

Promise of unrestricted mobility and freedom with wireless powering of a Ventricular Assist Device (VAD).

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Purpose: Advances in wireless data communication have significantly improved the portability of electronic devices. For use with a Ventricular Assist Device (VAD), wireless power technology will eliminate complications and infections caused by the driveline. We propose to power a VAD device with the Free-range Resonant Electrical Energy Delivery (FREE-D) wireless power system by strong resonant coupling technology which affords seamless energy supply without compromising mobility or need for a direct contact between the individual and energy source. The current investigation shows powering a maglev pump with a FREE-D system.

Methods: The experimental configuration consists of a single turn drive resonator, a multi-turn spiral transmit resonator, and multi-turn receive resonators attached to the hardware and software for pump control. Also included in the experimental configuration is an RF-DC rectifier to convert the oscillating RF signal to DC power, and a voltage regulator to provide proper voltage to the VAD. To achieve a seamless wireless power delivery over larger distances in order to accommodate any room size, the relay resonator was introduced.

Results: The VAD pump speed was swept over a full range from 1800 – 3000 rpms for a continuous two week time period. Wireless power was delivered across one meter with efficiencies for the resonators, the RF-DC rectifier and the voltage regulator over 80% for an overall system efficiency of 54%. The pump worked without interruptions or fluctuations throughout the entire two-week time period. The wireless power transfer distance can be increased even further by introducing more relay resonators to the system.

Conclusion: FREE-D system has the potential to allow a completely tether free existence with unrestricted mobility and freedom. FREE-D system does not interfere with the operation of a maglev pump and works well with high efficiency.