

CASE STUDY

Wastewater Level Monitoring

Foam and ice challenges in SBR tanks overcome with ABM's non-contact radar level sensors

Industry

Municipal Wastewater

Application

Sequencing Batch
Reactor (SBR) Tank Level

Product

ABM Explosion-Proof,
Non-Contact Radar
Level Sensors



Figure 1: ABM's Non-Contact Radar Level Sensor installed in the SBR basin.

BACKGROUND

Level sensors are critical in controlling sequencing batch reactor (SBR) systems, monitoring liquid levels in the basins and helping to control pumps that move wastewater through the system.

A municipal wastewater treatment plant (WWTP) was experiencing issues with its existing level sensors. Due to a challenging environment, surface conditions and obstructions, the level sensors produced inaccurate and unreliable results.

To meet the demands of the difficult application, ABM's explosion-proof, non-contact radar level sensors were installed (Fig. 1), exceeding the plant's expectations.

PROBLEM

When existing radar level sensors continuously produced unstable results, the WWTP knew it was time to find a replacement solution.

The environment posed many challenges for the existing sensors. As the SBR cycles through treatment stages, the liquid surface conditions change from stable to turbulent, with foam and ice common on the surface.

In this case, the exiting sensors could not measure through the foam and ice, creating inaccurate level measurements. Both foam and ice can absorb, reflect, and attenuate microwave signals and affect a radar sensor's performance.

In addition to surface conditions, obstructions and condensation amplified inaccuracy issues. Pipes inside the tank (Fig. 2) created false echoes that were not adequately managed by the sensors. Condensation build-up on the sensor's antennas compounded the issue, creating a weak signal and maintenance issues.

The plant sought a proven solution to monitor the SBR system and ensure continuous operation.

SOLUTION

ABM's explosion-proof, non-contact radar level sensors with horn antennas (Fig. 3) were selected for the project due to their proven ability to perform under challenging conditions.

Working with the plant, a sensor model was selected to match the application criteria and mitigate future operational issues.



Figure 2: Pipes, tank walls and other obstructions around the sensors mounting.



Figure 3: Explosion-proof radar sensor with horn antenna (ABM300-100R6C4-ALHR6-EXP).

Foam and Ice

Selecting the right radar level sensor was essential for the application. ABM engineers recommended a low-frequency sensor model to manage ice and foam concerns in the SBR basins (Fig. 4).

Low-frequency radar signals are preferred for measuring through foam and ice on a liquid surface because of the longer wavelengths, reduced absorption and improved signal stability.

- Longer wavelengths tend to penetrate materials more effectively, allowing the radar signal to reach the liquid surface beneath the foam or ice layer for accurate measurements.
- Compared to higher-frequency signals, the low-frequency signals are less prone to absorption by foam or ice, ensuring a strong return signal to the sensor.
- Low-frequency signals are less affected by reflections and signal distortion from foam or ice, improving signal stability and reliability.



Figure 4: ABM radar level sensors installed in SBR basins measuring through foam and ice.

False Echoes

ABM's self-adjusting technology automatically manages false echoes without user involvement. The radar sensors have continuous feedback with their environment, automatically adjusting the transmitted power and receiver sensitivity to get the same amplitude of wanted echo regardless of the distance to the liquid surface or the tank conditions.

This technique allows the receiver to detect only one echo from the liquid surface while all false echoes from the pipes, tank walls and other obstructions are pushed under the noise level and eliminated, resulting in reliable and stable measurements.

Condensation

As for condensation, ABM's radar level sensors are designed with self-cleaning operation. The rod antenna is made of non-stick Teflon material that prevents condensation or build-up from forming. In addition, the antenna shape is tapered to discourage accumulation, making it easier to shed condensation.

CONCLUSION

Implementing ABM's explosion-proof, non-contact radar level sensors proved instrumental in resolving the challenges the municipal wastewater treatment plant faced. The plant can now monitor tank levels and control pumps in the SBR system more confidently.

The successful deployment of ABM's solution exceeded expectations and showcased the importance of selecting specialized technologies tailored to the unique demands of challenging environments in wastewater treatment systems.

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