LOAD AND STRESS ANALYSIS and Fatigue Life Cycle OF THE PROPELLER BLADE IN CYCLOIDAL DRIVE

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The Cycloidal Drive or Voith Schneider Propellers (VSP) are widely used in the ship with safety and extreme maneuverability requirements. On the Cycloidal Drive, the rotor is mounted below the ship's hull and rotate about a vertical axis. A circular array of the blades project vertically from the rotor and simultaneously pivoting around their own axes to create angle of attack (AoA) which sync with the rotation of the rotor and generates lift at various direction and magnitude. The resultant force of all blades can be generated freely in any direction. Anyway, the oscillation of the blade to create lift leads to fatigue and one of Thailand's ship is prone to propeller blade break down at the root of the blade. The objective of this research is to investigate the stress on the propeller blade and the influence of the rotor speed on the magnitude of the stress. The investigation has been carried out as 3-D nonstationary flow around the propeller using ANSYS Fluent 15.0 with the Shear-stress transport (SST) k-ω turbulence model. The calculation stress will be used to predict fatigue life cycle of blade. The overall results suggest the maximum stress occurred at the junction between the shaft, which mounted in a rotor casing and protruded blade as a cyclic load between tension and compression. Blade will subject to stress more than 400 MPa when rotate at 350 degree, this high stress is greater than yield point of manganese aluminum bronze which is used for blade material. Fatigue life cycle of blade is about 7 years.