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The influence of corrosion on the life of steel ropes and prediction of their decommissioning

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Abstract: Operation of steel wire ropes brings a number of risks that affect their lifetime. During operation of steel ropes the one of the most adverse effects is the effect of corrosion. Manufacturers are working hard to eliminate the effect of corrosion by lubricating cables, surface protection of wires and alike, but these methods are not able eliminate corrosion rise and propagation totally. To examine the process of degradation of the mechanical properties of the steel ropes in the corrosive environment, we conducted research on a rope sample as a whole and on the samples of individual wires. The samples were exposed to the saline solution for a period of total duration of 64 days. The monitoring of the degradation was carried out at 16-day intervals when the samples were subjected to mechanical tests. The rope sample as a whole was subjected to the tensile test. The individual wire samples were subjected to the tensile test, alternating bend test and torsion test. The criteria according to the standard EN 12927-6 and the Slovak Mining Office Regulation (SBU) No. 50/1989 Coll. were used to evaluate the results of the degradation of the mechanical properties. These were then confronted with the criteria used in maritime shipping. Based on the results of the mechanical tests, the trend of the degradation of the mechanical properties in the saline solution and marginal values for the rope decommissioning were determined. Gradually, with an increase of the impact of corrosion on the rope samples, the impact on rope rotation resistivity was also registered, besides the mechanical properties changes.

Keywords: steel rope, corrosion, mechanical tests, steel wire rope lifetime