Usage of MFAM Technology to determine the influence of the Earth's magnetic field on the diagnosis of steel wire rope

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Steel wire ropes used in roped transport devices are subjected to bending fatigue. According to the application area, steel wire ropes are often exposed to atmospheric influences, and the impact of corrosion is inevitable. Non-destructive damage detection is a critical way to assess damage states to guarantee wire ropes reliability and safety. Microelectromechanical systems (MEMS) have allowed magnetic field sensors with potential applications such as the automotive industry, navigation systems telecommunications, and non-destructive testing. Optically-pumped magnetometers (OPMs) have been developed since the 1960s. OPMs have generated renewed interest over the last 15 years due to their increased sensitivity when operated in the spin-exchange relaxation free (SERF) regime. The Geometrics' MFAM is a laser pumped caesium magnetometer module that measures the total magnetic field strength. It uses caesium atoms contained in a small, evacuated glass vapour cell as the sensing element. The paper presents the application of MFAM sensors for diagnostics steel wire ropes. The module features two sensors that can be used independently or as an intrinsic gradiometer. The examined cable is the 7x7+7x19W+IWRC steel wire rope type of 6,5 mm diameter, coated, with a metallic central core strand and crossed to the right. Cable construction is robust and widely used in the industrial field, mainly in lifting applications. The examination aims to check the influence of the Earth's magnetic field on the diagnosis of steel rope using MFAM Technology. The steel wire rope was placed in various configurations, changing its position - both geographically and magnetically. Under the rope, an MFAM Magnetometer (2 sensors: M1 and M2) was attached, which with the use of appropriate software, could move at a constant speed of 3 mm/s. There are recorded the measurement of the magnetic field around the rope over a measuring length.

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