

Abstract

Masters of Engineering Degree (Mechanical) *(or Aerospace or Engineering Mechanics)*

Project Title:

Dynamic Flow Rate System for Ventricular Assist Devices

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Abstract:

Heart failure results in very high mortality and morbidity for those suffered. Now the gold-standard treatment for end-stage heart failure is still heart transplantation. However the number of donor hearts are very limited. As a result, implantable mechanical circulatory devices (MCDs) have come up as another option for improving survival in these patients. Among the MCDs, LVAD is widely used and performs well.

At present, most clinically implanted rotary blood pumps are operated at constant speed and adjusted by the manual-control approach such as the Jarvik 2000. At constant speed, changes in the remaining cardiac activity cause a minor adaptation of pump flow to physiologic demand. However, this increase remains below the natural response owing to the Frank-Starling mechanism. Therefore, to avoid over-pumping with subsequent collapse of the left ventricle and impairment of right heart function owing to septal shift a speed-control system capable of adapting to the patient's physiologic requirements would provide additional clinical benefit.

In this project, an automatic speed control was developed and implemented with creating a feedback mechanism that would determine whether or not the user was being active. This would then adjust the RPM of the pump, allowing the patient to see an increase in blood flow when under physical stress.