

PROCESS INSTRUMENTATION

# Cutting pump operation energy costs with advanced level controllers

[usa.siemens.com/level](http://usa.siemens.com/level)

What energy-saving practices do you perform at home? Turning off the lights when leaving a room, replacing drafty windows for energy-efficient ones, running your dishwasher at times when electricity is less expensive?

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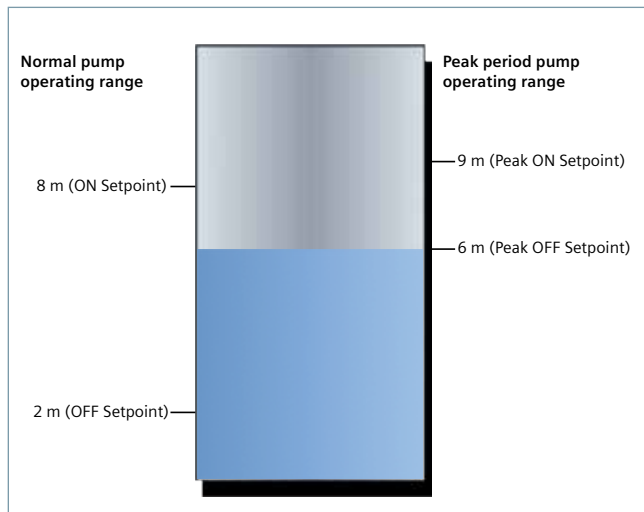


Figure 1: During peak periods, the pump operating range is much smaller than in normal operation, reducing the amount of time pumps must run.

These are great practices and are sure to save you money each month. But what about creating energy cost savings in the millions of dollars? Siemens' newest SITRANS LT500 HydroRanger level controller with mA/HART sensor inputs and SITRANS LUT400, helps wastewater treatment facilities save significant amounts of money each year.

For a water/wastewater treatment plant (W/WWTP), pumping is one of the most expensive parts of day-to-day operations. Varying from country to country, these costs range from 30 to 50 percent or more of a W/WWTP's hydro bills – and in the future, this number will only increase as energy prices climb. Overall, water and wastewater treatment are one of the largest energy consumers in most municipalities, so any savings have an impact on more than just the W/WWTP.

### By the numbers

Just how much does pumping cost? Take your average 50 horsepower pump. In an hour, this pump consumes around 37 kilowatts. Do the math and at a cost of \$0.065 per kilowatt hour (kWh) – Ontario, Canada's off-peak price – that one pump costs a W/WWTP \$12 every day, \$4400 each year (as it has a running time of five hours per day).

But we know that many places, including Canada, the UK, Germany, South Africa, USA and Australia, have different rates according to the time of day or season energy is consumed. So while our single pump costs \$0.065 per hour during low-energy periods, it now costs up to 80% more during Ontario's peak-energy periods. So if the same company did all of its pumping during these peak periods, over the course of a year it would have spent an additional \$3500! And remember this is just for a single pump – many W/WWTPs have hundreds of pumps, depending on a facility's size.



Siemens Echomax transducers installed in the well and the SITRANS LUT400 controller measure the level of water and control pump operations.

Of course, no company is going to pump only in peak-energy periods – as we have just seen, that would be outrageously expensive. But, since wastewater treatment happens at all times of the day, facilities must pump during these high-cost periods.

### So, how do I save money?

By choosing Siemens' newest level controller, the SITRANS LT500 HydroRanger, which is compatible with LR110/LR120 Hart radar level transmitters or any 4-20 mA input device or either the LUT430 or LUT440, which are compatible with EchoMax transducers. All these instruments can control economy-pumping routines (also known as skimming). Furthermore, they all provide a full suite of advanced level, volume and pump control functions designed to optimize your process.

In normal operation, the controller will turn on pumps once water reaches the high level set point and then will begin pumping down to the low level set point. In economy pumping, the controller will pump wells down to their lowest level before the premium rate period starts, thereby maximizing the well's storage capacity. The controller then maintains a higher level during the tariff period by using the storage capacity of the collection network. Pumping in this way ensures compliance with environmental regulations and minimizes energy use in peak tariff periods.

### How do I set up an economy-pumping regime?

Install the SITRANS HydroRanger and connect it to either a SITRANS LR110 or LR120 or both (dual point version) or if you prefer ultrasonic technology sensors, installed the SITRANS LUT400 ultrasonic controller and connect it to a Siemens Echomax transducer in your well. You will set pump on and off points based on your local peak-energy periods. During summer in Ontario, for example, the peak tariff period is between 11 a.m. and 5 p.m. In the winter, these times change to 7-11 a.m. and 5-7 p.m. You can program up to five peak zones during one 24-hour period.



Setting up an economy-pumping regime and performing infiltration and ingress monitoring is simple and can cut your company's energy costs dramatically.

To begin setting up your economy-pumping regime, enable either SITRANS controller's Energy Savings function. Set the Peak Lead Time to 60 minutes to start pumping water down 60 minutes before the high-cost period begins so the well is at its lowest point. Depending on the volume of your well, you can set your Peak Lead Time to any amount between zero and 65,535 minutes.

On the controller, select the Peak Start Time of 11:00 a.m. and the Peak End Time of 5:00 p.m. Set your Peak ON Setpoint to nine meters and the Peak OFF Setpoint to six meters, as shown in Figure 1.

In Normal Operation mode, the controller starts the pump when water reaches eight meters and stops the pump at two meters. In Energy Saving mode, the controller turns on the pump when water reaches nine meters and stops pumping at six meters, thus running the pump for the minimum amount of time during peak tariff periods. Cost-savings through economy-pumping regimes are simple to put in place with these steps.

Don't forget that when you are setting up your controller, you can take advantage of the real-time clock for daylight saving time adjustment. The real-time clock is a useful feature – input your location's daylight saving time and economy pumping will occur throughout the year without interruption.

### Infiltration and ingress (I&I) monitoring

Another cost-saving feature of these controllers is infiltration and ingress monitoring of the pumped volume feature and built-in datalogging capabilities.

In a closed collection network, it is inefficient and costly to pump rainwater entering the system due to leakages from degraded pipes. The controller calculates pumped volumes, providing useful historical trending information for detecting abnormal increases of pumped water.

To use this feature, provide the known volume in the well between the pump's ON and OFF setpoints. The controller will calculate the pumped volume based on the rate of level change in the well during pumping. It also calculates the inflow rate based on the rate of level change in the well just prior to pump startup.

The LT500 HydroRanger or the LUT400 logs this information for you to review via the controller's communications options, or by connecting a USB cable and downloading logs directly to your computer. By comparing these results, you can see if inflow rates are greater due to rainwater entering the system. Repair those damaged pipes and the cost savings begin! In the case of the SITRANS LT500 HydroRanger, you have the additional benefit of a high-performance micro SD (Storage Device) card to retrieve such data.

Through economy pumping and I&I monitoring, advanced level controllers give companies the potential for significant energy savings. One SITRANS LUT400 user stated that every small change his company makes to reduce consumption has the potential to save millions of dollars each year.



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