

ABSTRACT

Effect of preliminary deformation of strands in compacted ropes on their durability and strength parameters.

Steel ropes as tie rods are load bearing elements used in many fields of economy. On account of their advantages, they are also widely utilized in mining. They are commonly used in vertical transport devices and less frequently in horizontal transport. Significance of ropes in hoisting devices, because of function they fulfil, is great. In many cases, durability and reliability of used ropes has a great impact on safety and efficiency of a whole process of mining production. Wide range of applications of ropes and their role in mining exploitation entail that the requirements they have to meet are constantly rising. This in turn causes their new types and constructions to appear on the market. This also has impact on the fact, that materials used in production of the ropes have increasingly better tensile properties, and in many cases the parameters of ropes are dedicated to specific work conditions. The result of such actions was the development of new construction of rope with plane contacting wires called the compacted wire rope. The plane contact effect was achieved thanks to a process of compressing the strands of the rope. To define the fatigue durability of compacted ropes and their tensile properties, a series of on site and model tests were performed, results of which are presented in this thesis. Their aim was to specify if, and in what range, preliminary deformation of strands in compacted ropes affects controlled parameters of these ropes. To achieve the established goal, a testing methodology was developed and a wide range of on-site, static load tests of compacted and conventional ropes were performed. Scope of those tests also included fatigue tests of ropes. Results of the research included defining of breaking force, moments of untwisting, moduli of elasticity and fatigue durability of tested ropes. Acquired results were subjected to an comparative analysis, aimed to define a real effect of preliminary deformation of strands on determined parameters. Obtained results clearly indicate that preliminary deformation of strands in compacted ropes has a substantial effect on defined parameters and fatigue properties of tested ropes. That fact is confirmed by results of model tests, methodology and results of which are also presented in the thesis.

In order to apply developed methodology, performed tests and results in practice, guidelines were developed regarding assessment and control of technical condition of compacted ropes and also their selection and way of usage. Results of this research, along with following conclusions, were included in the work.

Methodology of on site and model tests presented in the thesis, with test results and analysis, and also elaborated conclusions, should constitute a valuable source of knowledge in the field of testing, selection and exploitation of compacted ropes and other types of ropes in mining industry. Versatility of developed solutions should be also applicable in other lines of industry where ropes are applied.