ntinuou[illegible] rolling mill to the endless roll[illegible] construction of rolling and rolling lin[illegible] future [illegible] will allow for the customer to m[illegible] facto[illegible] finishe[illegible] roduc[illegible] within a minim[illegible] period and to c[illegible] a comple[illegible] stages with minim[illegible] xpenses.

ROLLING MILL 1700

The mill is equipped with the:
counterbending device, axial shift and thermal work roll cambering systems;
highly-mechanized work roll-changing device with the strip present in the stands;
constant rolling level maintenance device of high accuracy;
hydraulic screw-down mechanism;
process control system.

MACHINES, EQUIPMENT, PROCESSING SYSTEMS

The extension of the range of rolled products and assurance of the strip high quality require the utilization of the working stands with high reduction capacity.

Heavy-duty working stands with the rolling force up to 100,000 kN and rolling torque up to 6000 kNm were manufactured at NKMZ.

WIDE-STRIP HOT-ROLLING MILL VERTICAL ROLL STAND

To reduce the slabs up to 150 mm in width and to form the workpiece edges a vertical roll stand fitted with the rolls with grooves and hydraulic screw-down mechanisms were developed and constructed at NKMZ.

A special feature of the stand construction is also the unconventional arrangement of the work rolls drive with the hollow output shafts that gives a considerable gain in the stand height clearance as compared with the conventional drive.

The high dimensional accuracy through cross and longitudinal sections of strips and plates, the optimal shape are obtained both in working stands and in the mill by means of the modern facilities and automatic control systems developed by NKMZ.

Among these are a hydraulic screwdown mechanism, counter-bending and auxiliary bending systems, systems for axial shift and thermal cambering of work rolls, [illegible] "water curtain" type laminar cooling system on the run-out roller table with appropriate systems for controlling process variables.

We manufacture hydraulic screwdown mechanisms for the automatic gauge control system. The setting speed is 4 mm/s, the stroke is 30-160 mm, the setting accuracy is 0.01 mm.

In addition to the hydraulic bending of work rolls and in conjunction with it to influence the strip shape more efficiently we suggest a thermal cambering system which contains quick-acting shut-off valves providing a prompt control of cooling nozzles and a discrete influence on the work roll profile.

The work roll shift system provides a high quality of the strip surface, a possibility to perform a program-free rolling, reduces the number of roll changes.

The cambering, counter-bending and auxiliary bending systems influence greatly a strip cross section.

Shift range: ±10% of barrel lenght.

Crossing range: ±1%.

The convenience in using our rolling mills is also obtained by means of mechanization of auxialiary production operations such as changing of work and backup rolls, banding and marking of coils, sampling, assembly and disassembly of bearings for rolls.

ecologically purer technologies is manufacturing of hot-rolled products with casting and rolling processes combined.

NKMZ is prepared to propose to their customers: Technology and equipment permitting sheet production on the continuous-casting direct-rolling facility (CCDR) incorporating in one technological row a thin slab continuous casting machine, end-charged end-discharged furnace and hot-rolling mill with the capacity up to 1,700,000 t/year.

COLD ROLLING MILLS

Cold rolling mills for producing aluminium and steel strips are operating today in many works of ferrous and non-ferrous metallurgy in the countries of CIS and abroad.

When designing rolling mills a package of software on automated calculation, design and optimization both of technological schedules and structural parameters of future equipment is used, a number of the following urgent tasks being solved:

fitting of rolling mills with hydraulic fast acting high-sensitive screw-down mechanisms as well as with high-efficient mechanisms of preliminary and prompt strip crown and shape control;

optimization of reduction schedules and utilization of high-efficient rolling lubricants;

development, research and bringing the new rolling processes facilitating the intensification of technological schedules and the finished product quality improvement to a commercial level.

In the field of cold rolling of strips made of aluminium and its alloys we have developed an ingenious conception of the reversing-non-reversing mill.

Rolling on this mill is performed in batches, in the same way as on the non-reversing mill, each coil of the batch being rolled in the reversing schedule first and then the whole batch being rolled according to the non-reversing rolling technology. The capacity of the mill is 10-15% higher than that of the non-reversing one due to the higher machine-handling time ratio. The mill operation permits the reduction of energy expenditure, extension of service life of a number of machines and mechanisms and considerable decrease of the required volume of mechanized stores for coils.

The working stand of the mill is equipped with the hydraulic screw-down mechanism, the work roll positive and negative bending system, automatic plate-changing mechanism and wedge mechanism for maintaining the rolling level. The version of a six-high working stand is also possible. The coiler and floating uncoiler with the cantilivered drum and hinged support are connected to the double-motor drives ensuring maintenance of tensions within a wide range.

The reducers of drives of the working stand, coiler and uncoiler are performed as speed reducers that provide minimun energy-intensity of the mill as a whole.

The mill is fitted with the automatic system with the functions of rolling process control, diagnostics, setting of mill to roll the predetermined products, maximum possible automation of the back-up and work roll-change process as well as with the other systems ensuring the process of rolling.

We design and manufacture cold rolling mills for producing strips of carbon, transformer and stainless steel such as:

reversing mills;

three-, four-, six-stand non-reversing mills;

endless rolling mills;

single stand skin mills;

two-stand skin mills.

When constructing the cold-rolling mills for producing steel strips both for the new shops and the ones under reconstruction, there may be proposed a variant of transformation of the

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Cold Strip Rolling

Cold rolling allows to reduce the hot-rolled strip gauge to the range of 0.2–2.2 mm. Typical cold rolling plant comprises several sections: continuous pickling line, cold rolling mill, annealing furnace, temper mill as well as inspection and finishing line.

The pickling process is conducted in order to remove the mill scale formed in the hot rolling process which can cause surface defects in the finished products. Pickling is performed in a continuous line and consists in passing the strip through a scale breaker and a tank filled with sulfuric, hydrochloric or a mixture of nitric and hydrofluoric acid. Afterwards the strip is rinsed, dried, trimmed and electrostatically oiled to assure the proper friction conditions during subsequent rolling.

Cold strip rolling is usually carried out in four or five-stand tandem mills or in single-stand multi-roll mills (e.g. six-high, twelve-high or twenty-high mills). Work-hardened cold-rolled strips are subjected to either continuous or batch recrystallization annealing at temperature within the range of 600–700 °C.

Annealed strip is slightly tempered in the four-high skin mill where it undergoes a certain small amount of deformation. Temper rolling is conducted in order to improve the surface flatness, to develop the required surface roughness and to suppress the yield-point elongation.

After skin pass rolling, the strip is marked and undergoes quality inspection. For temporary anticorrosion protection strip is oiled. According to customer's demands, cold rolled strip is coiled, slit or trimmed and cut to sheets of specified length. Both protective and decorative coatings can be applied to the cold rolled strip.

Cold rolled strip is also a basic feedstock in sheet metal forming processes.

What is a Plate?

The term 'plate' is used generically in the steel industry to mean a rectangular piece of flat-rolled steel.

Plates are delivered flat (as distinct from strip, which is thin enough to be formed into a coil and transported in that form).

Typical dimensions for plates are:

Thicknesses of 10 to 50 mm

Widths in excess of 2 m and up to 5 m

Length of 4 m to 30 m

though greater and smaller values of all these parameters may be produced.

The ordered dimensions of plates are characteristic of their application. The upper limit of the width is characteristic of the mill that rolls them.

Plates are mostly used in structural applications, which means they have to be strong, tough and (usually) weldable. Formability (ductility) is normally a secondary consideration and may be foregone to maximise the primary properties. The properties of a plate are partly determined by the composition of the steel from which it is made, but also partly determined by the rolling practice used to form it. This is invariably a hot rolling process.

The rolling process for a plate thus has two objectives which must be satisfied at the same time:

to achieve the correct dimensions

to achieve the correct mechanical properties

As in any manufacturing process, product objectives must be combined with business requirements of operational efficiency. This means that the development of a plate product by a steel company involves the optimisation of both alloy design and process design.