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FEATURES OF TECHNOLOGIES OF CONTINUOUS CASTING AND ROLLING OF ALUMINIUM

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The results of patent-literary review of methods of the continuous casting and rolling of aluminium are presented, the basic stages of development are expounded and the comparative analysis of existent technologies is executed.

Keywords: cathouse machine, crystallizer, rolling mill, billet, rolled wire

After appearance of idea for combination of rolling with the continuous casting technology of this production passed the considerable way of development. In the beginning rolled wire it was tried to get, giving a liquid metal directly in an interrolling gap. However positive results were got neither with steel nor with the coloured metals from the presence of sliding friction between the initial hardening surface of bar and surface of form.

Most distribution in modern metallurgy was got technology, in which reduction of bars got the continuous casting, takes place after crystallization of metal. As a result of complete division of crystallization and deformation processes for metal rolled wire on an exit from a rolling mill has a homogeneous structure, its mechanical properties get better and a probable assortment broadens [1].

In future the process of the continuous rolling was perfected and serve of metal on rollers began to execute through attachments, set between them. Thus crystallization and deformation of metal is partly divided, but from the location of rollers near-by crystallizer, the process of rolling of metal begins, when a core of bar is as early as the liquid state. Thus there is not formation of contraction cavity, however a bar is exposed to reduction at the temperature of transition of metal from a liquid phase in hard, id est. it's very subzero plasticity. As a result cracks which are filled by fusion with higher content of alloying elements appear in its central part. In addition, nonsolidified part of metal is ousted in the back-end of bar. All of it results in chemical heterogeneity of rent on its section and length. At creation of aggregates for the production of rental types on such technology basic difficulty consisted of development of crystallizeroв which would provide high-rate enough of output of bar and did not reduce the productivity of rolling mill. I. Propertsi (Italy), patented the method of making of rolled wireи from the coloured metals by the method of the continuous casting and rolling (CCR) and offered the construction of casting-rental aggregate (CRA), realizing this method [2].

At such method, sliding of bar is eliminated on the walls of revolved crystallizera and it is not required to make effort for its drawing out, and for the rate of casting it is enough to increase the diameter of crystallizer or section of chamfer [3,4].

In the beginning technology of the continuous casting and rolling was applied for making of wire from lead and zinc. However in course of time it found general application for the production of rolled wireи from an aluminium and copper, major materials for cable industry. The first lines of CCR of aluminium rolled wireи were set on the plants of companies «Imperial Chemical Industries» (Great Britain), «Montecatini» (Italy) and «Pechiney» (France). Presently more than 85 % aluminium rolled wire is produced on the equipment of «Continuus-Properzi» [4,5].

In the USSR, and now in Russian Federation, from middle of 50th XX century creation of CRA for the production of aluminium and copper rolled wire realize OAJ «RNRIMETENG». In 1961 its casting-rental aggregate of CRA-AK, in a great deal look like the Italian variant, was put into an operation at the Dneprovskij aluminium plant (Zaporozhe). In all on developments of this organization on the plants of metallurgical industry 20 similar options are inculcated [4]. In the USA by companies «Southwire» and «Western Electric» by modernization of casting machine and system of cooling of bar on the line of «Properzi» CRA of the greater productivity are worked out [6].

For the rate of casting in an aggregate there is increased length of contact of the cast billet with crystallizer due to the increase of corner of scope its steel ribbon from 180 to 270°. Here the tensioner of ribbon was executed by four-wheel, and system of the aquatic cooling of bar - able to provide more intensive crystallization of metal.

There are distinctions and in completing of rolling mills. So, CRA, produced in Russian Federation, twelve-stand have rolling mills with double-roll cages which are collected in two blocks for six cages with a general drive. Volatile cutters set for trimming of front end between blocks. In a rolling mills to the станах company «Properzi» use double-roll working cages in a draft group and three-high cages - in a clean group. The common amount of cages is varied from eight to fifteen.

In technological lines of every CRA there is the furnace area which is intended for preparation of metal to casting. If an aggregate is set on a production, where electrolyzes are not, then on the furnace area execute yet and melting of aluminium [7].

At the beginning of 70th XX century of firms «Hazelett Strip Casting Corporation» (USA), «Mhoolen» (Belgium) and «Kruppindustrietchnik» (Germany) worked out the technological process of «SMS-MEER Contirod» for a production from the coloured metals and alloys of not only rolled wireи of certain diameter but also wide bands [1,3]. Most machines of casting-rolling aggregate of «SMS-MEER», their functional setting, and also principle of conduct of technological process CRA «Properzi» is analogical. A difference consists in that instead of rotor casting machine use mobile crystallizer of band type of «Hazelett» [8].

Possessing undeniable advantages before other castings technologies, a method of CCR is effective only in the conditions of mass production. At making of small volumes, application of CRA unprofitably as from frequent transitions from one standard size of type on other standard size the additional complete sets of the calibrated rollers and considerable expenses of time are required on a changeover. In these conditions the options of the continuous casting and pressing of the coloured metals the method of conform become more effective, in

which for passing to other assortment of product it is necessary only to change a press-matrix.

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