

The Dewatering Institute Awards - Equipment Or Material Innovation Of The Year 2025

Nominee: CLC - Conductive Level Controller, Minerex Environmental Ltd

Problem Context

Dewatering construction sites is inherently challenging due to Mother nature and maybe even John Doe in an excavator. Rainfall, varying soil types, fluctuating groundwater levels, and accidental breaches all make work difficult to keep the site dry and compliant. Maintaining a dry site is critical to general site safety, preventing delays and equipment damage. The dewatering systems we put into place must be versatile and responsive to allow for these rapid changes. Pumps are the heart of any dewatering operation, and their reliable operation is critical for project success. However, the water being pumped is often far from clean. Contaminants such as oils, silt, debris, and concrete runoff can wreak havoc on the sensors controlling the operation. The pumps may drive the system like a heart, but it's the sensors that think for it like a brain. Sensor failures caused by water contamination may lead to premature pump shutdowns or missed triggers.

Consider the Situation

The site had been pumping steadily at a low rate for several weeks following a major concrete pour. The water being discharged contained high levels of calcium carbonate, which accumulated on and adhered to a water level sensor located inside the final stage of the settlement tank. This sensor was responsible for controlling the activation of the pump for discharge. Over time, scaling from calcium carbonate began to interfere with the accuracy of the sensor's readings. One night, during a period of heavy rainfall, the excavation pumps began to pump at full capacity to manage the sudden influx of water. The increased flow entered the settlement tank; however, the level sensor failed to detect the rapid rise in water. As a result, the pump did not activate, causing the settlement tank to overflow and damage some nearby facilities and buildings.

Consider the Situation

In many cases, the average flow rate may be quite low but remains constant. Operating a pump continuously under such low-flow conditions can cause overheating and eventual pump damage. These situations often occur in remote areas of a site where limitations in signal, power supply, or cost make it impractical to install a dedicated level control system. Traditional float switches are also unsuitable in these scenarios due to their low precision, high risk of entanglement, and unreliable response.



PLC Conductive Level Controller

Consider the Situation

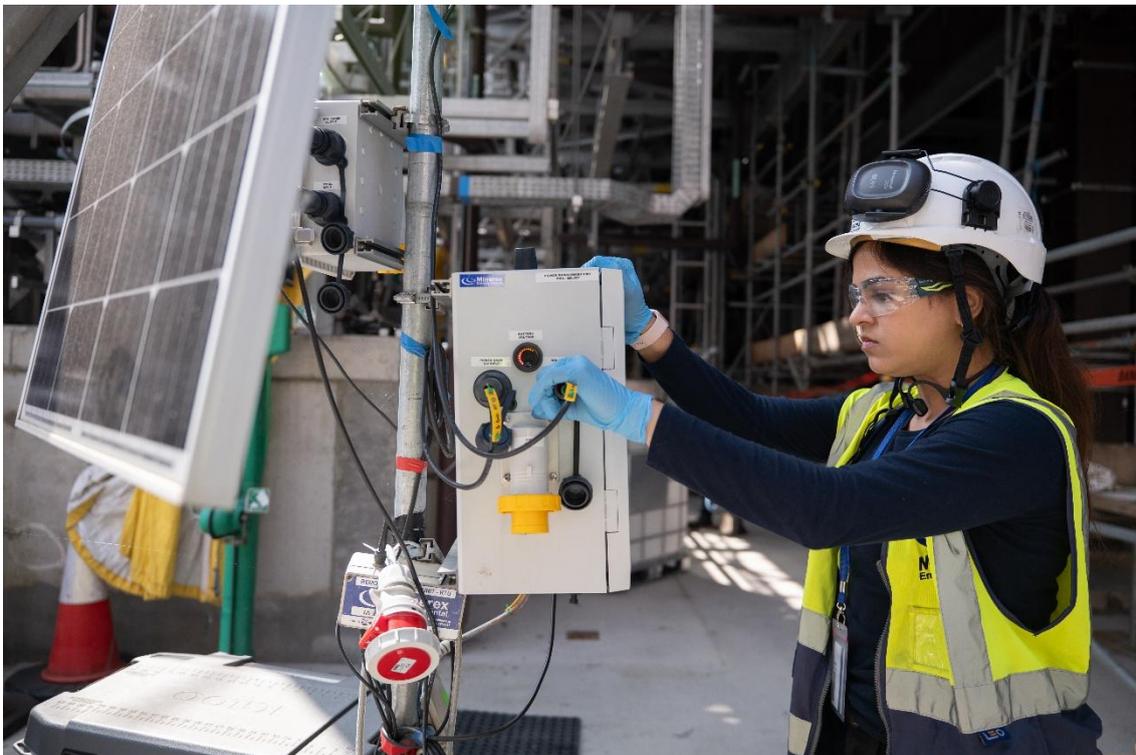
Water from the construction site is directed into a settlement pond. The inflow and outflow of the pond are controlled by a water level sensor, ensuring the pond is neither over-drained nor overfilled. Settlement ponds are highly effective at allowing suspended solids to settle; however, over time, a layer of sludge accumulates at the bottom. This sludge can be enriched with concrete runoff and mixed with general debris, which may harden around the sensor and obstruct its function. As a result, the sensor provided inaccurate readings, leading to the pond level going too low. This low pond level meant that water with high suspended solids from the bottom of the pond was discharged into the storm sewer.



Conclusion

It is clear there is a need for a pump control system that:

1. Is physically robust and resistance both to impact and abrasion, but also buildup of contaminants.
2. Can be installed in such a manner that a buildup of sludge will not affect the control system's performance.
3. Is simple enough to be easily integrated without a dedicated PLC.
4. Is low cost to minimize financial burden on client.
5. It is reactive and instantaneous, avoiding delays.
6. It is easy to mobilise and set up only takes a few minutes and no major training.
7. Can be used for 110v, 220v but also 400v.
8. Does not get tangled like a normal float switch.
9. A system that can be relied upon even if the conditions change.



Solution - Conductive Level Controller

Instead of relying on a complicated, fragile, and expensive sensor and PLC setup, we can utilize the conductive properties of water, it's conductivity!
The conductive level controller uses three robust probes to monitor and control the water level in a tank.

Reference Probe (Probe 1 - Always Submerged)

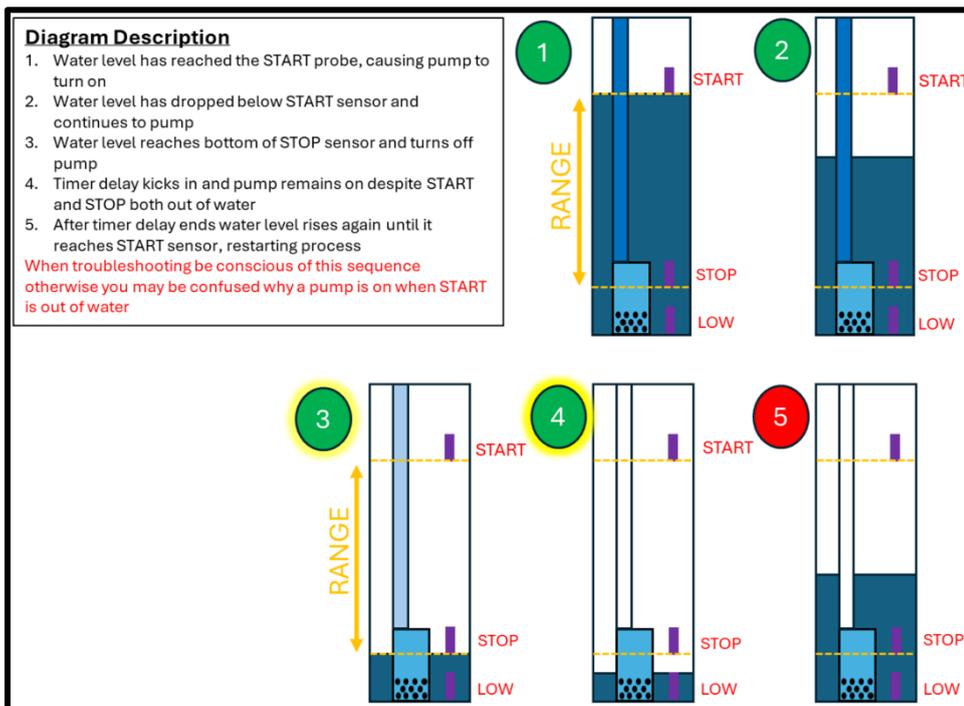
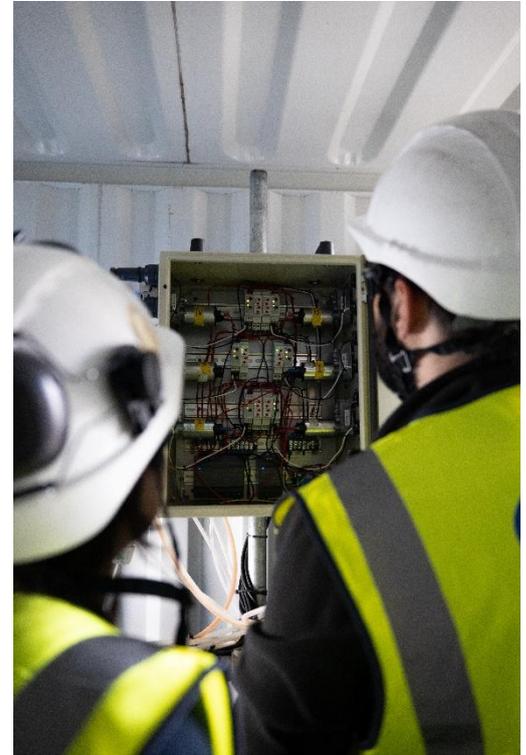
- This probe is permanently immersed in water and continuously outputs a low-voltage AC signal.

High-Level Probe (Probe 2 - Pump Start)

- Located near the upper desired water level.
- When water rises and makes contact with both Probe 1 and Probe 2, the conductive path allows the AC signal from Probe 1 to reach Probe 2.
- Detection of the AC signal at Probe 2 triggers a relay to turn the pump on, initiating water removal.
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Low-Level Probe (Probe 3 - Pump Stop)

- Located above Probe 1 but below Probe 2.
- As the pump lowers the water level, the water eventually drops below Probe 3.
- Once Probe 3 loses electrical connection with the AC signal from Probe 1, the relay triggers the relay to turn the pump off, preventing the tank from running dry.



Note from the Team

This system has saved countless pumps from burning out, prevented numerous late-night callouts, and avoided thousands of euros in fees and headaches.

We are proud to present the CLC to TDI and its associates as a potential solution worth considering for your project.

Like many systems developed at Minerex, the CLC was created to address a problem for which no off-the-shelf solution existed.

This challenge brought our teams of engineers and scientists together once again to advance automation, enhancing not only the level of service we provide to our clients but also our own quality of life by reducing stress and the need for frequent site interventions.

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