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Design of gas foil thrust bearing for vertically operated turboexpander used in cryogenic application

Content :

Thrust load in the turbomachines is generated by the pressure differential acting upon the compressor wheel, turbine wheels and the impulsive force generated due to the axial flow on these wheels. This thrust or axial load is supported by thrust bearing or axial bearings. The gas bearing is preferable for a turboexpander to make it oil-free to avoid contamination with the process gas. The gas bearings used in the high-speed turbomachines can be with the rigid or compliant type. Compliant type gas bearings e.g. Gas Foil Bearings has many attractive advantages compared to the rigid bearings such as higher load carrying capacity, compensation for misalignment, accommodation of thermal distortion, larger clearance, etc. Gas foil thrust bearing are designed to take the axial load of the rotor, and they are consist of a bearing base, engineered spring structure foil, a smooth top foil and an attachment mechanism between foils and bearing base. Different investigators work on different types of engineered spring structure, and they are bump type, tape type, mesh type, etc. The bump type is most popular for its easy fabrication and assembly methodology. This paper focuses on the steps to calculate the thrust load in a turboexpander and a detail design methodology of for a pair of bump type gas foil thrust bearings.

Primary authors : Prof. BEHERA, Suraj Kumar (National Institute of Technology, Rourkela, Rourkela 769008, Odisha (INDIA))

Co-authors : Prof. SARANGI, Sunil Kumar (National Institute of Technology, Rourkela, Rourkela 769008, Odisha (INDIA)) ; Prof. SAHOO, Ranjit Kumar (National Institute of Technology, Rourkela, Rourkela 769008, Odisha (INDIA)) ; Mr. SINGH, Trilok (Bhabha Atomic Research Centre, Trombay, Mumbai 400086, Mah (INDIA))

Presenter : Prof. BEHERA, Suraj Kumar (National Institute of Technology, Rourkela, Rourkela 769008, Odisha (INDIA))

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