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NOISE RESEARCH OF TOOTH WHEEL OF THE PINION STAND OF THE RADIAL-SHIFTING BEND WITH MODIFIED TEETH (GEARS)

Abstract. A new combined method for manufacturing bars and tubes with a stable sub microcrystalline structure is proposed in the article: intensive plastic deformation by the method of radial-shear rolling with a combination of pressing. The influence of the modified teeth of the gear wheels of the radial-shear stand on the noise and vibration of its drive is investigated. At the same time, a special methodology was developed and appropriate research tools were used. To determine the noise level in tooth gears with modified teeth of the wheels, a special stand was designed and manufactured. As the object of investigation, medium-speed disc type straight-toothed pairs of medium sizes were chosen. The tests carried out on the stands were designed to find out the effect of modified wheel teeth on noise and vibration, the variation of skew, speed and load, and the effectiveness of the effect of the profile modification of the teeth of the wheels on noise and vibration when varying the gap between the teeth, speed and load. The conducted experimental studies to determine the noise levels of tooth gears with modified teeth showed that for transmissions with 7÷9 degree of use of longitudinally modified teeth on one mating wheel, a significant reduction in the load concentration and a reduction in vibration and noise of 3÷5 dB, and the use of a profile modification of the teeth along the entire height of tooth, obtained by hydro abrasive method, allowed to reduce the noise level by 4÷6 dB. If there is no load, the noise level increases with the depth of the profile modification. Under load, as the profile modification increases, the transmission noise level first decreases, then increases.

Keywords: modified teeth, gear train, contact markings (strips), modification depth, gear tooth contact, gear-meshing frequency.

Introduction. Rolling mills belong to the class of heavy energy-intensive aggregates, which are manufactured on individual projects in single copies [1, 2]. Each type of mill is characterized by its design and specific operating conditions, depending on the technology. They are low-speed, powerful crimping mills and relatively lightly loaded high-speed training and wire mills, continuous wide-band hot and cold rolling mills with a wide range of speeds along the stands, rolling mills for bars, pipes and etc.

Intensification of rolling production processes increases the load on heavy-loaded elements of mill stands, gear stands, reducers, combined reducers, etc. [3-5]. The cyclic action of powers leads to the appearance of defects in the mating elements. Gaps in gear train and bearings are one of the main reasons for increasing vibrations and the appearance of dynamic loads, leading to the destruction of parts. The primary task in the operation of mechanisms is the detection of incipient defects at early stage of occurrence using diagnostic tools.

For most mills and their stands, the impact character of the load application is typical, first of all, at the moment when the workpiece is caught by rolls [6]. This circumstance leads to the formation of