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The 5th International
Youth Scientific and Technical Conference

MAGNITOGORSK ROLLING PRACTICE 2020

Proceedings of the 5th International Youth Scientific and Technical Conference

Edited by A.G. Korchunov

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These scientific publications constitute the proceedings of the 5th International Youth Scientific and Technical Conference «Magnitogorsk Rolling Practice 2020» devoted to metal and alloy forming**.**

Subjects of the reports delivered by young researchers show a considerable interest in research areas related to development of finite element models of metal and alloy forming processes using special software, innovative cold and hot plastic working processes, new materials with a higher level of performance, methods used to determine true resistance of metals and alloys to deformation, and physical simulation of metal and alloy forming processes.

The Conference had a title of the winner of the competition held by the Russian Foundation for Basic Research for the best projects of organizing scientific events in the Russian Federation in 2020.

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MAGNITOGORSK ROLLING PRACTICE 2020

Материалы V международной молодежной
научно-технической конференции

Под редакцией А.Г. Корчунова

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Представлены материалы докладов V международной молодежной научно-технической конференции «Magnitogorsk Rolling Practice 2020», посвященной вопросам обработки металлов и сплавов давлением.

Тематика докладов молодых ученых свидетельствует о существенном интересе к научным направлениям, связанных с разработкой конечно-элементных моделей процессов обработки металлов и сплавов давлением в специализированных программных комплексах, инновационных процессов холодной и горячей пластической обработки, новых материалов с повышенным уровнем эксплуатационных характеристик, методик определения истинного сопротивления металлов и сплавов деформации, физического моделирования процессов обработки металлов и сплавов давлением.

Конференция проводилась в статусе победителя конкурса Российского фонда фундаментальных исследований на лучшие проекты организации научных мероприятий на территории Российской Федерации в 2020 г.

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The new knife calibration procedure is performed using several radii to ensure gradual deformation. In order to prevent the free flow of metal in the direction of the gauge exit, the gauge height is also increased. The hot guillotining process was simulated using the proposed calibration procedure. It was found that the geometry of the knife gauges determines the geometry of the end part. Based on the simulation results, it was concluded that the proposed calibration procedure helps reduce the ovality of the end face of the workpiece by 47% compared with the current calibration procedure.

Conclusions: The use of the new knife calibration procedure will reduce the ovality of the workpiece by 47%; one of the ways to minimize the ovality of the end face of the workpiece after cutting can be reducing the width of the upper knife gauge while increasing the height of the lower knife gauge; the computer model of hot guillotine cutters can be used for further research of the hot guillotining process.

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METHOD FOR CALCULATING THE TEMPERATURE OF THE DEFORMATION CONE CROSS-SECTIONS IN A COLD PILGER ROLLING MILL

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The process of pilger rolling is widely used for manufacturing cold and hot deformed precision pipes of a wide range of alloys and steel grades [1-3]. Such modes as cold and warm rolling, as well as rolling without emulsion are used in the cold pilger rolling process. In spite of a relatively small feed (2-6 mm) and considering the deformation cone length (300-500 mm), the metal is shaped in rather tough conditions (the mill stand can make up to 280 double strokes per minute). The cold rolling process generates a significant amount of heat [2-6]. This research paper describes a method that helps compensate for the thermal effect when rolling pipes using salt as grease and without using emulsion for cooling. Fig. 1 shows a comparison of the existing and proposed methods for calculating the working tool calibration [5-6].

The proposed method allows to calculate more precisely the cold pilger rolling process. The results of the calculations have been checked in practice and have confirmed the efficiency of the method [2-6].

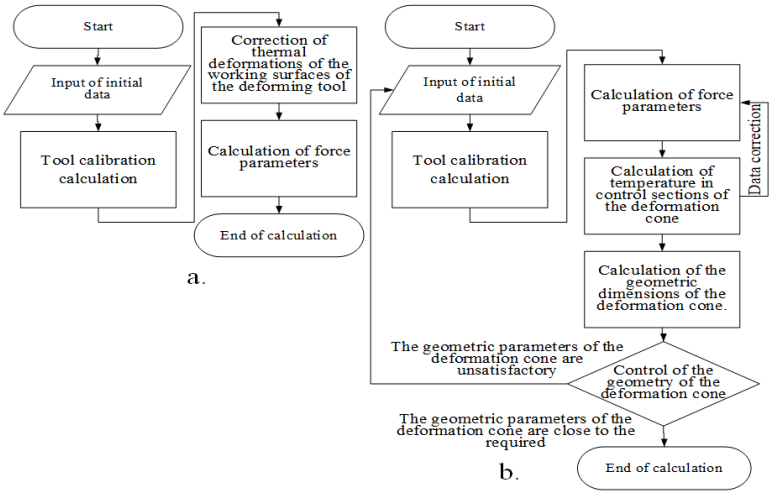

Fig. 1. Existing (a) and proposed (b) calculation methodology

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UNDERSTANDING THE EFFECT OF MULTI-STAGE HEAT TREATMENT SCHEDULES ON THE MICROSTRUCTURE AND PROPERTIES OF CRYOGENIC STEEL

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One of the strategic objectives in the industrial development of today's Russia is to develop the industrial facilities and to increase an export share of liquefied natural gas in the Arctic regions of the Russian Federation (Fig. 1). This predetermines the need to