



Using Laser Level Transmitters to significantly improve reliability and reduce maintenance time and costs

Middlesex County Utilities Authority,
New Jersey, USA

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ABB is making a world of difference by using Laser Level Technology to significantly improve data reliability and reduce maintenance time and costs at the Middlesex County Utilities Authority in New Jersey.

Introduction

Accurate measurements are crucial to ensure systems are working efficiently

Accurate measurements are crucial to ensure systems are working efficiently in all industries. It is especially important at the Middlesex County Utilities Authority's (MCUA's) Wastewater Division located in Sayreville, New Jersey. The MCUA operates the Edward J. Patten Water Reclamation Center, also known as the Central Treatment Plant (CTP), which provides wastewater services to approximately 943,000 residential and industrial users in Middlesex County, as well as several municipalities in Somerset and Union Counties. Wastewater is conveyed through five pumping stations and over 50 miles of regional interceptors delivering an estimated 100 million gallons per day (MGD) of wastewater, which can peak at over 300 MGD during heavy rain events.

Non-contact measurement devices are essential for monitoring the processes at the CTP as wastewater is continuously processed through preliminary, primary, and secondary treatment prior to

discharging to the Raritan Bay and Raritan River. The settled sludge is thickened, dewatered, and dried using thin film dryers to create a final material with a total solids content of approximately 60%, which is used as intermediate daily cover at the Middlesex County Landfill, located in East Brunswick, New Jersey.

As the need for new non-contact measurement technologies became apparent, the MCUA contacted ABB and their long-time channel partner Miller Energy (formerly Applied Analytics) to evaluate solutions that can provide accurate measurements in the applications around the plant. Laser Level Transmitters (LLTs) were found to be one product that could be integrated into several processes at the CTP to allow for improved monitoring and assist in process control decisions. LLTs were installed at the following locations in the CTP as detailed in the following sections: Sludge Storage Silos, Thickener Tank Overflow (TTO) Pump Station, Utility Shaft, Odor Control System (OCS), and Dry Polymer Mixing Tanks.





Five Sludge Storage Silos

Sludge Storage Silos

MCUA has five Sludge Storage Silos that store dewatered sludge prior to entering the thin film dryers. Due to the viscous state of the sludge, access issues, and obstructions, getting accurate measurements within the silos is difficult. ABB LLT100s were installed on two sides of each silo as a trial to evaluate the efficiency of these devices. The LLTs were found to provide more accurate measurement of the sludge cake level in the silo. Based on the success of the LLTs at this location, additional devices were installed at other locations within the CTP.



Bar Screen at TTO Pump Station



ABB LLT100 on Top of Sludge Storage Silo

TTO Pump Station - Bar Screen

Based on the success of the LLT100 at Sludge Storage Silos, MCUA decided to evaluate whether they could be useful in addressing a long-standing challenge of determining the bar screen differential at the TTO Pump Station.

The existing submersible level transducer had erratic readings; thus, the bar screen was run on a timer to avoid blockages instead of activating based on the differential level as designed. This led to extra wear and tear of the bar screen equipment and high energy consumption. LLT100 units were installed on the upstream and downstream side of the bar screen to accurately monitor the water levels and trigger the bar screen based on the differential measurements. The LLT100s were found to be successful in this application and have reduced the bar screen runtime, subsequently generating savings in energy consumption, and extending the service life of the equipment. The LLT100 lasers have been running continuously since installation in 2020 without any maintenance.

Utility Shaft and Sump Pump

MCUA owns and maintains a utility tunnel under the Raritan River used for the conveyance of wastewater, re-use water, and landfill gas. Access to the tunnel is through a 60-foot (ft) deep shaft that contains a sump pump to maintain water levels and avoid flooding. Monitoring the water levels in the tunnel is important for safety, operational needs, and to minimize corrosion of pipes and equipment. Based on the reliability of the LLTs at other areas of the facility, automation engineers decided to install a LLT100 at this location. It was found to be especially suitable for this purpose since it does not have a beam angle and has a range of 660 ft. One of the potential challenges at this location is the extreme humidity that could cause lens fogging to occur. To minimize faulty readings, the LLT was installed on a vented riser on the top of the shaft's concrete cover to combat the humidity.



Top of 60 ft Utility Shaft

Odor Control System (OCS)

The OCS was another area that was found to be suitable for the installation of LLTs. The CTP utilizes a wet OCS system that involves adding city water to the sumps as makeup water to compensate for evaporation and to maintain the chemical concentrations used for air treatment prior to being emitted to the atmosphere. Accurate water level measurement is crucial to ensure that the sump levels are within the design setpoint, and that the system is operating optimally. A capacitance probe level measurement solution was previously used in this area but was found to be ineffective due to constant fouling requiring frequent maintenance. This system was replaced with LLT100s, which have been found to be reliable and effective at maintaining the correct water levels in the water sump. The LLT100s have remained maintenance free since installation over a year ago.



Odor Control Scrubbing Tank



Polymer Mixing Tank

Dry Polymer Mixing Tanks

Most recently, the plant has added LLT100 level sensors to the Dry Polymer Mixing Tanks. Dry polymer is mixed with water, stirred and aged for 45 minutes before it is used as an aid for the continuous sludge dewatering process. The dusty and sticky environment created by the mixing presents a unique challenge. The amount of water that is added is critical and quick water level detection is necessary. A capacitance level sensor was previously used in this area but was plagued with constant fouling and inaccuracies. The LLT100 was found to be ideal for this application as it is unaffected by the dusty conditions from the mixing operations within the measurement area. Fast and accurate measurements using the LLT100 allow for the precise control of water enabling optimum cycle times.

Summary

The MCUA has implemented the ABB LLT100s in several different processes throughout the CTP. MCUA employees have been impressed with the overall performance of the transmitters. The units were easy to install compared to traditional level switches, ultrasonic level meters and guided wave radar level meters, which were challenging or impossible to use due to moisture, dust, moving process equipment and accessibility issues. The units have required very little maintenance and cleaning, even in the most difficult environments. Furthermore, the LLT100s ability to measure levels up to 600 ft away has allowed for more flexibility in measurement locations, which ultimately leads to improved plant performance, safety, and sustainability.



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