DOI https://doi.org/10.30525/978-9934-26-506-8-57

INCREASING THE OPERATIONAL DURABILITY OF THE FRICTION TOOL FOR SPINNING OF NECKS

ПІДВИЩЕННЯ ЕКСПЛУАТАЦІЙНОЇ ДОВГОВІЧНОСТІ ІНСТРУМЕНТУ ТЕРТЯ ДЛЯ РОТАЦІЙНОЇ ОБКАТКИ ГОРЛОВИН

Kulik T.O.,
PhD (Engineering), LLC "Technical university "Metinvest polytechnic", Zaporizhzhia, Ukraine

Кулік Т.О.,
к.т.н., ТОВ «Технічний університет «Метінвест політехніка», м. Запоріжжя, Україна

Kulik O.M.
PhD (Engineering), Associate Professor, LLC "Technical university "Metinvest polytechnic", Zaporizhzhia, Ukraine

Кулік О.М.,
к.т.н., доцент, ТОВ «Технічний університет «Метінвест політехніка», м. Запоріжжя, Україна

One of the main tasks of blank production is to reduce the cost price by maximally bringing the blank closer to the final geometric characteristics of the finished part and, as a result, reducing the labour intensity and energy intensity of the technological process, increasing the material utilization factor, and improving the performance characteristics of the manufactured products. It's essential for mass and large-scale production parts, such as belt conveyor rollers. Hot spinning (rotational running-in) with a friction tool, compared to other methods of plastic deformation of tubular blanks, has several advantages: high productivity, insignificant deformation force, and excellent technological capabilities, including those allowing the forming necks of a relatively small diameter at the ends of a tubular blank, to obtain a blank that is maximally close in shape to the finished product [1].

In addition, as shown by the experience of operating rollers of an axless design obtained by spinning from a hollow blank, their performance is 2.5 times higher than traditional rollers on axles. This is because the technology of spinning of necks provides improved metal properties in necks from the point of view of the thermomechanical aspect [2].

At the same time, the research on the process showed that the necks of the rollers are especially sensitive both in macro-geometry and in the stability of thermomechanical parameters to the geometric characteristics of the working profile of the friction spinning tool. This places increased demands on the

operational durability of the tool, requires constant strict control of the condition of its working surface and compels its prompt and timely replacement.

To increase the operational durability of the friction tool, ensure quick replacement of its working surfaces and reduce the consumption of wear-resistant alloy, a design of a friction tool with a separate base is proposed. The tool's design is such that the tool unit has several working areas with the required working surface (Fig. 1). The tool base is made in the form of a rectangular prism with grooves along the perimeter and in the side walls and is equipped with a fastening unit for the working part of the tool unit in the form of a support flange located in the base grooves, as well as at least one support insert installed on one side of the base with the possibility of plane-parallel movement. The working part of the tool unit is made with end ribs and an even number of working sections. During the tool's operation, only a section of the working part of the tool unit comes into contact with the workpiece, which is replaced after it wears out.

Such a design allows for quick reinstallation of the tool unit so that an unworn section of the working surface comes into contact with the workpiece.

a) b)

Fig. 1. Set of tools for rotary spinning of necks of relatively small diameter with quick-change working part (a) and cross-section of the assembled instrument (b)

Thus, the use of the proposed design of a friction tool with a separate base and several working sections of the spinning tool unit increases the operational durability of the tool and ensures stable macrogeometric parameters of the finished product.

Bibliography

1. Study on optimization of thermal spinning process of accumulator shell / Bin Li et al. *Mechanics & Industry*. 2020. Vol. 21 P. 2073–2084.

2. Кулік О. М., Кулік Т. О. Термомеханічний аспект технології отримання труб з горловиною відносно малого діаметру ротаційною обкаткою. *Литво. Металургія. 2024* : матеріали XX Міжн. наук.-практ. конф., м. Київ, 28-30 трав. 2024 р. С. 409-412.