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IMPLEMENTATION OF PREVENTIVE QUALITY MANAGEMENT SYSTEM FOR PRODUCTION OF TMCP PROCESSED 10MN2VNBAL STEEL HEAVY PLATES

ВПРОВАДЖЕННЯ ПРЕВЕНТИВНОЇ СИСТЕМИ УПРАВЛІННЯ ЯКІСТЮ ДЛЯ ВИРОБНИЦТВА ТОВСТОЛИСТОВОГО ПРОКАТУ ЗІ СТАЛІ 10MN2VNBAL, ОБРОБЛЕНОГО ТМСР

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The quality of hot-rolled steel products is formed by technological means as a set of mechanical, environmental, surface and other operational properties of rolled products that determine their suitability to meet certain customer needs [1, 2]. To obtain an increased level of mechanical properties of rolled plates, a number of effective but energy-intensive heat treatment schemes are used with preliminary modification of the composition of alloying elements and the formation of multiphase structures [3]: ART treatment of steels with

medium manganese content, isothermal quenching of nanostructured steels with carbide-free bainite, Q&P treatment and D&P treatment. In most hot plate mills, more energy-efficient thermomechanical controlled process (TMCP) technologies are suitable for implementation, but the quality control system must be continuously improved to produce rolled products with improved quality indicators [4]. For this purpose, in order to ensure the full functioning and development of an enterprise or company, a quality management system in accordance with the requirements of ISO 9000 and ISO 9001 standards is relevant for implementation at all process areas, starting with the supply of raw materials, including work with suppliers, equipment maintenance, and ending with the processes of working with customers – consumers of products. For complex rolling operations at full-cycle steelmaking facilities, it is particularly important to develop a preventive quality management system when developing new products and improving existing technologies.

The goal of the work was to formalize and implement in the conditions of a heavy plate rolling mill shop the quality management methodology for 10Mn2VNbAl steel flat products produced by a thermomechanical controlled process (TMCP) rolling with a predicted increasing of mechanical properties indices. It is shown that the quality management system is relevant to be implemented in all process areas, from the supply of raw materials to the processes of working with consumers of products, in order to operate and achieve the enterprise development.

The basis for creating control criteria is information on already manufactured products and the results of their quality control (at the enterprise and based on customer feedback). Corrective actions are integrated into the QMS processes as an element of the Deming cycle (PDCA), which is successfully implemented in relation to TMCP rolling of low-carbon low-allow steel heavy plates [4]. It follows from [2, 5] that each production facility builds its own quality control system that takes into account the specifics of its structure and management methods. Thus, in order to control the production process and ensure the predicted quality of thermomechanically treated rolled products, it is necessary to develop a preventive quality management system to establish and manage the relevant technological factors, which is the objective of this study.

On the basis of the analysis, it has been established those additional requirements for quality indices of rolled products exceed the values established by normative documents, which should be taken into account when developing technologies. The proposed methodology includes the use of Ishikawa's approaches to establish factors affecting quality indicators, processing of statistical information with the construction of Pareto charts (fig. 1, a) and determination of compliance of the distribution of indicator values with the normal law. Designation for stability of the process and

indicators levels performed by the method of coloured markers with tracking of results (by Shewhart charts (fig. 1, b), as an example). If the permissible level of deviation is exceeded, or if the indicator falls into the yellow or red field, the process personnel take actions to ensure that the indicator falls within the required limits/green field. A unit of production, batch, or other item produced outside the green field must be tracked separately.

Based on the analysis, it was found that additional requirements for rolled products exceed the values established by regulatory documents and need to be taken into account when developing technologies. It is determined that, based on the relationships between rolling process parameters and mechanical properties of finished TMCP rolled products established by a set of statistical data processing methods, which are incorporated into the quality management methodology, it is possible to increase the stability of rolling processes.

Decision-making on technology improvement with control of influencing factors of the thermomechanical rolling process, as a separate element of the quality system, is subject to the Deming cycle (PDCA).

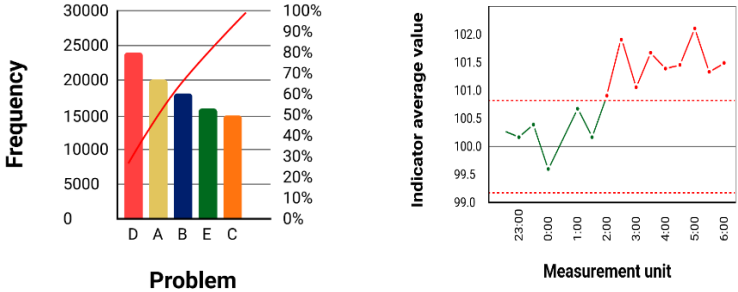

Fig. 1. Pareto (a) and Shewhart (b) charts

The testing of the proposed methodology showed decreases in the standard deviation of yield strength, tensile strength and percent elongation by 44%, 31% and 46% respectively, regard to the primary data obtained when rolling 10Mn2VNbAl steel at heavy plate mill 3600.

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IMPROVEMENT OF THE EMULSION CLEANING SYSTEM OF THE COLD ROLLING MILLS OF THE COLD ROLLING PLANT TO REMOVE HYDRAULIC OILS FROM THE ROLLING EMULSION

ВДОСКОНАЛЕННЯ СИСТЕМИ ОЧИЩЕННЯ ЕМУЛЬСІЇ СТАНІВ ХОЛОДНОЇ ПРОКАТКИ ЦХП З МЕТОЮ ВИДАЛЕННЯ ГІДРАВЛІЧНИХ ОЛИВ З ПРОКАТНОЇ ЕМУЛЬСІЇ

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Система очищення емульсії сучасного стану холодної прокатки зазвичай включає магнітну (найбільш поширені – ланцюгового типу) або на основі фільтрів очистку емульсії від частинок заліза і бруду та скімер,