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MAGNETICALLY SUSPENDED ROTARY BLOOD PUMP

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ABSTRACT

MiTiHeart™ LVAD is a rotary centrifugal blood pump with a hybrid passive/active magnetic bearing support system. It exhibits low power loss, low vibration, and high reliability under transient operating conditions. Unique features of the design include a simple and direct flow path for both main and washing blood flows, non-contact pump rotor, i.e., no rubbing surfaces, and relatively large clearances between the pump rotor and housing. The first prototype was constructed from medical grade polycarbonate. To reduce the possibility of thrombosis, the internally exposed surfaces were coated with a biocompatible polymer. Hemolysis test results showed a low normalized index of hemolysis of 0.01 mg/dL. An acute animal test was successfully completed at the Hershey Medical Center. During the test, the pump was implanted in a calf and operated in parallel with the heart. Following the acute test a chronic 200-hour implant study was completed. A second prototype was constructed using a titanium alloy for all blood contacting surfaces and incorporating a redundant hydro-dynamic thrust bearing. This prototype was successfully evaluated in two chronic implant studies in a calf animal model for a total of 130 hours.

Keywords: blood pump, magnetic bearing, thrust bearing, biotribology, heart failure.