INMET

Innovative metallurgical technology

COMPACT HIGH-TECH METALLURGICAL COMPLEX

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DESIGNATION

Compact high-tech metallugical complex (CHMC-50) is designed for small sections of rolled steel to GOST 2590-88, reinforcement diameter of 8 -:-25mm Class A1, A2, A3, GOST 5781-82, a 6.0 -: -11.7 meters from the steel scrap in the amount of 50,000 tons per year.

CHCM-50 is supplied with set of equipment steel-making department, department of steel continuous casting, rolling office.

OPERATING CONDITIONS

-covered;

-ambient temperature from +5 ˚C to +35 ˚C (for performance UHL4) and from +5 ˚C to +45 ˚C (TC4 for execution);

, relative humidity up to 80% at +25 ˚C (for performance UHL4) and 98% at +35 ˚C (TC4 for execution);

the temperature of cooling water from the +5 ˚C to +25 ˚C;

Environment-explosive, containing no corrosive gas and impurities, destroying the isolation and metals;

-the absence of impurities in the cooling water, forming a precipitate;

the temperature of the cooling water should not be below the ambient temperature in the room more than 15 ˚C.

Safety CHMC-50 meets the requirements of GOST 12.2.003-91 (RUS.) and 12.3.002-91 (RUS.).

Fire Safety CHMC-50 meets the requirements of GOST 12.1.004-91 (RUS).

Parameters of the metallurgical complex CHMC-50.

Table 1

№	Name of Parameter	Value
1	**Range of products:** Armature A1, 2,3 GOST 5781-82, R52544-2006, № Round of GOST 2590-88, 535-88, 19281-89, mm Square of GOST 2591-88, 535-88, mm Strip of GOST 103-76, 535-88, mm Corner of GOST 8509-93, 535-88, 19281-89, mm Channel with GOST 8240-89, 535-88, №	 12,14,16,18,20,25 12-:-24 10-:-20 40-:-150x4-:-12 25,32,40,50,63 6,5
2	**Output, ton / yea**	50000
3	**Mode of operation, shift**	3
4	**The annual fund of working time, hour**	6500
5	**Dimensions of the production corps, the length of the width, m**	145.0 x 36.0

Technical characteristics of equipment metallurgical complex CHMC-50.

Table 2

№	Technical characteristics	Value
1	**Steelmaking Department**	
1.1.	**Induction Furnace**,	
1.2.	The number of melting pot, pieces.	2
	Melting capacity of melting pot, ton	5
	Hourly productivity of the furnace, tons / hr	8,5
	Loading device in the furnace charge	
	Capacity of the receiving container, m3	6,0
2	**Department of casting and rolling**	
2.1.	**Centrifugal Casting Machine**	
2.2.	The frequency of rotation of the ring mold, sec-1	30-:-40
2.3.	The diameter of the ring blank, mm	1200-:-1350
	The width of the ring blank, mm	120-:-200
	The thickness of the ring blank, mm	16-:-30
	Number of ring blanks per hour, pcs.	60-:-180
	Dressing machine	
	Shears effort, ton	100
	Diameter of rolls, mm	350
	Power drive rolls, KW	125
	The strain by rolling, %	10-:-12
	Rolling mill, type - continuous	
	Finishing mill stands	
	The number of rolling stands, pieces	4
	The diameter of the barrel roll, mm	320
	Power drive roll stand, KW	250
	Rolling speed at the exit of the last rolling stand, m / sec	6-:-8 м/сек
3	**Department of rolled products cooling**	
3.1.	**The line accelerated cooling, length, m**	6
3.2.	Cooling fluid, m3/min	3,0-:-3,5
	Cooling bed, Length, m	12,0

Total consumption of basic energy resources.

Table 3

№	Name energy resource	Value
1.	Electricity, MW	8,5
2.	Natural gas, m3/hr	50,0
3.	The water in the reverse cycle, m3/hr	600,0

Layout of complex equipment

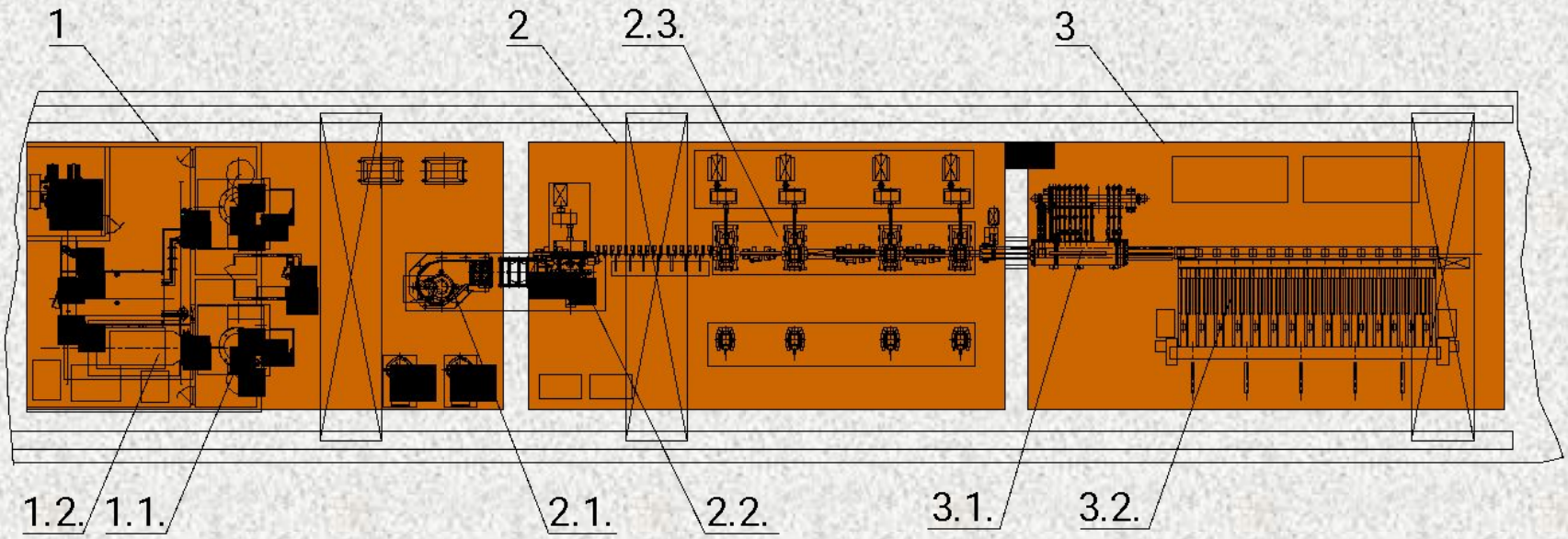


Fig. 1

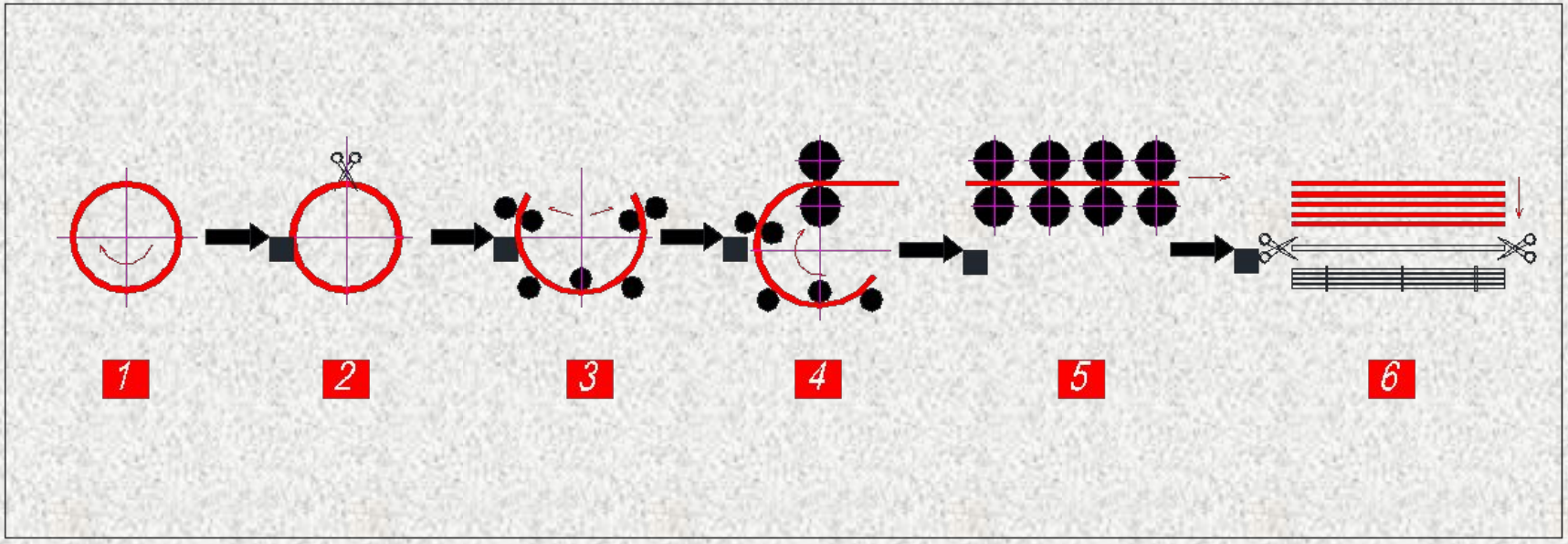
Designation of positions on Table 2

FEATURES HIGH METALLURGICAL TECHNOLOGY

The new approach is considered a fundamental difference of metallurgical technology, is that the initial billet cast at a special centrifugal casting machine in the form of a ring. Die cast ring at 1150 -: -1200 ˚ C shall be issued from the casting machine without stopping the rotation of the mold, with the rate of 60 -: -180 pcs. / Hour. Further, the ring is cut and straightened by rolling in the dressing deforming machine in straight strip. Strip, then, without preheating, rolled in the finishing group of stands to obtain the required length of rolled.

Since the dimensions of the cross section of the original billet as close to the size of finished rolled, it provides minimal metal and energy complex equipment, increases the energy efficiency of the process, reduces manufacturing costs by 20 -: -25%.

A process flow diagram



1 Continuous spun casting of ring billet.

2 Cutting of ring by hydraulic shears.

3 C-shaped deformation.

4 Straightening of ring billets in flat strip.

5 Multi-slitting rolling.

6 Cooling, cutting, packing.

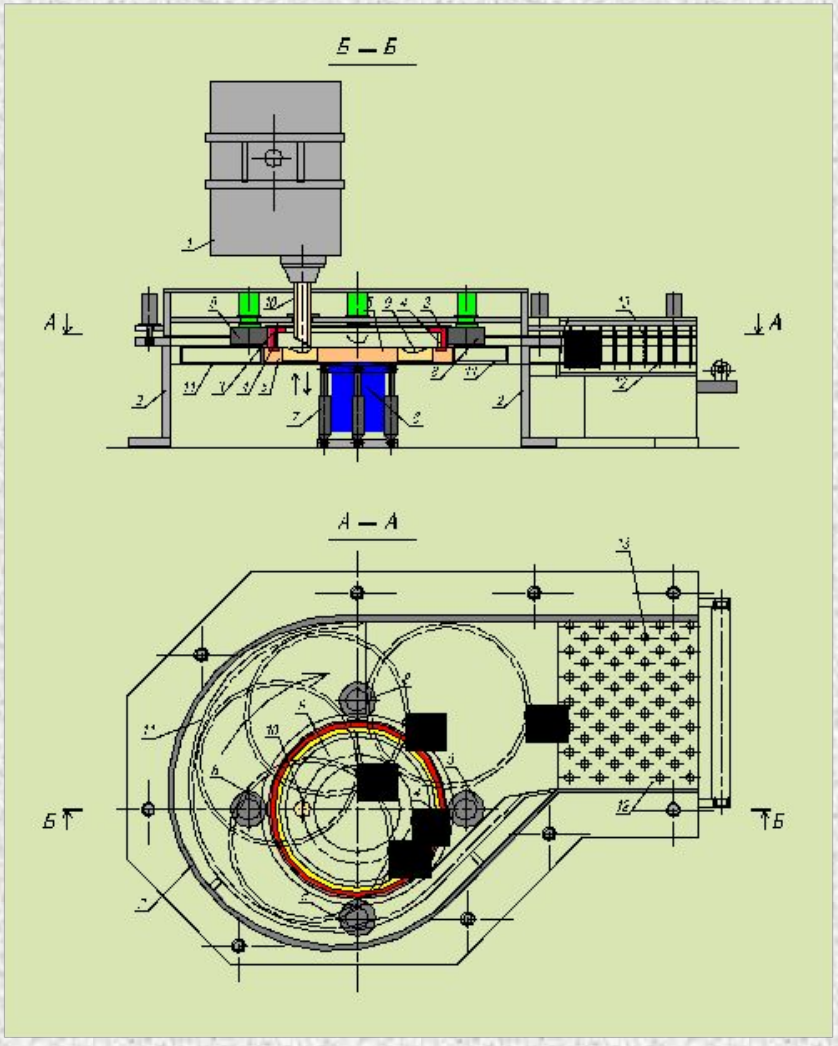


Figure 2. Special centrifugal casting machine.

1. Casting ladle, 2. Stand, 3. Mold, 4. Ring blank, 5. The lower wall of the mold 6. Drive axial rotation of the lower mold wall, 7. Drive vertical movement of the lower mold wall, 8. Support rollers drive the rotation of the mold, 9. An annular groove is a prominent form of a drop, 10. Tube feeder, 11. The guide groove 12. The camera delay, 13. The moderator of the steel chain.

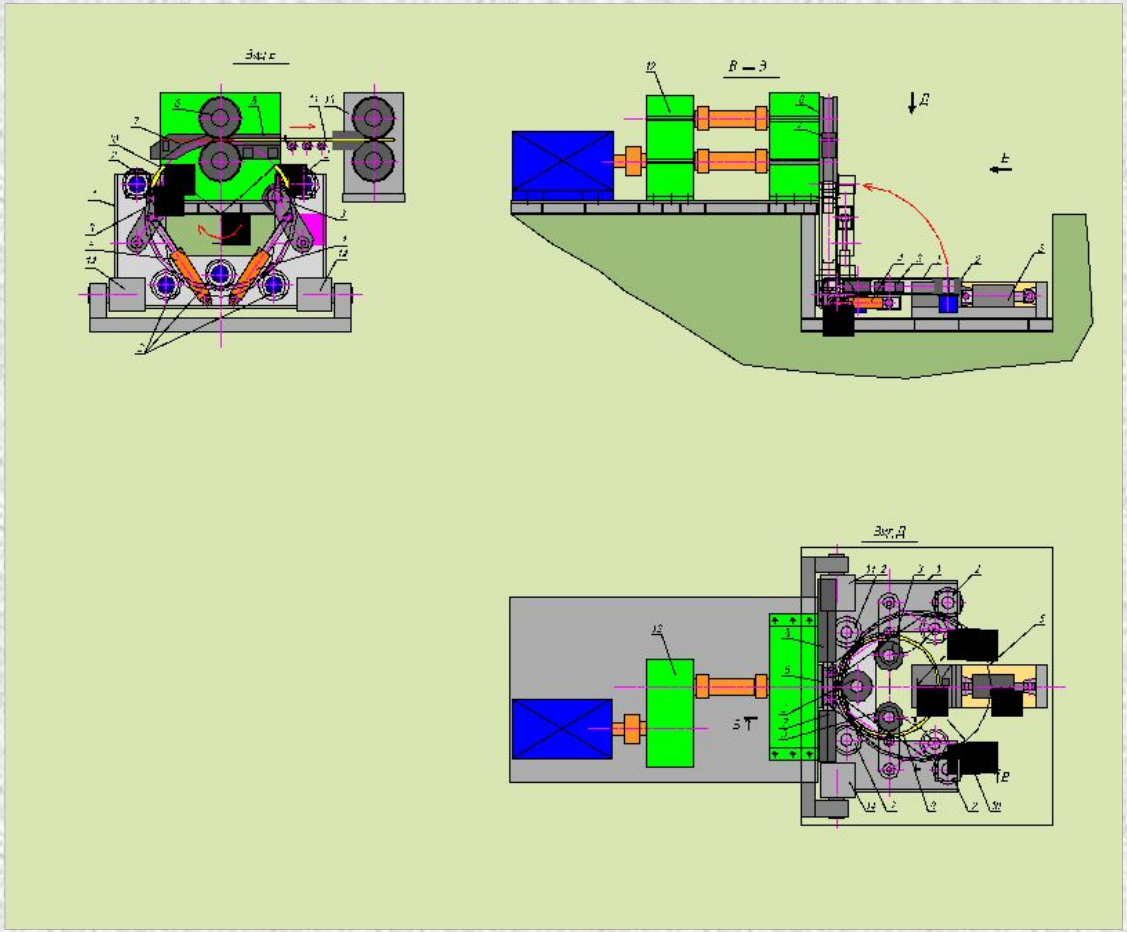


Figure 5. Dressing machine

1. Frame of roller guide, 2. Drive rollers of the roller guide, 3. Rollers of Hydraulic straightening, 4. Cylinder of Hydraulic straightening, 5. Shears, 6. Console mill rolls, 7. Threading guide, 8. Delivery guide, 9. The original ring blank, 10. Interim blank C-shaped, 11. Straight strip, 12. Pinion stand, 13. The first rolling stand continuous finishing group, 14. Hydraulic drive for turn 90 ˚ of frame roller guide.

DESCRIPTION OF THE METALLURGICAL COMPLEX

The metallurgical complex CHMC-50 is located in the industrial building with total area of 5.2 thousand m2. Industrial building consists of two spans 145 meters and a width of 18 meters. In each span overhead cranes installed capacity of 15 tons. The first span of the main technological equipment are located - is the production span. In the second span, are: scrap yard with the site preparation, mechanical workshop with machine tools, plumbing repair site, repair shop electrical equipment. Figure 4 shows the layout of the production building CHMC -50.

The manufacturing process begins with receipt of the original scrap on the receiving warehouse. Scrap comes to the f / w wagons or trucks. At the receiving warehouse scrap is sorted and if necessary, cut into smaller pieces to allow mechanized filling in an induction furnace. Prepared by the metal, with a bulk density of 0.65 -: -0.85 m3/ton is loaded first in the process box. The volume of the box is equal to 5.0 tones of smelting. Before you start filling in the oven a mobile charging machine leaves the warehouse bay and scrap metal from the pouring process boxes in a hopper charging machine.

Mechanized filling the furnace charging machine, which is installed on the rail track in front of the crucible induction furnaces, vibratory actuator includes charging machine and under the influence of vibration of the scrap hopper charging machine starts to pour into the crucible furnace. Ferroalloys and lime filling is done manually, assistant steelmaker.

In the steelmaking unit is located and accessories:

- Silos for storage of ferroalloys, lime, etc.;
- Stands for the repair and dry lining steel ladles;
- Skimmer, ladle;
- Stand heating ladle;
- Emergency casting a ditch.

Office of the furnace is carried out with the remote.

In the induction furnace melting metal charge is made, and the heating of metal using electricity.

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Upon reaching the desired chemical composition and temperature of the melt, the metal poured into the ladle with a cutoff of ferrous slag (maximum drain slag in the ladle in the production of 3-5 kg / t). In the stream of metal in the production of ferroalloys sit down, and for the guidance of the new slag-forming reductive slag. Chemical composition of steel is controlled by sampling and rapid analysis in the laboratory.

To ensure the necessary stability of the ladle lining, as a working high-alumina layer is used (walls) and magnesium oxide carburet (slag belt) refractory products. These refractory materials have a low thermal resistance, so the temperature of the ladle lining, is in operation, must not fall below 700 ... 800 º C. After completion of casting to the centrifugal casting machine and slag discharge, the bucket is transmitted to the stand to increase the heating temperature is lining up to 1000 ° C and maintain it until acceptance of the following melting of the oven.

The resulting liquid steel in the ladle is transferred by crane to the casting department and placed on a bench casting centrifugal casting machine for continuous casting billets of initial ring.

As part of the casting-rolling complex offered specialized centrifugal casting machine with the vertical axis of rotation of the mold. The design of the centrifugal casting machine allows you to retrieve a ring from a blank piece of the mold at a temperature of 1150 -: -1250 ˚ C. Removing the ring is non-stop rotation of the mold in a continuous mode - 60 - 180 pieces / minute. Following the issuance of ring blank of the centrifugal casting machine, it comes to roller table to the dressing deforming machine on which the cutting of the original ring blank hydraulic shears to give the intermediate billet C-shape and straightened the intermediate billet rolling in straight-line strip. The resulting strip transmission roller conveyor is set in a continuous rolling mill group, which rolled to the desired section of rebar, and is rolling with slitting stripes separated by 4 -: -6 bars. The size of the initial ring blank is chosen so that after rolling the length of the rods was rolled 11.8 -: -12 meters.

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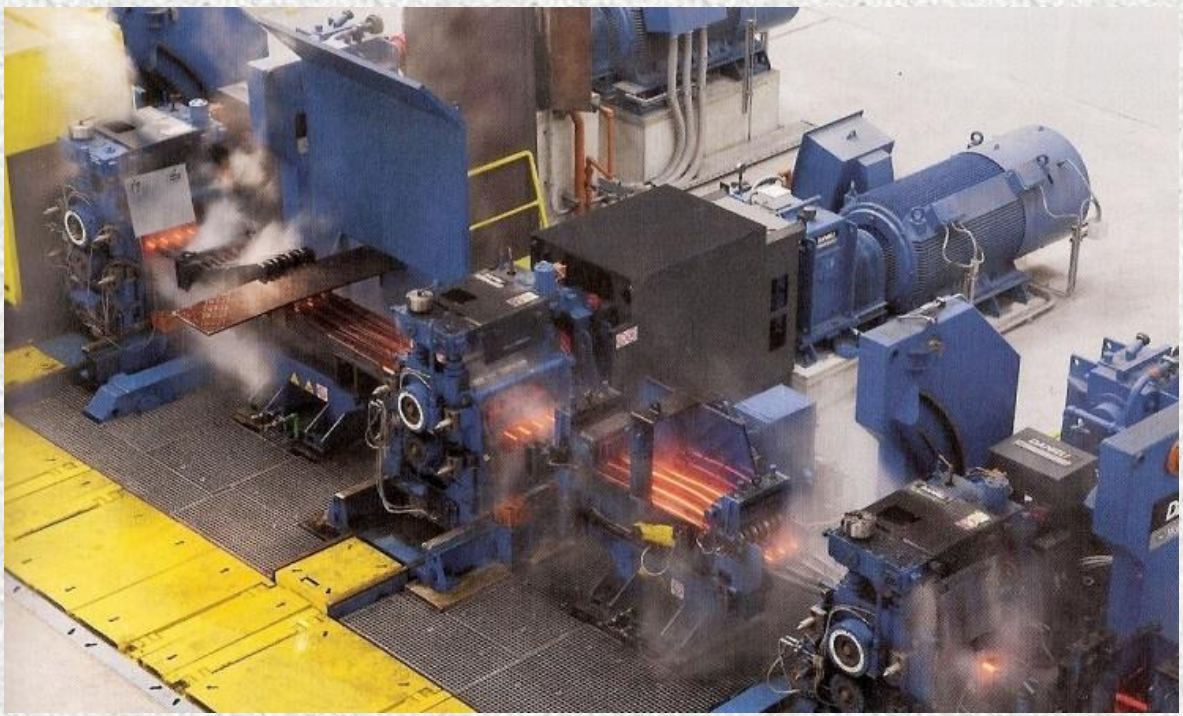

Fig.5 Multi-slitting rolling in the finishing group of stands.

The technology of rolling multi-slitting developed by Danieli Italy and has been successfully used in modern small-section rolling mill.

The feasibility of rolling in a few lines due to the achievement of the desired optimum weight billet 45 -: -50 kg, corresponding to the requested volume production of 50 thousand tons of rolled small sections, and the required length of rolled **L**, being in the range of 6 -: -12 meters.

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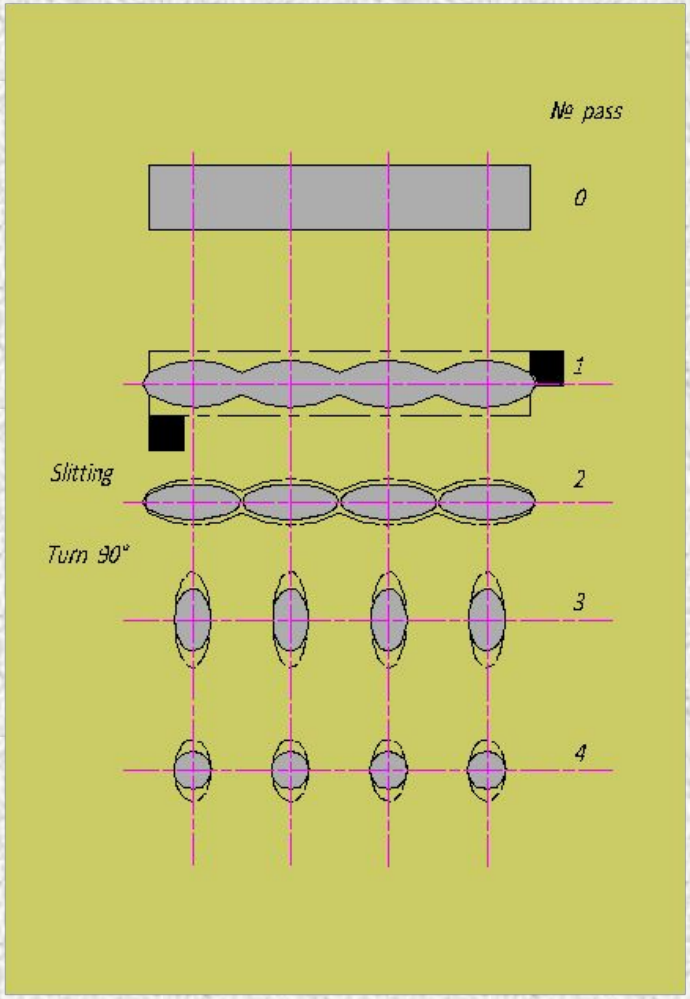
Fig.6 Scheme of calibration rolls in the finishing group of stands



After rolling in the last stand of rolling mill rolls pulling the metal blocks are fed into the accelerated cooling, between which and the final set of drawing rollers. In these blocks is an intensive cooling of the moving solid metal incidental highly turbulent flow of water in a closed volume, with the transportation of rolled is pulling rollers. If you do not need intensive cooling, rental cooling units transported roller tables. The devices are located in blocks of accelerated cooling, are designed to cool the rolled to 450-500˚C (sometimes up to 350-400 ˚C) for thermal hardening of the metal, reducing the depth of the layer and decarbonized exception cementite mesh formation on the surface of the metal.

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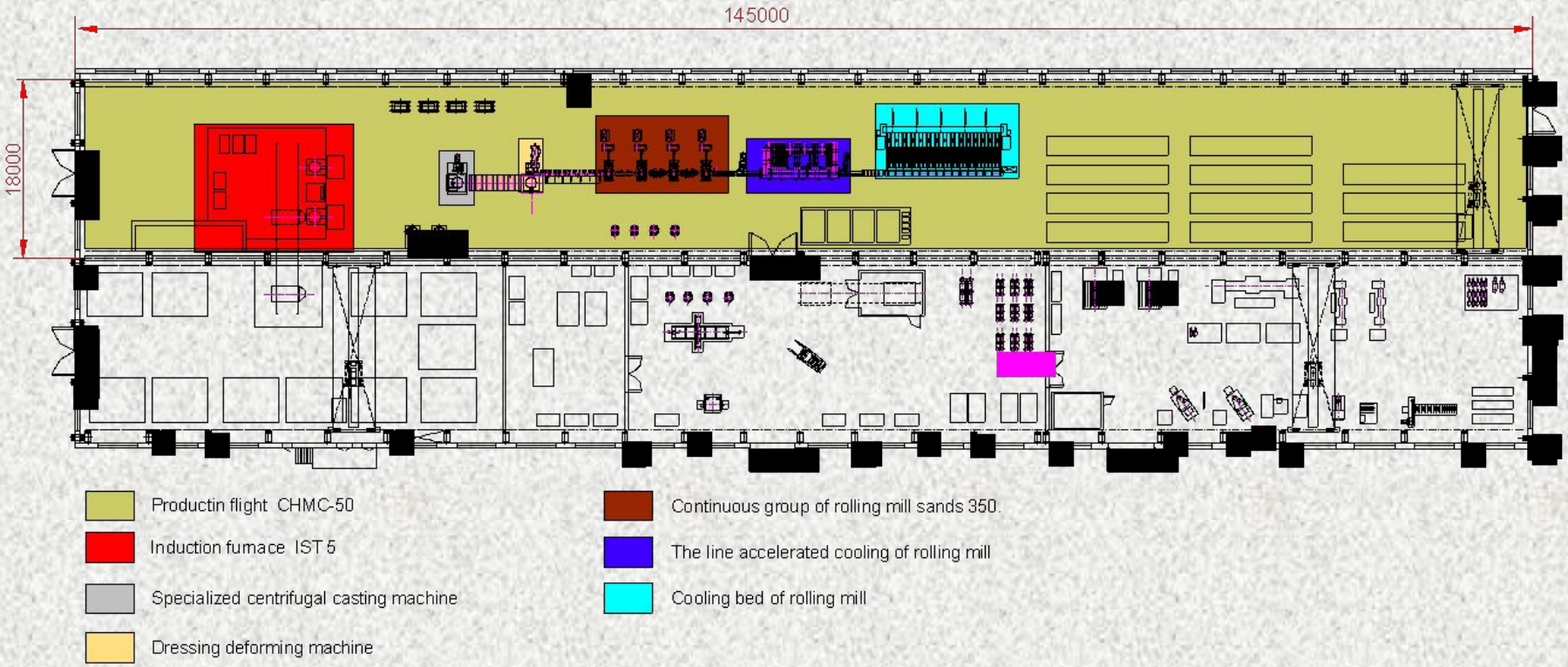
Bars, up to 12 meters, arrive at a chain cooling bed. Cooling of the metal occurs naturally in the air when you move the peals of the cooling bed. After cooling, the rods are reset to transmit roller, are transferred to the site cold cutting shears to trim the ends and cutting to the required length of 11.7, 9.0, 6.0 meters. Cut to length on site rolled transmitted assorted pockets for binding. The pockets are set on the scales for weighing packages shipped rolled. Rail packages manually. After strapping packages weighing up to rolled 5 t crane shipped to the warehouse of finished products.

Considered a new metallurgical technology can significantly reduce the capital cost per ton of production by 2.5 -: -3.2 per cent. The costs to create a metallurgical production capacity of 250,000 tons per year is 160 -: -180 million USD, the cost of creating the CHMC-50 10.5 -: -12.0 million USD. Thus cost per unit to reduced from 700 -: -730 $ / ton to 210 -: -250 $ / ton.

Reduction of capital costs achieved by:
-reduction of energy and materials processing equipment;
-reduce the production area per unit of output;
-lack of unique steel-making, casting and rolling equipment and machinery requiring a high level of crane tracks, and high capacity cranes

Layout production building CHMC-50.

Fig.4



The new metallurgical technology reduces manufacturing costs by 20 -: -25%.
Reduced operating costs achieved by:
- Application billet with dimensions as close to the size of finished rolled;
- Avoid pre-heating of the initial billet before rolling;
- No excessive rolling deformation, the formation of the finished structure;
- Percent increase in dimension and the output of suitable rolled to 0.985;
- Reduction of production personnel and support services;
-exception or a significant reduction in transport costs on transportation costs of raw materials and finished products.

CONTACT

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