



**Scottish
Water**

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Burnside SPS

Investigation into the Deragger II's Energy Savings and other Benefits.

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1. Introduction

The demonstration site is a dry well with 2 Foul Pumps (22kW) and 2 Storm pumps (42kW). Normal operating conditions are one storm pump and 2 foul pumps running together. The storm pumps are duty alternate rotation.

The Clearwater Controls DERAGGER II device was installed on each pump on the site. Keypads with modbus data logging enabled were installed with each DERAGGER II.

A flow rate 4-20mA signal from a flow meter on the outlet pipe was wired into the Deragger on Storm Pump 1 to enable us to calculate the volume pumped whilst the pumps were running.

Data was collected between the 1st August and the 5th of August with anti-ragging enabled on Storm Pump2 (ST2) and Foul Pump2 (FP2).

Data was also collected between 5th of August and 13th of August with anti-ragging enabled on all pumps.

The purpose of this was to determine if the site would experience a reduction of energy costs with the DERAGGER II device installed and anti-ragging enabled.

To determine this comparisons will be made on a like for like basis. Only data where ST1, FP1 & FP2 or ST2, FP1 & FP2 are running will be used.

A calculation of the volume pumped when ST1, FP1 & FP2 are running and the totals kWh used to pump that volume will be made.

The volume pumped when ST2, FP1 & FP2 are running and the total kWh used to pump that volume will also be made.

To aid this comparison this shall be expressed as a litres/kWh ratio.

Full details of the impact on flow rates is detailed in Appendix A.

Immediate results:

- Since implementation, blockages have been substantially reduced.
- **Energy consumption has been reduced by 46.8%.**
- Reductions in labour costs due to removal of manual lifting of pumps, freeing key resource to address other more productive tasks.

2. Results Summary – Graphical Representation

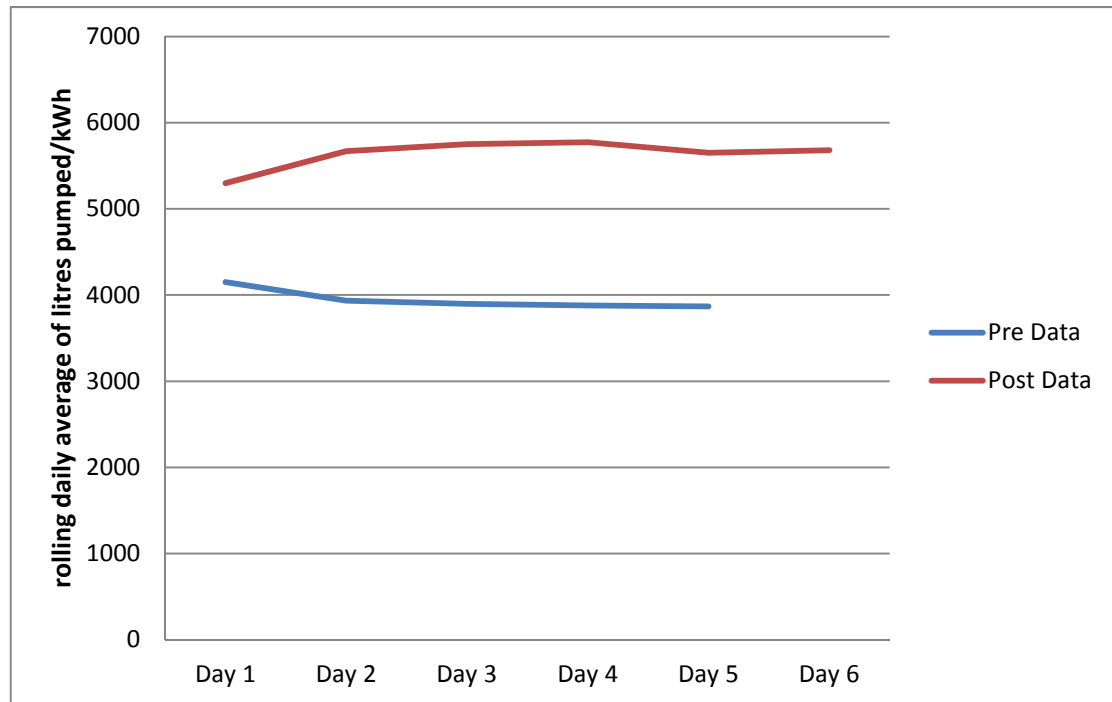
After anti-ragging was enabled on all four pumps we can see an average increase of **46.8%** in litres pumped per kilowatt hour.

- Anti-Ragging enabled on Storm Pump 2 & Foul Pump 2

Date	Based on running time	Litres pumped per kWh
01-August-2016	02:37	4150
02-August-2016	06:50	3721
03-August-2016	05:20	3821
04-August-2016	06:47	3826
05-August-2016	01:53	3822

- Anti-Ragging enabled on all 4 pumps

Date	Based on running time	Litres pumped per kWh
05-August-2016	02:27	5298
06-August-2016	03:05	6043
08-August-2016	02:50	5905
09-August-2016	04:25	5850
10-August-2016	06:20	5150
11-August-2016	03:36	5823



Pre-Data = anti-ragging not activated

Post-Data = anti-ragging activated

3. Conclusion:

Having performed a simple retro-fit of the DERAGGER II anti-ragging devices:

- Burnside no longer suffers from any major blocking incidents.
- There has been a reduction in operational costs from reduced manually lifting and cleaning.
- There is an average energy saving of 46.8%.

Appendix A

Primary Y Axis 0 - 100 A

Secondary Y Axis 0 -100% of 0 - 300 l/s

Green pen: Storm Pump 1 current.

Red pen: Storm pump 2 current

Blue Pen: Foul pump 1 current.

Orange Pen: Flow rate.

i. Anti-Ragging on Storm Pump2 and Foul Pump 2

The graph below shows some sample data from 4 pump runs.

The first and third runs are with Storm pump 1 and the 2 foul pump running.

The second and fourth runs are with Storm pump 2 and the 2 foul pumps running.

Anti-Ragging is enabled on Storm pump 2 and Foul pump 2.

ii. Observations

When the first combination is running the flow rate is between 150 - 180 l/s.

When the second combination is running the flow rate is between 205 - 235 l/s.

This can be seen all the way through the data set.

