

Energy conservation through advanced control – Pumping System Advanced Control Case Study

Energy conservation through control is an area of engineering which has been practiced for the past 30 years. Enman, as a leading energy management consultancy, has been successfully working on the development of this technology for various process and utility plants. The control systems are designed as supervisory control systems, obtaining the best possible efficiency of a given system installation.

In the past year, Enman has implemented a large number of advanced control projects for a variety of applications, such as HVAC, chiller, refrigeration, boiler, compressed air and demand control. The majority of the projects were pilot projects partially funded by the Victorian Government.

An advanced control system was recently completed for a cooling tower and water pumping system for the Parkville site of CSL Limited. The water pumping system provides cooling to process as well as a large number of air conditioning systems on the site. A photograph of the plant is shown below.



The system consists of five pumps and four cooling towers. The system had installed PLC control, however was bypassed as the control never worked successfully. At the outset of this project, therefore, the system was operated manually from summer to winter.

The advanced control system which was installed consisted of: a PLC with Panel View, four variable speed drives for the cooling tower fans, one variable speed drive for one of the pumps, as well as various field equipment, such as flow and pressure transmitters, and ambient wet and dry bulb temperature sensors.

The PLC provides the advanced control for the cooling tower system. Panel View provides the control display, the facility for setting control parameters as well as live and historical energy consumption readings. The control allows the water temperature setpoint to be floated based on ambient wet bulb temperature. The cooling water temperature is maintained by controlling the speed of the fans in the cooling towers.

The pumping system is controlled based on end use pressure and flow, taking into account frictional losses. The pumps are staged in and out, depending on end use demand in the area, with the variable speed drive balancing the flow. The power requirement by pumps and fans were monitored and the results are shown in the following figures.

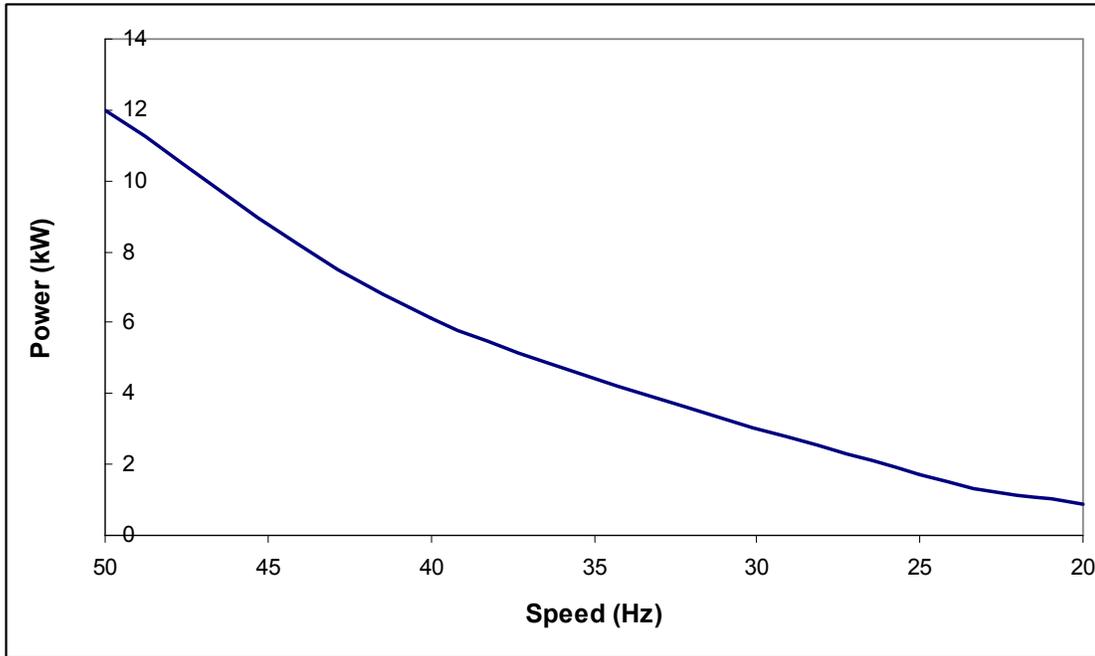


Figure 1: Fan power consumption with variable speed drive

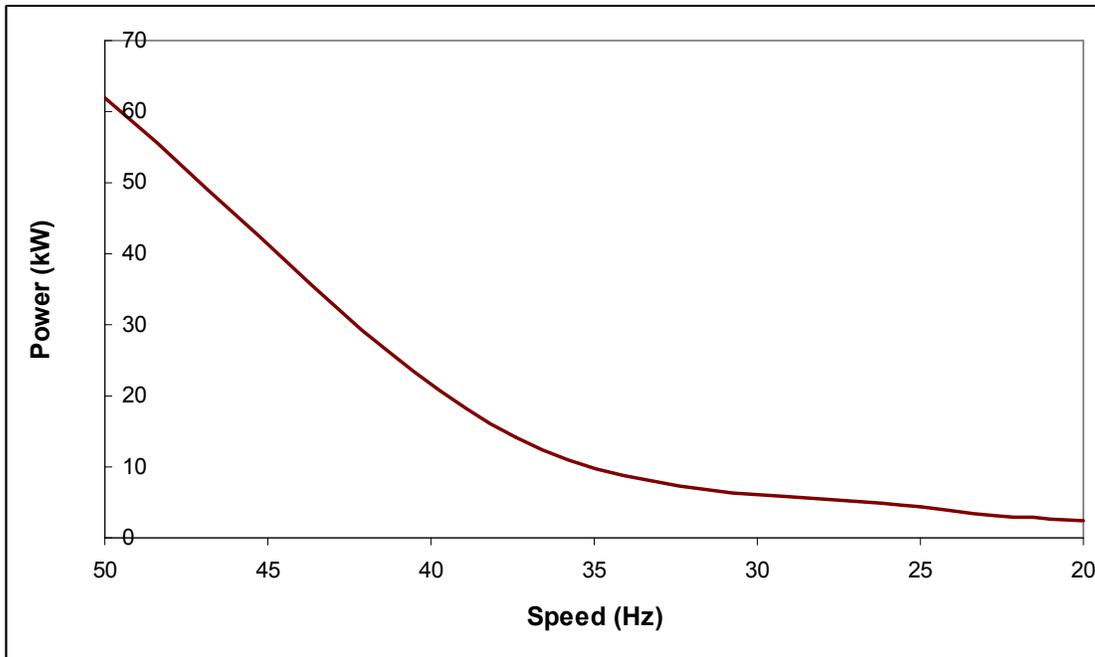


Figure 2: Pump power consumption with variable speed drive

The advanced control system has provided higher energy saving than anticipated. After commissioning the system, the energy savings were measured and normalised for weather conditions.

The energy consumption through this control system was reduced by 848 MWh/year, which represents a 40% saving. This represents a cost saving in the order of \$60,000/year and greenhouse gas emission reduction 905.66 t CO₂-e/year.

Based on the success of this project, CSL Limited is now considering advanced control in all other cooling tower plants on the site.