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Unlocking Efficiency in a Mature Water Abstraction System

At a Glance

- £19,200 in annual energy savings achieved
- 228,571 kWh reduction in electricity consumption
- 101 tonnes of CO_2 emissions avoided per year
- Adaptive control strategy implemented across borehole and high-lift pumps

Revisiting a “Fully Optimised” System

A large-scale water abstraction and treatment system, previously reviewed and deemed efficient, was revisited with a fresh engineering perspective. Despite prior optimisation, abstraction costs varied significantly across three source sites, prompting a deeper investigation.

Key challenges include:

- The system included seven borehole pumps, multiple inter-stage pumps and seven high-lift pumps.
- One site showed disproportionately high costs due to reliance on a remote borehole.
- High flow rates were causing start/stop cycling, high frictional losses, and deep pumping levels.

This revealed that even systems considered “optimised” can benefit from a second look, especially when approached with a process energy mindset.

Focused Analysis for Smarter Control

Rather than over-engineering the solution, we focused on two critical areas:

- Reservoir operations to understand abstraction timing and demand patterns.
- Contact tank dynamics at the remote borehole site to assess flow limitations.

This streamlined modelling approach revealed that the fixed flow rate of high-lift pumps was constraining the potential benefits of VSDs on the borehole pumps.

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Solution Summary

Energy savings

228,571 kWh reduction

Cost impact

£19,200 saved annually

Carbon reduction

101 tonnes of CO_2 avoided each year

Flow-Led Control: Optimising Abstraction with Intelligence

To reduce energy consumption while maintaining supply reliability, we implemented a control strategy tailored to the system's hydraulic behaviour.

Solution highlights:

- Pump speeds were dynamically adjusted based on reservoir and contact tank levels.
- This flow-responsive method enabled more effective use of available storage.
- Control logic moved away from static set-points to real-time system feedback.

Impact:

- The system now meets demand using the minimum required energy.
- Pumping efficiency remained constant, but operational energy use dropped significantly.
- The abstraction process became smoother, more predictable, and less wasteful.

Engaging Site Teams for Seamless Delivery

Engagement with site operations was central to the project's success. By involving the team early, we ensured the proposed control strategy was clearly understood and practically viable. Their input helped shape the final implementation, resulting in a smooth transition and full confidence in the system's performance.

enquiries@projectiveengineering.com