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C2Po1A-08: Analysis of unbalance response of the rotor of a typical cryogenic turbine for helium refrigerator under thermal effect

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As the core equipment of a helium cryogenic system, the safe and stable operation of a helium turbine is critical to the smooth operation of the entire system. During the processing and assembly of the rotor, it is inevitable to produce unbalance. The unbalance force generated by the unbalance measure may affect the stability of the turbine and even cause damage to the equipment. In order to study the unbalance response of the rotor in a low temperature environment, the finite element method is used in this paper to calculate the resonance amplitude of the rotor at critical speed under thermal effect. The results show that the thermal effect significantly increases the value of the first-order resonance amplitude of each part of the rotor, but the effect on the second-order resonance amplitude is relatively limited. In addition, the influence of the balance quality grade, bearing stiffness, and damping on the unbalance response are also studied when considering thermal effect.
KEYWORDS: Helium turbine, Unbalance response, Thermal effect, Resonance amplitude

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