and automation and process control systems for the new and upgraded plant units.
Additionally, it supported Sohar Steel with the integration of a new compensation plant, necessary on the electrical power supply side to allow the power increase for the new production schedule.

EAF Installation and Commissioning

Equipment supply on site was conducted as scheduled and soon after preassembled under Danieli's advisory services.
Many simulations were carried out jointly by Sohar and Danieli teams to carefully plan the sequence of installation, commissioning, dismantling of existing equipment, in order to minimize the shutdown and to ensure smooth and safe operations.
The successful startup confirmed a job well done.

Conclusion

This project has shown again that revamping programs need a close, team-based approach right from the first discussion of an idea until startup is complete. Danieli has proven to have the right strategy of having dedicated teams of experts for revamping projects, which serves the customer during the whole project life, from proposal stage, to engineering, procurement, and startup, to make sure the project is successfully executed and started up within the specified time and scope ■

SOHAR STEEL

DANIELI CENTRO CRANES GAINS OUTSTANDING REFERENCE FOR TEEMING CRANES IN EUROPE.

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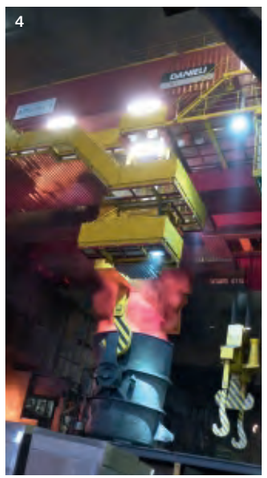

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460-T EOT TEEMING CRANE
at Arcelormittal Gent, Belgium

In December 2014, ArcelorMittal Gent (Belgium), the steelmaker's flagship plant in Europe, reconfirmed its technologica l partnership with Danieli concerning the supply of high-tech/ high-reliability cranes, awarding the order for its new four-girder type, 460-t EOT teeming crane.
This will be a strategic installation for the integrated steel works, fundamental to ensure plant productivity, and incorporating several operating and safety features, such as:

> Double hoisting speed through two independent motors connected by planetary gears.
> Safe, full-load hoisting and lowering with one motor at only half speed, in case one motor or related controls should fail.
> Safe rope reeving arrangement on main hoist (load is safely suspended and safely lowered even in case of one rope failure).
> Safety brakes acting on the drum flange with hydraulic control, automatically set in case of over speed due to any cause.
> Overload protection for all the hoist units by electronic load cells.
> Four-motor arrangement for both trolley translation and bridge traveling movements; the trolley and the bridge also will operate in case of one or two motor or related control failure.
> Automation and drives assembled inside air conditioned electrical room.
> Integrated automation software to assist the operator with automatic crane positioning along the building bay
> Air conditioning system for electrical room arranged with redundant solution. Even with half of the air conditioning units in operation, the electrical room's internal temperature will be maintained below 35 °C with outside temperature of 70 °C.
> High-tech crane monitoring system to record crane working cycles, crane component faults recording system, preventive maintenance planning, and component troubleshooting to reduce maintenance operator intervention time.
To optimize on-site installation activities and minimize commissioning schedule, the crane will be completely preassembled and pre-commissioned before shipment, including the execution of all crane movements and cold testing of the equipment at Danieli HQ workshops in Italy, one of the few heavy mechanical workshops in Europe that allows for assembly of such huge equipment, both in weight -in excess of 700 tons- and overall dimensions- being as tall as a four-story building. Performing the complete mechanical and electrical assembly of the crane in optimal workshop conditions, including its full cabling and relevant testing, will avoid any possible inconvenience that may occur while executing such a complex job on-site. This order confirms the customer's satisfaction with Danieli technical solutions, being the third consecutive order for cranes that AM Gent has awarded to Danieli, following the order for two coil-handling cranes (one under commissioning; the second under engineering stage), and the order for a 50-t high-speed unloader, at present under advanced engineering stage.
The long-lasting partnership between AM and Danieli concerning cranes dates back to 2001, and qualifying references are in operation at AM Works in Dunkerque, France, Bremen, Germany, Acindar, Argentina, and Dobra Gorniza, Poland, just to mention some.

High reliability, maintenance-friendly solutions, overall engineering co-developed with customer operational teams, and with specific emphasis on ergonomics, as well as comprehensive operator-oriented solutions, are the key factors for AM in its selection of suppliers, and on which Danieli proved its superiority with facts ■

1 Four-girder, 225/63/20-t EOT teeming crane at AM Kryviy Rih, Ukraine.
2 220-t teeming crane in operation at AM Acindar, Argentina.
3-4 420-t EOT crane in operation at AM Bremen, Germany.
5 Preassembly of a trolley for a 420-t EOT crane.

OPENING CEREMONY FOR

THE NEW ALUMINUM HOT ROLLING MILL AT AMAG, AUSTRIA

AMAG celebrated the formal opening of its new hot-rolling mill in Ranshofen on November 20, 2014. Construction of the greenfield rolling mill, which began in April 2012, was completed successfully and on schedule after just over two and a half years.

September 9, 2014. The Management Board of AMAG and Danieli celebrate the commissioning of the Twin-Coiler rolling mill.

240 invitees -politicians, business people and media people, as well as employees of AMAG- attended the event.

Dr. Wolfgang Hofer, Management Board member of B&C Private Foundation, Provincial Governor Dr. Josef Pühringer, Dipl.-Ing. Helmut Wieser, CEO of AMAG, starting up the new hot-rolling mill.

The high-tech aluminum 50,000-kN hot-rolling stand.

AMAG
AUSTRIA METALL

Helmut Wieser, Chief Executive Officer of AMAG, Austria Metall AG: *"Inaugurating the new rolling mill is an important event for us. The new products and expanded capacities strengthen our position as an innovative growth and development partner for our customers. And to our employees and to the people in the region, this demonstrates our clear commitment to this location and its successful economic development."*
About 240 invitees, including numerous politicians, business people and media representatives, as well as employees of AMAG, came to take a look at the new plant. Located on an area covering the size of approximately four soccer fields, with half a kilometer in length and about 100 meters in width, AMAG's new hot-rolling mill is currently one of the largest investments made in the aluminum industry in Europe.
The modern twin-coiler hot rolling mill started up successfully at Ranshofen on September 9, 2014, thus achieving the most significant milestone in this large-scale 220 million Euro investment project right on schedule.
The plant is designed to produce hot-rolled coils, heavy and light plate, and clad panels, in thicknesses of 3 to 160 mm and widths up to 2,300 mm.
The main equipment of the rolling line are an entry/exit coiler with belt wrapper, a rolling stand and side trimming shear for coil production, and a 160-mm heavy shear for cutting plate to length.
Also, the plant is complete with all the related auxiliary facilities, such as fume exhaust system, all fluid systems and emulsion cooling system.
Danieli Automation supplied its Level 1 and Level 2 systems to run the plant.

This expansion has allowed AMAG to increase its production capacity for aluminum plates and hot-rolled sheets by 50%. At the same time, the range of products will be extended to include larger dimensions, and greater emphasis will be placed on high-strength special products. The new products can be applied in the aerospace industry, in transportation and mechanical engineering, especially in wind power plants, which are AMAG's key growth sectors.

This smooth, on-time startup is a clear demonstration of Danieli Wean United's technological know-how and capabilities in executing complex projects for the aluminum sector ■

CONTINUOUS IMPROVEMENT
TO COPE WITH THE EVER-INCREASING MARKET DEMANDS

Innovative head design for plate stretcher

Aluminum plates need to be stretched and flattened after solution heat treatment to release the cooling-induced residual stresses.
Directly after leaving the treatment furnace, the yield strength of the aluminum plate is relatively low. Some alloys age very quickly (resulting in high yield-strength levels) and therefore are time-sensitive for the stretching operation.

Depending on the alloy, rolling process, and heat-treatment conditions, the plate needs to be stretched a certain percentage to release stresses. However, the influence of each individual stretching process cannot be predetermined: it might end in a flat and stress-relieved plate or, in the worst case, end in a cracked plate. The risk of plate cracks can be minimized by the features incorporated in Danieli's stretcher design and automation process control, while the amount of stretch elongation depends on several conditions: alloy, pre-stretch force, retraction rate after release. Head design is different, depending mainly on machine force, specific force, head dimension, and weights. Danieli developed three different designs:
> Full welded lamellas and box;
> Bolt lamellas and welded box (patented);
> Bolt forged lamellas and bolt box (patented).

	Max stretching force (MN)	Max Jaw specific load (kN/mm)
Welded	60	55
Bolted and Welded	85	65
Bolted and Forged	120+	80

Each of the design fits a different application range of maximum load force and jaw-specific load

Focusing on the bolted and welded design, the head consists of a front part where individual lamellas are welded on a supporting frame; this front part is then bolted with several pretension rods to a back part, so as to form the complete, very stiff head assembly.
The solution developed by Danieli with pretensioned bolts eliminates the typical problem of the gap arising during stretching between the front part and the back portion, which do not affect the stretching process but could lead to damages in the not unlikely event of plate breakage or plate slippage.
A natural development of the above solution is the construction of the head with a large, forged part forming the front lamella portion, and two shells bolted together forming the back part. As before, the pretensioned bolts join the two parts in a single, stiff piece. This solution makes it possible to drastically increase the stretching force and at same time to increase the minimum plate width to be stretched at said maximum force, thus allowing stretching of aluminum plates under the highest limit of jaw specific load actually recognized by the market (up to 85 kN/mm). Extensive calculations and simulations of the actual stretching procedures have been carried out for the proper dimensioning of each part of the machine, from boxes to column, from preloaded bolts to gripper device, etc. The results show that the stretcher body is very low stressed, with very small deformation, thus ensuring a uniform stretching effect not only through the plate length but also through the plate width, resulting in a very short scrap part to be cut, with obvious benefits. A second remarkable advantage is the possibility of transporting the equipment in smaller and lighter pieces rather than a single, full head weighing up to 400 tons. These results, obtained in the past few months, confirm Danieli Wean United's ability to face new challenges and successfully meet profitability targets in the new aluminum market segment ■

New slitting shear for Hydro Aluminium, Germany

HYDRO

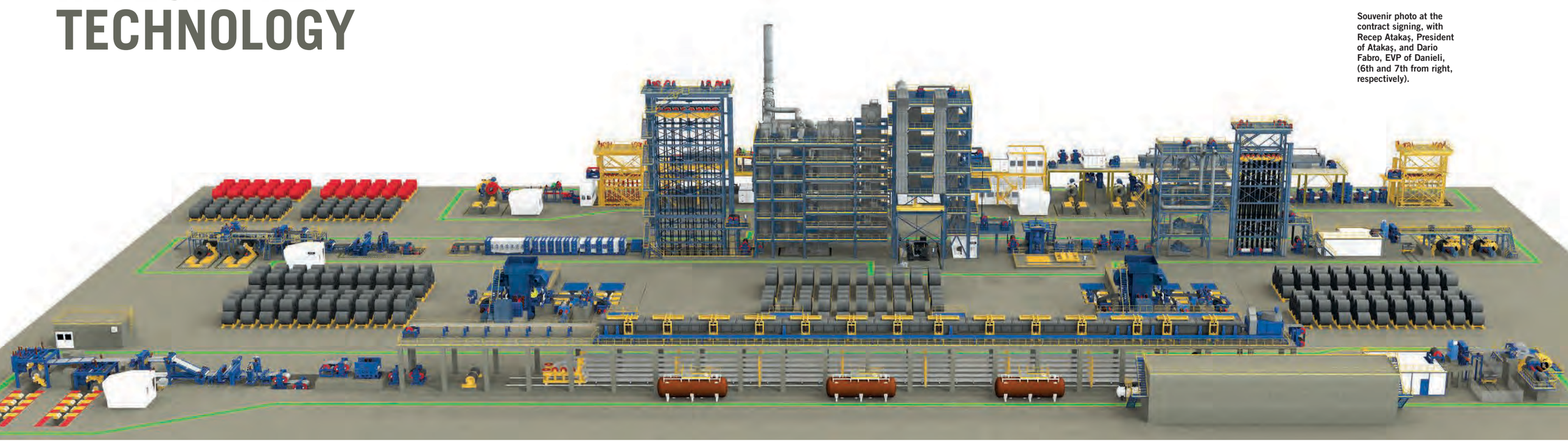
Hydro Aluminium has a number of rolled products operations in Grevenbroich, Germany, employing about 2,000 people. Total production capacity of 440,000 tpy includes aluminum foil and lithographic products, aluminum strip, coil coating for can lids, and products for the automotive and building industries. Hydro Rolled Products GmbH is a long-standing partner of Danieli Fröhling, having frequent business relations since the 1970s. The first process line for lithographic strip at Grevenbroich was built in 1985. Meanwhile, Hydro Aluminium is a global leader for production and sales of lithographic strip, having around a 30% share of the total market. Aluminum strip for printing applications has to meet various special requirements, the primary ones being a perfect surface with no scratches or impurities, absolute evenness and thermal stability, as well as certain mechanical properties. Therefore, plant and equipment for processing these strips needs to be extremely accurate with respect to smooth handling, highest accuracy and cleanliness during operation.

Operations at the lithographic strip center of Hydro Rolled Products in Grevenbroich will benefit from an improved CNC-shear concept with individual adjustment for all knife heads, that ensures ultimate flexibility and accuracy in strip slitting.

Assembly of a high-tech CNC slitting shear in Danieli Fröhling's workshop in Meinerzhagen, Germany.

Danieli Fröhling received an order for a new CNC slitting shear for the lithographic strip center in Grevenbroich. The proven CNC shear principle, invented by Danieli Fröhling in 1991 and regularly improved over the past two decades, will form the basis for this new application. All knife heads (in pairs) can be adjusted individually for cutting width, cutting gap, and immersion, as well as parallelism of top and bottom knives to each other. This is necessary to provide the best knife positioning during cutting, thereby ensuring absolutely no cutting marks on the strip and the lowest possible stresses induced during the cutting operation. The special control mechanism provided by a number of sensors allows regular calibration cycles within a few seconds whenever this is deemed necessary by the operators (for instance at temperature changes, knife change, material change, etc.) Up to three finished strips may be produced at the same time, plus trimming of the incoming strip. Close width tolerances of final material are guaranteed. Final strip width can be selected in a step-less sequence, and within a wide range of 380 mm up to 1,660 mm, with a thickness range from 0.1 up to 0.5 mm. Furthermore, the shear is provided with special media couplings that allow operation either from left to right or from right to left (seen from operator's side). Right from the design phase, Danieli Fröhling will consider all the necessary measures to ensure an extremely short installation time to guarantee minimal impact on continuing operations at the customer's site ■

DANIELI CONFIRMS ITS WORLDWIDE LEADERSHIP IN THE SUPPLY OF COLD MILL COMPLEX INTEGRATED TECHNOLOGY



1.2-Mtpy innovative Cold Mill Complex at Atakaş, Turkey

Atakaş selected Danieli as the sole supplier of the technological equipment for the state-of-the-art cold mill complex to be built in Iskenderun to produce 1,200,000 tpy of pickled/cold-rolled/galvanized/painted and annealed & skin-passed coils, starting from incoming hot-rolled coils. Each plant unit making up the facility will include state-of-the-art equipment and the latest technological packages of Danieli Wean United to guarantee a superior product quality and increased overall plant yield. Danieli Automation will design and supply all the electrical equipment and control systems for the entire plant, providing the customer with an integrated and optimized system configuration. The single-source automation system and the experience of Danieli Automation, which has been developing innovative solutions in the steel industry for the past 40 years, will ensure high plant efficiency, thanks to common interfaces and design concepts, as well as a smoother project execution, a quicker and more efficient startup, and an easier transfer of know-how. The plant will be located on the seaside and will come on stream gradually in 2016, starting with the pickling line and ending with the color-coating line ■

Souvenir photo at the contract signing, with Recep Atakaş, President of Atakaş, and Dario Fabro, EVP of Danieli, (6th and 7th from right, respectively).

A new cold mill complex for LMZ, Russia

DANIELI CONFIRMS ITS WORLDWIDE LEADERSHIP IN THE SUPPLY OF COLD MILL COMPLEX INTEGRATED TECHNOLOGY

The new cold mill complex will be erected in Lysva City, Perm Region (Russia) in a greenfield area adjacent to the existing facilities so as to take advantage of the existing transportation infrastructure.
While the color-coating and printing line (phase 1 of LMZ's development program) is intended to increase the production capacity and expand the product portfolio in the existing operation, the new cold mill complex (phase 2) will result in a massive increase of the production capacity and the further widening of the product range.
Danieli will supply the complete mechanical, hydraulic, electrical, and automation and process control equipment and systems for the new facility, which concepts were developed in strict cooperation with LMZ, to provide it with the most advanced equipment that achieves utmost product quality and production process efficiency, and to minimize the environmental impact.

Main plant units
_ Push-Pull Pickling Line
_ Two-stand Cold Reversing Mill
_ Batch Annealing line
_ Temper Mill
_ Hot Dip Galvanizing Line
_ Color-Coating Line
_ Color-Coating and Printing Line.

820,000-tpy Push-Pull Pickling Line
Scale removal from the strip surface will be done in a five-stage pickling section with Turboflo® technology, followed by a counter-flow cascade rinsing section and a dryer.
The line configuration with a double payoff reel, combined with the efficiency of the Turboflo® system, will make it possible to achieve a high threading speed that will maintain a high level of productivity (max process speed of 220 mpm).
The advanced pickling model developed for this installation will improve the descaling process and reduce energy and acid consumption. An acid regeneration plant will allow complete regeneration of the spent hydrochloric acid producing iron oxide as a by-product.
Then, the pickled hot band (1.5 to 6.0 mm thick; 800 to 1,600 wide) will be trimmed to the desired width by a fully automatic side trimmer and helicoidal scrap chopper.

Cold Reversing Mill
The two-stand cold reversing mill (rolling speed of 1,500 mpm; roll force of 2,000 t) will achieve a material yield comparable to one of a fully continuous mill, thanks to the new layout concept featuring Danieli's new laser welder, hence reaching the extraordinary production capacity of 820,000 tpy (exit strip thickness from 0.25 to 3.5 mm).

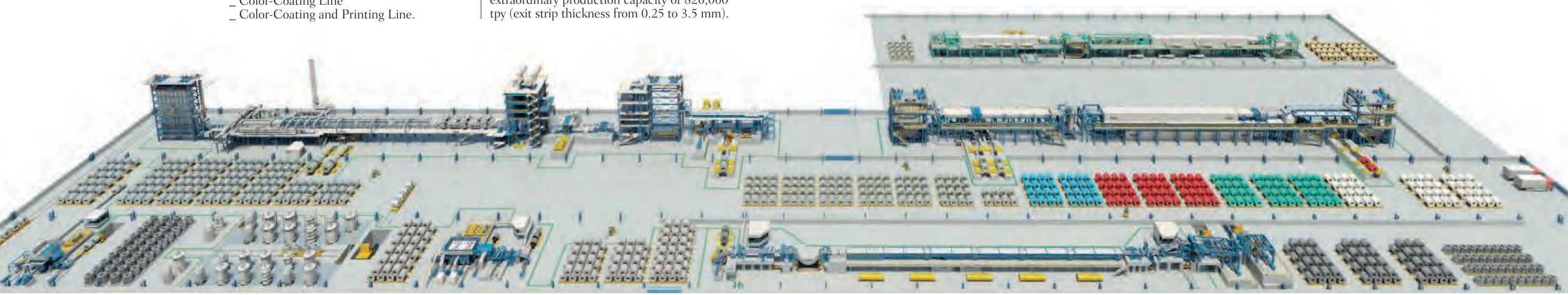
Yury Kiselev, Chairman of the Board of Directors of LMZ (right) and Gianpietro Benedetti, Chairman and CEO of Danieli, signing the contract for the new cold mill complex.

A DOUBLE SUCCESS

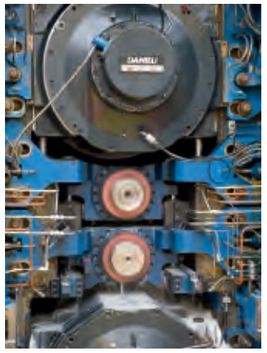
SOON AFTER THE ORDER FOR A COLOR-COATING AND PRINTING LINE, LYSVA METALLURGICAL PLANT ZAO PLACED THE ORDER FOR A COLD MILL COMPLEX TO PRODUCE UP TO 820,000 TPY OF GALVANIZED, PAINTED, AS WELL AS ANNEALED AND TEMPERED COILS, MOSTLY INTENDED FOR SALE TO THE LOCAL CONSTRUCTION INDUSTRY AND HOME APPLIANCES MARKETS.

The mill stands will be equipped with heavy-duty positive and negative bending and ultrafast HAGC control to obtain impressive thickness tolerances. Level 1 and level 2 automation systems with fully automatic sequences for threading, welding and rolling will promote consistently superior performance in terms of product quality and productivity.

410,000-tpy Hot-Dip Galvanizing Line
The hot-dip galvanizing line will produce galvanized steel strip for the building and home appliances industries.
The line features Danieli's new laser welder -able to weld all current and future steel grades in the product mix, strip cleaning section, entry and exit vertical accumulators and single coating pot.
A Danieli Centro Combustion furnace featuring free-flame and radiant-tube



DANIELI CONFIRMS ITS WORLDWIDE LEADERSHIP IN THE SUPPLY OF COLD MILL COMPLEX INTEGRATED TECHNOLOGY



Detail of a four-high high-tech cold mill stand.

Example of cold strip mill setup management table.

DMMS-Danieli Maintenance Management System represents an outstanding support tool for cost-effective maintenance.

sections will be installed to anneal all steel grades in the mix, with extreme energy efficiency.
Danieli Kohler's zinc pot technology package includes Q-Robot Zinc; X-Jet air knives; advanced bearings and rolls; and closed-loop coating gauge control, to ensure first-rate performance for coating gauge accuracy, zinc consumption, and plant productivity (process speed of 200 mpm; coating type: GI, 60 - 350 g/m^2 total).
Perfect strip surface texturing and strip shape will be achieved through an in-line four-high skin-pass mill and tension leveling section.
The galvanizing line is completed by a post-treatment section with chemical coater and dryer oven to apply passivation and anti-finger processes.

Color-coating line

The 220,000-tpy line features a fully automated Dancoater system for chemical treatment and paint application (coating type: PUR, PVDF, EP, SP) on strips with thickness from 0.25 to 1.5 mm. The line's horizontal catenary-type ovens will ensure high productivity (process speed of 150 mpm) and high quality on a very wide range of final products.

Batch Annealing Plant

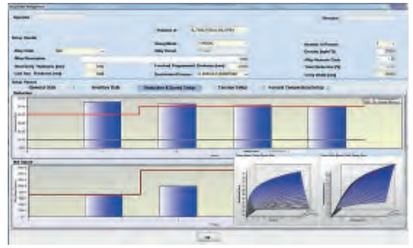
A 100% hydrogen atmosphere with a powerful convection system will ensure uniform through-coil thermal cycle and excellent surface cleanliness.
Level 2 annealing and cooling model will optimize furnace charging and productivity.
Fast-cooling stands are provided to minimize storage time of the annealed coils.

Temper Mill

A high-speed (roll force of 1,000 t; 690 mpm max.) temper mill capable of processing the entire range of grades in the mix, from ultra-soft steel to AHSS grades, will be used to impart the strips' final mechanical properties and textures .
The temper mill is equipped with fully automatic threading and tailout sequences to improve mill efficiency and productivity.

Electricals and Automation

Danieli Automation will supply a complete and integrated package of electrical, automation, and process control systems.
Its wide experience and process know-how inform the technologies that define the Q-Drive drives, HiTHIX thickness gauge, complete Level 1 automation developed on PLC and HiPAC devices, Level 2 covering the entire process for quality certification, material tracking, production management, and process control.
Danieli's proprietary mathematical models



will control the automatic management of the critical process variables and phenomena to guarantee the best product quality, governing flow stress and friction, roll deflection, forward slip, forces and torques, plastic and elastic deformations, furnace temperatures, and annealing process.
In addition, a Q3-DMMS Danieli Maintenance Management System will be installed. This system, developed in synergy by Danieli Service, Danieli Automation, and Danieli mechanical engineering departments, controls the equipment down to the last detail and represents an outstanding support tool for cost-effective maintenance.
This is a comprehensive package for maintenance planning and managing, cost and performance control, equipment history, and inventory handling. Spare parts are inventoried and optimized, and the maintenance knowledge installed right from the beginning can be continuously expanded to become a valuable company asset.
The cold mill complex is scheduled to go on stream by the end of 2016, and will be one of the world's most advanced production facilities of its kind, giving LMZ the possibility of supplying high-quality steel at a competitive price.

The future

The next stage of LMZ's development program will include a 1.2-Mtpy cold mill complex designed for flexible application of color-coating and printing technologies, and innovative coatings such as GI, GL, zinc, and magnesium. New technologies will be applied to minimize production costs and the environmental impact of the processes ■

PRECISION COILING OF THICK GAUGES AND HSS GRADES

Powerful Downcoiler Technology

Danieli developed -first in the world- an original technology to meet the challenge of precision coiling for thick-gauge, wide plates up to 3,200 mm, and HSS grades up to API X100.

As early as 1994, Danieli supplied to Geneva Steel, USA, a machine capable of coiling heavy plates up to 28.5 mm thick and 3,200 mm wide in API X80 grade. Today, these coilers are installed in both new and existing mills where a wide range of products must be handled.

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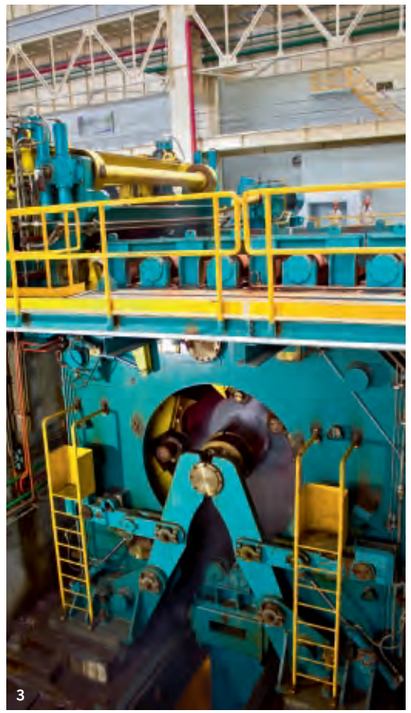

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Market challenges

New, diversified, cost-effective products are critical to achieving sustainability and competitiveness in the ever-changing market. New and existing hot-strip mills must be capable of coiling a wide product mix, including value-added steel grades like thin-gauge, multi-phase and extra-thick high-strength steels, including line pipe grades -with tensile strengths reaching 1080 MPa, precision coiling of line pipe steel grades such as API X100 is a challenge. To meet this challenge, a powerful coiling device is essential.

Danieli solutions

Following are some of the special features developed by Danieli for the Powerful Downcoiler:

> Heavy rooster roll:
A powerful hydraulically operated rooster roll at the pinch-roll entry side controls the strip during tail-out from finishing stand, which is essential during thick-strip coiling.
> Quick change pinch roll:
Pinch rolls are designed for efficient pre-bending of incoming thick strips, with minimal power consumption. These hydraulically tiltable pinch rolls are installed in a housing that is quickly removable in order to allow fast changing of both top and bottom rolls.
> Threading gate in two parts: The pre-bent thick strip enters the specially designed threading gate that is divided into two parts and guides the strip to the first wrapper roll with minimal friction between strip and aprons. Both threading gate parts are hydraulically actuated and controlled independently in position-control mode. The divided threading gate allows safe coiling of both extra-thick, high-strength material and thin strip with excellent coil shape.
> Pushing roll:
A hydraulically operated pushing roll is mounted in front of the wrapper roll at the end of the second threading section, to guide the very thick strip head into the gap between the wrapper roll and the mandrel, with complete control of the strip.
> Wrapper rolls: Three robust wrapper rolls with dynamic jump control and step control operate in both position and pressure control modes. Wrapper rolls are equipped with a specially designed spring below the wrapper roll chocks, which makes the strip head pass through the gap between the wrapper roll and the mandrel, with the wrapper roll gently absorbing the initial impact.
> Sideguides: with pre-centering as well as lateral guiding features, they provide coils with neat, leveled edges without any telescopicity. Designed with two guiding parts -the main guides and pulsating guides- they operate in both position control and force control mode, thus making the strip perfectly centered.

Advantages of the Powerful Downcoiler:
> Retractable-type design for off-line maintenance;
> Heavy-duty, four-segment mandrel designed to withstand extreme thermal and mechanical loads;
> Efficient coiling of strip at very low temperatures to achieve the required mechanical properties;
> Excellent coil quality right from the beginning of coiling;
> Compact coiling of heavy-gauge and high-strength steels, even at low coiling speeds;
> Low operating and maintenance costs.

The Powerful Downcoilers feature a robust mechanical design combined with an intelligent, advanced automation system that make it possible to create perfect compact coils each and every time, that can satisfy every steel producer's needs and market demands ■

1 1994, Geneva Steel, USA. Danieli supplied the first Powerful Downcoiler in the world.
2 2000, Ipsco Mobile (Now SSAB Alabama), USA. 3,124-mm-wide, 25.4-mm thick coiled plate.
3 The Powerful Downcoiler installed at Jiangyin Xincheng, P.R. of China.

Main Danieli Powerful Downcoilers installed so far

Customer	Country	Year	Thickness (mm)	Width (mm)
Geneva Steel	USA	1994	28.5	3,200
SSAB Alabama	USA	1999	25.4	3,124
Jiangyin Xingcheng	China	2008	25.4	3,000
Jindal Steel & Power	India	2013	25.4	3,000

New production record at Hot Strip Mills No.1 and No.2 at Tangshan Guofeng, China

OVER 530,000 TONS (+28%) PRODUCED IN DECEMBER

Almost a decade after their startup, the two 1,450-mm Danieli Hot Strip Mills, are still impressing with their productivity and reliability, standing stably well over their designed productivity. In December they produced over 530,000 tons, recording a +28% compared to their nominal capacity. Satisfaction for the great achievement was recently shared to the Danieli management by Zhang Zheng, Chairman of the Board of Tangshan Guofeng ■

From thin to thick HSS plates

INNOVATIVE MULTI-CASSETTE LEVELERS FOR OUTSTANDING PERFORMANCES

Multi-cassette levelers are the right choice for producers looking for efficient leveling of products from high-strength thin plates up to very heavy gauges for special purposes. Now, Anshan Iron & Steel is cooperating with Danieli to install a new multi-cassette leveler with ultra-extended capability in their Plate Mill 4300. The startup is scheduled for Q3 of 2015.

Plate market development

Since the plate market is constantly developing, many steel producers are continuously expanding the capabilities of their plate mills in terms of grade quality and dimensional range, often including thin-gauge, high-strength steel products for engineering construction, as well as heavy-gauge plates for power generation and military applications. Danieli supports this trend, proposing technology packages for plate mills that allow producers to increase the efficiency and quality of their lines, while also proposing different leveler machine arrangements capable of ensuring superior geometrical properties for plates, as well as lower internal stresses.

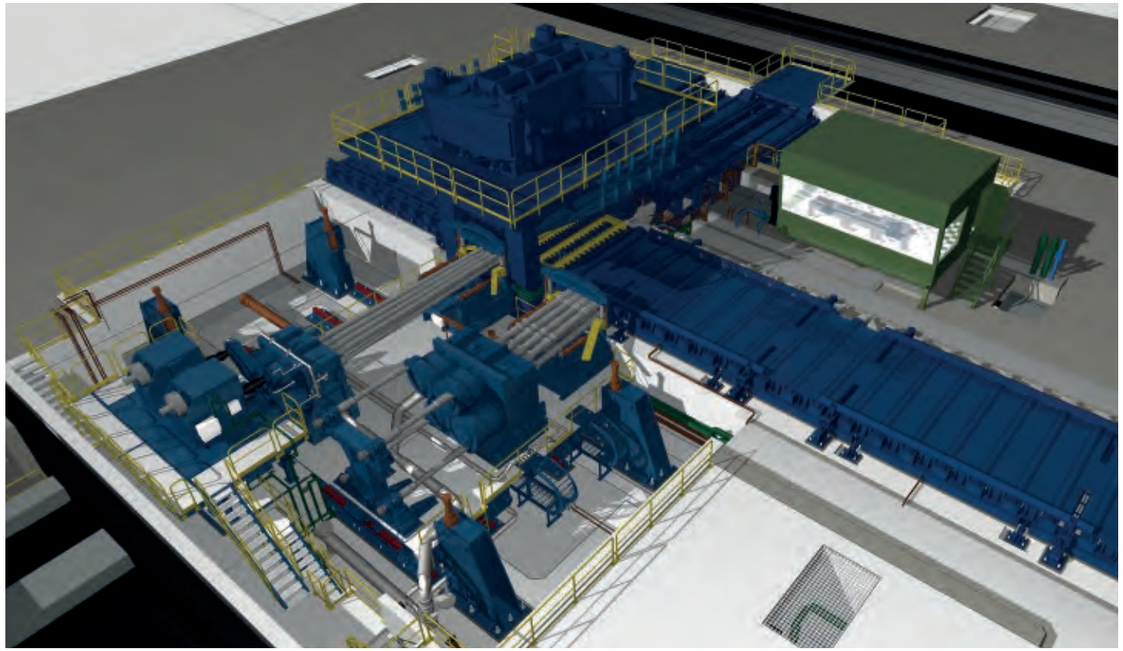
Multi-cassette levelers with no limitations

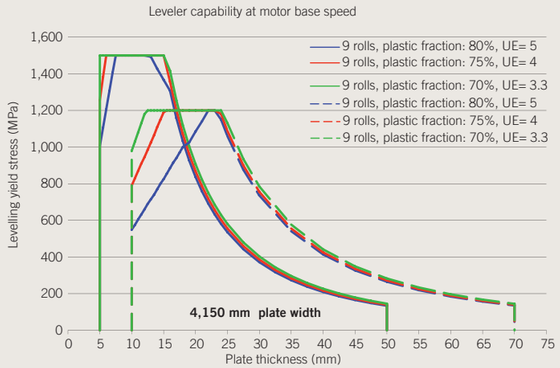
It is a well-known leveling theory that thin-gauge plates are processed better by operating cassettes with small roll diameters and roll pitches, in order to guarantee the required material overstretch. On the other hand, heavy-gauge plate leveling requires a machine with a cassette that has a large roll diameter and roll pitch sufficient to withstand the huge forces and torque characteristic of this process.
Thus, a compromise is required to adapt the leveling system to the mix required by the production line. However, considering the extended product mix of today's plate mills, a traditional single-cassette leveler might not be enough to reach the required production target; a different concept -using a multi-cassette arrangement- is therefore required.
The multi-cassette design can easily guarantee extended leveling capabilities of around +50% compared with a single-cassette arrangement, and represents the ideal solution for those producers who would like to have no practical leveling limitations on their production mix.

Danieli Multi-Cassette leveler at Anshan Iron & Steel

Danieli and Anshan Iron & Steel, a leading producer of HSS plates as well as special heavy gauges for power generation and military applications, are working together to install a new Multi-Cassette Leveler on Plate Mill 4300, to replace an old machine inadequate to process the new product mix with the required quality levels. The project aims to have no leveling limitations for processing plates over a vast range of thicknesses (5 to 70 mm), with yield strength values up to 1,500 MPa, reaching flatness better than 3 mm/m, using two cassettes of nine rolls each (with working roll diameter of 205 and 360 mm), and withstanding a maximum force in excess of 6,000 tons!
The arrangement includes a set of packages typical of Danieli's state-of-the-art leveling technology, such as:
> Top/Bottom roll height-adjustment system;
> Dynamic hydraulic multipoint bending system;
> Hydraulic Gap Adjustment system (HAGC);
> Hydraulic work roll-balancing system;
> Automatic cassette scale-evacuation system;
> L1 & L2 control system with mathematical models and auto-learning function from Danieli Automation.

The drive system is comprised of two sets (one for each cassette) of spindles and gearbox, based on Danieli's MULTIMOTOR technology, mounted on a quick, shiftable platform. When the cassette configuration needs to be changed, in just a few minutes the platform automatically shifts the right set of spindle and gearbox into working position. Similarly, the operator side is equipped with an additional, shiftable platform for quick cassette changing. The operation can be completed automatically without using an overhead crane ■



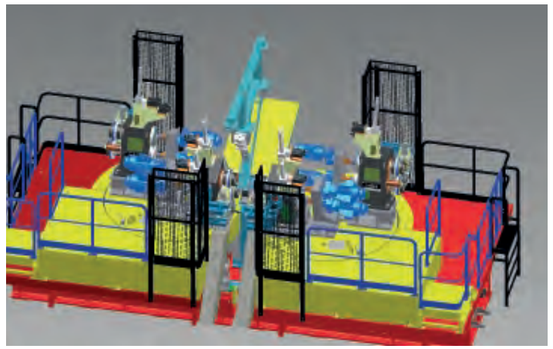


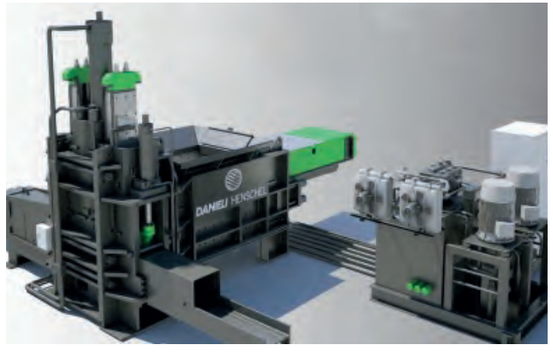
Thickness-to-yield strength diagram according to various steel grades. The multi-cassette design can easily guarantee extended leveling capabilities of around +50% compared with a single-cassette arrangement. Above: 3D rendering of the innovative cold leveler to be installed at Anshan Iron & Steel.

SUCCESSFUL PLANT MODERNIZATIONS
TO ENHANCE PLANT PRODUCTIVITY AND QUALITY, AIMING AT THE LOWEST OPEX

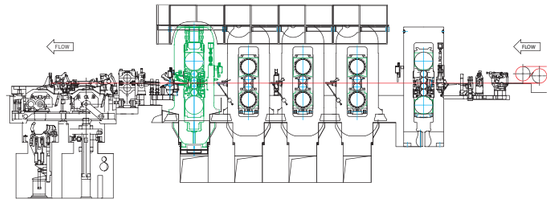
New side trimming section for tinning line *at USS Gary (IN), USA*

Currently, all the tin-coated product from ETL #1 must be processed on a separate rewinding line for required side trimming. The goal of the project is to add this capability to the existing ETL#1, discontinue operation of the rewind line, and thereby reduce overall production costs significantly. The main challenge was to locate the new side trimmer and associated scrap handling equipment. Various locations were considered before deciding on the preferred position in front of the existing pay-off reels. This solution benefits from having fewer space restrictions and makes it possible to install the new equipment without impacting normal production of the line.
The end-user for product coming off this line, the tinplate canning industry, demands high accuracies in edge trim. In addition, the side trimmer machine has to carry out "flying" width changes due to limited storage capacity at the entry looper. To meet these design requirements, US Steel chose Danieli as its supplier due to our experience and proven, high-accuracy, state-of-the-art side trimmer design. The overall scope of the project includes a complete new strip by-pass system back over the top of the existing payoff reels, associated steering units, side trimmer, scrap handling system, tension bridle, deflector rolls, support structure, and automation. The side trimmer incorporates a number of special design features, including full turret-head with eight individually driven cutter heads, servo-driven gap and lap adjustment, anti-backlash hydraulic cutting head pre-loading, hydraulic locking of both width adjust and head rotation, integral burr masher and scrap chutes with hardened liners to minimize wear, and quick-release covers in case of scrap cobble.
Another challenge associated with the project is how to deal with the scrap. At full throughput the new equipment will produce 3.3 tph of side trim scrap. Working closely with Danieli Centro Recycling, we have incorporated a three-compression baling machine, conveyor and truck loading system for the scrap bales. To eliminate the need for internal scrap pits and labor-intensive scrap handling, the conveyor system carries the bales outside the building to an external truck loading bay for immediate delivery to scrap reclamation. This arrangement has the added challenge of having to operate during the inclement winter weather conditions on the shores of Lake Michigan. Equipment is being manufactured now, with installation due to start in second quarter 2015. There have been some unique design challenges associated with the project that have been solved in a collaborative manner with the client. It is hoped we can build on this relationship with US Steel for similar projects in the near future ■





Six-high mill stand for tandem mill revamp *at Angang Steel, China*



At the production site in Anshan City (Liaoning Province) Angang Steel operates a 1,676-mm five-stand tandem cold mill coupled with a pickling line. The contract awarded in June 2014 for the revamp of the tandem cold mill mainly involves dismantling of the existing four-high stand No. 4, together with its equipment, and the installation of a new six-high mill stand, equipped with all the devices needed to increase thickness accuracy and shape control of the final product. For this purpose a selective roll coolant system also will be provided, to operate in a closed loop with the exit shapemeter roll.
Mechanically, it is a very challenging job due to the limitations imposed by the need to install the new equipment with minimal impact on the existing foundations, in order to minimize line shutdown for revamping. Other important modifications will be the upgrade of the inter-stand equipment, and on each of the five stands the backup roll bearings will be changed from oil-film type to roller bearings, with the addition of an air-oil lubrication system. Two new reducers will be supplied for the first and last stand to optimize the rolling speeds for maximum line productivity and efficiency. These two gearboxes, as per the customer's request, will be manufactured entirely in our Buttrio workshop to guarantee the best achievable quality. Installation of the new equipment will be performed during the line shutdown planned for May 2015 ■

Main plant data

Material	LC, IF, HSS, HC
Entry thickness	1.5 – 6.5 mm
Entry width	800 - 1,630 mm
Exit thickness	0.30 - 3.0 mm
Exit width	750 - 1,600 mm
Max coil OD	2,200 mm
Coil weight	30 tons

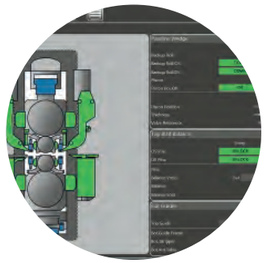
Acceptance of the world's first automatic sampling station for API X80, 25.4-mm-thick strip

The efficient follow-up of all project phases and the valuable collaboration between Danieli's and the steelmaker's project teams led to the signing of the Final Acceptance Certificate for the new sampling station soon after its startup.
This innovative, compact sampling station was expressly developed for semi-automatic cutting of scraps and samples from very thick, high-strength strip coils.
Installed in the automatic coil sampling area, it is comprised of a coil loading station, coil transfer car, unbending machine, circumferential and radial strapping machines, coil removing station, and scrap and sample evacuation equipment.
Scraps and samples from high-strength coils are cut by a carbide-tipped disk saw in semi-automatic mode. Then, samples are automatically collected in a movable basket in an orderly sequence. The result is a consistent reduction of total cycle time ■

Automatic in-line sampling station.

FINAL ACCEPTANCE OF SKIN-PASS MILL AND COIL DIVIDING LINE
at Usiminas, Cubatao, Brazil

The official signing of the Acceptance Certificate in June 2014 marks the end of a project that was characterized by the cooperative and positive attitude of the two companies' project teams. Installation and commissioning activities also were carried out smoothly by the two joint teams.



The four-high skin-pass mill and coil dividing line designed for a total production capacity of 800,000 tpy successfully passed all performance tests, skin-passing and recoiling all the required steel grades in strip widths from 700 to 2,050 mm and thicknesses from 1.2 to 6.5 mm (up to 12.7 mm for the coil dividing line), to the full satisfaction of the Usiminas team.

Further to all technological machines and systems -manufactured jointly at Danieli HQ and Danieli Thailand workshops- Danieli's scope of supply also included all the auxiliary systems (hydraulic, pneumatic, dust exhaust system, HVAC and FF for electrical and hydraulic cabins) and a complete electrical and automation package, including HMI, Level 1, Level 2, and MET Level 3 Coil Yard Management system, implemented by Danieli Automation.

Local support provided by Danieli do Brazil contributed substantially to the success of the project ■

USIMINAS

X-JET air-knives for exposed automotive products
at Yieh Phui, China

The new HDGL under construction at Yieh Phui (China) Technomaterial Co. Ltd. will produce GI and GA coated coils, to feed the booming automotive industry of P.R. of China.

The production will focus on very high quality standards to supply the exposed panels of vehicles whose surface appearance is of paramount importance.
Danieli Kohler will supply an X-JET air-knife system equipped with all state-of-the-art features and able to operate with air or nitrogen. Elevator/positioners, X-JET rigs, edge baffles, roll rigs, air/nitrogen supply system, maintenance stands/cars, and the electrical automation system are included in the scope of supply.
All the equipment will be manufactured and fully tested in Danieli's workshops, in order to reduce on-site installation and commissioning activities.
The order for the X-JET equipment for the new automotive HDGL at Yieh Phui (China) Technomaterial is an important and prestigious milestone that confirms our leadership in air-wiping technology ■

Final Acceptance of Recoiling & Chemical Processing Line
at WNM, P.R. of China

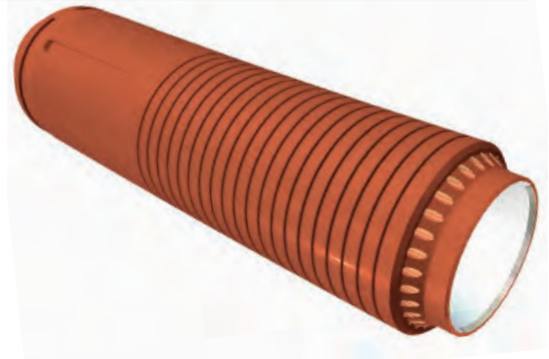
On September 24, 2014, Danieli AKV signed the final acceptance for the main equipment of the recoiling and chemical processing line of Waelzholz New Material (Taicang) Co., Ltd. (WNM).
The line was accepted in full compliance with all the stringent contractual performance figures and to the complete satisfaction of the customer. The successful implementation of the project demonstrated the Danieli China team's strong capabilities for project management, project engineering, equipment manufacturing, and site services.
During the installation and commissioning period, the Danieli China project team also responded positively and effectively to the customer's additional optimization requirements.
We are convinced that the successful implementation of this project has opened a door for future cooperation with WNM, one of the world's most renowned special steel producers, and with its parent company CDW located in Germany ■

At WNM site (from left): Liang Chunquan, Maintenance Manager WNM; Juergen Jentsch, General Manager WNM; Zhang Chang, EVP Danieli China.

DANIELI LEADING CASTING TECHNOLOGY FOR HIGHEST PRODUCTIVITY AND QUALITY

TMK Seversky, Russia. Excellent results of PowerMould tests

Through several heats and sequences performed, PowerMould confirmed its effectiveness for casting 156-mm round billets at a speed of 3.2-3.5 mpm, for all steel grades in the range, with excellent product quality for both surface and internal macrostructures.



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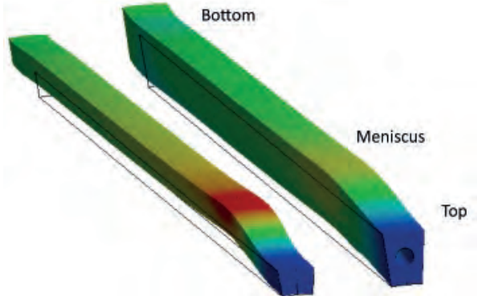
The 12-m radius, five-strand conticaster installed in 2008 at OJSC STW was designed for 150-, 156-, 290-, 360-, and 400-mm round billet production. The steel grade product mix includes LC grades, including peritectic, standard quality carbon and corrosion-resistant grades, cold-resistant steels alloyed with chromium, molybdenum, vanadium, and MC steels with carbon content up to 0.60%.
After the commissioning of the 135-t EAF and the development of the new process cycle, the maximum casting speeds for 150- and 156-mm rounds reached 2.6-2.7 mpm: too slow to exploit the steelmaking facility at full capacity.
Then, Danieli was asked to investigate the feasibility of increasing the casting speed of those sections up to 3.5 mpm. After having analyzed current process and equipment a proposal was made concerning mold oscillators, secondary cooling, and mold crystallizers.
The agreed supply therefore involved:

> Revamping of the mold oscillation unit to have the possibility of stroke adjustment according to the section to be cast, and to ensure optimal oscillation negative strip time in the range of 0.10 to 0.25 seconds for all the casting sections produced.
> Modification of the secondary cooling systems to increase the extent of the cooling area in the first zone. The installation of an additional nozzle row resulted in a 25% increase of cooling capacity, while the increase of number of nozzles in each row from four to eight gave a better cooling uniformity.
> PowerMould crystallizer with high thickness mold walls and cooling channels embedded into the copper body.



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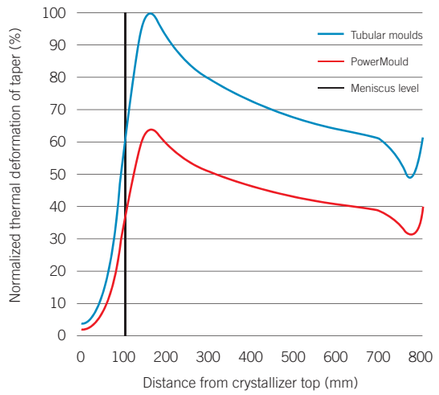

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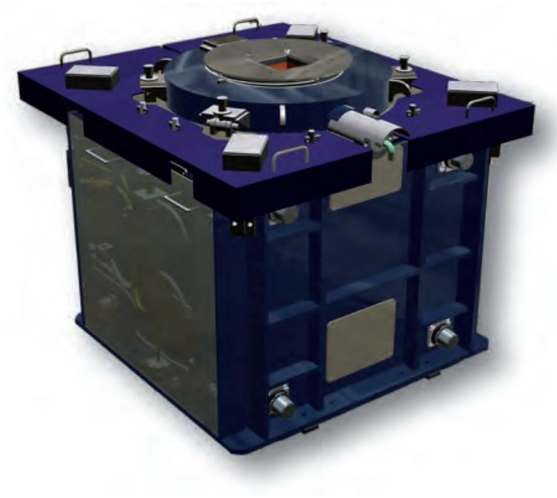
1 Danieli PowerMould crystallizer.
2 Comparison of simulated thermal deformation of tubular molds (left) vs. Power Mould (right).
3 Comparison of normalized thermal deformation of taper of tubular molds vs. Power Mould.
4 Macrostructures of 156-mm billets cast at 3.4-3.5 mpm (steel grade 13XØA).
5 Macrostructures of 156-mm billets cast at 3.4-3.5 mpm (steel grade 26XMØA).
6 Surface quality inspection on a peritectic steel grade (13XØA).



Increasing primary cooling uniformity, due to absence of cooling jacket, can be recognized as the main advantage of this type of mold when casting round sections. In the PowerMould, the correct water flow distribution around the product section relies on channels embedded in the mold, and therefore is not affected by the quality of mechanical centering between the mould tube and any steel jacket.
Moreover, from a thermo-mechanical point of view, the geometrical shape of the crystallizer takes advantage of a particularly enhanced stiffness, making it possible to reduce the thermal strain of the copper around the meniscus zone to 65%.
This means that better preservation of the design mold taper is generally achieved during the casting process, as may be seen from both plant feedbacks and simulated results.

Testing of pilot equipment was carried out in two stages, on one of the five strands, after a thorough verification of the proper functioning of all equipment, and setting the new casting parameters (liquid steel level, mold and secondary cooling zone water flow, casting powder type, etc.)
Several heats and sequences performed confirmed the ability of the new equipment to cast 150- and 156-mm sections -of all steel grades in the range- at speeds of 3.2 to 3.5 mpm, without compromising the billet surface and inner macrostructure quality.

OJSC STW and Danieli have mutually planned the continuation of testing activities for establishing an operational range of casting speeds around 3.6 - 3.8 mpm, demonstrating how a well-established partnership can result in renovated equipment through innovative technologies, to remain competitive by achieving quality and productivity ■

Even in the more complex cases of steel / section size, the technology supplied by Danieli makes it possible to achieve the highest levels of finished product quality.

LATEST CASTING TECHNOLOGY TO PRODUCE SPECIAL STEELS IN TOTAL QUALITY

BAOSTEEL BAOSHAN (SHANGHAI) CHINA

Round sections added to top-quality caster


1

The 14-m, four-strand Danieli caster at BaoShan was commissioned in spring 2008, casting 320x425-mm sections and doing so using what at the time was the latest Danieli technology on the market.
Six years later Danieli and BaoSteel are collaborating to upgrade the caster to produce additional sizes, including 300-, 380- and in the future 450-mm round sections. This revamping/upgrading will allow this machine to cast both high-quality rectangular blooms but also perfect rounds (thanks to the existing nine-pinch roll set-up). Most of the output will be focused on the existing section, though this conticaster will be able to easily adapt to new market demands in the future. The product mix for the round sections includes mainly piping products (high-alloy carbon grades) but also stainless steel grades for high corrosion-resistant pipes.
Between the supply of the original machine and this revamping, BaoSteel has put its trust in Danieli and awarded contracts for two more major projects, involving two, 14-m radius conticasters: one at Nantong (producing 290-, 370-, and 430-mm rounds), and another at Shaoguan (producing 280x280-, 320x320-, and 320x425-mm blooms). The hot startup for the revamped caster is expected by mid 2015 ■


2

BAOSTEEL

1 Macroetch of a 430-mm round bloom cast at Baosteel Nantong.
2 Existing conticaster in BaoShan.
3 Design of the PowerMould cooling channels allows modulation of the primary cooling water and avoids overcooling of the corners typically observed in conventional molds.
4 Macroetch of a 410x530 mm bloom (Grade #45).

COGNE ACCIAI SPECIALI, ITALY

New technological packages for the stainless steel conticaster


3

At the end of '90s, Danieli supplied to Cogne Acciai Speciali a 10-m radius 4-strand conticaster to produce stainless steel billets and blooms in the range of 160x160 mm to 200x270 mm. In 2009, the caster product mix was extended to 310x350 mm blooms to partially replace the section of 220x270 mm and part of the ingot casting production feeding Cogne's rolling mills. The first heat with the new casting section was processed successfully in September 2010. In 2014, focusing on continuous improvement, Cogne Acciai Speciali launched an upgrading project for the four-strand conticaster that involves installing a series of technology packages and a new casting section of 280x340 mm (with a mold length of 780 mm). Applying dynamic positioning and set-up of Final EMS, new Twin and Triple Power technology for Dynamic Soft Reduction, PowerMould for 160x160 mm sections, and Hy-Power for oscillation tables will maximize performance and final product quality. Additional activities will be the upgrade of the cooling curve and of all L1 and L2 automation and process control systems.
The 280x340 mm section guarantees the proper width / thickness ratio required for the Soft Reduction technology and a proper reduction ratio between as-cast and rolled product. The target is to obtain a final rolled bar free of defects, with a low FBH, and to reduce the ingot casting needs. Soft Reduction technology efficiency and flexibility is maximized thanks to the innovative design of the new Twin and Triple Power straightening units, which feature a larger number of rolls and a narrow roll pitch, resulting in a high-speed (mm/min) bloom reduction process. PowerMould on section 160x160 mm aims to improve the surface and subsurface quality of the billet corners, enabling direct rolling for producing wire rod products. The design of the PowerMould cooling channels allows modulation of the primary cooling water and avoids overcooling of the corners typically observed in conventional molds. Additional benefits are its mechanical rigidity, taper preservation during the entire running life, and its alignment-free functionality. The revolutionary Hy-Power drive installed on board of the hydraulic cylinder of the oscillation tables replaces the standard hydraulic system usually composed of a hydraulic unit, servo-valves, accumulators, and interconnecting piping required to move an oscillation table. It represents a perfect example of what the application of a technological package would mean:
> Simplified installation;
> Reduced equipment;
> Maximized performances.

Danieli and Cogne Acciaierie Speciali once again confirm their partnership in the steel industry ■

COGNE

XINING SPECIAL STEEL, CHINA

New milestone in continuous casting: 410x530-mm bloom cast successfully on a Danieli curved conticaster

The three-strand, 16.5-m radius Danieli caster for medium and large rectangular bloom is designed to cast 250x280- and 410x530-mm sections; the latter is the largest rectangular section ever cast on a Danieli curved conticaster. Steel grades processed -coming from the Danieli-supplied secondary metallurgy station- include alloy structural, spring, gear, and bearing qualities. The caster also has been designed to cast stainless grades. Production has been focusing mainly on the small sections, while casting of the larger blooms will take over once the break-down mill becomes fully operational. This caster features all the latest technological advances in continuous casting for high-quality grades, including a high-tech mold, Final EMS, Dynamic Soft Reduction (10 units), and Quenching box technology for high Al/N grades. Furthermore, the caster operates with Danieli stopper rods mounted on a large tundish designed


4

to achieve the best steel cleanliness; automatic powder feeding is installed too,-- for safer and better controlled operations. Complete Level 1 and Level 2 systems were supplied by Danieli Automation and provide state-of-art equipment operation and process control. The automation includes an online Liquid Pool Control system used to optimize the secondary cooling, stirring, and soft reduction effects on a continuous basis. Following the success of this project -which has established a close, trust-based relationship between Danieli and Xining Special Steel- Danieli has been awarded the assignment to revamp an old SMS machine (11-m radius caster, producing 250x280 mm blooms), an assignment that will be carried out during 2015 ■

Rolling mill revamping projects to boost quality and productivity

New finishing ends for two structural mills

at Ansteel, China

Within the context of a relocation project for its 800 and 580 structural mills, Anshan Iron & Steel Group Co. (Ansteel) decided to include automatic operations for the finishing end facilities, to achieve higher finished product quality. The two mills process a wide range of quality carbon and alloy steel grades, destined for transportation, mining, shipbuilding, construction, automotive, engineering and other strategic applications.
The upgrading project awarded to Danieli China also will increase annual capacity, raising it to 400,000 and 600,000 tpy, respectively, for the 580 and the 800 mills.
The 580 mill produces single- and double-bulb flats from #5 to #16, channels from 7.5 to 16, I beams from 10 to 16, angles from 7.5 to 12.5, mining arcs from #11 to #12, rounds from 50 to 85-mm, M18 channel plate steel, light rails from 12 to 24, and flats from 124x25 to 130x25 mm. The supply for the 580 mill includes a transfer bed for layer forming at the cooling bed exit side, three disc saws for final cold cutting to commercial length, two magnetic stacking stations to process 12-m long bars, liftable roller table and collecting pockets for rounds and non-qualified sections, and final collecting tables for stacks. The 800 mill will be equipped to handle larger sections, such as bulb flats from #18 to #27, channels from 18 to 30, I beams from 20 to 40, angles from 16 to 20, U piles from 25U to 36U, and rounds from 90 to 120-mm-dia. State-of-the-art finishing facilities will include a roller straightener machine, layer former, three cold disc saws and final collecting stations for stacks.
Danieli Automation China also will supply the electrical and automation systems for both mills. Start-up of the 580 mill was scheduled to take place during the fourth quarter of 2014, while that of the 800 mill is scheduled for the first quarter of 2015 ■

Extending SBQ mill product mix

at Changshu Longteng Special Steel, China

Danieli core equipment will be added to the Danieli Medium SBQ Mill ordered in November 2013 to produce special profiles, including elevator guide rails and flat rack steel. Rolling of T70 to T140 elevator guide rails and 63x43-mm flat rack steel in quality carbon and alloy structural steels, for final mechanical machining and cold drawing, will require the installation of a pinch roll with bar turning function at the entry side of stand #1; two SHS housingless horizontal stands for roughing and intermediate mill (resulting in a 17-stand rolling mill); six gear boxes with double gear ratio for the intermediate and finishing mills; a water cooling box modification at finishing mill exit side; an off-line roller straightener and relevant entry/exit services; and new roller guides.
The project will be executed by Danieli China. Production of elevator guide rails is scheduled to commence in the Q1 of 2015. This second order illustrates the customer's satisfaction with and confidence in Danieli for the excellent work currently in progress on the Medium SBQ Mill ■

SBQ bar mill upgrading and Heavy Bar Mill Revamping

at Asil Çelik, Turkey

Estabilished in 1974, Asil Çelik has quickly become a leading producer of quality and special steel bars used in automotive, OEM, machinery, and other demanding applications.
Within its expansion project, the medium bar mill modernization will adopt Danieli's cutting-edge production technology for quality steel long products.

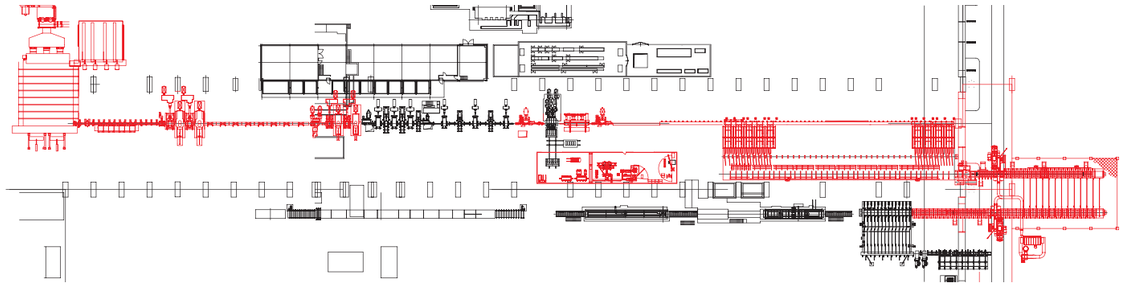
SBQ Bar Mill

The order, effective from mid 2014, foresees installation of a 120-tph walking-beam reheating furnace (from Danieli Centro Combustion), a four-stand high-speed rougher, a four-stand intermediate mill (with insulated roller table), and a four-stand Kocks RSB block as finishing mill for the entire range of SBQ bars. A 66x12-m walking-beam rake-type cooling bed with hoods, a cold cutting-to-length system, and two cold saws will complete the supply.
The product mix of the 100-tph mill will include rounds from 19 to 100-mm-dia (19 to 60 mm through thermomechanical rolling); squares from 50 to 80 mm; hexagons from 18 to 80 mm; flats from 50x6 to 150x50 mm, in a wide range of high-quality alloyed, unalloyed, and high-alloyed steel grades. The mill, to be fed with 160-, 200-, and 240-mm square billets coming from the steel meltshop supplied by Danieli in 1997, also can perform LTR-Low Temperature Rolling and normalizing processes thanks to additional water boxes installed through the rolling line. Danieli Automation will supply all the electrical, automation, and process control services for the whole plant. This order strengthens Danieli's technological leadership in long products mills for special steels, and follows recent successes with similar plants, achieved at Baosteel Shanghai No. 5, Charter Steel, ATI Teledyne Allvac, and Bhushan Power and Steel in India started up at the beginning of the 2011. The startup for the Asil Çelik plant is scheduled before the end of 2015

Contract signing at Danieli HQ. From left: B. Zuter, Area Sales Manager, Kocks; L. Gori, VP Sales, DMH Medium & Heavy Section Mills; A. Diasparro, VP, Danieli Key Account Management; O. Kilavuz, General Manger, Asil Çelik; C. Beckbolet, Fematek; M. Lerz, Director Contracting & Financing, Danieli.
Below: layout of the SBQ mill. In red is highlithed the equipment making up the upgrading.

Heavy Bar Mill

The aim of this revamp project to be carried out at Asil Çelik -Turkey's largest producer of specialty steel long products- is to automate the rolling process, improve bar quality, extend the product range, and reduce maintenance needs. The existing, reversing two-high finishing stand will be replaced with a cutting-edge, 850-mm-dia modern unit, offering high stiffness and axial rigidity, automatic bottom-roll adjustment during rolling, quick roll/chock unit change functionality, including rest bars/roller guides (in less than 20 minutes), and recovery of the existing roll fleet. The supply also will include manipulators; a new automation control system for the entire line; replacement of the auxiliary DC motors and converters with AC motors and drives; substitution of the two main DC analogue converters with new digital ones; and a newly developed pass design for 600-mm round blooms -which are to replace ingots as feedstock- also shall be incorporated into the supply.
The mill will produce rounds from 75 to 250 mm, and round-cornered squares from 50 to 245 mm, in heat-treating, case hardening, microalloyed, boron, free-cutting, bearing, spring, and stainless steel grades for demanding applications.
Danieli Automation will supply the electrics, and Level 1 and Level 2 automation systems.
Plant startup is scheduled for Summer 2015 ■



Rolling mill revamping projects to boost quality and productivity

CSB / COMPACT SIZING BLOCK DEBUTS SUCCESSFULLY IN CHINA

The commissioning of the first CSB-Compact Sizing Block in China took place at Yuxi Xianfu Iron & Steel in August 2014, achieving full customer satisfaction and confirming the reliability of Danieli wire rod mill technologies.

In January 2013, Yuxi Xianfu Iron & Steel (Group) awarded a contract to Danieli for the supply of core equipment and process technology for a 700,000-tpy wire rod line, to be installed at Yuxi Xianfu works (Yunnan Province). Main equipment supplied included:
> Three-pass CSB-Compact Sizing Block equipped with M2-multiple drive technology;
> OFB-Oil Film Bearing loop-laying head (patented), with associated auxiliaries;
> WCC-Wire Rod Controlled Cooling line for QTR-Quenching and Tempering and UFG-Ultra Fine Grain processes for concrete reinforcement grades;
> Danieli Automation Level 1 and Level 2 automation and process control systems.

This line produces 5.5- to 20-mm wire rod in coils weighing up to 2,050 kg, at a max. rolling speed of up to 115 mps. The product mix includes LC, MC, microalloyed, and reinforcement grades. From the beginning, the project teams from Danieli HQ and Danieli China showed their motivation and determination to develop all project stages promptly and efficiently, from engineering to construction, installation, and commissioning, and to achieve the targeted quality results within the contractual deadline.
The release of the Final Acceptance Certificate on August 11, 2014, was the proper recognition for a job well done ■

The CSB-Compacting Sizing Block is the ideal answer to meet all requirements of modern wire rod mills in terms of consistent production of high-quality products and flexibility. The system's compactness makes it an ideal solution for upgrading existing wire rod mill lines. The M2 technology, with each module of the CSB block driven by an independent motor, makes it possible to reach the best over-speed set-up for each finished round, thus resulting in excellent and consistent finished product quality and size tolerance.

ESS / ESS COMPACT CANTILEVER STANDS AT ORI MARTIN, ITALY

A winning technology proven by 1,100+ ESS units in operation worlwide

Within the scope of the modernization project of the bar and wire rod mill for quality and special steel grades, Ori Martin will insert an additional ESS-Energy Saving cantilever Stand as the line's initial roughing stand, No. 1. This stand was necessary in order to roll a new, larger starting billet of 160x160 mm. The original rolling mill was supplied by Danieli in the 1980s ■

Back in 1983, Danieli Morgårdshammar was first in the world to engineer, design, and manufacture the ESS compact cantilever stands with ring carrying shafts mounted on oil-film bearings. Today, more than 1,100 ESS units installed worldwide are operating successfully in bar, wire rod, and section mills, for both commercial and specialty steels. The advanced and rational design of the ESS, with fewer and standardized components, make the machine almost maintenance-free. Major evidence of this is the virtually unlimited service life of the oil-film lubricated, plain metal bearings.

SMH / 80-FT-LONG AUTOMATIC STACKER AT NUCOR UTAH, USA

The SMH 580 WinStack ordered by Nucor is the 139th Danieli automatic stacker for light, medium, and heavy sections installed and commissioned since 1970.

Another step is marked in the long-term relationship between Nucor and Danieli by the order for the modernization of Utah #1 mill plant finishing facilities. A new, 80-ft-long automatic stacker with single magnetic heads will be installed to process flats (3 to 12-in.), squares (up to 2-1/4-in.), equal leg angles (2 to 6x1-in.), unequal leg angles (up to 7x4x3/4-in.), and channels (up 10x30 lbs/ft), with nominal lengths from 20 to 60 ft, at rates of up 150 stph. Danieli Automation will supply the electrical equipment and the automation system. Startup of the new facilities is scheduled by the end of September 2015 ■

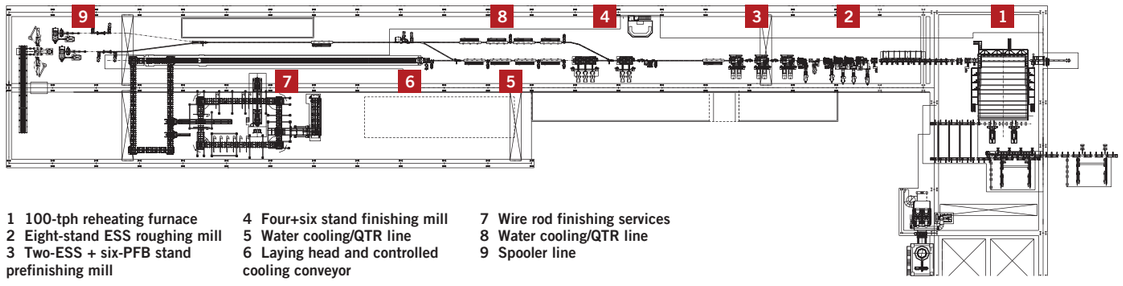
H3 DANIELI WIRE ROD ROLLING TECHNOLOGY

SINOBRAS, BRAZIL

Sinobras is the first integrated long product steelmaker for construction steel in the North-North East region of Brazil. In its move to quickly expand its plants, following the order for a scrap shredder unit (currently under installation), Sinobras assigned a contract to Danieli for a 510,000-tpy wire rod and spooled bar-in-coil mill to be supplied on a partial turnkey basis.

From left: Ian Correa, COO, Sinobras; Gianpietro Benedetti, Chairman and CEO, Danieli; José Vilmar Ferreira, CEO, Sinobras; Giovanni Nigris, EVP Danieli.

Why H3? HCube stands for High-productivity, High-quality, and High-efficiency wire rod lines, and represents the ultimate technological achievement for producing wire rod.
The new facility will include a 16-pass rolling mill with cantilever stands; M2 multiple drive; four- and six-pass modular finishing blocks with related DCR ring changing robots; DSC/QTR/QTS heat treatment lines; and a spooled coiling line -first of its kind in Brazil- provided for handling of 3,000-kg coils. Based on a 100-tph nominal capacity, energy-recovering reheating furnace with ultra low-NOx, CO_2 and O_2, with top and bottom burners, supplied by Danieli Centro Combustion, the plant will roll 130- and 160-mm billets into plain and deformed wire rod (from 5.5 to 16 mm; up to 25 mm in the future) and rounds from 10 to 25 mm dia on the Spooler line. The constant finishing speed of the wire rod line will be 110 mps for rounds 5.5-mm rounds and 35 mps for 10-mm rounds on the Spooler line.
A CCW-Controlled Cooling Conveyor for wire rod with Sundco V-H type coil handling system and a spooler line will complete the supply. The auxiliary equipment includes a water treatment plant supplied by Danieli Engineering, the entire Level 1 and Level 2 automation systems by Danieli Automation, and all the EOT cranes, supplied by Danieli Centro Cranes. This mill will represent the state-of-the-art for wire rod and spooler lines for commercial steel grades in South America.The startup of the rolling mill is expected by the end of 2015 ■



1 100-tph reheating furnace
2 Eight-stand ESS roughing mill
3 Two-ESS + six-PFB stand prefinishing mill
4 Four+six stand finishing mill
5 Water cooling/QTR line
6 Laying head and controlled cooling conveyor
7 Wire rod finishing services
8 Water cooling/QTR line
9 Spooler line

DILER DEMIR ÇELIK, TURKEY

Increased finishing speed and final quality of wire rod will be made possible by installing the latest H3 technology "core" products, such as a Twin Module Block and Turbo-loop laying head.

Signing of the contracts at Diler HQ in Istanbul. From left: Ömer Mustafa Yazici, Member of the Board, Diler; Fikret Kuzucu, Executive Member of the Board, Diler; Marco Lerz, Director Contracting & Financing, Danieli; F. Hasan Arol, Purchasing & Import Dept. Manager, Diler; Andrea Diasparro, VP, Danieli Key Account Management; Executives of Diler Project & Technical team.

The completion of the Diler Demir Çeljk wire rod mill took place in mid-June 2014 with the order for the supply of a new set of water cooling boxes, a TMB-Twin Module Block, a TLH-Turbo loop laying head, and new coil finishing end by Sund Birsta, all installed on the Danieli 0.6-Mtpy high-speed wire rod mill supplied in 2005.
The modernization project is certain to enhance Diler Demir Çelik's competitiveness in both the local and the export markets.
With the insertion of a TMB sizing block with M2 Multiple drive technology the mill will be expanding wire rod production from 4.5 to 26 mm-dia plain and 6 to 16-mm-dia deformed wire rod in 2.3-ton coils.
The steel grades produced (even through the Low Temperature Rolling process) are LC, MC, HC, and alloy qualities for a wide range of final applications that include mechanical engineering, drawing, cold-heading, spring, bearing, and tyre cord.
The increased finishing speed (up to 120 mps in hot rolling mode) and the variations in the product mix and operating conditions will contribute to remarkable improvements in the plant's productivity.
The innovative side-shifting TLH-Turboloop Laying Head (patented) is a globally unique technology featuring pipeless, multi-pattern, vibration-free operation (even at the highest speeds), resulting in an optimal coil pattern, undisputable wear rate and improved plant efficiency thanks to the latest generation of Oil-Film Bearing laying head solutions for smallest rounds production.
Minor modification to the existing line and equipment will accommodate the new working conditions involving the water cooling line, pinch rolls, and the high-speed shear. A vertical coil handling system and coil compactor from Sund Birsta, unloading system with marking, and coil collecting rack will complete the supply.
Danieli Automation will supply all electrics and an advanced automation system.
Plant startup is scheduled for the end of 2015 ■

SHANDONG GUANGFU, CHINA

Signing the Final Acceptance Certificate, from left: Zhang Bing, Project Manager of Huatian MCC; Alberto Celano, Area Sales Manager, Danieli; Wei Yueqiang, Sales Manager, Danieli China, and executives of both companies.

In October 2014, Shandong Guangfu Group and Huatian MCC released the Final Acceptance Certificate for the Danieli high-speed wire rod mill, which installation is one of the main items of the Guangfu Group's Product Structure Improvement Macro Planning project. Now, the plant is producing on a constant basis, and the FAC was released with full customer satisfaction. The Danieli-supplied equipment mainly includes: a two-pass DWB pre-finishing block; a high-speed finish rolling line (eight-pass DWB block plus four-pass TMB/WRS finishing block); WCC-Wire Rod Controlled Cooling line (also suitable for LTR-Low Temperature Rolling process); and an OFB-Oil-Film-Bearing laying head with associated auxiliaries. The line is designed to produce 5.5- to 16-mm dia. plain and deformed wire rod in coils weighing up to 2,050 kg, at the guaranteed rolling speed of up to 115 mps, in a product mix that includes quality carbon, cold-heading, welding wire, spring steel, and low-alloy steel grades.
Automation and process control systems were supplied by Danieli Automation ■

DANIELI H³
WIRE ROD ROLLING TECHNOLOGY

FERRIERE NORD, ITALY
SOLIDIFIES CSB SIZING TECHNOLOGIES AND PROCESS FOR ITS 130-MPS WIRE ROD MILL

The H3 technology has arrived at Ferriere Nord with the recent order for new water cooling lines for the existing two-strand wire rod mill. After the record-setting success for high-speed wire rod rolling -126.2 mps reached one year ago on the two lines- Ferriere Nord has set the new, ambitious goal of producing wire rod at a stable and constant speed of 130 mps. Investments have been made accordingly, to reach the target smoothly and quickly. The latest design cooling lines allow:
> Fast and easy replacement of the cooling elements, to reduce changing times and guarantee their perfect alignment;
> Easy and fast cobble removal;
> High cooling efficiency and low water consumption;
> Low wear on the elements thanks to innovative and selected materials.
Danieli Automation will integrate all the electrical systems and the automation services for the lines. The plant startup is scheduled before the end of 2015 ■

As a pioneer in high-speed wire rod production in Italy, Ferriere Nord continues to invest with the selection of new Danieli technology and equipment, becoming a "real" H3 mill.

PITTINI FERRIERE NORD

24th and 25th EWR LINES START OPERATION

Ferriere Nord, Italy

The modernization project of bar mill No. 1, to be completed by the installation of a newly designed spooler coiling line, will provide Ferriere Nord the ability to respond faster to the market's demand for concrete reinforcing bar products.

Following the meltshop modernization with the installation of a top-performance Danieli EAF, the modernization project of bar mill No. 1 was executed according to schedule, with 20 SHS^{PLUS} housingless stands (for a total of 42, including the spare operational units) and an EWR® Endless Welding Rolling line installed and quickly commissioned in September 2014.
The welder installed is the second unit to operate in Italy and the 24th in operation worldwide. It is designed for automatic continuous welding of billets up to 170 mm in low- and medium-carbon steels at rates of up to 140 tph ■

Dana-Y Steel, Vietnam

The 25th EWR line installed worldwide since 1997 -and the first ever in Vietnam- follows the line successfully installed at Ferriere Nord, Italy in September 2014.

Installation and startup of the new EWR® Endless Welding Rolling line on Dana-Y's 250,000-tpy wire rod mill proceeded according to schedule.
Operating in the endless rolling mode through automatic, continuous on-line welding of billets at the delivery side of the reheating furnace, Dana-Y will benefit by the higher productivity, material yield, and plant efficiency, reducing production costs and granting homogeneous material quality across the entire product range for endlessly rolled stock ■

THÉP DANA-Ý

Ho Nghia Tin, Dana-Y Deputy General Director, stands proudly in front of the EWR equipment during installation in mid October 2014.

Danieli Automation *Highlights*

Q-Robot
The technology arm of Danieli Automation

Energy saving in rolling mills

Higher power for higher productivity

Process energy saving with a fast ROI

Product quality constantly under control

Energy saving in rolling mills

POWER

NEW SINGLE-ROW INDUCTION HEATING FURNACE AT SIDENOR THESSALONIKI, GREECE

The new order, second in a row for induction heating equipment, follows the successful startup of a QHEAT induction heating system at Sovel plant. The new furnace is designed to operate in different modes:

> Hot charging: the billets are conveyed to the induction furnace directly from the conticaster, using the most energy-efficient method that generates only a negligible scale formation;
> Hot charging with a hybrid cycle: the billets from the conticaster are sent to the gas-fired reheating furnace and then to the induction furnace, with a flexible process decoupling the rolling mill from the caster, with negligible scale formation due to low temperatures in the reheating furnace;
> Cold charging with a hybrid cycle: the cold billets are charged in the reheating furnace and then sent to the induction furnace. This means minimal gas consumption compared to normal cold charging and negligible scale formation due to low temperatures in the reheating furnace.

The equipment supplied is mechanically and electrically robust, and is designed to have the fine modularity of a 1-MW load considering power inverter, matching circuit and power inductor.
One design detail to be highlighted is the modularity and extendibility of the power equipment, and the independent power control of each power inverter to optimize billet temperature equalization.
In case of failure, thanks to the flexibility of the system, the inductors can be excluded one-by-one without stopping the process; the automation control will automatically rearrange the lost power to other active power inductors. As usual, all power equipment incorporates a simple and fast maintenance concept: through a detailed fault report of the entire system maintenance workers can easily identify the cause of the failure. All power equipment is designed for quick-changing operations; for example, using the inverter power module with wheeled frames, power capacitors are exchangeable, one-by-one, without involving bus bar, each internal water connection having a quick coupling or dedicated tap.
The main interface of Danieli Automation Power Equipment is the Configurator software, a powerful and user-friendly tool application that allows system parameterization, tuning, accurate and fast signal tracing, graphic status indication, and fault/alarm monitoring. The connection between drive and PC is made by a normal Ethernet connection, to allow easy remote support both by Danieli personnel and customer personnel.
The QHeat system is equipped with a dedicated operator touch panel, located on the control unit door, for local command, fault, and alarm monitoring and parameterization.

PLANT CHARACTERISTICS

> Coil power up to 1,000 kW for 140-mm square billet;

> Overall power of 12 MW with three inverter switchboards;

> Nominal productivity of 120 tph;

> Three inverter switchboards of 4 MW, extendible up to 5 MW;

> 12 power inductors with each capacitor bank;

> Three water-cooling units to manage the internal demineralized water, two of which are dedicated to power inductors cooling.

Process energy saving with a fast ROI

POWER

DANIELI AUTOMATION MULTI-LEVEL MV QDRIVE TECHNOLOGY AT RED OCTOBER GROUP, RUSSIA

Danieli Automation recently acquired two new orders from Red October Group, Russia, to supply three MV Multilevel (MV-ML) QDrive inverter cabinets for Fume Treatment Plant (FTP) fan applications, with motor-rated voltage of 6.6 kV.
The first order, for the Volgograd site, concerns a new MV-ML QDrive inverter cabinet with a synchronized bypass switchboard for soft starting and commutating synchronously to the MV supply network three 6.6-kV, 1,900-kW induction motors for the FTP fans. The second order, for the Zlatoust site, is for the supply of two MV-ML QDrive cabinets for two induction motors for FTP fans, rated 6.6 kV and 1,400 kW respectively. Moreover, a MV Multilevel QDrive for an existing 6.6-kV, 630-kW fan motor was started up successfully at Italy's RMB shredding plant.

REDUCED COMSUMPTION WITH VARIABLE-SPEED FANS

A typical case where process energy saving could be applied is an existing fan application for exhausted fumes treatment or dust removal (i.e. 630 kW - 6 kV DOL motor), usually equipped with a fixed-speed motor, with process control realized through mechanical fan damper modulation.
Updating the process control system by installing a new Danieli Automation Multilevel MV QDrive variable-speed drive, and keeping all existing MV switchgear, cables, and motor, a considerable savings in energy consumption of about 20-30% can be achieved, with a fast and reliable return of investment.

Higher power for higher productivity

ezzsteel
The Middle East Steel Professionals

STEEL MAKING

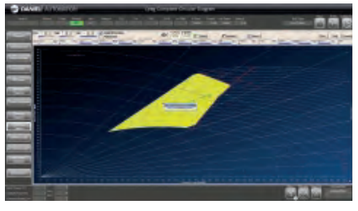
EAF REVAMPING AT AL EZZ STEEL REBARS, EGYPT

Handshake between Mahmoud Taha, Rolling Mills Manager at ESR (fourth from left) and Enrico Plazzogna, EVP Sales of Danieli Automation, in the presence of executives of both companies.

The role of electrical and automation system and powerful transformer for lower electrode consumption and more stable operation.

As part of the modernization program of their steelmaking facilities in Sadat City, in September 2014 Al Ezz Steel Rebars (ESR) assigned an important contract to Danieli Automation to modernize the meltshop's electrical and automation systems, with the main target of replacing the EAF transformer with a new-generation model, to permit an effective increase of the available power for the EAF, together with a new secondary system. Moreover, the obsolete automatic control based on Step5 PLC will be replaced by up-to-date control system with a HiREG PLUS technology package.
The new transformer will be sized with higher capacity than the existing one, though operating within the same power range. The main items of the revamping project are:

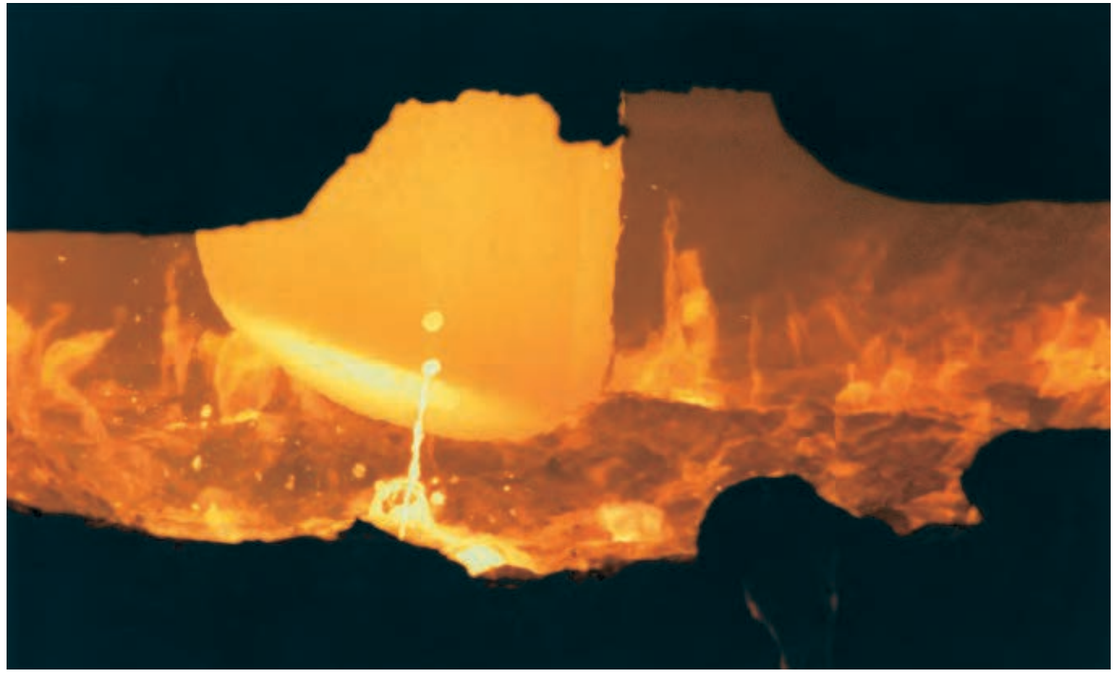
> EAF transformer and EAF MV switchgear with a new secondary system: the existing EAF PLC S5 will be replaced 1 to 1 with new PLC S7 series;
> Level 1, basic automation and technological controls, based on distributed architecture providing clean separation of application modules and easy maintenance;
> PLC unit used for sequence control and interlocking;
> HMI (Human Machine Interface) functions based on PC hardware on the existing EAF pulpit
> New HiREG PLUS, supplied as a package, with its switchboard and integrated user screen, providing working points and impedance for advanced digital electrode regulation.



Molten Steel Path Automation System

STEEL MAKING

FOR SAFER OPERATION AT GERDAU CORSA SAPI, MEXICO



Performing safe closing for each sector of the EAF cooling system, Danieli Automation's Molten Steel Path automation system prevents any water from falling into the furnace, a possible cause of dangerous explosions due to the mixing of water with the liquid steel.
All the automation will be provided by a Siemens safe PLC of the S7-300F series, which will control the motorized valves that are feeding, or by-passing, the EBT, and the modules/shell and roof/fourth hole panels.
The system will have nine emergency buttons located between the EAF plancher and the operator pulpit that will be activated by the EAF operators in case of a water leakage inside the furnace.
Once one of the emergency buttons is pressed, the system will provide an immediate or smooth closing of the delivery and return valves of the affected circuit, depending on the status of the process (charging, melting, refining, or tapping). To avoid any backpressure of the water, the cooling circuits include by-pass valves that will be automatically opened in case of an emergency.
In case of smooth closing during the refining or tapping phases, the automation will slowly close the circuit by maintaining a minimal water flow, by taking under control the water temperature. If the process is not completed after a programmed time, the system will provide the full closing of the circuit and the immediate stoppage of the process.
The Molten Steel Path system also considers an operator interface with dedicated screens in the EAF HMI application, showing the operator if a button has been pressed, the status of the valves, and the status of the process.
From the HMI the operator also can operate manual controls to test the system during the shutdown of the furnace, and to reset the emergency condition once the damage that generated the problem is repaired.
During the furnace operations, the system will automatically lock any tentative manual controls from the HMI to avoid undesired actions on the system. Of course, if the operator forgets the system in manual mode, or if any feeding/return valves will be closed prior to the process start, the system will not consent to the process start, considering it as an important consent to grant.
From the hardware point of view, the safety PLC will ensure safe operation on the cooling system and a three-phase UPS will ensure power redundancy in case of failure of the main power supply.

Robotics in the metal industry

ROBOTICS

ROBOT APPLICATIONS CREATED TO HELP THE OPERATOR TO WORK MORE PRECISELY AND RELIABLY

Q-ROBOT is the result of the most advanced alliance between industrial robotics and process automation.
A set of solutions for each production area introduces flexible automation in dangerous places where human intervention is still necessary to finalize the production.
An anthropomorphic robot makes it possible to relocate the worker to healthier, safer surroundings, and manages the repetitive and labor-intensive tasks that are often linked to poor process quality. However, full adjustment of all parameters is available to the operators.
All Q-ROBOT systems are designed specifically to be used in harsh environments with severe pollution.

SAMPLE
Temperature sampling and steel analysis in EAF and LF

EBT
Automatic obstruction removal in arc furnaces' EBT

SCAN
Refractory thickness robotic cell measurement system

LAB
Robotized fully automated analysis for metal samples

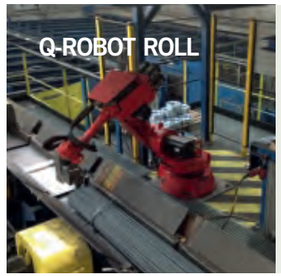
LADLE
Multi-purpose robotic cell for ladle area in casting floor

MOULD
Robotic system for powder management in casting process

TAG
Robotic station for billets labelling on the cooling plate

MARK
Robot for lateral paint jet marking of billets or slabs

DEBURR
Automatic in-line deburring and chamfering of billets and slabs



DESTRAP
Automatic coils de-strapping machine

DEBURR
Automatic in-line deburring and chamfering of bars

BUNDLE TAG
Robotic cell for labeling bundled rods

COIL TAG
Robotic cell for labeling wire rod coils

MARK
Robotic cell for paint-jet marking of flat products

CAP
Robotic cell for tube caps application on finished products

MAN
Robotic cell for application and pre-screwing of couplings on finished products

PRO
Application of tube protectors on finished products

MARK
Robotic cell for lateral ink-jet marking of tubes

SKIM
Anthropomorphic robot for skimming and zinc dross removal

S/J INGOTS
Robotic system for ingot loading into the zinc pot

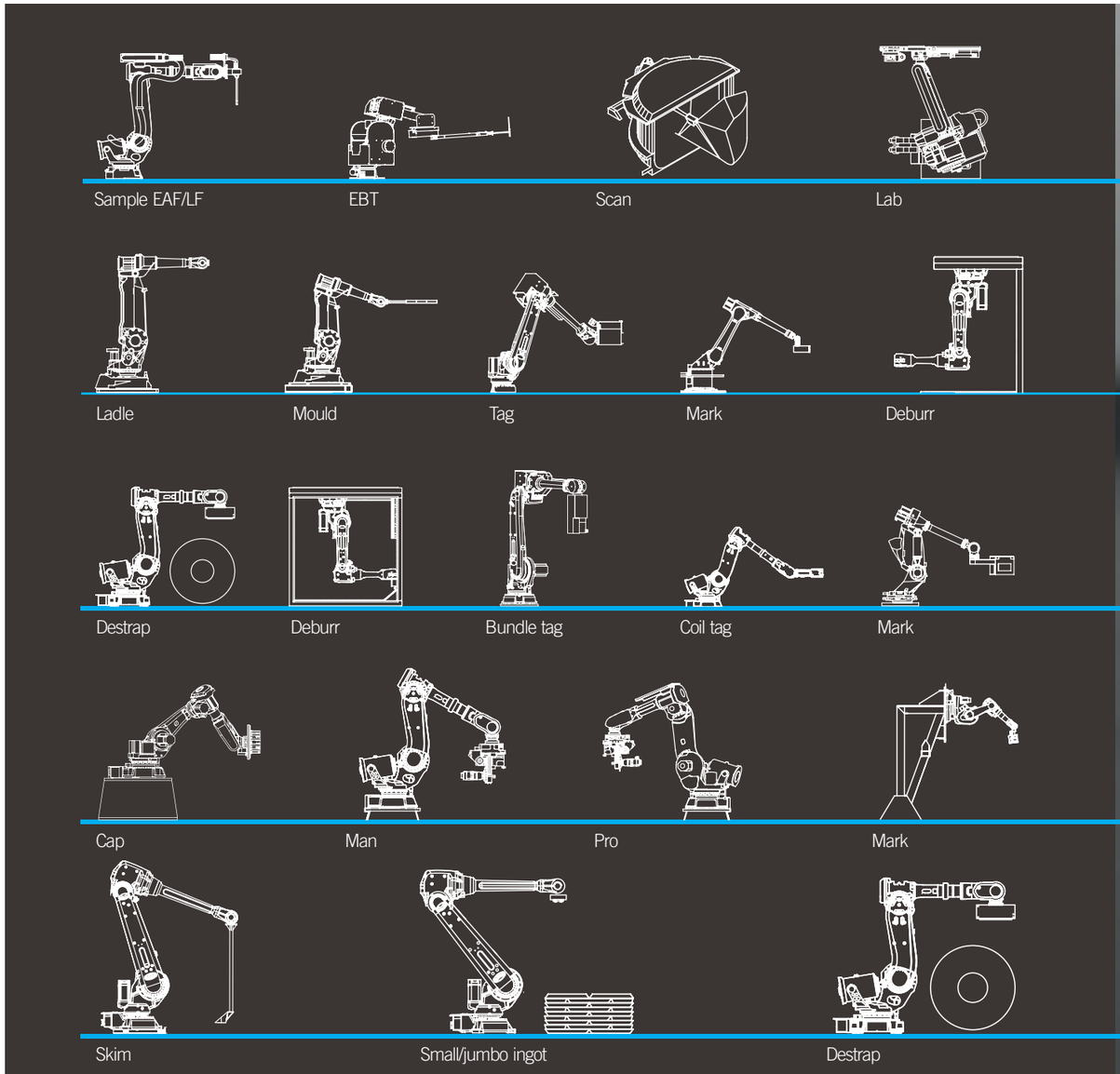
DESTRAP
Automatic coil de-strapping machine

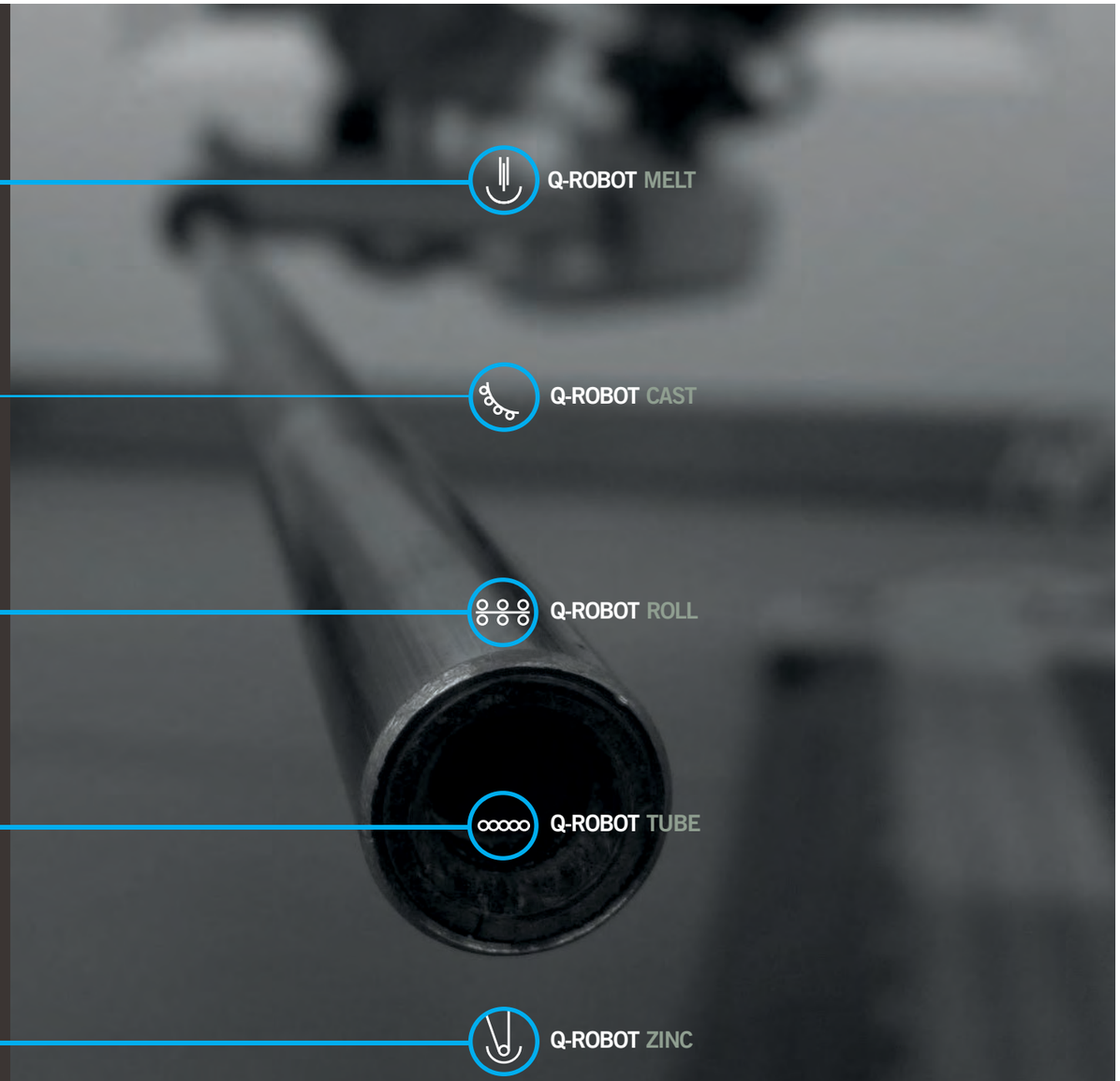
Highlights **DANIELI AUTOMATION**

Q-ROBOTS
Complete product range

The future in automation
will include the knowledge
in the system, and assign people
for safer and higher-level activities.
Danieli Automation represents
an innovative and front-running reality
in Robotics for the metal industry.

ROBOTICS





Up to 1% higher yield thanks to new L2 automation system

LONG PRODUCTS

HOT CUT OPTIMIZATION SYSTEM FOR THE SBQ BAR MILL AT GERDAU PINDAMONHANGABA, BRAZIL

The demand for higher plant productivity and yield is always rising, aiming to reduce as much as possible the quantity of scrap material generated during the rolling phase, especially from SBQ mills.
These plants are characterized by highly fragmented production in terms of rolled lots, each one with different requirements for commercial product lengths.

The new cut optimization system helps in selecting the best commercial length for each production order, within a set range, in order to maintain the highest level of productivity and to minimize the quantity of scrap produced.
The Level2 hot cut optimization system installed successfully at Gerdau Pindamonhangaba, uses the weight of the billets charged into the furnace to predict how to divide the bars optimally on the cooling bed, according to the best commercial length selected within the length range associated to each production order.
The system, thanks to the tracking of material along the mill, automatically sends, billet after billet and order after order, the cut pattern to the hot dividing shear, preventing any operator errors.

Thanks to the real-time setup of the dividing shear it's possible to maintain a small inter-billet time, even between different production orders, preventing the operator from changing the setup manually and increasing the inter-billet time.
Billet after billet, the system compares the real length measured by the speedometer located at exit of mill (before the dividing shear) with the estimated one, and calculates the correction factor to be used for the next billet to be rolled; this allows a better estimation of the lengths for the next billet, compensating for changes in the final section of the rolled material.
The added value of the system is expressed in:

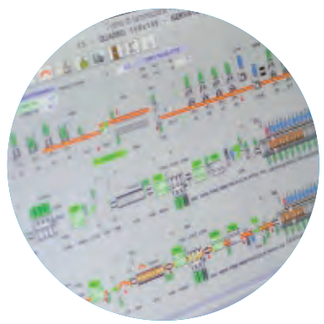
> Minimization of scrap, selecting the best commercial length inside the range indicated, increasing the yield;
> Maintaining high productivity, feeding finishing area with layers of bars with homogeneous length;
> Prevention of human errors through the real-time setup of the dividing shear.

GERDAU

Revamp of bar and wire rod mill control system

AT KYOEI STEEL, VIETNAM

Kyoei Steel Viet Nam Co., Ltd. (KSVC), one of the largest steelmakers in Vietnam, has contracted Danieli Automation to modernize the automation system of the bar and wire rod mill located in Tam Diep Industrial Zone (Ninh Binh Province).
The rolling mill, not supplied by Danieli, will have the existing control system, based on proprietary and obsolete cards, upgraded with new operator workstations, new mill speed control, and shear PLC new main control desk, and FDA system.
The new automation will provide all the features of a modern, state-of-the-art mill, such as interstand tension and loop control, shear cut optimization, and automatic cobble detection, which together with an advanced diagnostic system will contribute to improve the plant performances.
Moreover, the new system will be based only on standard components available on the market, thereby contributing to the reduction of spare cost and shutdowns.

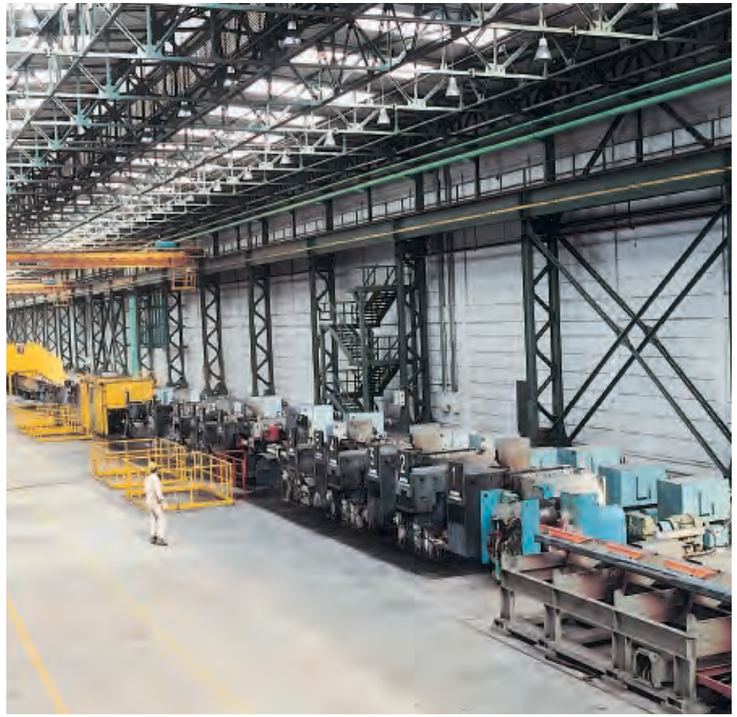


KYOEI STEEL

More efficient and reliable operation

LONG PRODUCTS

ROLLING MILL REVAMPING AT EZZ STEEL REBARS, EGYPT



Ezz Steel Rebar (ESR) is planning some investments to enhance plant performance at the Sadat City facilities, for both the meltshop and the rolling mills.
In September 2014 ESR placed an order with Danieli Automation for upgrading HW and SW of the control system of Danieli bar mill No. 2, originally based on Siemens S5 PLC. Seven PLCs will be replaced with Siemens S7 PLCs, with updated Level 1 software functions for mill speed control and auxiliaries controls. Interfaces and HMI systems also will adopt the latest Danieli Automation design, strengthened by engineering and maintenance tools, such as Engineering Workstation and Programming Units, for easy maintenance of the SW application, and FDA-Fast Data Analyzer for on-line and historical analysis of plant parameters.
The upgrade has a very tight schedule, but ESR can count on Danieli Automation's wide experience in revamping projects for mill controls and on an engineering program consisting of Factory Acceptance Tests to be executed in our workshop before the software delivery, in order to shorten the commissioning times.

ezzsteel
The Middle East Steel Professionals

Danieli Automation special instruments: product quality constantly under control

INSTRU-MENTS

HIPROFILE GAUGES FOR IMMEDIATE QUALITY CONTROL AT GERDAU PINDAMONHANGABA, BRAZIL

Two HiPROFILE gauges will be installed in the SBQ bar and wire rod mill No. 2 in operation at Gerdau Pindamonhangaba (SP) facilities, at the exit of the sizing block and at the exit of the fast finishing block. Another gauge, the HiGAUGE, is installed at the sizing block entry, thereby providing the best configuration for the dimensional control of the rolled material. These gauges will certify the quality of the bars by measuring 100% of the rolled material in hot condition for bars up to 80 mm, and with a very high accuracy (± 0.015 mm). Another HiPROFILE LITE (and HiGAUGE) is installed in the new Pindamonhangaba rolling mill No. 3, providing a certified product and optimizing knowledge and spare parts between the two lines. Critical factors that help the HiPROFILE LITE stand out among its competitors –confirmed by the wide number of references worldwide- are ease of installation, no need for cooling water or compressed air, very low maintenance and spare parts requirements, modular configuration, and robust construction. HiPROFILE LITE is the only gauge now available to the market that is able to measure 100% of rebar products in diameters from 5 up to 80 mm. Thanks to its particular configuration -three heads placed 120° one from the other- it is the ideal solution for detecting rolled products coming from three-roll Kocks sizing and calibration blocks. Both gauges have been delivered in the record time of just three months from the order, and were commissioned at the beginning of 2015.

From left: Peterson Ferreira da Cunha, Project Manager, Gerdau; Marco Castenetto, Area Sales Manager, Danieli Morgårdshammar; Renato Lucas Aparecido Da Silva, Project Engineer, Gerdau; Pedro Koiti Ikeda, Rolling Mill Specialist, Gerdau; Eduardo Viana, Service Engineer, Danieli.

GERDAU STEEL INDIA

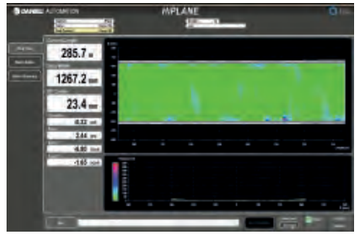
Gerdau Group decided to invest in Danieli Automation also for its section mill located in Tadipatri, installing a HiPROFILE PR84120F model, to measure rounds, round-cornered squares, and flat products.
The gauge will be delivered within March 2015 and commissioned by April 2015.

GERDAU

HiPLANE Flatness detection with laser multisectioning techniques

INSTRU-MENTS

Danieli Automation expanded its portfolio of special instrumentation for hot strip and plate mills with HiPLANE, a new system to measure the flatness of the product. The announcement comes after an onsite installation and the success achieved during the performance validation tests done in recent months. HiPLANE benefits from the long experience of Danieli Automation with the laser sectioning technique, proven by more than one hundred applications in long and flat products. This technique has been improved with an innovative, blue laser line generator capable of producing a series of perfectly spaced, sharp and parallel lines, starting from a single light source. By the use of these multiple laser lines, high-speed, high-resolution cameras and proprietary algorithms of image and data processing, HiPLANE acquires detailed I-Unit and topographic maps and also detects the cross bow and the width of the material, eliminating the disturbances caused by bounces and vibrations due to transportation of the product on the roller table. HiPLANE is interfaced with Level 1 and Level 2 automation to give the information necessary to feedback the flatness control models. The system, installed on a platform above the roller table, works on both hot and cold material and has a modular design to fit to products with different maximum widths.



Old plants made new with low investment

CUSTOMER SUPPORT

OWS AND HMI SYSTEM UPGRADING AT SSB-SOUTHERN STEEL BERHAD, MALAYSIA

Souvenir photo after contract signing at SSB with Ma Kong Chong, Electrical Manager, RM4, SSB (right) and Francesco Zamparo, After Sales Manager, Danieli Automation.

The scope of the work is to upgrade the existing supervision system of the RM4 rolling mill with a state-of-the-art, new OWS/HMI system. The replacement is required due to the obsolescence of the existing HMI hardware and software: the PT/OT system is running on an old software platform (Windows 3.11 operating system) no longer supported, causing limitation and problems in system performances. The proposed new system, running on a Windows 7 Pro operating system, is better performing and much more reliable.
At least the new OWS (recipe system, enhanced PT version) and HMI system will have the same functionality as the existing PT/OT, but with improved user-friendly interface and response time.
The cold test of the new system can be done during normal rolling without interrupting production, in parallel with the existing system.
Installation of modifications in the PLC software (few hours required) could be done during programmed maintenance off day.

AUTOMATION UPGRADING AT PACIFIC STEEL, NEW ZEALAND

The scope of the work is upgrading the automation of the dividing shear, mill auxiliaries, and pinch roll.

Mill auxiliaries
Software and hardware for upgraded mill auxiliaries control, including PLC and Remote Board from S5 to S7, and modifications to existing automation (OWS, HMI and PLCs).

Dividing shear drive full digitalization
The dividing shear drive already operates partially on Profibus (speed reference, speed feedback, and knives position are on the Profibus, but control and status are hard-wired). The necessary software modifications (Drive and PLC) will be implemented to allow full communication between drive and PLC through Profibus.

Pinch roll (before dividing shear) drive full digitalization
The existing pinch roll drive is a Simoreg DC (6RA7031-6DV62-0-Z). A new CBP card (Profibus communication card) will be provided, installed and the necessary software modifications (on drive and PLC) will be implemented to allow the communication between drive and PLC through Profibus.

Automation revamps in Indonesia

CUSTOMER SUPPORT

INTERMEDIATE SHEAR PLC AT PT TUNGGAL JAYA STEEL, SURABAYA

A new PLC Siemens S7 will replace the old equipment (Cabinet L02) and a new PLC software will be developed. The new SW will be linked to the ongoing update to the Danieli Automation dividing shear PLC, to reach the ideal cutting sequences and lengths for a twin channel discharging system and perfect tail optimization lengths. Included in the scope of supply are the technical support for the commissioning advisory service, the cut cycle control, speed, recalibration, head and tail cropping, emergency chopping, shear test cycle, pinch roll, control and cut optimization. Commissioning is scheduled for Q1 of 2015.

REHEATING FURNACE AT PT THE MASTER STEEL MFG., JAKARTA

Danieli Automation will supply software and hardware for the furnace area automation PLC upgrade from S5 to Siemens S7 (32BB.L01) , in order to manage combustion, movements, and auxiliaries of the furnace. This job also will include advisory services on site, and reheating furnace tuning and synchronizing with the on-going Danieli Automation mill speed control automation revamping.
The aim of this revamping is to ensure continuity of the production and avoid sudden stoppages of the plant caused by failures of old equipment.
The revamping consists of different levels of automation, interfaced through a common communication network for integrated and effective plant supervisory control system:

> Operator Work Station (OWS) and HMI to provide the pulpit operators with graphical interface to the plant and basic process control functionality;
> Equipment Control System (Level 1): monitoring, control, and regulation of the mechanical equipment is performed using PLC, interfaced with I/O signals, which executes all control loops, sequences, interlocks, and other functions. Moreover, new and additional functions will be implemented in the new S7 PLC:
> Temperature and combustion control: for each zone, the temperature control loop compares the current temperature measured via thermocouples with the set-point and calculates the amount of heat necessary to have a closer match between the actual and the set-point values;
> Air excess control: the air excess control, integrated with the control of air/fuel ratio described above, guarantees a good thermal efficiency and reduces the scale losses;
> Furnace over-pressure control: the set point for the desired amount of over-pressure to be maintained inside the reheating furnace is set via the OWS. A low differential pressure sensor is used to check the pressure inside the furnace, compared with the atmosphere pressure;
> Combustion air-pressure control: the control system compares the measured value with the set-point set via the OWS, and adjusts it

continuously in order to achieve and maintain a close match between the two values;
> Reheating furnace charging and discharging cycles: the proper material physical flow in the reheating furnace area is controlled in automatic, semiautomatic, and manual mode.

Commissioning is scheduled in the Q1 of 2015.

DANIELI AUTOMATION
PRODUCT LINES

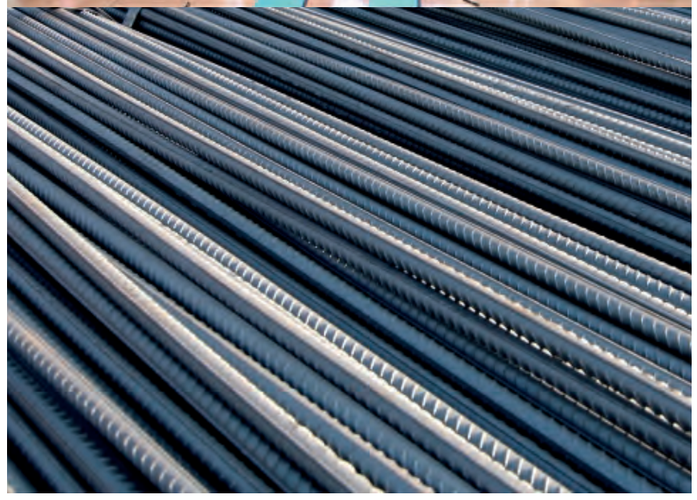
Process Automation and Control Systems
Integrated Production Management Systems
In-Line Quality Control Systems
Contact-free Optical Gauges
Turnkey Electrical Plants
Customized Instruments for Steelmaking

Danieli Automation Q-Robot technology.

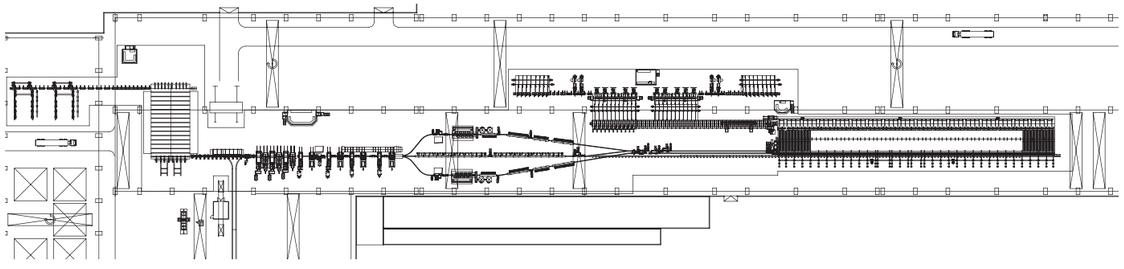
The SteelAsia Manufacturing Corp. expansion project continues with a state-of-the-art, high-speed, high-capacity rolling mill. Once again, Danieli's know-how and rolling technology for long products was preferred.

1.2-MTPY BAR MILL AT STEELASIA, PHILIPPINES

The new mill's product range will be 8 to 36 mm rebars, produced at rates of up to 200 tph, starting with 150-mm billets weighing approximately 2,100 kg. The rolling mill is made up of 14 SHS^{PLUS} housingless stands plus two eight-pass finishing blocks. Through an advanced multi-strand slit-rolling system, rebars from 8 to 20 mm will be rolled on two strands at finishing speeds of up to 40 mps. The plant is completed by a QTB system for the on-line Quenching and Tempering process of rebars, a double HTC-High-speed Twin Channel system, a 102x12-m cooling bed with associated cold-cutting-to-length, automatic bar counting and forming stations with short bar recovery, tying machines for sub-bundles and master bundles up to 2,000 kg, and collecting stations. Danieli Automation will supply Level 1 and Level 2 automation and equipment and process control systems. Plant startup is scheduled for the beginning of 2016 ■



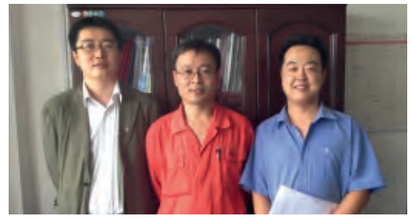
Top, from right: R. Hidalgo, VP Corporate Devt., SteelAsia; P. Repolona, VP Manufacturing, SteelAsia; B. Yao, President SteelAsia; G. Mareschi Danieli, CEO Danieli Thailand; A. Nardone, VP Key Account Mgt., Danieli; C. Pagano, Sales Director, Danieli. Bottom: the plant layout is the typical Danieli high-speed, high-capacity bar mill.



LEADERSHIP IN BAR-IN-COIL PRODUCTION TECHNOLOGY

Bar-in-coil line at Dongbei Special Steel, China

Less than seven months since the contract with Wuxi Walsin Lihwa was signed, another important Chinese stainless and special steel producer -Dalian High Alloy Bar and Wire Rod Co. Ltd. (DSSC Group)- chose Danieli technologies for its bar-in-coil line, reconfirming Danieli's leadership in the long-product market.



On September 3, 2014 Dongbei Special Steel Group Dalian High Alloy Bar And Wire Rod Co. Ltd. placed its order with Danieli for a bar-in-coil line, to produce mainly austenitic, mastensitic, and ferritic stainless steel coils, as well as specialty engineering steels. The new line will be installed in the existing Danieli SBQ plant at Dalian City, and will be implemented with all the latest available Danieli Long Products technologies and equipment, which means the best available on the market.
The highlights of the newly designed line will be the two Garret coilers, of the latest generation; a bar-surface-friendly guiding and defect-free coil handling system feeding the walking-beam conveyor; the DSC-Danieli Structure Control system, including water cooling lines; a walking-beam cooling conveyor; and the Danieli Automation electrical, automation, and process control system.
All this will make it possible to reach the project goals smoothly, and will ensure the manufacturers will achieve a product with superior finish, in terms of coil shape and surface quality. The starting material will be 180 and 150 x 5,000-9,000 mm square billets, producing 14 to 50-mm coiled bars at speeds of up to 16 mps, in coils weighing up to 2.3 t. The whole project will be carried out by Danieli China. Plant startup is scheduled for Q4 of 2015 ■

Souvenir photo of the contract signing. From right: Lu Yi, Senior Engineer of Dalian; Yu Guangjiang, Vice General Manager of Dalian; Li Mengmeng, Sales VP of Danieli China, Long Product Division.

NEW SBQ LINE IN OPERATION
at Nanjing Iron & Steel, China

The Final Acceptance Certificate for the 800,000-tpy bar mill for SBQ products was released in August 2014, the plant having successfully passed all the performance tests with full customer satisfaction.

The plant is comprised basically of a 20-pass, upstream rolling line with H/V SHS stands; water cooling line for LTR-Low Temperature Rolling process; four-pass RSB-Reducing and Sizing Block (equipped with an automatic quick changing system and Danieli Automation's HiGauge and HiProfile on-line measuring/testing systems); a fast transfer device in the cooling bed area for slow cooling; and cutting-to-length, automatic bundling, tying, weighing, and collecting services. Installation of a bar-in-coil line is foreseen in the future. The equipment, process know-how, and automation system provided by Danieli combine perfectly to meet all the requirements of modern SBQ rolling, in terms of finished product quality, high yield, and flexible and consistent operation with minimized maintenance needs. This line is designed to produce 16- to 80-mm bars at speeds of up to 18 mps in a wide range of SBQ steels, including carbon and alloy structural, bearing, spring, cold heading, free-cutting, and anchor chain grades ■

FINAL ACCEPTANCE FOR MEDIUM BAR LINE FOR STAINLESS STEEL
at FDNC, China

Danieli SHS housingless stands confirm their reliability and enhanced performance capability for stainless steel products, once again strengthening Danieli's presence in the Chinese market.

In August 2012, Fujian Dingxin Nickel Co. Ltd. awarded a contract to Danieli for a 500,000-tpy rolling mill for medium-sized stainless steel bars, to be installed at Ningde City. After one year of satisfactory operation, the activities carried out jointly and cooperatively by Danieli and Dingxin teams, have brought the mill to its full performance capability, leading to the release of the Final Acceptance Certificate on January 2, 2014. Full satisfaction and appreciation for the hard work provided by both sides was expressed in a congratulatory letter we received from Dingxin. The medium-size bar line with 11 SHS housingless stands in H/V configuration, and a special cooling bed equipped with double bar synchronized discharging, proved effective in matching the customer's special requirements. Starting from 200x9,000-mm billets, the new line produces 60 to 105-mm round bars at rates of up to 100 tph ■

630,000 TPY
Excellent performance continues at BSRM Steels, Bangladesh

BSRM's 300,000-tpy rebar mill was commissioned in 2008. With continual support from Danieli, the mill has become the world's best performing rebar mill, producing 630,000 t in 2013, and at the same time keeps energy and power consumption to the minimum.

In August 2014 the rebar RM No.1 set a new production record, as explained by Sunil Kumar Das, Head of Operations, BSRM Group:

"…today we have successfully completed the trial run of 50-mm, grade 460 deformed bar. We really appreciate and thank Danieli for the prompt and active support in this matter. We have tested and found the right speed, steel composition, and the QTB properties and process parameters in order to have a suitable and saleable product, good for our domestic and export markets…"

These performances, which further strengthen BSRM Group's position among the leading rebar producers in Asia, have been achieved once again thanks to the solid cooperation established between BSRM and Danieli. Danieli, in turn, is proud to be associated with BSRM Steels, which has selected the best the equipment available to produce prime quality rebars optimizing production costs, yield, and productivity ■

Danieli Training Program for Benteler's Sammy Project in Shreveport (LA), USA

This training program formed an integral part of the contract between Benteler and Danieli for the new, 4.5-inch FQM seamless pipe mill plant. Danieli already has developed, organized, and conducted a training program for employees in the facilities of the Bossier Parish Community College, officially opened on November 6, 2014.

BENTELER

1 Cutting the ribbon for the BPCC. From left: Tim Erway, COO; Ronda Simmons, HR Manager; Patrick Guillaume, Project Director, Benteler Steel/ Tube Shreveport; Bobby Jindal, Governor of Louisiana; Doug Rimmer, President of the Bossier Police Jury.
2 Bernd Brinkmann, and Gianpiero Grandi EVP DCT.
3 Danieli team of specialized training instructors.
4 One of the theoretical training classes.

Around 40 Benteler Steel employees and contractors gathered to help celebrate the official opening of Bossier Parish Community College's $22-million Center for Advanced Manufacturing and Engineering Technology in Bossier City, Louisiana. The 65,000-square-foot training center also will offer training in forklift operation, overhead cranes and programmable logic controllers. Training facilities for both the energy industry as well as manufacturers will be conducted at this Center, too. Construction of the Benteler Steel/Tube Shreveport plant will be divided into two phases. The first phase, due to open in August 2015, is a hot rolling tube mill equipped with several finishing lines for producing seamless tubes. Phase 2 includes building an electric melt shop for producing high-quality steel on-site. At full production capacity, the project will bring 675 permanent jobs to the Shreveport area.

Workers already have been attending orientation and training programs at the Training Center on BPCC campus since July last year ■

FIRST SEAMLESS PIPES FROM THE FQM MILL *at TMK Seversky, Russia*


1


2


3

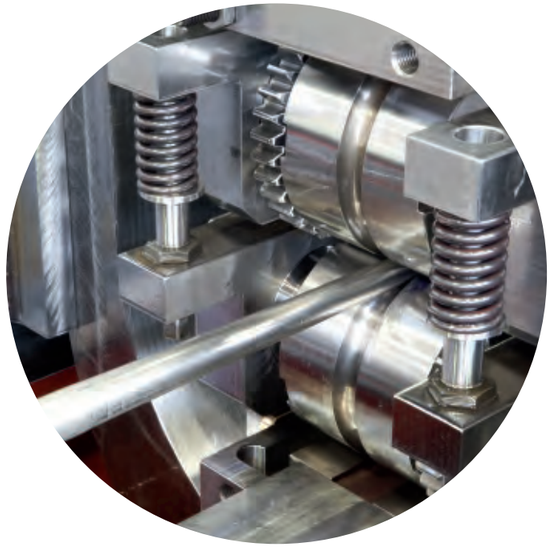
4

Seversky Tube Works, a company of TMK Group, world leader in the manufacture of OCTG premium pipes for the oil and gas industry, began production at its new state-of-the-art FQM seamless rolling mill on July 5, 2014. Eventually, this mill is to replace the hot pilger mill currently in operation at the plant.
A few weeks later, following the cold commissioning of the Sizing Block and the cooling bed/cut-to-length area, the Preliminary Acceptance Certificate was released.
Quality controls performed on the first batch of pipes gave a very positive feedback in terms of geometrical tolerances and internal/ external pipe skin smoothness, leading TMK to start sales activities immediately.
The FQM plant will be capable of producing over 600,000 tpy of high-quality seamless pipes with ODs ranging from 168 to 365.1 mm and with wall thicknesses up to 40 mm. The majority of pipes will be used for gas and oil extraction and therefore must meet extremely high demands where tolerance and quality are concerned, since they are destined for operation under particularly aggressive and complex environments, such as those found in Arctic offshore operations. The production of FQM seamless pipes also will meet the mechanical, structural, and chemical requirements for other demanding applications. The Prime Minister of Russia, Dmitrij A. Medvedev, and the Governor of the Sverdlovsk Region, Yevgeny Kuivashev, recently visited the plant for a meeting dedicated to the presentation of the best available technologies in the industry.
They were given the opportunity to witness the strategic investment program of the TMK Group, which aims to secure for the company a leading position in the worldwide OCTG seamless pipe market.
TMK and Danieli teams will continue their solid and successful cooperation to fine-tune the mill during hot commissioning in order to accomplish all contractual performance parameters ■

1 Boris Pyankov, Production Director of TMK Seversky, congratulates Davide Marino, Site Manager of DCT, for the successful plant startup.
2 The first tube rolled entering the intermediate reheating and normalizing furnace.
3 Souvenir photo for the Danieli team that carried out the plant startup and commissioning.
4 The five-stand FQM-Fine Quality Mill.

COLD PILGER MILL FOR TUBES AND BARS *at NFC, India*

According to the contract signed in March 2014, Danieli Centro Tube (DCT) will supply a "Quarto"-type Cold Pilger Mill (CPM) with an innovative design that will represent a step forward in the cold rolling of zirconium alloy seamless tubes and bars.



Established in Hyderabad in 1971, NFC is now the Government of India's major industrial unit in the Department of Atomic Energy. Its mission is to fulfill the requirements for nuclear fuel and zirconium for the country's nuclear power program. NFC is a unique center for manufacturing of reactor fuel and other reactor core components, starting from ore concentrate to finished ready-to-use products.

NFC is recognized worldwide as a center of excellence in theoretical and applied R&D in zirconium alloy tubes used for cladding in nuclear reactors. Consequently, DCT is extremely proud of this first order, which was secured by winning an open tender. For NFC this order is especially important since it is an integral part of a global strategy that anticipates important investments over the next few years to modernize the existing cold workshop in Hyderabad. The main goal is to increase the current production capacity by installing additional state-of-the-art CPMs capable of producing very high quality products and reducing to a minimum the percentage of defective tubes rejected after cold pilgering. Cold pilgering is a longitudinal cold-rolling process where the diameter and wall thickness of the tubes are reduced simultaneously using ring dies and a tapered mandrel in a large number of small forming steps. During each mill stroke a pair of grooved rolls rotate back and forth in synchronization with the movement of the cassette. Tube feeding and turning can occur at the two ends of the stroke positions. The project at NFC foresees the design, fabrication, supply, advisory supervision of installation, commissioning, and performance test demonstration of the Tube / Bar reducing mill (right-hand type) for the reduction of Zircaloy or stainless materials, with maximum strength in an initial state up to 1,000 MPa. DCT's Tubular Equipment Division (DTE), in technological partnership with Russia's JSC Institute Tsvetmetobrabotka, is one of the few suppliers that maintain an unquestionable knowledge in all technological parameters involved in the cold pilgering process. This unique piece of technology, which has to reduce hollow and solid bars of zirconium by matching many critical requirements -chemical composition, mechanical properties, room and elevated temperature tensile strength, hardness, corrosion (water/steam at elevated temperature), microstructure soundness, visual and surface finish and dimensional tolerance- requires a perfect combination of highly sophisticated technical solutions in mill design and deep-seated technological knowledge. NFC selecting DCT as a supplier for this project is an impressive result and opens very interesting opportunities for the future, especially considering India's massive plans for expansion to increase the country's nuclear power generating capacity. After the commissioning of the first CPMs supplied to Rosatom-Tvel-Elemash, this new order solidifies DCT's position as a supplier of state-of-the-art Cold Pilger Mills for cutting-edge applications. Furthermore, over the next few years the Corrosion Resistant Alloys (CRA) sector will be one of the key drivers in the OCTG market, which is characterized by the development of unconventional resources, such as shale gas, shale oil, and tight sands. Deep well, high temperature and pressure, sweet and high-corrosion environments are progressively required to implement highly sophisticated materials. Traditional carbon steel API grades are inadequate for many applications, therefore carbon steel with enhanced sour service performances or martensitic grades (13Cr and Super 13Cr) are becoming increasingly important.
In highly corrosive conditions, when ferritic-austenitic grades are required, Danieli is able to provide solutions in order to produce OCTG tubes using the hot extrusion process followed by cold pilgering. The enhancement of equipment like CPMs for CRA and coupling and tube threading machines for premium connections was the precedent for opening DTE's dedicated offices in Brescia, where all efforts related to the development of these new technologies could be concentrated.

Ever since DCT was established in 2004 its top priority has been to develop new technologies and equipment for tube production. Now, a decade later, this order from NFC offers a breakthrough opportunity for collaboration with this company, to solidify and promote DTE's efforts in cold rolling of non-ferrous metal seamless tubes for niche applications ■

Inauguration of new tubing factory *celebrated at TPI, India*

The high-efficiency ERW tube welding line installed at Tube Products of India marks a milestone for increasing Danieli W+K presence in India.

In October 2014, TPI-Tube Products of India celebrated the successful launch and startup of the new Danieli W+K ERW tube welding plant which includes a finishing floor. This plant has been installed at TPI's Tiruttani facility near Chennai, and is designed to process a max. OD pipe of 180 mm and wall thickness of 12.7 mm.
The finished products are high-precision and thick-walled tubes for the material handling and automotive industry and hollow sections used for construction. The inauguration ceremony for the plant was attended by a crowd of more than 300 distinguished guests and was opened by the Chairman, A. Vellayan, Vice-Chairman M. M. Murugappan, TPI's President, K.K. Paul, and by TII's Managing Director, L. Ramkumar.
By establishing the new greenfield Tiruttani factory for precision tubing, including the new ERW tube welding line as well as tube drawing and finishing lines, TPI will be in a position to explore new markets for thick-walled precision tubes with extremely high tensile strengths.
Supply of Danieli W+K's ERW tube welding line was performed in close cooperation with the technical team of TPI and features state-of-the-art technology, which will result in high performances for high-precision finished products and high production speeds.
The new line is fitted with a flying saw, designed as a two-blade multi cutter, an automatic inside scarfing system, and a finishing line with an automatic bundling station. During the opening ceremony, TPI's President emphasized the excellent and extremely close teamwork that has been established between TPI and Danieli W+K. This no doubt will guarantee the success of any future cooperation ■

200-tph reheating furnace *commissioned at Vizag Steel, India*

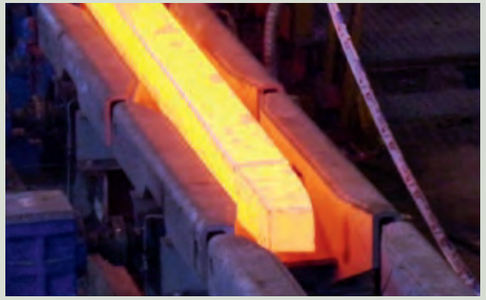
OFFICIAL OPENING CEREMONY FOR THE COMMISSIONING OF THE 200-TPH STRUCTURAL MILL FURNACE TOOK PLACE ON SEPTEMBER 25, 2014.

This milestone is another feather in the cap of Danieli Centro Combustion (DCC) in its ongoing co-operation with Rashtriya Ispat Nigam Ltd. (RINL), also known as Vizag Steel. VSP agreed wholeheartedly with DCC's plan for starting the furnace, and particular appreciation was extended to the DCC Team working at the project site in achieving this important milestone. Shri Rakesh Singh, India's Secretary to the Union Ministry of Steel, had the honor of lighting the furnace for the first time and declaring the STM furnace "commissioned". DCC also is constructing similar types of reheating furnaces for other major steel producers in India, such as 220-tph walking-beam (WB) furnace for JSW Toranagallu, Karnataka; 245-tph WB furnace for JSW at Dolvi, Maharashtra; 90-tph WB furnace for Jayaswal Neco Industries at Siltara in Raipur; 100-tph walking-hearth furnace for Suryadev Alloys & Power in Chennai. DCC already has commissioned a 110-tph WB furnace for Bhushan Power & Steel at Jharsuguda, Odisha; a 30-tph walking-hearth furnace (for 100% stainless steel) for Mittal Corporation at Indore, Madhya Pradesh; a 50/70-tph WB furnace for Sunflag Iron & Steel at Bhandara, Maharashtra; and a 30-tph pusher-type furnace for Tecpro System, at Alwar, Rajasthan. In recent years, growth in the Indian steel industry has been not only encouraging but also has demonstrated consistency. DCC's development strategy is closely aligned with an expected increase in sales in the Indian steel industry. This variation in the supply of different types of reheating furnaces with different capacities offers DCC an even more competitive edge and over the next few years it is foreseen that DCC will become the key player for the design and supply of reheating furnaces in India. Stefano Deplano, Managing Director of DCC, described this co-operation with RINL as an important and strategic one, toward expanding operations in India and contributing to India's ambitious plans to grow its steelmaking capacity to over 150 Mtpy in the near future ■

Sri Rakesh Singh, IAS, Secretary to GOI, Ministry of Steel commissioning the reheating furnace, in the presence of Sri Lokesh Chandra, IAS, Joint Secretary, Sri P. Madhusudan, CMD, RINL, directors and union leaders.

Souvenir photo for the DCC site team in front of the plate celebrating the event.

ACCEPTANCE OF THE 220-TPH WALKING-BEAM FURNACE *at JSW Steel, Toranagallu, India*



On February 28, 2013, Danieli Centro Combustion and Danieli Centro Combustion India (DCCI) were awarded a contract to the design, supply, and commission a 220-tph walking-beam furnace to be installed at the 1.2-Mtpy Rebar Mill of India's single largest steel complex, JSW Steel located in Toranagallu, Karnataka. The Preliminary Acceptance Certificate (PAC) was signed on October 9, 2014. The furnace is processing low and medium carbon steel grades and is fed by mixed gas rated at 1,850 kcal/Nm³. The furnace light-up procedure started on August 31, 2014. The first hot billet was discharged from the furnace on September 20, 2014, shortly after the refractory dry-out cycle. Furnace light up was achieved in the record time of 18-month period from the contract coming into force.

This event marked another new milestone for DCCI, which continues to expand rapidly in response to the increasing demands of the reheating furnace market in India ■

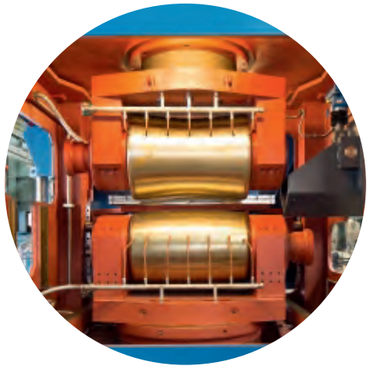
New heat treatment furnace for heavy bars *at Ascometal Les Dunes, France*

On October 1, 2014, Ascometal, a European market leader in special steel long products for all major markets, including automotive, bearings, spring, oil and gas, and mechanics, awarded Danieli Olivotto Ferrè a contract to update the heat treatment facility in Leffrinckoucke, near to Dunkerque in France.
The turnkey supply of a new batch roller hearth furnace shall increase the capacity of the already up-and-running heat treatment facility.
The furnace design is identical to the furnaces supplied by Danieli Olivotto Ferrè originally in 2007, and will perform tempering, softening, annealing, and other thermal processes. An inner chamber equipped with a combustion system and high-temperature recirculating fan will make the furnace capable to perform optimally within a wide range of temperatures (from 450 to 760 °C) and reaching challenging temperature uniformity of +5 °C for each single bar layer treated in the batch mode. Processed bars range from 80 to 313 mm in diameter and 4 to 14 m in length, for a maximum single bar weight of 5.3 t.
The furnace has a maximum load capacity of 42 t.
Since the new furnace will be an exact copy of the ones already in operation at Ascometal Les Dunes, the order was placed under the condition that the challenging target of the furnace entering into production in April 2015 was met. This order marks a significant step forward for Danieli Centro Combustion, increasing its visibility and expertise in this particular market sector where Ascometal Les Dunes is a leader ■

Heavy-duty straightening machine for large rounds
at Acciaierie Venete, Italy

ACCIAIERIE VENETE

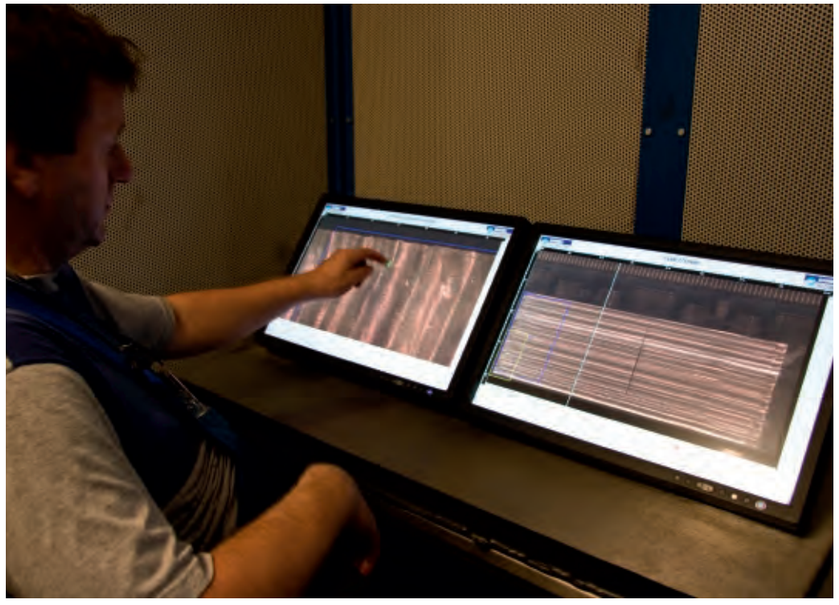
Danieli Centro Maskin was commissioned by Acciaierie Venete, Italy, with the supply of a heavy-duty RLL 250 two-roll straightener. The machine, the largest in Danieli Centro Maskin product range, features a huge straightening force of 9,000 kN, allowing optimal straightening of high-strength special steel bars. Automatic setup of machine settings allows minimal production changeover times, increasing plant yield and minimizing downtimes due to operator errors. Safety systems integrated in the machine prevent damages due to uneven shape of hot rolled bars, reducing maintenance costs while allowing superior straightening speeds.
Two-roll straightening of big bars offers many advantages compared to alternative methods (e.g. multi-roll straightening and press straightening) including better quality finished product due to the homogeneous straightening results along the complete bar length; this application, however, requires a deep knowledge of the straightening process and a state-of-the-art design, which Danieli Centro Maskin gained through more than 60 years of experience and 250 worldwide references ■

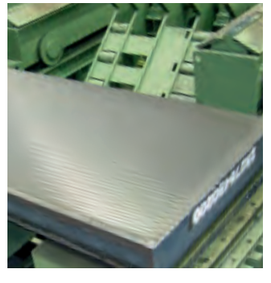


From left: T. Maneo, Cold Finishing Manager, Acciaierie Venete; R. Palermo, Sales Area Manager, DCMK; G. Zuccaro, Plant Manager, Acciaierie Venete; L. Crespan, EVP, DCMK; F. Magni, JAM, Danieli.

INNOVATIVE SLAB-CONDITIONING TECHNOLOGY
ordered by Baosteel, China

Baosteel, one of the leading special steel producers in China, has extended its already close cooperation with Danieli Centro Maskin by assigning a new order for a slab-grinding plant at their Baoshan Works. Carbon steel slabs will be subjected to primary conditioning by scarfing, and then inspected and ground to ensure 100% quality control. Inspection will be implemented by means of the unique Danieli Automation IntelliGrind system equipped with DDS-Depth Detection Survey technology, to ensure automatic detection of the defects and data transmission to a set of two, 630-kW SuperGrinders, the most powerful grinding machines available on the market. Each unit also will be equipped with a 200-kW edge grinder to assist the main units in the conditioning of the slab corners. The plant is designed to inspect and grind 1 million tpy of slabs at a maximum surface temperature of 800 °C. All slabs coming out of the four-face scarfer located upstream will require near end grinding. Part of the product mix will require spot and pattern grinding, while a certain amount of full skin grinding also will be needed. This is why, in order to effectively respond to the demand for high production capacity together with flexibility of operation, two SuperGrinders working in parallel were selected by Baosteel. Danieli Centro





Maskin grinding units are recognized worldwide as the most appropriate conditioning tool for all steel grades, combining high capacity with unparalleled precision, quality, and consistency in the grinding depth removal thanks to the unique Hi-Grind technology. The new plant will offer a level of process integration and automation never experienced before. The "human factor" will be drastically reduced, with no worker being required to operate on the shop floor. After having supplied and successfully commissioned similar plants over the past three years at Ilva (Riva Group) in Italy, and Posco in Korea, the Baosteel plant will take another step forward in slab-conditioning process technology. The plant is designed to increase the production volume of high-quality carbon steel coils, primarily for the automotive and other demanding applications, such as for pressure vessels and shipbuilding plates.

The plant is scheduled to enter into operation in late 2015.

Danieli Centro Maskin and Danieli Automation, with feedback from over 1,000 customers, will launch further technical developments in the coming years for conditioning of both flat and long products to help steel producers to raise productivity of highest quality products even further, while at the same time reducing the operational costs ■

BAOSTEEL

NEW SLAB GRINDING PLANT IN OPERATION
at Posco Gwangyang, Korea

The new plant in Gwangyang has made great strides in carbon steel slab processing, a market segment in which the increasing demand for high-quality conditioned material from specific markets, such as automotive, is constantly increasing. In this same context, the necessity to minimize the over-removal of material, and at the same time to ensure a very high productivity under any production conditions, makes the Danieli Centro Maskin Super Grinders the optimal solution.

In October 2014, Danieli Centro Maskin successfully completed the commissioning of the new slab grinding facility at Posco Gwangyang. This new plant will operate mainly on ultra-low carbon steel grades for applications in automotive sector. The plant, fully integrated online downstream of the caster, is designed to offer high flexibility in conditioning methods, able to operate in both full skin and spot grinding modes, as well as to support a scarfing plant by completing the grinding of the near ends of the slabs that, as is well known, cannot be conditioned with a four-face scarfer. The plant is fully automated, integrally and remotely controlled by a separate operating room located in appropriate position to survey the entire handling, inspection and conditioning process. The incoming slabs are 12-m long, 250-mm thick with maximum width of 2.2 m. This new grinding plant consists of two main HGS300 units, equipped with 315-kW main grinder and 90-kW edge grinders to assist in edge and corner conditioning.
The plant already operates almost constantly in hot conditions with slab surface temperatures up to 800 °C, thanks to the exclusive CASTGRIND design. This is the technology for hot grinding developed by Danieli Centro Maskin in the mid 1990s and now extensively adopted in many plants worldwide, mainly for integrated plants, but very frequently also in case of off-line, stand-alone grinding units. Smooth and efficient commissioning operations were made possible by the co-operation between Posco and Danieli Centro Maskin, a long-lasting relationship that counts today over 30 units in operation at the various Posco Works. At full steam, the new facility is set to process up to 1 Mtpy of slabs thanks to the high flexibility offered by Danieli Centro Masking with its selective grinding approach, the benefits of the HIGRIND system, and the E-CUBE technology -derived from 50 years of grinding experience- that optimizes grinding wheel life by automatically varying the grinding wheel angle on the slab ■

posco

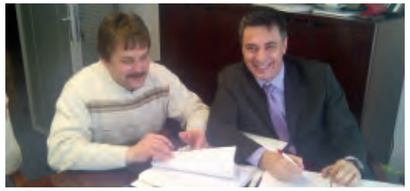
COIL-TO-BAR DRAWING LINE AT DEW, GERMANY

The special steels processing plant of DEW-Deutsche Edelstahlwerke in Hagen, Germany, will install a complete coil-to-bar drawing plant, supplied by Danieli Centro Maskin. The line will produce cold-drawn, cut-to-length, and chamfered bars of up to 16-mm diameter in a wide range of special steels. The key technological detail of the line incorporates the Danieli chain-track drawing unit rather than a conventional, cam-based drawing unit, since the Danieli chain-track system with over 30 years of reference plants, was proven to guarantee numerous operational advantages ■

Souvenir photo in Hagen. From left: Ingo Robin, Maintenance Manager, DEW; Benedikt Lotz, Technical Office, DEW; Markus Liedlich, Cold Finishing Manager, DEW; Kristiaan van Teutem, EVP Danieli Centro Maskin; Ulrich Schmitz, Bright Bar Project Coordinator.

35-MN OPEN-DIE FORGING PLANT
at Ruspolymet, Russia

Signing the contract, with Evgeny Prikazov, Director of Ruspolymet (left) and Massimiliano Mancini, Sales Manager of Danieli Breda.



Ruspolymet Group is involved in the manufacture and sale of rings and forged products in high-alloy steels, Ni-base and Ti-alloys, destined mostly for critical applications in nuclear, aerospace, avionic and military markets. The Company's manufacture of aerospace rings stands today as benchmark in Russia, boasting an annual turnover of 150 M Euro.

In March 2014, only four years after an earlier order, Ruspolymet OJSC awarded Danieli Breda with a new contract for the construction of an integrated plant to be located in Kulebaki (Nizhny Novgorod region). The new open-die forging plant is based on a modern, 35-MN two-column forging press integrated with a 12-t rail-bound manipulator. The Danforge® automation system will enable Ruspolymet to process up to 12t ingots of extremely critical alloys (e.g. HS alloys, Inconel, Ti-alloys) with maximum efficiency and reliability. The new facility, featuring all up-to-date advanced features in open-die forging technology, developed by Danieli Breda, is an integral part of the Kulebaky Works Phase 2 modernization program,initiated in 2010 to expand the product portfolio and enter into an even more challenging and competitive market ■

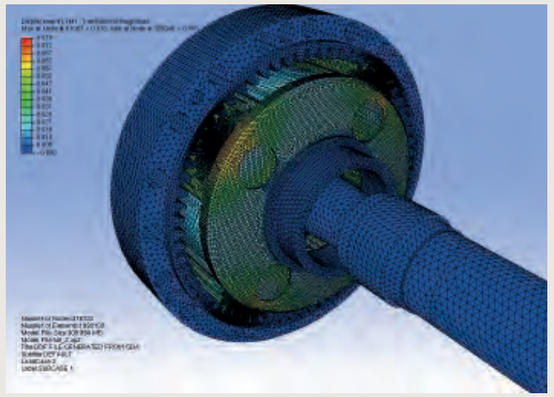
DRIVE THE FUTURE

> GEARBOXES:
PARALLEL AXES, ORTHOGONAL AXES, SPEED INCREASER, GEAR CHANGE REDUCER, PLANETARY GEARBOXES

> DANJOINT SPINDLES:
UNIVERSAL CARDAN, SLIPPER-TYPE, GEAR-TYPE

> COUPLINGS:
GEAR-TYPE, SHEAR PINS (SAFETY DEVICE)

100 years of expertise for gearboxes and drivetrain equipment



DANIELI TRANSMISSIONS
DRIVETRAIN TECHNOLOGY

100 years of expertise
for gearboxes
and drivetrain equipment

Mill stand drivetrains are critical components for metal processing plants seeking to achieve and maintain high levels of performance. From high-torque (up to 20,000 kNm), reversing or non-reversing, roughing mills to high-speed finishing stands, power transmission must be delivered with exceptional reliability.
The drive technologies for rolling mill stands is one of the most important fields of activity for the newly formed Danieli Transmissions product line, but drive systems are developed for different machines in the metal industry, such as uncoilers, recoilers, revolving furnaces and drum shears, crop shears, levelers, flatteners, tilting drives, edging stands, hoisting reducer, etc.
Danieli Transmissions establishes in one team all the Group's power transmission technical expertise, to achieve the perfect combination and integration among the different machines and arrangements of motors, gearboxes, couplings, pinion stands, and spindles required to suit the most demanding requirements. The new product line includes designs and manufacturing for:

> **Gearboxes**: Parallel axes, orthogonal axes, speed increaser, gear change reducer, planetary gearboxes;

> **DanJoint spindles**: Universal cardan, slipper-type, gear-type;

> **Couplings**: Gear-type, shear pins (safety device).

To complete the power transmission package, the Condition Monitoring System can be included in mill drivetrains to allow recording and control for spindle torque, gearbox vibration, and lubricating oil contamination levels, to improve the maintenance organization and avoid unexpected plant stoppages due to machine failure.
Modern, powerful, and high-precision machine tools, together with highly skilled operators, make it possible to manufacture an ample range of equipment that will satisfy even the most demanding requests, such as:

> Case-hardening helical gear wheels up to 40 mm of module and 20 tons of weight.

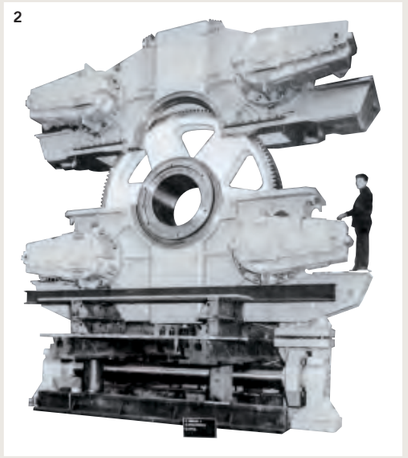
> Cardan shafts up to 1,400 mm diameter and a torque capability of 16,700 kNm.

> Slipper-type spindles up to 1,400 mm diameter and max. torque of 19,930 kNm.

> Gear-type spindles up to 1,100 mm diameter and max. torque up to 20,100 kNm.

DRIVE THE FUTURE

1



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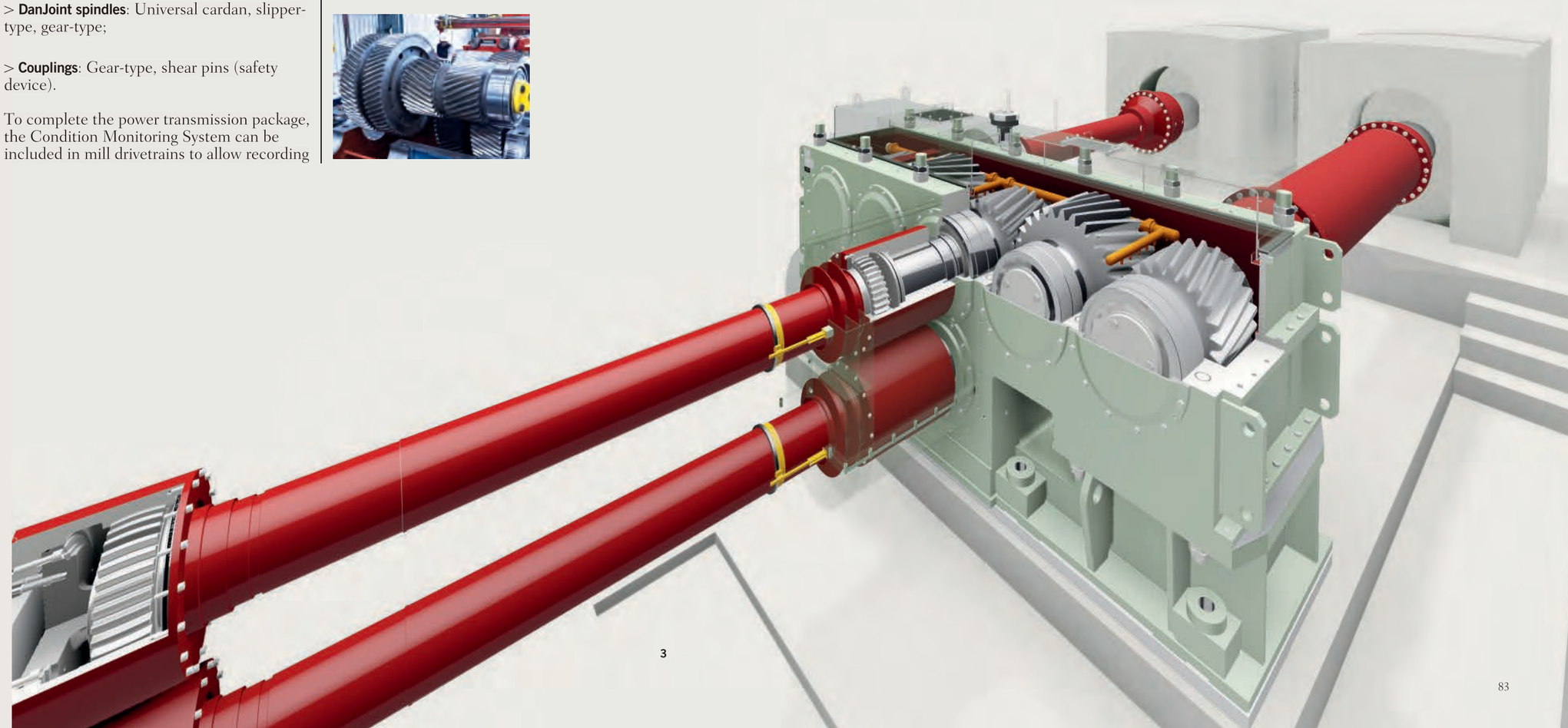


3

1 Assembly of a combined gearbox/pinion stand for a three-pass roughing mill for long products ('60s).
2 Main gear housing in an oxygen converter gearbox.
3 Rendering of a gearbox for aluminium cold rolling mill stand designed for a total installed power of 8,400 kW, max. rolling torque 730 kNm, and max. speed 930 rpm.

RECENT PLANT DRIVETRAIN PROJECTS

DRIVE THE FUTURE

COMPLETE PROJECTS

Hot plate mill for aluminum
KUMZ, Russia

> Reversing roughing mill stand: total installed power 14,000 kW, max. rolling torque 5,570 kNm, max. speed 80 rpm, equipped with two DanJoint slipper-type spindles 1,400 mm dia. (the biggest supplied so far), drive-side oil lubrication and roll-side grease lubrication, 8° max. angle.
> Finishing mill stand: total installed power 9,000 kW, max. rolling torque 3,782 kNm, max. speed 150 rpm equipped with two DanJoint gear-type spindles 845 mm dia., continuous oil lubrication, 2.5° max. angle.
> Vertical edging stand: total installed power 1,500 kW, max. rolling torque 141 kNm, max. speed 1,500 rpm, equipped with two DanJoint cardan-type spindles 490 mm dia., grease lubrication, 10° max. angle.

Hot strip mill
Southern Steel, Malaysia

Reversing roughing stand: 1,500 kW, max. speed 800 rpm, max. rolling torque 3,690 kNm, equipped with two reversing DanJoint gear-type spindles 750 mm dia., continuous oil lubrication, 2.5° max. angle. F1 and F2 finishing stands (10,000 kW total installed power, max. rolling torque 360 kNm,

max. speed 660 rpm) are equipped with DanJoint gear-type spindles, 600 mm dia. continuous oil lubrication, 2.5° max. angle.

Breakdown mill
ABS, Italy

This reversing mill stand (6,300 kW, max. speed 120 rpm, max. rolling torque 6,204 kNm) features the biggest DanJoint cardan-type spindles size 1390 mm dia., grease lubrication, 6° max. angle.

Hot strip mill
Shanghai Meishan, China

Seven finishing stands, total installed power 55,000 kW, max. rolling torque 4,213 kNm, max. speed 600 rpm, 14 DanJoint gear-type spindles 845 to 600 mm dia., continuous oil lubrication, 2.5° max. angle.

Hot strip mill
Middle East

Two roughing stands and four finishing stands, total installed power 50,400 kW, max. rolling torque 9,400 kNm, max. speed 560 rpm, 12 DanJoint gear-type spindles 960 to 600 mm dia., grease lubrication, 2.5° max. angle.

Hot strip mill
OMK Vyksa, Russia

Two roughing stands and five finishing stands, total installed power 53,000 kW, max. rolling torque 7,860 kNm, max. speed 680 rpm, 14 DanJoint gear-type spindles 980 to 600 mm dia., grease lubrication, 2.5° max. angle.

Hot strip mill
NMDC, India

Two roughing stands and four finishing stands, total installed power 56,500 kW, max. rolling torque 9,610 kNm, max. speed 580 rpm, 12 DanJoint gear-type spindles 960 to 600 mm dia., grease lubrication, 2.5° max. angle.

Tandem cold mill
Yieh Phui strip mill, China

Five stands, total installed power 22,000 kW, max. rolling torque 550 kNm, max. speed 1,500 rpm, 10 DanJoint gear-type spindles 390 mm dia., grease lubrication, 4° max. angle.

Section mill
Far East

13 stands, total installed power 16,200 kW, max. rolling torque 1,150 kNm, max. speed 2,000 rpm, 26 DanJoint cardan-type spindles size 600 to 225 mm dia., grease lubrication, 10° max. angle.

Heavy section and rail mill
Mechel Chelyabinsk, Russia

Two universal reversible roughing stands, one edging stander, one universal finishing stand, total installed power 1,500 kW, max. rolling torque 1,722 kNm, max. speed 1,000 rpm, eight DanJoint cardan-type spindles 700 to 600 mm dia., grease lubrication, 5° max. angle.

UPGRADING PROJECTS

Aluminum cold strip mill,
Russia

One stand, total installed power 8,400 kW, max. rolling torque 730 kNm, max. speed 930 rpm, two DanJoint gear-type spindles 495 mm dia., continuous oil lubrication, 2.3° max. angle.

HSS Plate leveler
Anshan Iron & Steel, China

Two drive units for double-cassette leveler, total installed power 2,400 kW, max. motor torque 16 kNm, max. speed 2,000 rpm, two planetary gearboxes.

Hot strip mill
Essar Algoma, Canada

Four finishing stands, total installed power 24,600 kW, max. rolling torque 4,570 kNm, max. speed 450 rpm, four DanJoint gear-type spindles 850 to 600 mm dia., continuous oil lubrication, 2.2° max. angle

Hot strip mill
Erdemir, Turkey

One stand, total installed power 5,966 kW, max. rolling torque 6,107 kNm, max. speed 375 rpm, two DanJoint gear-type spindles 724 mm dia., grease lubrication, 4° max. angle.

Hot strip mill
Sahaviriya Steel Ind. Thailand

Two finishing stands, total installed power 10,400 kW, max. rolling torque 585 kNm, max. speed 400 rpm, four DanJoint gear-type spindles 630 mm dia., continuous oil lubrication, 3° max. angle.

Plate / Steckel mill
JSPL, India

One stand, total installed power 11,185 kW, max. rolling torque 2,670 kNm, max. speed 150 rpm, two DanJoint slipper-type spindles 1,220 mm dia., drive-side oil lubrication / roll-side grease lubrication, 6.9° max. angle.

Hot strip mill
Shanghai Meishan. China

Edging stand, total installed power 3,000 kW, max. rolling torque 1,500 kNm, max. speed 275 rpm, two DanJoint cardan-type spindles 900 mm dia., grease lubrication, 15° max. angle.

Section mill
Posco SS, Vietnam

Breakdown mill, two universal reversing stands, one edging stand, total installed power 14,000 kW, max. rolling torque 1,092 kNm, max. speed 1,000 rpm, eight DanJoint cardan-type spindles 650 mm dia., grease lubrication, 5° max. angle.

Bar mill
Ferriere Nord, Italy

20 stands, total installed power 13,850 kW, max. rolling torque 580 kNm, max. speed 1,800 rpm, 40 DanJoint gear-type spindles 450 to 273 mm dia., grease lubrication, 2° max. angle ■

>MH<
ROLLER GUIDE TRAINING AT FERRIERE NORD, ITALY

Danieli Customer Service and Danieli Service teams accelerate the learning curve

Ferriere Nord's bar mill was upgraded in January 2014, a project that also included supplying the new 1100 series roller guides. The latest generation of Morgårdshammar roller guides follows the heritage of the existing 1000 series, the best sellers among >MH< guides since the development of the world's first roller guides in the 1940s.
The new series will ensure the operators have:

> Increased load capacity;
> Increased service life;
> Increased rigidity;
> Simplified guide setting.

Moreover, the new guides use the same consumables and guide mounting as the older 1000 series, and this will reduce the effect on customer's guide replacement costs. A specific, on-site training program for the new guides was organized together with the customer, to present the features of the >MH< 1100 series roller guide, detailing placement and maintenance procedures. Morgårdshammar guide specialists covered the following topics:

> Utilization of the documentation provided to the customer (guide list, maintenance manuals, roll pass design, drawings, BOM).
> Theoretical and practical training for setting all the different guides, according to the stock dimensions (FRS, SR, MDR2, and CTD series).
> Selection criteria of the consumable parts (rollers, entry guide halves, static guides, and pipes) and description of maintenance and assembly procedures (with particular attention to the roller assembly and bearing clearance setting).
> Guide installation and alignment on the stand.

Morgårdshammar guide specialists, together with customer technicians, prepared all the necessary guides for the hot and performance tests, which were passed successfully and in due time. This training effort increased the customers' confidence and reduced the learning curve necessary for the customer's guide technicians to prepare and install the guides properly, according to the product mix. Results confirmed that >MH< guide equipment and specialists represent an added value for the customers ■

FERRIERE NORD

>MH< MORGÅRDSHAMMAR GUIDE ACADEMY

SEMINARS ON ALL TOPICS RELATED TO THE OPTIMAL USE OF ROLLING MILL GUIDING EQUIPMENT WERE HELD RECENTLY IN BRAZIL AND PERU.

During the seminars held at Votorantim's Barra Mansa and for Gerdau's Pindamonhangaba rolling mills in Brazil, rolling mill managers, mechanical engineers, technical department and production personnel, and supervisors had the opportunity to understand the value of roller guides and their influence on plant productivity, operations safety, and finished product quality.
At Aceros Arequipa in Pisco, the customer-focused training sessions provided the rolling mill plant personnel with the main guidelines for properly maintaining and setting different guide equipment. Moreover, the latest MH Guiding Systems developments were presented, focusing in particular on PRG and PRD settings. The customer expressed particular interest in the possibility of a test campaign with the new SRW-E18 special alloy guide for Delta-type high-speed finishing blocks ■

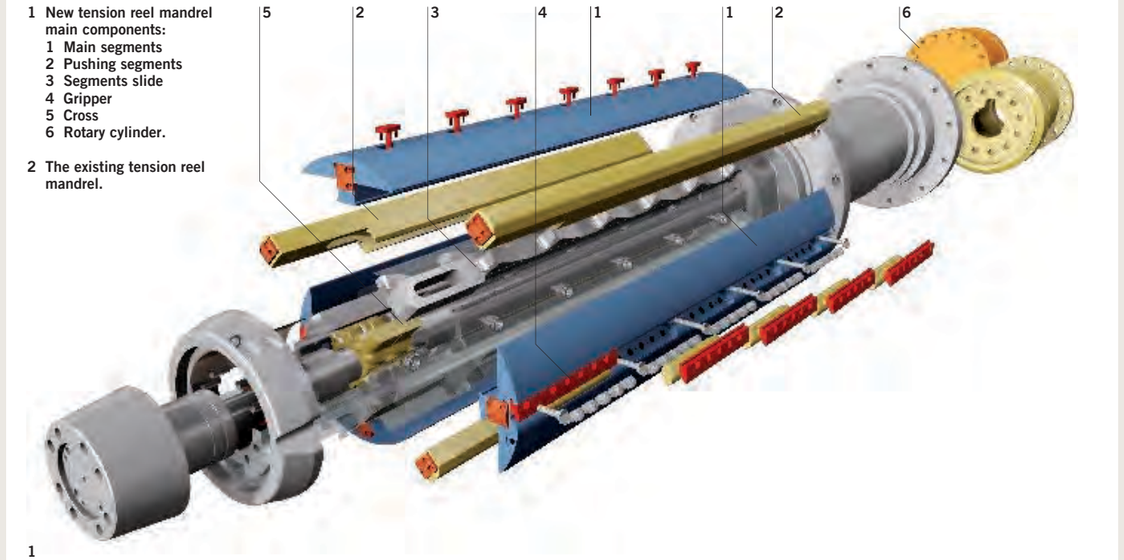
Demands for improving plant performances are continually increasing.
On the other hand, plant production and efficiency are of particular importance to the operators, as is the safety of the environment where they work. To answer these requirements, in 2008 Danieli launched the Guide Academy, a complete course that covers all topics directly related to roller guides (e.g. plant layout, roll pass design, etc.), and provides customers with all necessary elements to increase and develop the operators' know-how. It also is an opportunity to experience all innovations developed by Danieli in this field. Moreover, thanks to the presence of experienced technicians, current and/or potential problems that relate to the customer's plant could be rapidly analyzed.
This is a clear example of how Danieli Roller Guide Division cooperates with customers to improve their production quality and worker safety, and to increase the innovation in this product.

Danieli Service cost-effective plant reconditioning

High-tech capital equipment with improved features selected as cold-mill spare parts at the CSN Paranà complex, in Brazil

1 New tension reel mandrel main components:
1 Main segments
2 Pushing segments
3 Segments slide
4 Gripper
5 Cross
6 Rotary cylinder.

2 The existing tension reel mandrel.



1

Since 2000, Danieli Service has been working closely with CSN to support the steelmaker as needed for technical assistance, spare parts, and training courses. The CSN Paranà cold mill complex includes a push-pull pickling line, a cold reversing mill, and a galvanizing line. On its expansion in 2006, painting and cutting lines were added. All of these lines were supplied by Danieli competitors. After several years of operation

2

CSN decided to purchase two new mandrels as spares for the main tension reels of the cold rolling mill.
A specific supplier selection process was focused specifically on improving the reliability of the tension reels. At the end of the process, Danieli Service was selected thanks to its project characteristics, manufacturing strengths, and already well established reliability proven by the Danieli mandrels supplied in 2008 for CSN's continuous pickling line coilers. The new mandrels will be of the mechanical wedged type for expansion and head gripper slots. Both mandrels will be available for installation in the entry or exit tension reel and will be capable of up-winding or under-winding coils. The modifications to the tension reels will not preclude installing the original hydraulic mandrels ■

Improving machine performances through periodic data analysis

DANIELI CONDITION MONITORING SERVICE

Danieli Service is able to provide a Portable Monitoring Service to apply the concept of predictive maintenance, collecting vibration signals that come from the machines during their work cycles. Through the identification of its own components frequencies, it is possible to evaluate machines' health and look for any fault symptoms at an early stage, while there is still time to take actions. Knowing in advance the real status of each rolling component, including bearings, gears and shafts, it is possible to schedule specific maintenance during the planned stoppages and so avoid catastrophic failures and production losses.

How it works
Our specialists perform the vibration measurements using a portable instrument called "spectra analyzer", provided with a piezoelectric sensor with a magnetic base, placed directly on significant equipment locations, properly identified by Danieli along the drive train of the main equipment, to find sources of possible failures, such as unbalance, misalignment, mechanical looseness, bearings and gears defects, and electrical motors problems.
Data is acquired according to a specific setup and downloaded via a dedicated software for further analysis. Shortly afterward, when the data have been analyzed in detail, customers receive a full report with recommendations for corrective actions.

Where it works
The vibration analysis can be carried out easily on the main equipment of the long and flat rolling mills, such as:
> All types of gearboxes' pinion stands for the roughing, intermediate and finishing area;
> Stands of particular design, such as cantilever stands type ESS;
> All kinds of gearboxes (with bevel gears, parallel axis, epicyclic gearboxes);
> Specific equipment, such as wire rod blocks and loop laying heads;
> Motors;
> Fans;
> Pumps.

The advantages
These lie in the vibration analysis process, performed thanks to:
> Know-how and experience in vibration analysis;
> Skilled field specialists certified as Vibration Analysts according to ISO 18436;
> An extensive database of case histories;
> Specific maintenance advice provided by Danieli's technical department.

Integrated approach
Danieli also can provide specific thermographic data measurements perfectly integrated with the vibration analysis; furthermore, thanks to the mechanical inspection, it's possible to go into deeper detail of evaluation and remediation by a Danieli dedicated department ■

DANIELI CMS ONGOING PROJECTS

> **Feralpi Lonato, Italy.**
Wire rod mill HSB and LLH.

> **Ferriere Nord, Potenza, Italy.**
Bar mill gearboxes.

> **CMC Zawiercie, Poland.**
Bar mill motors and gearboxes, merchant flexible bar mill motors and gearboxes.

> **ALPA, France.**
Bar mill planetary gearboxes and motors.

> **Iton Seine, France.**
Bar mill planetary gearboxes and motors.

> **SAM Montereau, France.**
Bar mill planetary gearboxes and motors.

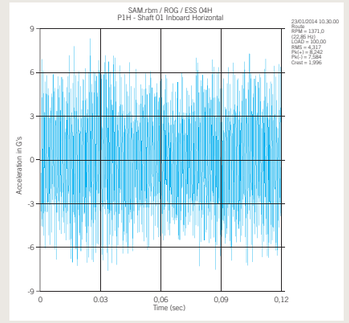
> **Siderurgica Sevillana, Spain.**
Bar mill planetary gearboxes and motors.

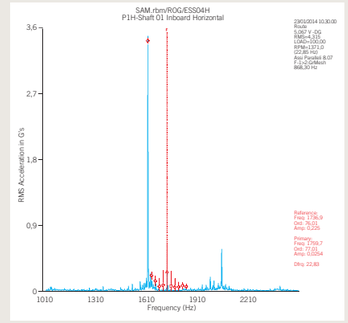
> **Arcelor Mittal, Poland.**
Wire rod mill.

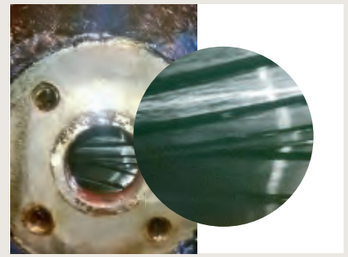
Case Histories
Revealing how this Danieli technical assistance package produces benefits in terms of equipment maintenance and downtime reduction.

SAM Montereau, France
Plant: Roughing mill;
Machine: ESS cantilever stand;
Equipment: Planetary gearbox.

Analysis of the vibration data acquired on the first stage of the planetary gearbox showed significant effects from impact between the gear teeth, with consequent pitting on their surfaces. A mechanical inspection was carried out during the plant shutdown.
The early detection of the defect made it possible to schedule a proper overhaul of the gearbox during planned maintenance activities, avoiding unforeseen breakdown with consequent loss of production.
The big impacts between the gear teeth are reported by the waveform signal, as in figure 1, while figure 2 highlights a high peak value corresponding to the proper gear teeth frequency. The defect detected on the gear of the ESS stand's planetary gearbox (picture 3) is shown in the picture 4.

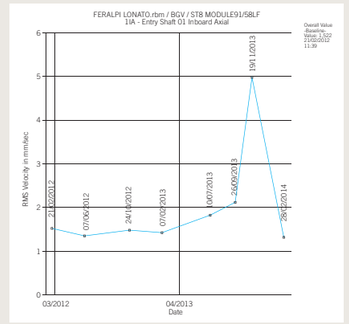


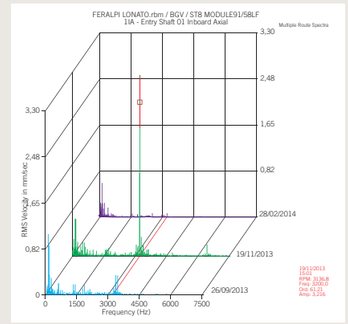




Feralpi Lonato (BS), Italy
Plant: Wire rod mill;
Machine: High-speed finishing block;
Equipment: Gearbox.

The periodic data analysis allows the inspectors to follow the evolving trend of a defect. This case reports a fault concerning broken gear teeth. During the November 19, 2013 vibration measurement, the overall vibration rose to a critical value, as reported in figure 2. Through this analysis Danieli recommended the customer replace the gear with a new one, during planned maintenance stoppage, avoiding a massive unforeseen failure during the production. The last vibration analysis held after the replacement shows a low overall value, a clear signal of a correct working condition (Figure 5, 6)





DANIELI DRC SYSTEM:
PNEUMATIC MANIPULATOR FOR THE SAFEST CHANGING OF ROLLING RINGS ON FAST FINISHING BLOCKS

This innovative device supports maintenance efforts to change rolling rings in fast finishing blocks, assuring a safe and easy procedure for maintenance personnel, and assisting operators in equipment handling and setup.

Strategic improvements in maintenance activities

The Danieli pneumatic manipulator consists of a column on a base plate installed in a fixed or movable configuration, according to the customers' needs. The gripping tool is connected to the manipulator by a pneumatic rotating joint that allows a 360° rotation on its vertical axis; the clamping device is self-balanced for easy manual operation and set to the required angle (0°, 45° and 90°). All arms are manually driven and vertical movements are assisted by a pneumatic balancing cylinder. A single operator can easily manage all movements thanks to ergonomic controls, keeping hands away from heavy tooling. Clamps are designed to meet the specific customer's requirements.

Technical data for standard solution	
Working area	5,400 mm radius over 360°
Lift capacity	50 kg
Air supply pressure	Min. 0.85 MPa
Air supply quality	Dry and filtered
Electrical power supply	Not needed
Quality certified	According to 2006/42/C

Customized solutions are available with different values.

DRC system advantages:

> Avoids operators' manual handling of rolling rings and locking unit.
> Ensures precise and safe on-line setup of the complete ring unit, and its removal.
> Ensures secure pick-up and installation of the ring units on off-line stands ■

Three winning steps for safety and fast setup practice:

- **Step one: gripping of the ring and locking unit;**
- **Step two: ring and locking units self-carrying;**
- **Step three: ring and locking units installation or off-line positioning.**

New Order

Danieli technology: safety and productivity run together

>DRC< Danieli Ring Changing system at the 500,000-tpy wire rod mill at Xingcheng, China

Danieli was awarded a contract by Jiangyin Xingcheng Special Steel Works Co., Ltd. to supply equipment and services for a new, high-speed wire rod line with a capacity of 500,000 tpy of coils. Danieli Service, together with the bar and wire rod team, recommended the Danieli rings changing system (DRC) for this new modern rolling mill, in order to improve operators' safety and make the ring setup more precise.

One year later, Danieli Service agreed to supply three sets of DRC for installation on the 2-stand finishing block (size 250 SHD), on the 8-stand finishing block (size 200 SHD), and on the 4-stand TMB-Twin Module Block.

This is the first equipment supplied by Danieli Service, provided as after-sales for the new wire rod mill that is strengthening our relationship with Xingcheng Group ■

XINGCHENG STEEL

Long-lasting partnership with Kroman Çelik Sanayii, *Turkey*

Refurbishing EAF electrode arms at Danieli Service's Termomakina workshop

Only six months since it was incorporated to the Danieli Group, the first overhauling job was completed successfully at the Danieli Termomakina workshop in Düzce, Turkey. The main activity involved replacing the frontal bimetallic plates of the EAF electrode arm phase 1, installed at Kroman plant in Kocaeli.
The sequence of the main operations performed included removing worn plates by cutting, installing new plates and steel-steel welding, copper-to-copper welding and non-destructive tests, and surface fine machining. The job was completed within the assigned timeframe (from October 3 to 7, 2014, during the Bayram Feast shutdown period). The Termomakina workshop is organized to support customers in Turkey and the surrounding region with machine overhauling capabilities (e.g., oscillating tables, electrode arms, gearboxes, levellers, caster segments, mandrels), bringing new life to existing equipment. Termomakina capabilities include engineering, construction, and startup for a complete range of industrial and port cranes, revamping and upgrading out-of-date cranes, manufacturing of transfer cars, cooling bed equipment, and mining machinery, and to act as a Danieli Service Centre.

Souvenir photo of Danieli Service and Kroman Çelik Executives. From left: Oezguer Yigit and Massimo Badini for Danieli Service; Bulent Senliyim, Investments Manager, Tugrul Yilmaz, Investments Chief; Kavgas Vasilis, Danieli Service, Site Manager.

Souvenir photo after the execution EAF's electrode arm refurbishment at Danieli Termomakina workshop. First and second from left are Enrico Macchiaiolo, Sr. Engineer Maintenance, Steelmaking Danieli Service, and Mahir Bayture, General Manager, Danieli Termomakina.

SUPPORT EXPANDS FROM REFURBISHMENT IN A DANIELI REGIONAL WORKSHOP TO ON-SITE ADVISORY SERVICES

Successful Spooler line restart

The original rolling mill was supplied by Danieli and commissioned in 2005. At that time the market conditions led Kroman to focus its production on wire rod and straight bars, while leaving the spooler area idle. The current steel market makes it possible to reconsider producing spooler products to enhance the steelmaker's competitiveness in a challenging scenario, and rediscovering a hidden potential. Consequently, Kroman requested Danieli Service's support to define and coordinate the needed actions plan.
Danieli Service proposed a project featuring a limited-impact first phase; with a beneficial increase in process reliability expected by implementing minor equipment upgrades.
In a very short timeframe of three weeks, and forced by plant availability for ordinary production purposes, a team of senior specialists from Danieli Service and Danieli Automation Global Service,

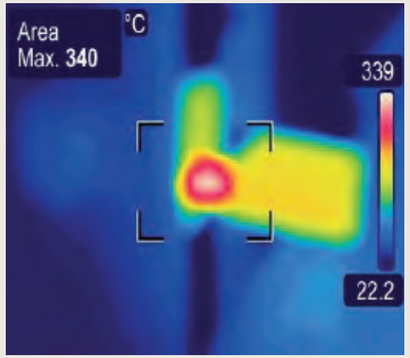
working closely with Kroman's personnel, inspected and refurbished the equipment to restart production of spooled coils. Coils of 16-mm rebar (already processed during the original commissioning phase) were produced smoothly, as were rebar 12 and 10 mm, two new additional products that required dedicated new line settings. Now, 2.6-tons billets are turned into 1,190-mm spools in compliance to DIN 488 BSt500S, at a speed of 26 mps for all the products, and via fast finishing block, and achieving Kroman's full satisfaction ■

INTEGRACTION
SMART SERVICES FOR INTEGRATED SUPPORT

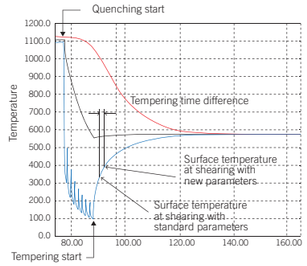
DANCUT

>550< shear blade performance improvement according to QTB parameters

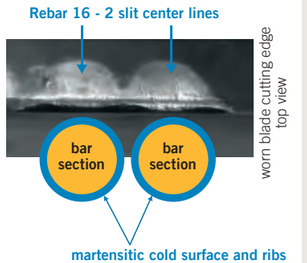
DanCut consultation for shear blades performance improvement



1 Rebar temperature at shear entry with standard QTB parameters.



2 Rebar surface temperature variation due to longer tempering time after quenching. Surface temperature impacts directly on shear blade lifetime performance.



3 Shear blade wear rate due to martensite not completely tempered rebar surface.

Recently Danieli Service provided consultation to EZDK, Egypt, to improve the lifetime performance of DanCut550 shear blades on Bar Mill No. 1 in Alexandria. The main issue under evaluation was determining why RB16 was underperforming with respect to all the other rolled diameters.

Since plant startup, the set-up of the QTB line had been modified, using all coolers in order to maintain mechanical characteristics of the rebar after increasing production capacity and rolling speed (+10%).
A detailed survey of the thermal behavior of the bars from the quenching boxes through the cooling bed and actual working parameters, and some trials held on the plant revealed that such modifications reduced the tempering time of the rebar surface in the travel between the last cooler and the shear, thereby reducing the surface temperature of the RB16 to 340 °C. Considering that the main parameter affecting service life performance of those blades is exactly the surface temperature, Danieli Service suggested optimizing the cooling parameters by switching off the last two coolers and installing a stripper and dryers.
This new arrangement increased tempering time and consequently surface temperature up to 400 °C; the result has been a 2.5-times extension of the blades' service life ■

Shear blade performance for RB 16, two-strand slit before and after QTB parameters improvement.

Before	After - Phase 1	After- Phase 2
Standard shear blade	DanCut550 shear blade	DanCut550 shear blade
2,000 - 3,000 tons	6,000 - 8,000 tons	15,000 - 20,000 tons

+20%

Production records at EZDK, Egypt

The Danieli Service team is proud to receive the feedback of customers satisfied with the quality and effectiveness of its technical support programs:

<... I'd like to express my great appreciation to all colleagues in Danieli Service for their great effort and continuous cooperation during the past year, 2014…who have given us their full support to improve maintenance performance and to achieve our production targets.
I believe that without your great support we would not have achieved the annual production record in 2014 (808,709 tons), which is about 20% more than the 675,000 tons annual nominal capacity of Bar Mill No.1>

Ahmed Emam Noureldin

Mechanical Maintenance Manager
Bar Mill No.1 and No.2 Rolling Mills Department
Al Ezz Dekheila Steel, Alexandria, Egypt.

20,000

DANCUT KNIVES DELIVERED IN THREE YEARS

Danieli Service delivered its 20,000th DanCut knife to Acerbrag, in an official ceremony that took place at that plant in Argentina. The Group's DanCut product line is proud of these results, achieved in service to more than 100 customers worldwide, and providing more than 20 different materials and heat treatments for shear blades. Remarkable improvements have been introduced to this line of products in the past three years thanks to testing and introducing new materials, as well as drawing insights from other industry sectors -like aerospace and military- in order to improve the blades' service life and reduce maintenance costs.

The knife delivered in Acerbrag is made of DanCut 510, an alloy tool steel developed for hot cut shearing of long products that achieves 50 HRC hardness thanks to the heat treatment performed under vacuum ■

Above: souvenir picture of the formal take up of the 20,000th DanCut knife. From left: Marcelo Febre, Long Products Mgr., Acerbrag; Norberto Bertolot, Rolling Mill Mgr., Acerbrag; Walter Max Schmitt, Executive Mgr., Sales, Danieli Service.

Crane modernization
and continuous improvement
with Danieli Service's customized solutions
and genuine spare parts supply.

Customer support for cranes

Danieli Centro Cranes and Danieli Service are committed to excellence through the practice of continuous improvement for modernizing cranes with customized solutions and supply of genuine spare parts. Worldwide, we are servicing more than 600 cranes manufactured by us, and extending technological improvements to equipment supplied by others.

Cranes modernization Revamping and refurbishments are green investments that aim to reduce energy and maintenance costs, comply with new requirements and regulations, and improve safety and reliability regardless of the original crane manufacturer. Modernization is a technological step that favors the environment, investing just a fraction of the cost of a new crane. Our long-term solutions are focused on minimizing downtimes, extending service life, and increasing productivity. We count several successful projects in which we have increased the overall accuracy and reliability through electrical improvements, mechanical re-engineering, and automation upgrades. Recently, Gerdau Açominas commissioned to Danieli do Brazil the safety improvement of its most important technological crane at Ouro Branco plant. The customized emergency brake system will be supplied during March 2015, for installation and startup activities to be performed during a dedicated shutdown of the 330-t teeming crane. Main structure surveys and crane equipment inspections allow us to decide whether to refurbish or replace the worn-out components in order to ensure easier and faster spare availability through our worldwide service network.

GENUINE STANDARDIZED SPARE PARTS AND TAILORED COMPONENTS

Wheels Our forged steel crane wheels assembled with roller bearing and squared-machined supports ensure perfect alignments and easy replacement. Danieli controls the entire wheel manufacturing cycle directly, from material base casting, through precise billets cutting, to final machining. High-quality steel selection and special hardening process enhance the mechanical characteristics of the base material. Heat treatment improves the hardness in depth, reducing the wear and extending the service life: the resulting compression prevents the rolling surface from cracks, pitting, and spalling. Wheel manufacturing is constantly controlled by means of strict quality procedures, such as ND tests and hardness verification. Each piece is eventually marked and historicized in order to ensure global traceability.

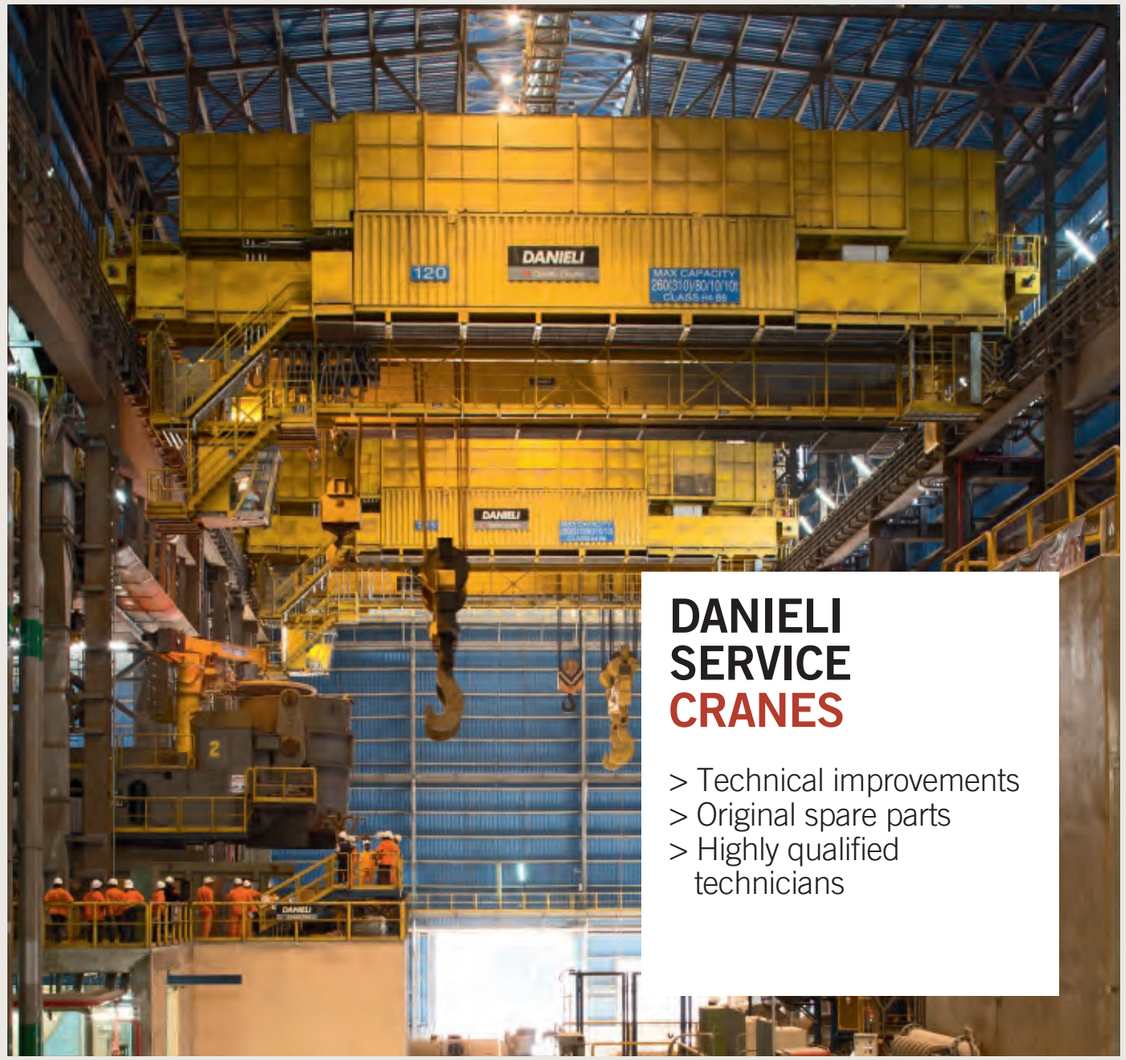
Gearboxes The excellent quality of gearboxes is certified by strict controls on materials, components, heat treatments, and special painting cycles that give them the highest reliability for operations running continuously operations. They may have multiple configurations. HPD type gearboxes can be designed with three or four reduction stages, according to the requested gear ratio, and can be assembled in different input/output configurations. So far, several frame sizes have been standardized, even though tailored solutions of different sizes may be designed and manufactured for particular requirements. The range extends to planetary gearboxes to ensure redundancy and maintenance benefits along operations.

Brakes Drum and disc brakes offer automatic backlash recovery as well as easy and fast shoe/lining replacement. Emergency brakes have a fast response time for increased safety requirements and high thermal linings capacity. Manual compensation of lining wearing, if necessary, is easily completed within few minutes.

Lifting components and other parts On request, Danieli designs original and improved solutions for customers no longer able to find genuine spares on the market: spindles, joints, drums, sheaves, hook blocks, and lifting beams cover just some of our successful supplies.

CRANES ACTIVITY MONITORING SYSTEM

Condition-monitoring systems observe the state of the crane in order to make maintenance management easier and more effective by minimizing spare parts cost, system downtime, and time spent on inspections. The system is designed to monitor, record, and report crane activities tracked through PLC logics. The information gathered can be sent either to operating panels or PC workstations via Ethernet network, to be downloaded and analyzed ■



DANIELI SERVICE CRANES

> Technical improvements
> Original spare parts
> Highly qualified technicians

Nucor Steel Hertford's wide slab caster alignment, USA

MAINTENANCE COMPETENCE CENTER TO LEAD COST-EFFECTIVE MAINTENANCE ACTIVITIES

1

2

10 years after the start-up, and with over 12 million tons of prime-quality steel produced, NSHC once again confirmed its trust in Danieli by assigning the task of verifying the slab caster alignment and taking the necessary action to maintain the prime quality rate for the plate steel market.

Project description
Started up in 2002, the Nucor Steel Plate Mill in Cofield, NC, is one of the largest medium-slab casters in the world -3.200-mm slab wide- and processes a wide range of carbon, HSLA, and pressure vessel-quality steel grades in discrete plates. To guarantee the highest quality for the finished product, the periodical evaluation of the caster alignment is one of the most important factors.
For the past two years this task has been carried out during the annual shutdowns, with the constant on-site presence of Danieli Service personnel to develop, in a spirit of teamwork with the customer's personnel, the main tasks required during the shutdowns and to develop as well the best workshop practices.
Danieli's approach to improve the plant performances is based on the DMAIC technique:

The Danieli Service Maintenance Competence Center provides a wide spectrum of competencies, such as mechanical designers, technologists, laser specialists, mechanical supervisors and maintenance engineers, that ensure cost-effective plant maintenance and upgrading to enhance productivity and quality.

Step 01_Define
> Quality data collect;
> Maintenance practices analysis.

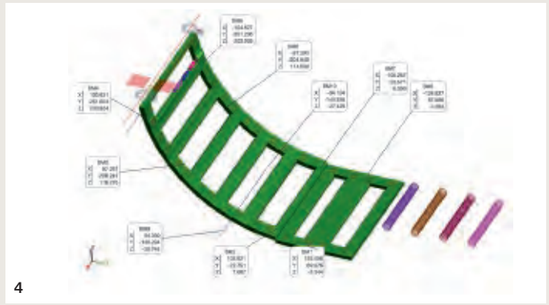
Step 02_Measure
> Stand laser realignment;
> Caster laser measurements during down-time;
> Caster LVDT-Linear Variable Differential Transformer measurements during operation-time.

Step 03_Analyze
> Dedicated team to analyze collected data;
> CAD simulation;
> Improvement solutions;
> Alignment action plan.

Step 04_Improve
> Stand realignment in the workshop;
> Equipment refurbishment;
> Caster realignment.

Step 05_Control
> Metallurgical advisory service;
> Workshop stand realignment, periodic checking;
> Periodic caster checking.

3



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A distinctive aspect of the Danieli's approach to caster alignment is that the caster situation and behavior is determined both during down-time and operating-time, thanks to laser measurements and LVDT-Linear Variable Differential Transformer technology, respectively. With more accurate measurements there are increased possibilities for maximizing the caster's performance and minimizing the Mean Time To Repair in preventive maintenance.

Results
As expected, after many years of operation, the measurements showed small deviations of the caster structure and stands, therefore a corrective action was required.
Due to the massive production volumes and the short time available for shutdowns, the corrective actions were carried out step by step, integrated in the ordinary and preventive maintenance schedules.

Achievements
Danieli Service's intervention soon produced significant effects:
> Product quality improvement: 71% reduction of the already excellent NSHC's global defect rate;
> Downtime reduction for equipment change time during shutdowns has been drastically reduced due to upgrading of several components (e.g.: the time needed to replace the mold oscillator has been halved thanks to a customized frame modification). ■

1 The Danieli Wide Slab Caster in operation.
2 Bender on line checking.
3 Banana vector displacement.
4 Absolute laser measures.
5 Workshop rolls realignment.
6 Oscillator table planarity measurement.
7 Bender sitting on line checking.
8 Bender alignment checking.
9 Banana laser shooting.
10 LVDT positioning.

5

9

6

10

7

8

CCM type	vertical-curved medium slab caster
Main radius	6,500 mm
No. of strand	1
Castable thickness	160 mm in SR to 152.4 mm
	135 mm in SR to 127.0 mm
Castable width	min 1,750 mm
	max 3,350 mm
Number of segments	8
Nominal production	954,737 tpy
Nominal heat size	150 ton

NUCOR

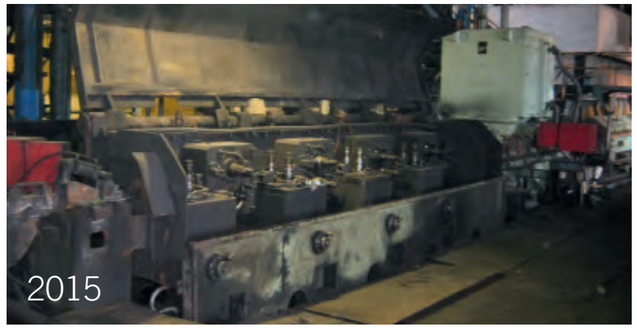
High-quality equipment and service for wire rod production

Souvenir photo with, from left: Alessandro Bertoli, Executive Manager, Danieli Technical Service; Samsul Nurhidayat, Production Manager, PT Ispat Indo; Massimo Rovere, Sales Director, Danieli Service.

In 1977 Danieli supplied a wire rod line to the PT Ispat Indo plant in Indonesia. It was among the first lines equipped with a fast finishing block of the BGV concept, with the modules and mandrels assembled on horizontal and vertical configurations at 90° to each other. Originally, the BGV block supplied featured six stands, with rolling ring diameters of 200 and 160 mm, operating at a speed of up to 42 mps.

In 1982, the finishing block was modernized, and two additional stands were installed to optimize and increase the productivity and speed (up to 60 mps).

After operating for 38 years, the finishing block is still running, constantly and reliably at 60 mps, with excellent performance in operation; a bright example of excellent equipment design and manufacturing. Another critical factor contributing to such an impressive result has been the regular monitoring and prompt standard maintenance of the equipment, using original spares and thanks to an always-available technical support provided by Danieli Service to PT Ispat Indo within the context of their long-term cooperation based on a win-win approach ■



SOLID FACTS: 38 YEARS OF UNINTERRUPTED OPERATION

1977 **New, six-pass Danieli finishing block for 42 mps production.**

1982 **Finishing block upgraded to eight-pass design for 60 mps production.**

2015 **Still working with quality and reliability at full customer satisfaction.**

2015 DANIELI TRAINING OPEN COURSES AND SEMINARS

Danieli knowledge sharing with new open courses and seminars for steel and non-ferrous industries.

Danieli Training Center Knowledge and Expertise

OPEN COURSES

May 18 - 22 (5 days)	**EAF and LF best practices for operation**	Danieli HQ, Buttrio (Udine), Italy
June 09 - 11 (3 days)	**Refractories**	Danieli HQ, Buttrio (Udine), Italy
September 22 - 24 (3 days)	**Hot skin-pass mill, operation and maintenance best practices**	Danieli HQ, Buttrio (Udine), Italy
November 03 - 05 (3 days)	**Hot Strip Mill maintenance best practices**	Danieli HQ, Buttrio (Udine), Italy
November 09 - 13 (5 days)	**Hydraulic systems**	Danieli Co. Ltd, Rayong, Thailand

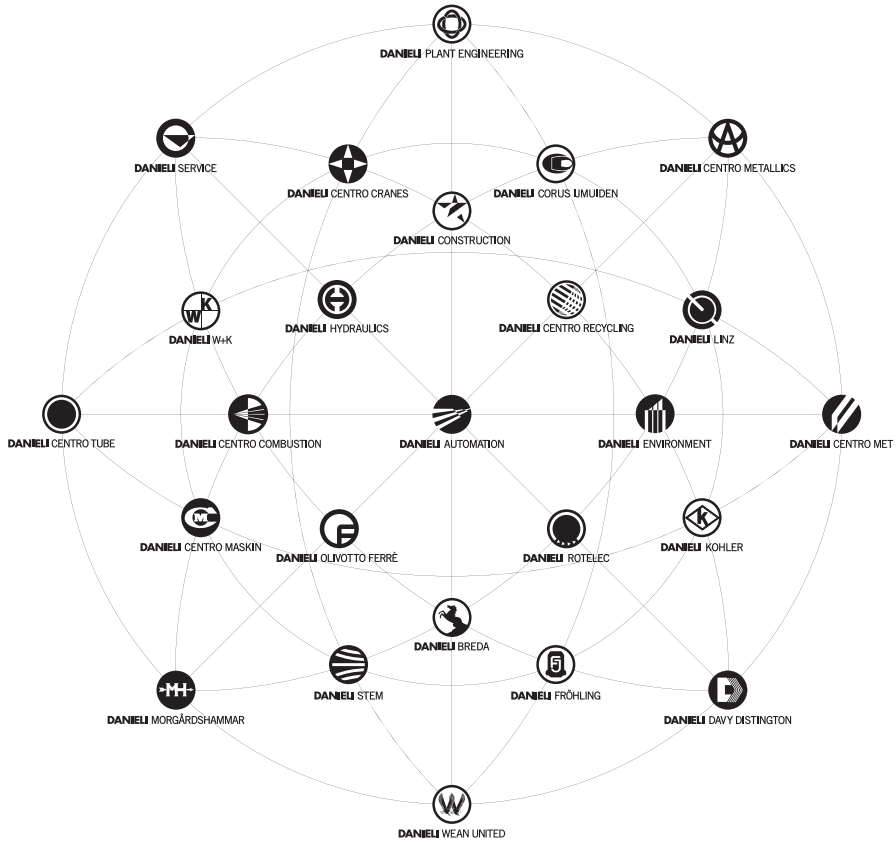
SEMINARS

June 17 - 18 (2 Days).	**DanOil Hydrodynamic Bearing**	Danieli HQ, Buttrio (Udine), Italy
September 15 - 16 (2 Days)	**Morgårdshammar Roller Guides**	Danieli E&S, Völkermarkt, Austria
November 04 - 06 (3 Days).	**Leadership, Managing Teams, Performance Management**	Danieli Milan, Italy
November 09 - 11 (3 Days)	**Team Working, Time Management, Conflict**	Danieli Milan, Italy

This year Danieli is offering theoretical and practical Open Courses and Seminars that will provide attendees with opportunities to learn, to network and to improve operational and maintenance capabilities for metals industry operations. Danieli's open courses calendar covers many areas and disciplines encompassing all metals production. All courses are given by certified instructors and field experts giving you opportunities to extend your knowledge into technical and operative areas. Updates and recommendations for best practices will be shared with metals producers to provide usable information that can be transferred to their organizations. Discussions on the challenges of effectively balancing improvements with cost concerns, innovation and operating procedures, will be beneficial to all. Sessions covering the most important topics on our products not only provide the most up-to-date information in the field of metals production, but also are a unique opportunity for networking with key players, including manufacturers, consumers, researchers, consultants, and more. In addition, there will be a variety of workshops held in Danieli facilities, related to design aspects, technological parameters and operative and maintenance plant best practices.

For more information **https://adv.danieli.com/training2015**

DANIELI
THE RELIABLE INNOVATIVE PARTNER TO BE FRONT RUNNERS



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DANIELI TEAM
A CENTURY
OF PARTNERSHIP
EXPERIENCE

Innovative and reliable bar rolling technology featuring industrial production speeds of 45 mps on 2-strand-slit, 8-mm dia bars (record speed 50.2 mps); QTB technology for high-tensile bars up to 1,200 MPa; Sund Birsta equipment for 100% accurate counting, bundling (5-t master bundle) and tying operations; L2 integrated Danieli Automation BEST (Bar Excellent Superior Technologies) system.

DANIELI MORGÅRDSHAMMAR HIGH-CAPACITY BAR MILLS FOR UP TO 245 TPH HOURLY PRODUCTION

DANIELI

Since 1958 Danieli Morgårdshammar has designed and built

483 Complete long product rolling mills for commercial and specialty steels

DANIELI MORGÅRDSHAMMAR
Long Product Rolling Mills

DANIELI TEAM
A CENTURY
OF PARTNERSHIP
EXPERIENCE

DANIELI THE RELIABLE
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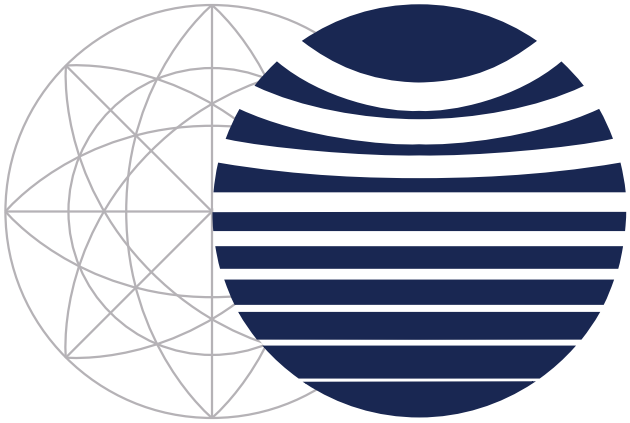
METEC 2015
MEET THE DANIELI TECHNOLOGY AT DANIELI LOUNGE HALLE 4 / G28



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Düsseldorf / Germany
16-20 June 2015