Fatigue Life Prediction of Wire Rope Based on Grey Particle Filter Method under Small Sample Condition

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Abstract

As the fatigue life prediction of wire rope has the defects of large samples and many interference factors, this paper takes the 6×31WS+FC type wire rope as research carrier. Based on small samples, the grey particle filter method has been creatively proposed to realize the wire rope fatigue life prediction under various load conditions. First, combining the reliability life data prediction with the equivalent alternating stress of the dangerous part during the fatigue test, the reliability stress-life curve was determined. Subsequently, the particle filter method has been used to modify the curve to obtain the modified P-S-N curve. Finally, with theory of fatigue damage accumulation, the fatigue life prediction model was established, and compared with the test results. The results show that based on small sample conditions, the proposed method can predict the fatigue life of wire ropes under various loading conditions with high precision, which proves the general applicability.

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