Figure 1. Traditional layout of a bar rolling mill with a production of 90 t/h

New generation finishing block technology for bar mills

The new generation finishing block – called 2XTechnology® – has been developed with the objectives in mind to achieve higher yields in new and revamped rolling mills while reducing investment efforts. After a first commercial installation the newly developed mill stand has proven to achieve higher productivity and better quality.

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In order to increase rebar production in rolling mills, the 2-slitting and fast finishing blocks **(figure 1)** have been adopted as a solution during the last few years. This solution provides a finishing speed of 40 m/s, but involves very high investment and production costs.

Usually the same finishing blocks as used in wire rod production are adopted here. As such, they are designed for speeds higher than 120 m/s. In the case of rebar production, the maximum speed in the cooling bed is 40 m/s. Therefore the machinery is over-dimensioned. This involves higher investment costs for civil work, electrical and piping parts and lubrication units and means higher consumption figures. Additionally, this solution requires expensive and time-consuming maintenance and a high degree of mechanical knowledge for the operating and maintenance personnel.

In order to avoid these problems, many mill suppliers suggest another solution: 3 or 4 slitting. This is a solution already adopted in the 1980s and 1990s, but involving control problems and problems in connection with the quality of the final products. Tight tolerances are very difficult to comply with and the quality of the rebar bundles is often poor.

Against this background, Pert developed a new mill stand type which permits higher yields in new or revamped rolling mills at low investment costs: the new generation finishing block called 2XTechnology® **(figure 2)**. With only one machine, it provides higher performance and production and better quality.

Technical characteristics

This new type of stands features a compact and rigid construction, the body being fabricated instead of consisting of cast components. Due to the new design, the rolling mill stands are extremely stiff. Very close tolerances can be achieved during rolling, even with varying rolling processes. Thanks to the 2XTechnology® finishing block, it is possible to roll with two stands simultaneously. In this way there is no more need to use two finishing blocks. The whole plant is more compact and requires less space than a plant of a traditional design **(figure 3)**.

The technical characteristics can be summarized as follows:
- round finishing, till a minimum dia. of 6 mm,
- maximum design speed = 45 m/s per strand,
- maximum rolling speed = 40 m/s per strand,
- fixed rolling axes,
- horizontal, horizontal/vertical and convertible arrangement,
- tungsten carbide rings,
- mechanical system for locking/unlocking of rolling rings,
- stand change time of only five minutes in total,
- stand change with the guide boxes already installed and aligned,

- lubrication of reduction units with forced oil circulation,
- machinery equipped with safety covers, which are opened by hydraulic cylinders **(figure 4)**,
- overgear coupling with connecting teeth.

The overgear group was designed with the following characteristics:
- gear with helicoid teeth, working factor = 2,
- thermally treated, ground and dynamically balanced teeth,
- shaft installed on pre-loaded roller bearings,
- minimum calculated life time of bearings = 50,000 h,
- forced oil lubrication of gears and bearings.

At the rolling stands, ring shafts are installed on the roller bearings for radial loads and spherical roller bearings for axial loads. The ring shafts, made of alloy steel, are heat treated. The rings are installed on the ring shaft, the ring grooves being cooled by high pressure water.

The welded and heat treated stand features high dimensional stability. Gaskets under the rings protect against water inlet. The ring shafts and bearings are installed on eccentric bushes, which if rotated change the distance between the centres of the rings. Right/left regulation is via a worm screw.

Pinion stands with bevel gear reduction units distribute the movement to the two rings shafts. Here the gears are installed on pre-loaded roller bearings. Bearings and gears are lubricated with forced oil. Also these gears are equipped with helicoid teeth (service factor = 2), thermally treated, ground and dynamically balanced. Minimum service life of the bearings has been calculated to be in the range of 50,000 hours.
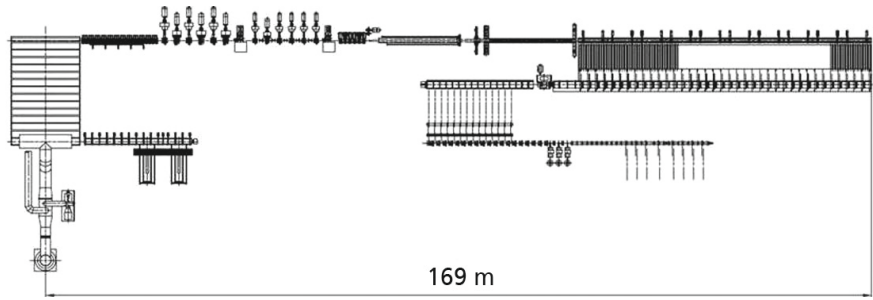

Figure 2. New layout of a bar rolling mill with a production rate of 90 t/h incorporating the 2XTechnology® finishing block
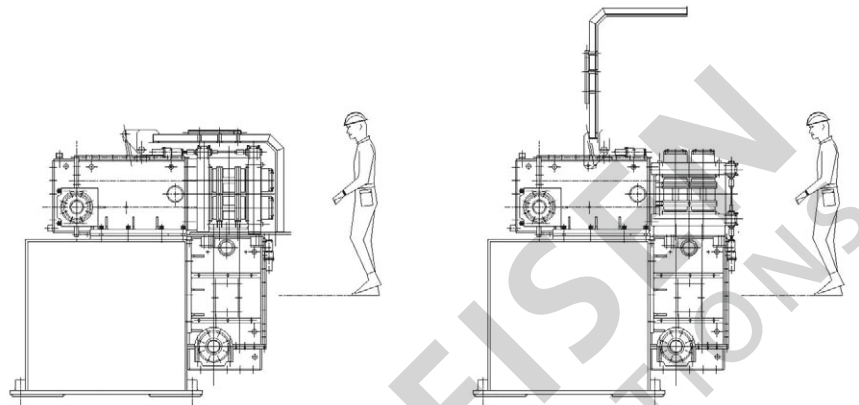

Figure 3. Principle of the 2XTechnology® finishing block in horizontal/vertical configuration

Conclusion

The advantages of 2XTechnology® finishing blocks compared to common finishing blocks are summarized in **table 1**. This innovation was introduced on the market in spring 2010 and immediately met with great interest, among others confirmed by a revamping contract for a rolling mill placed soon afterwards. By installation of the new stand type and the new finishing block, production of the plant will be increased and the final product quality improved.

Figure 4. 2XTechnology® finishing block

	2XTechnology®	Traditional design
No. of strands	Double strands	Single strand
Ring installation	On two supports	Cantilever rings
Installation of rings shafts	On roller bearings	On plain bearings
Lubrication of bearings	Grease	Oil
Life time of ring shafts	Unlimited	Limited
Water inlet in lubrication system	Eliminated	Frequently
Presetting of rings	In workshop	After installation
Gap regulation	From control room	During production stops
Foundation	Simple	Heavy
Oil pressure	2 bar	7 bar

Table 1. Comparison of finishing blocks design