



Mardan Water and Sanitation Services Trusts Vitro Technology for Remote Monitoring and Management of Water Wells

A Vitro Technology Crypto Secure IoT Solution

CRITICAL CUSTOMER CHALLENGES

- Limited visibility into the amount of water produced at public well sites
- High electricity costs in the operation of well pump equipment
- Limited control over remote staff operating well pump equipment

SOLUTION

- The Vitro Crystal securely transfers operating data from each well site including the amount of water produced, energy consumed and personnel managing the site for each shift using fingerprint authentication.

BENEFITS

- Precise operating data calculating watts per liter efficiency
- Authentication of staff operating well pump equipment
- Predictive maintenance and operating efficiency for each well
- Precise measurement of water produced per well
- Rugged design for remote industrial deployment



BACKGROUND

WSSCM was set up in 2016 with the task to manage the water supply, wastewater and solid waste management facilities. All drinking water, sanitation and solid waste management services in Mardan is managed by WSSM. Mardan is the second largest city of Khyber Pakhtunkhwa and has a population of 5 Million.

WSSM is a government agency tasked with the efficient distribution of water for an urban population exceeding 5 million residents. Given limited rainfall, well water is a scarce resource consuming large amounts of expensive electricity. Efficiency in the production and consumption of water is the key focus of WSSM.

Business Challenge

Given the scarcity of surface water, the challenge for WSSM is the production of water from deep tube wells exceeding 200 meters in depth. Extracting water from deep wells consumes large amounts of electricity. In addition, the water contains fine, abrasive silt that creates significant wear on the pumps and meters in the region. This difficult operating environment creates a service cycle for equipment requiring the rebuilding of pumps and meters. Each rebuilding reduces the pump rating, making it less efficient. In addition, the management of the pump equipment is delegated to local employees in remote sites, making it difficult to manage clock-in and clock-out time for each operator. Given the high voltage present, the operating environment is hazardous and must be controlled only by experienced personnel.

Vitro Technology Solution

WSSM realized that it needed to implement centralized, remote control and management of its wells and operating personnel throughout the Mardan Khyber region. The company turned to Vitro Technology to develop a secure network to monitor and control its pump, metering and personnel authentication. The Vitro Crystal Gateway is a hardened device capable of withstanding the harsh conditions of a pumping station, and features GSM provided by Zong Mobile, a division of China Mobile. The Crystal is integrated into a custom designed Motor Control Unit (MCU) that delivers local and remote control over the pumping equipment. In addition, Vitro integrated an electro-magnetic meter (EMeter) with no moving parts. The EMeter is an open, teflon-lined tube that measures water flow accurately without any contact with the silt that can foul mechanical meters.

Vitro also integrated a fingerprint device onto the MCU that controls clock-in and clock-out for employees. The fingerprint reader can also be used to authenticate the power switch at the well site. Without confirmation within 60 seconds of a change in the pump engagement, the system can be remotely managed to turn the pump on or off.

Results

Vitro dashboards and IoT data are stored and reported via Amazon AWS IoT. Vitro serves visibility in each location through a dashboard capable of reporting the amount of water produced, power consumed, and personnel present across a continual time-series. These metrics enable WSSM to report accurate watts per liter of water produced at a well site. This metric, an industry first, allows management to measure the power efficiency at each site.

Deeper wells need more electricity to produce a liter of water. And silt reduces the efficiency of pumps through their operation. Service increases efficiency of fouled pumps, but reduces the rating or amount of water each serviced pump can produce. Electricity costs in some deep well zones exceed \$2 million per month, making the watts per liter calculation the key management metric. Historical data gathered across each well site fuel artificial intelligence (AI) and machine learning (ML) tools hosted on AWS to build highly accurate predictive maintenance models. AI and ML models contribute to the management decision of when to service or to replace pumps in order to operate at peak efficiency.

Dashboard management control of equipment and personnel allows WSSM to stay ahead of the curve delivering clean, safe water while maximizing profit – exactly where this leading company wants to be.

About Vitro Technology

Vitro Technology Corporation builds and operates crypto-secure Industrial Internet of Things (IIoT, IoT) networks. Vitro IoT networks serve connectivity for remote, low density, low bandwidth equipment including authentication both for security and transmitted data. Vitro employs open-source hardware, software, ECC crypto-technology and hosted services, including resilient, low cost Linux IoT hardware and AWS IoT. Vitro IoT homogenizes the control and management of heterogeneous remote equipment, including sensors, actuators and controls. Vitro IoT also securely distills operating data across equipment categories into authenticated time-series data hosted on AWS IoT for analysis and predictive modeling.

