

IJTC2007-44199**HYBRID MAGNETIC BEARINGS FOR A CENTRIFUGAL BLOOD PUMP****Zhaohui Ren, Said Jahanmir, Hooshang Heshmat, and James Walton**
Mohawk Innovative Technology, Inc., Albany, NY 12205**ABSTRACT**

A hybrid passive/active magnetic bearing system was designed for a rotary centrifugal blood pump being developed for long-term circulatory support for heart failure patients. This system consists of two axially spaced bearing combinations for complete magnetic levitation of the rotor using only a single-axis active control. Each bearing combination comprises a pair of axially oppositely polarized permanent magnet rings on the rotor and a similar pair in the stator housing for both radial support and axial bias flux, and an electromagnetic coil to actively control the rotor axial position. The design permits a relatively large radial clearance between rotor and stator, and provides sufficient radial/axial stiffness, active controllability over the desired axial travel of the rotor. The bearing characteristics were evaluated by electromagnetic finite element analysis. The prototype pump was fabricated and levitated using a PID controller with zero-force balance algorithm to stabilize the rotor in the thrust direction and minimize the power draw. The experimental results confirmed the efficacy of the proposed magnetic bearing design and associated control algorithm.