DESIGN OPTIMIZATION AND EFFICIENCY MODELING OF A HOT GAS VANE MOTOR

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ABSTRACT

The purpose of this research is to model and analyze the dynamics of a hot gas vane motor for design optimization work. The pneumatic motor is a portable direct drive actuator that is intended as an alternative to battery-powered electromagnetic motors. It is believed that the vane motor could replace other solutions for portable power generation. An optimal design of the motor is desirable to maximize portability and efficiency. Modeling the device will make it possible to optimize the mechanical efficiency by altering the geometry of the motor's vanes and respective chambers. The modeling of the device focuses on determining the net amount of torque that is produced by the high pressures that drive the device. While the efficiency of the motor is affected to a great extent by its geometry, losses from friction will also be considered. A model of Stribeck friction was developed to account for losses from friction. For the device to remain portable, there are limitations on the size of the final design which will restrict the optimal efficiency of the vane motor.