**OVERVIEW**

Burdekin sugar cane farmer Paul Villis flood irrigates approximately 400 hectares of sugarcane using both groundwater and surface water. He has 25 pumps in total and many are equipped with a butterfly valve on the discharge pipe to allow the flow of water to be regulated (Figure 3). Paul regularly used the butterfly valve to restrict the flow of water because he believed that restricting the flow of water using the butterfly valve was more cost effective than running the pump at full flow. This is because at the lower flow rate, the pump was drawing the least amount of amps. Paul had three settings on the butterfly valve that he regularly used which allowed full flow, partial flow and low flow of water.

**THE ASSESSMENT**

An energy efficiency assessment was undertaken on a 22kW centrifugal pump. This assessment involved collecting inlet and outlet pressure at the pump, water flow (measured in litres/second using an ultrasonic flow meter shown in figure 1), and energy consumption (measured in kilowatt hours (kWh) using the Ergon electricity meters in the switchboard). This process was repeated using the three different regularly used settings of the butterfly valve. The pump was allowed a period of time to stabilise before any measurements were taken. Water flow and energy consumption were measured over a one hour period to overcome any short term fluctuations.

**RECOMMENDATIONS**

It is recommended that Paul use this pump with the butterfly valve at the fully open position where possible. Operating the pump this way cost only $9.79/ML compared to $15.78/ML when the butterfly valve is in the half open position.

**REMEDIAL ACTIONS**

Now that Paul is aware of the cost savings of running the pump at full flow, he intends to run the pump with the butterfly valve at the fully open position wherever possible. However, due to differing irrigation needs, he won’t be able to run the pump at full flow at all times.
OUTCOMES
As a result of being part of the Energy Efficiency Gains for Australian Irrigators’ project, Paul now feels more confident to assess the energy efficiency of the other pumps on his property. He plans to focus on the pumps that use the most energy to try and find ways to make more savings for his business.

RESULTS
As can be seen in Table 1, the fully open setting of the butterfly valve was the most cost effective setting by 38%. With the butterfly valve fully open, the pump pumped water at 96 L/s, this is 78% more than that of the half open setting which delivered water at 54 L/s. Energy consumption per hour was also more at the fully open position than the half open position, using 25 kWh and 18.6 kWh respectively, a 10% difference. However, as can be seen in Figure 2 when taking into account the flow of water and the amount of energy used, the fully open setting is by far the most cost effective, costing $9.79/ML compared to $15.78/ML.

<table>
<thead>
<tr>
<th>Butterfly Valve Setting</th>
<th>Amps</th>
<th>Flow (L/s)</th>
<th>Energy used per hour (kWh)</th>
<th>Cost per hour ($/h)</th>
<th>Cost per ML ($/ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half Open</td>
<td>Lowest</td>
<td>54</td>
<td>18.6</td>
<td>3.07</td>
<td>$15.78</td>
</tr>
<tr>
<td>2/3 open</td>
<td>63</td>
<td>19.7</td>
<td>3.24</td>
<td></td>
<td>$14.30</td>
</tr>
<tr>
<td>Fully open</td>
<td>Highest</td>
<td>96</td>
<td>20.5</td>
<td>3.38</td>
<td>$9.79</td>
</tr>
<tr>
<td>Difference (%)</td>
<td>+78%</td>
<td>+10%</td>
<td>+10%</td>
<td></td>
<td>-38%</td>
</tr>
</tbody>
</table>

The views expressed herein are not necessarily the views of the Commonwealth of Australia, and the Commonwealth does not accept responsibility for any information or advice contained herein.

WHY DOES REDUCING WATER FLOW CONSUME MORE ENERGY?
- Choking back your valve to half way will not halve your energy usage. Your pump will use less amps but you will take longer to pump the required amount of water—using more energy per megalitre overall.
- Power and energy can be thought of like distance and speed. Energy being distance and power being speed.
- In a journey what matters is the total distance covered (e.g. the total energy used) and not the speed you are going (e.g. power) at any point along that journey.
- Amps are the unit used to measure current flow. Amps x Volts = power (watts).
- kWh is a unit used to measure energy.

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