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Advanced automation system for Dragon Steel's new hot strip mill





Cover photo:
110-MN open-die forging press with four prestressed columns and a welded steel structure, at Fomas Group, Italy

Danieli & C. S.p.A., Buttrio, Italy

Contact: www.danieli.com
E-mail: info@danieli.com

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Topical themes

24 European Steel Association Eurofer welcomes EU Parliament resolution on steel industry

The steel industry is essential for growth and prosperity in Europe. It is in the interest of the whole European Union and its manufacturing sectors to have a competitive steel industry and to secure supply through domestic production. Strategic initiatives are needed, therefore, to support the sector and to keep it in Europe.

Raw materials

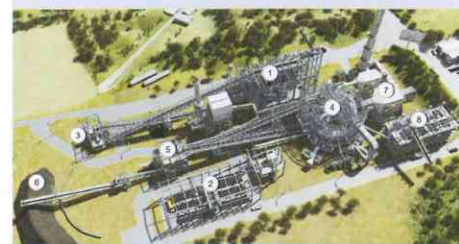
J. Chegwiddden

28 Iron ore industry to remain turbulent until 2020

With the disruption of supplies from India, concerns over slowing economic growth in China, the iron ore industry has faced a turbulent time during 2011 and 2012. Roskill's new report offers a deeper level of insight into the dynamics driving the market and offers a market outlook to 2020.

30 Circular pelletizing technology facilitates compact plants to be integrated on site

A new generation of pellet plants featuring a circular induration furnace as its core element was developed by Siemens Metals Technologies. This iron ore agglomeration facility is characterized by its highly compact layout and light-weight construction design. This is the basis for efficient and cost-effective installation at a mining site or within an iron and steel complex.



3-D view of a CPT plant

Steelmaking

C. Born, R. Granderath

32 Benchmark for heat recovery from the offgas duct at electric arc furnaces

Tenova's steam generation technology was for the first time applied to an EAF at Georgsmarienhütte, Germany, in 2009. Three years later, the projects at the Feralpi plant in Riesa and the Hyundai plant in Incheon extend the scope of this technology through additional innovations.

Continuous casting

A. Weyer, J. Frick

36 Secondary cooling concepts to increase the efficiency and flexibility of slab casters

To ensure the flexible production of different steel grades at variable casting speeds and with a wide range of product dimensions, novel cooling concepts are needed. For secondary cooling, this means that for all cooling strategies an as large as possible control range covering the whole product mix must be attained.

26 New executive board at Schmolz+Bickenbach, Switzerland

The global special steel producer Schmolz+Bickenbach (10,000 employees) has elected Johannes Nonn as new CEO and Hans-Jürgen Wiecha as new CFO. Ongoing restructuring measures are being implemented according to plan. However, the company is still facing a difficult market environment. Last year, the impact of the international financial and economic crisis was clearly noticeable on revenue and earnings.

Hot rolling

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42 High-strength rebar production at the new rolling plant at B.S.R.M. in Bangladesh

A so-called "market-sized" rolling mill plant is designed for low/medium-scale output capacity tailored for the specific demand of a regional market, but featuring the most advanced technologies for low-cost production of high-strength commercial steel long products. The Danieli QT, QTR and QTS processes are efficient and cost-saving tools to produce these types of steel.

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48 Second generation of Bi-Support rolling stands

The conditions of today's long steel products market with ever smaller profit margins and stronger competition require the use of rolling mills with minimized operational cost and the capability of assuring a final product of very high quality.



Roughing mill in H/V configuration

Automation

52 Advanced automation system for Dragon Steel's new hot strip mill

Dragon Steel Corporation, a subsidiary of China Steel Corporation, commissioned a new hot strip mill at their greenfield steel facility in Taichung, Taiwan. The new mill is capable to produce about 3 million t/year of a broad variety of high quality steel strip, including low carbon, API, IF, HSLA, BH, electric, and stainless grades.

U. Lettau

56 Condition monitoring of plants and process analysis with a single system

An adaptable condition monitoring system has been developed for different application scenarios and in variable sizes. From decentralized monitoring of individual physical machine performance figures up to the central acquisition of all relevant data for a total production, this new condition monitoring system covers a variety of applications and can be used independently of the automation manufacturer. It can be configured individually and connected to any conventional automation solution.

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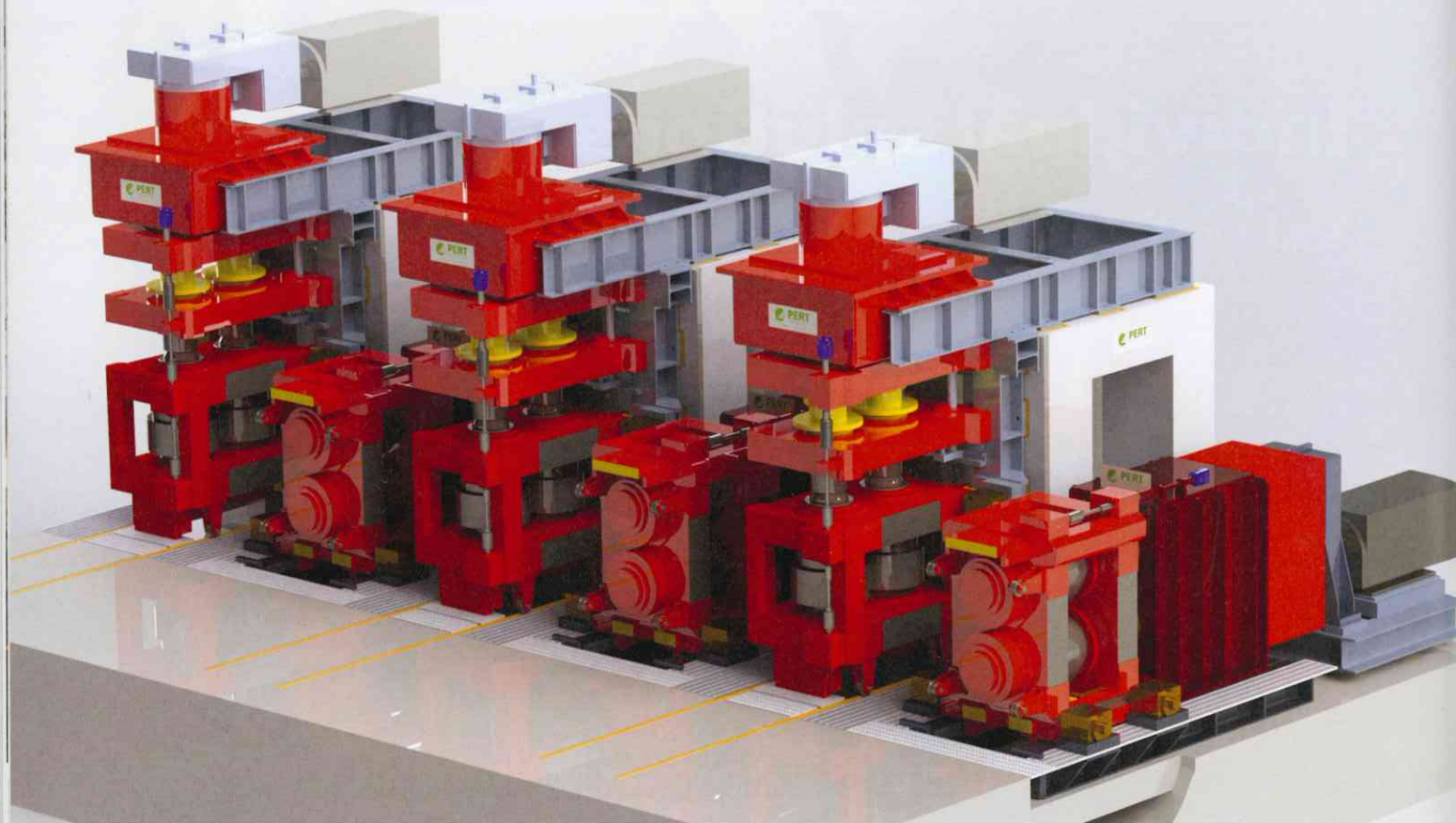


Figure 1. 3D illustration of a roughing mill in H/V configuration

Second generation of Bi-Support rolling stands

Today's long steel products market with ever smaller profit margins and stronger competition requires the use of rolling mills with minimized operational cost and the capability of assuring a final product of very high quality. Starting from these considerations, Pert has developed the second generation of its Bi-Support rolling stands.

For various years, the first generation of Pert Bi-Support rolling stands has been working successfully in many steel production plants worldwide. Pert, which is committed to continuously improving and further developing its equipment and plants, is now offering a new generation of its Bi-Support rolling stands (figure 1). The innovative features of these new Bi-Support stands are based on the enhanced concept of the rolling stands that have become a milestone in rolling technology for long products. While maintaining the benefits of the first generation, the new Bi-Support rolling stands provide the following innovative advantages:

- absence of spindles, chocks and on-board piping,
- use of rings instead of rolls (less groove wear per t of production),
- smaller dimension for easier handling,
- high stiffness,
- 85% less spare parts,
- increased working life of bearings (min. 50,000 h),

- ring gap regulation starting from 5 μ m,
- horizontal and vertical stands of the same design and fully interchangeable,
- mono-groove (roughing mill) and multi-groove (intermediate and finishing mill) design,
- roll gap regulation with eccentric system,
- easy maintenance.

All in all, the second-generation Bi-Support stands provide the possibility of improving the quality of the final product, cutting changeover times and downtimes for maintenance, reducing civil works and spare parts cost.

Improvement of final product quality

It is commonly known that in housingless stands the rolling load is concentrated on the tie rods, subjecting the adjusting screws to mechanical stress. This results in roll wear and mechanical yielding.

Massimiliano Zuccato, Matteo Tomba, Andrea Fontanini, Nicola Tomba, Pert srl, Tavagnacco, UD, Italy

Contact: www.pertengineering.com
E-mail: info@pertengineering.com

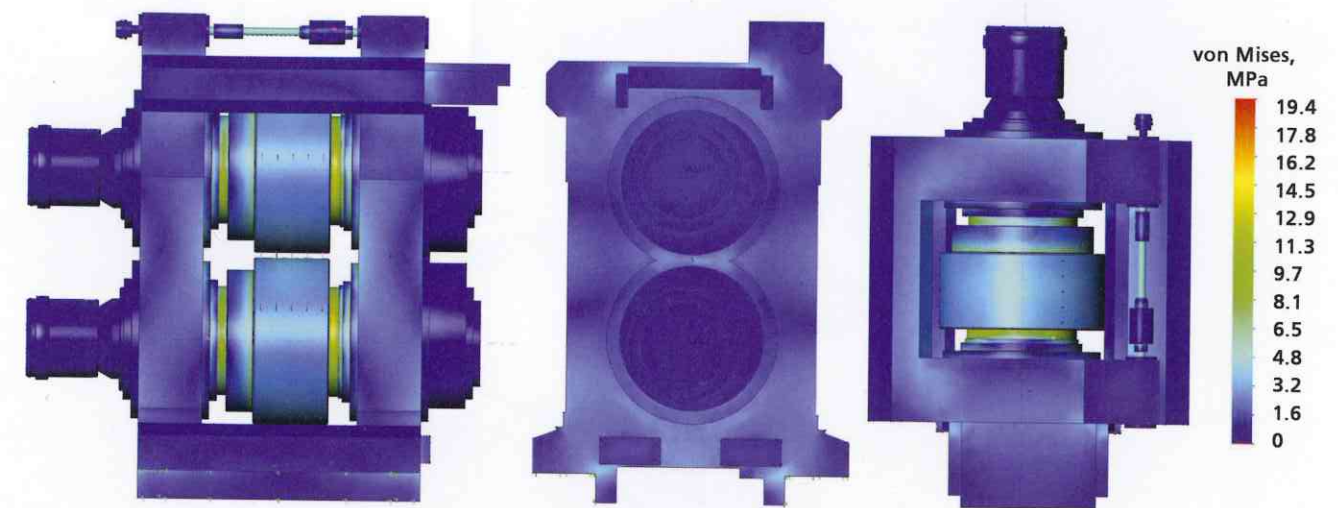


Figure 2. Pert Bi-Support stand under rolling load (P = 1,850 kN)

The Bi-Support stands, however, feature higher stiffness and better load distribution into the housing (figure 2), reducing mechanical yielding (deflection). As a consequence, dimensionally stable products can be manufactured reliably within the standard tolerances or even better.

The Bi-Support stands are designed to provide a force transmitting surface that is five times bigger than in housingless stands. Hence, housing elongation under load variation is reduced down to one fifth compared to common housingless stands. Further, Bi-Support stands have a stress path of approximately half the length of common housingless stands; hence, also the elongations are reduced proportionately.

Constraints are designed very near to the rolling load, so the rigidity of the stand is high and, consequently, the deflection of the ring-holding shaft is small. In comparison with common housingless stands, flexion is reduced to one third. Compared to a cantilever stand, it is halved.

Considering the above mentioned facts, the rigidity of the Bi-Support stands is approximately three times higher than that of the other types of rolling stands currently available on the market. This guarantees a very high quality to the final product.

Reduced downtimes of the plant for changeover and maintenance

Changing the stands involves approximately ten minutes from motor

stop to restart, including changing the ring-holding shaft. When a complete stand is available as a spare, changeover time goes down to approximately 2.5 minutes. Such reduced changing times are possible thanks to the reason that the second-generation Bi-Support stand does not have a container or piping on board, as typical of the housingless stand. Unlocking, lifting, replacement and re-locking of the rolling unit are fully automated, in both horizontal and vertical configuration.

Savings on buildings, cranes and civil works

Major efforts have been dedicated to containing the total stand size and reducing the stand height in the vertical configuration. As an example, the Bi-Support 650 vertical stand, being part of a roughing mill, has a height of just 4.3 m, against the average height of 7 to 8 m of common housingless stands.

There are several advantages due to the smaller stand dimensions. The rolling mill bay can be built less high, so the structure can be smaller and lighter. Thanks to the reduced height of the second-generation Bi-Support stand, the runways of the cranes are at a height of just 7.50 m. The crane capacity is only 60% of that required by a standard mill. All in all, civil works for the roughing, intermediate and finishing mills are reduced by 60%. For plants on ground level, the building can be made of prefabricated concrete; this option allows the initial investment to be reduced and

construction of the production site to be speeded up.

Low spare part cost

The new Bi-Support stands have no moving machined parts directly in contact with water or scale, as e. g. the tie rods in common housingless stands. All moving parts are positioned on the shoulder and protected by adequate gaskets.

The Bi-Support stands do not need any operator intervention in the rolling line, as with cantilever stands where the ring changes are to be performed in the working area of the plant. These changing operations are very difficult to perform with the risk of damaging the stand shafts.

The Bi-Support stand consists of only half the number of components in comparison with a common housingless stand. This allows the number of spare parts to be drastically reduced and, last but not least, also the stand weight.

In the Bi-Support stand the rolling rings are assembled on a heat-treated shaft made of alloyed steel (figure 3). This avoids any cracking due to overloading during rolling. Furthermore, when grooves have reached their end of life and there is no possibility of re-machining, only the worn rolling ring will be replaced, as the steel shaft on which the rings are installed can be re-used. In housingless stands the whole roll must be replaced.

The Bi-Support stand bearings have an increased working life, which is 2.5

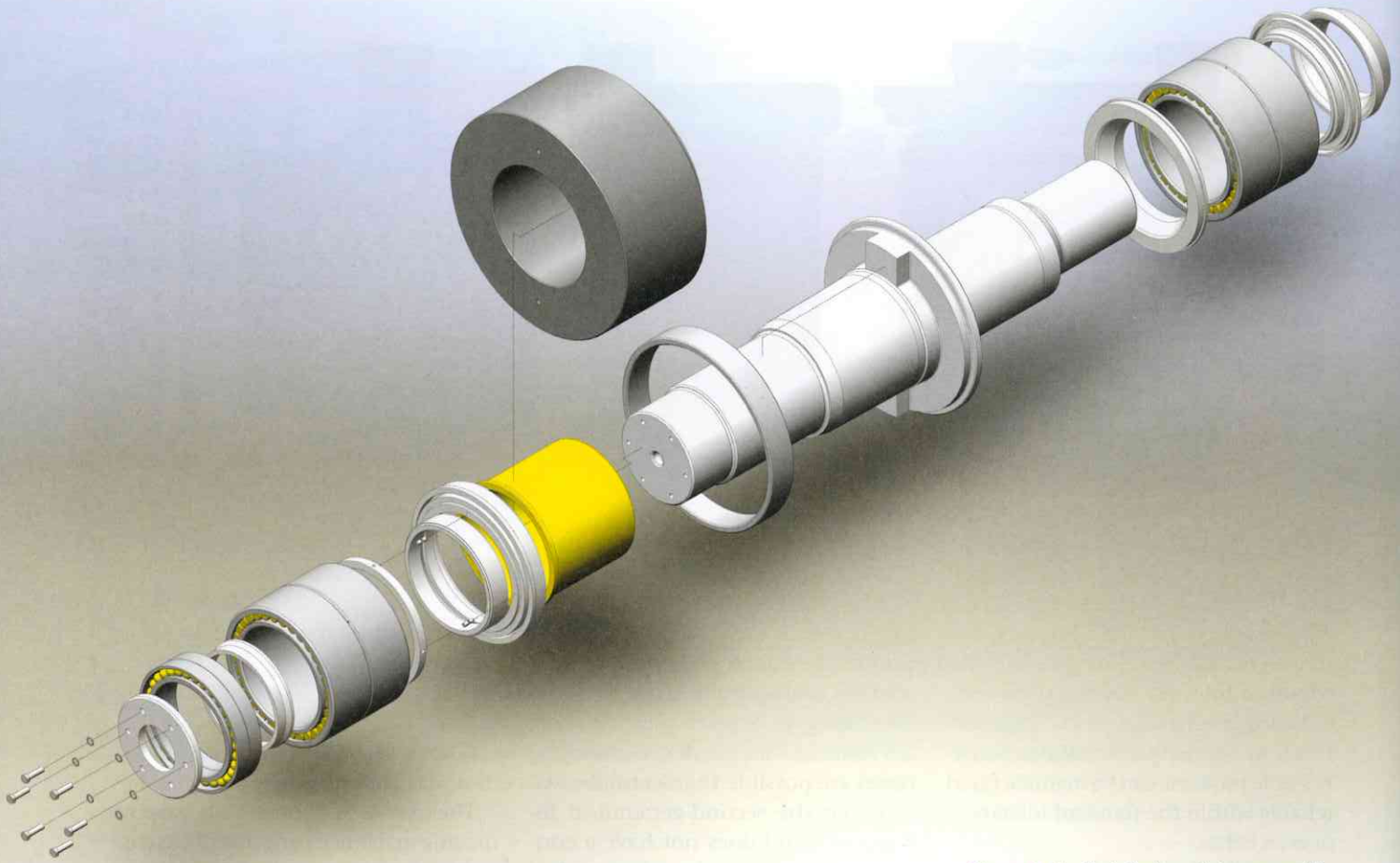


Figure 3. Typical shaft and ring assembly

times longer (min. 50,000 h) than in common housingless stands. The reason for this is the fact that in the housingless stand the rolling load is always fixed at the external ring of the bearing.

The second generation of Bi-Support stands has been designed and



Figure 4. Pert Bi-Support stand

developed with the objective to avoid the use of cardanic spindles. Instead of cardanic spindles, gear couplings have been installed, which, under appropriate working conditions, are not subject to wear. Therefore there is no need to replace them or keep any spare parts.

The lubrication system of Bi-Support stands is very simple, like a lubrication system of a normal gear box. Bi-Support stands do not need a special skimming device for separating water from oil, such as cantilever stands.

Conclusion

The new Bi-Support stands (figure 4) have been designed for use in rolling mills that produce rebars, rounds and sections in SBQ (special quality bar) steel grade, wire rod as well as light and medium sections. They are also suitable for special steel plants. Bi-Support stands can be supplied in different

configurations: horizontal, vertical or convertible, mono-groove (roughing mill) or multi-groove (intermediate and finishing mill). Each component group of the stands (basement, gear box and stand proper) is tested in the assembled condition in the Pert workshops to be "ready to roll" when shipped.

The use of second-generation Bi-Support stands results in multiple technological and economic advantages. Net savings on the initial investment result from the reduced expenditure on building and civil works. The small quantity of spare parts offers additional savings on production cost. Plant productivity increases thanks to the short changeover times and minimized downtimes for maintenance. The dimensional quality of the final products is very high. In general, the plant can be more efficiently operated, needing little maintenance and low manpower. Finally, also the costs of re-machining are minimized. ■