

REDUCING ENERGY WASTE IN CENTRIFUGAL PUMP SYSTEMS THROUGH THE IMPLEMENTATION OF BEP OPTIMIZED PRESSURE AND FLOW CONTROL

Author: Shane Corlman

Advisor: A. Sherif El-Gizawy

ABSTRACT

There currently exists a gap in the technology surrounding centrifugal pumps. When looking at modern literature regarding the application of centrifugal pump systems, the existing methods for control are throttle and speed control. Herein is described a new method, one which uses both throttle and speed control simultaneously to allow for the ability to precisely regulate pressure and flow for an entire system. Variable speed pumping, when combined with a control valve allows for control techniques which have the goal of optimizing the efficiency of the pump instead of just controlling flowrate. Developing a variable speed characterization and finding the best efficiency curve of a pump gives all the necessary tools to create a “dual controller” to operate a pump in the region of greatest reliability, always.

Experiments show that neither fixed speed operation nor variable speed operation without a control valve can accurately maintain operation at the best efficiency point of the pump. Therefore, a novel control system using both a variable speed pump and a control valve is proposed to replace individual throttle and speed control. The proposed system, when used with the best efficiency curve as the operational target, maintains the best efficiency point for any flow requirement within the applicable range of the pump. Additionally, experiments have shown that energy savings from the proposed control scheme can exceed 60%—a savings which no fixed

speed system can match. Dual control with a variable speed drive and control valve can reduce energy consumption and increase pump life and reliability when compared to throttle control or speed control alone by reducing the amount of time that the pump is operating away from its best efficiency point. Similarly, it provides the tools needed to produce any performance that an operator desires, whatever the application may be.