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Are your water pump stations Elves or Goblins?

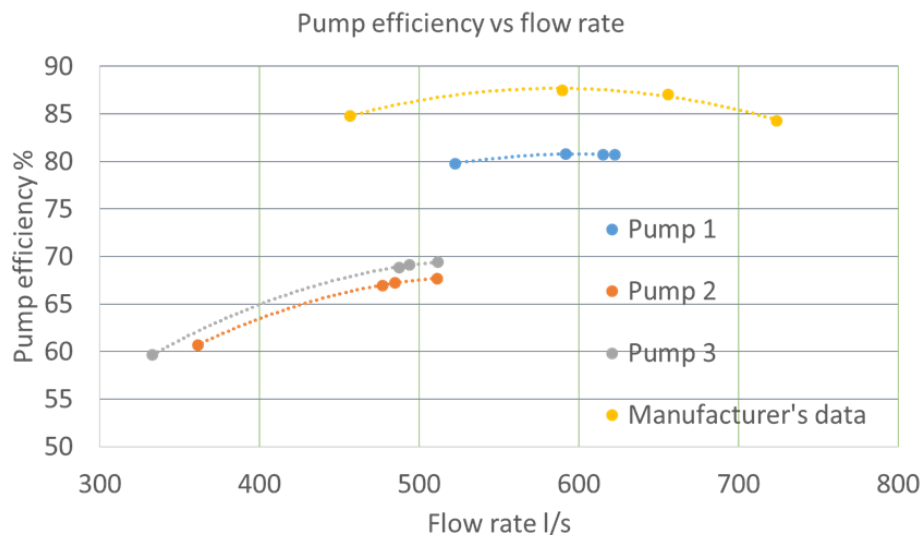
How do the energy efficiencies of your water pump stations compare with what would be possible, with new pumps operated in the most effective combination to provide the required flow rate?

The answer to this question can be provided with our *MicroPM pump monitors* (one per pump), feeding data to our *Micro Station Analyzer* (one for every group of pumps in parallel).

We have developed a new metric, the *Efficiency Loss Factor (ELF)* that is simple to interpret, and which instantly advises of the state of the pump station, and how much it has degraded from optimum. Additionally:

- (1) Pump Scheduling: We advise the best combination of pumps to use to achieve the demand flow rate for lowest cost.
- (2) Pump refurbishment: We advise the optimum time to refurbish pumps.

Here's a real-life case study, with three 800 kW pumps operated in parallel. Two of the pumps had significant wear problems, which went unnoticed for a year or more.



Pump	Pump efficiency η (open valve)	Flow rate l/s	Fraction of total flow rate
1	0.808	592	0.380
2	0.670	477	0.307
3	0.689	487	0.313
Average	0.729		

Manufacturer's pump efficiency at Best Efficiency Point is 0.875

Efficiency Loss Factor = $0.729/0.875 = 0.833$

The pump system is operating at an efficiency $(1-0.833)*100\% = 16.7\%$ lower than its' potential. Pumps 2 and 3 are obvious candidates for refurbishment.

What does this translate to in costs? There are 8,760 hours in a year.

The pumps were operated about 80% of the time, so $8760 * 0.8 = 7008$ hrs per year.

Power consumption was 2360 kW. Assume the cost of electricity is US\$ 0.10 per kWh.

Yearly energy cost = $7008 * 2360 * 0.10 = \text{US\$ } 1,653,888$

Yearly savings, operating optimally = $1,653,888 * 0.167 = \text{US\$ } 276,200$.

This pump station has since been equipped with our Micro Station Monitors, with a payback period of a few months. ***It now qualifies as an ELF!***

(Note: no disrespect is implied for Goblins, but they are expensive to run and are making our world more difficult to live in!)