

Azbil Radar Level Transmitter

A practical guide to azbil radar level transmitter, covering the reader intent, the relationship to azbil radar level transmitter, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



level-measurement

Main topic: Radar Level Meters

<https://www.level-meters.com/products/radar-level-meters/>

In the landscape of industrial process automation, precise level measurement is critical for operational safety, inventory management, and process efficiency. Among the various technologies available, radar-based systems have emerged as the preferred choice for non-contact measurement. The azbil radar level transmitter represents a significant segment of this market, offering high-frequency solutions for challenging environments. This guide explores the underlying physics of radar measurement, the specific features of Azbil's technology, and practical considerations for engineering selection and installation.

| Understanding Radar Level Measurement Principles

Before evaluating specific hardware like an azbil radar level transmitter, it is essential to understand how radar technology interacts with process media. Radar level instruments function by emitting electromagnetic waves toward the surface of a liquid or solid and measuring the reflected signal.

| Time of Flight (ToF) and Pulse Radar

Pulse radar transmitters emit a short microwave pulse toward the product surface. The instrument measures the time it takes for the pulse to travel to the surface and back to the sensor. Since the speed of light is constant, the distance is calculated as:

$$\text{Distance} = (\text{Speed of Light} \times \text{Time of Flight}) / 2$$

This method is robust and energy-efficient, making it suitable for many standard liquid level applications. However, it may struggle with very low dielectric materials or highly turbulent surfaces where the echo signal is weak.

| Frequency Modulated Continuous Wave (FMCW)

Many modern Radar Level Meters utilize FMCW technology. Instead of a pulse, the transmitter sends a continuous signal with a constantly changing frequency (a frequency sweep). When the reflected signal is received, it is compared to the frequency being emitted at that exact moment. The difference in frequency (the "beat frequency") is directly proportional to the distance.

FMCW radar, particularly those operating at higher frequencies such as 24 GHz or 80 GHz, provides superior resolution and a higher signal-to-noise ratio compared to pulse radar. This allows for accurate measurements even in the presence of steam, dust, or agitated surfaces.

Technical Overview of Azbil Radar Level Transmitters

Azbil (formerly Yamatake) provides a range of radar level transmitters designed for various industrial sectors, including chemicals, oil and gas, and water treatment. Their product line typically focuses on non-contact microwave technology, often categorized under the JRG series.

Key Features of the JRG Series

The azbil radar level transmitter is characterized by its ability to handle high temperatures and pressures. Most models utilize a two-wire loop-powered configuration, simplifying integration into existing 4-20 mA DC control loops with HART communication.

One of the defining technical aspects of these transmitters is the antenna design. Whether using a cone (horn) antenna or a PTFE drop antenna, the focus is on minimizing the "dead zone" (the area immediately below the sensor where measurement is impossible) and maximizing the signal strength reflected from the medium.

Selection Criteria and Comparison

Choosing the right radar instrument requires a detailed analysis of the process conditions. The following table provides a comparison of typical radar configurations used in industrial applications, including those offered by Azbil and other high-performance manufacturers.

Radar Technology Selection Table

Feature	24 GHz Radar	80 GHz Radar	Guided Wave Radar (GWR)
Measurement Range	Up to 30 m (98 ft)	Up to 100 m (328 ft)	Up to 60 m (197 ft)
Beam Angle	Wide (approx. 10°-15°)	Narrow (approx. 3°-4°)	N/A (signal follows probe)
Accuracy	±3 mm to ±10 mm	±1 mm	±2 mm
Best For	Large tanks, simple liquids	Small nozzles, tall silos	Low dielectric, foam, bypass pipes
Surface Turbulence	Moderate resistance	High resistance	Excellent resistance
Internal Obstructions	Sensitive	Less sensitive	Not applicable

When evaluating an azbil radar level transmitter, engineers should prioritize the frequency that matches their tank geometry. For instance, an 80 GHz unit is ideal for tanks with many internal obstructions (like agitators or heating coils) because the narrow beam can "miss" these obstacles more easily than a 24 GHz beam.

| Installation Considerations

Correct installation is the most critical factor in ensuring the long-term reliability of a radar level meter. Even the most advanced azbil radar level transmitter will fail to provide accurate data if positioned incorrectly.

| 1. Nozzle Geometry

The mounting nozzle should be as short and wide as possible. If the nozzle is too long or narrow, the radar signal may reflect off the internal walls of the nozzle, creating a "ringing" effect that masks the true level of the product. For an azbil radar level transmitter, the antenna should ideally extend slightly past the bottom of the nozzle.

| 2. Positioning and Clearance

Avoid the Center: Never mount the transmitter in the exact center of a circular tank. This can lead to multiple reflections from the tank walls that converge at the center, creating false echoes.

Wall Distance: Maintain a minimum distance from the tank wall, typically 1/6th of the tank diameter, to prevent interference.

Inflow Streams: Ensure the radar beam does not intersect with the path of the product entering the tank. Falling liquid or solids will scatter the signal and cause erratic readings.

| 3. Orientation

The transmitter must be mounted perfectly vertical. Even a slight tilt can cause the signal to bounce away from the sensor rather than back toward it, especially when measuring liquids with a low dielectric constant.

| Limitations and Application Challenges

While radar is highly versatile, it is not a "one-size-fits-all" solution. Several factors can limit the performance of an azbil radar level transmitter:

Dielectric Constant (ϵ_r): The dielectric constant of the medium determines how much energy is reflected. Hydrocarbons (like oil or fuel) have low dielectric constants (ϵ_r 1.9 to 2.5) and reflect less energy than water ($\epsilon_r \approx 80$). In very low dielectric applications, a Guided Wave Radar or a high-sensitivity FMCW unit is required.

Heavy Foam: Dense, thick foam can absorb the radar signal entirely, preventing an echo from returning to the sensor. While some radar frequencies can penetrate light foam, heavy chemical foam often requires alternative technologies like hydrostatic pressure or magnetic level gauges.

Vapor and Condensation: While radar is generally unaffected by vapor, extreme condensation on the antenna lens can attenuate the signal. Many Azbil models feature PTFE-coated antennas to encourage condensation to bead off, but regular maintenance may still be required in high-humidity environments.

Evaluating Alternatives in the Radar Market

While the azbil radar level transmitter is a robust choice, engineers often compare it against other industry-standard Radar Level Meters to find the best cost-to-performance ratio. Factors such as local support, ease of configuration via mobile apps (Bluetooth), and the availability of specialized materials (like Hastelloy or Monel for corrosive environments) play a significant role in the final procurement decision.

For many standard industrial applications, a versatile 26 GHz or 80 GHz transmitter provides the necessary accuracy (± 2 mm to ± 5 mm) and reliability. For specialized custody transfer applications where sub-millimeter accuracy is required, high-end FMCW models are the industry benchmark.

Frequently Asked Questions (FAQs)

Can an azbil radar level transmitter measure solids?

Yes, specific models are designed for bulk solids. However, solids measurement requires a higher frequency (typically 80 GHz) to handle the irregular angles of the material surface and the dust generated during filling.

Does the pressure inside the tank affect the radar measurement?

No. Unlike ultrasonic sensors, which depend on air density to transmit sound, radar uses electromagnetic waves. These waves travel at the speed of light regardless of the pressure or vacuum levels within the vessel.

| How do I handle a tank with a heavy agitator?

If the agitator is constantly moving, it will create "noise." Most modern radar transmitters, including those from Azbil, feature "False Echo Suppression" or "Empty Tank Mapping." This allows the software to identify the static reflections from the agitator and ignore them, focusing only on the moving level of the liquid.

| What is the typical lifespan of a radar transmitter?

In a well-specified application with proper installation, a radar transmitter can last 10 to 15 years. The primary failure points are usually electronic component degradation due to extreme heat or physical damage to the antenna from corrosive vapors.

| Conclusion

The azbil radar level transmitter remains a staple in the process industries due to its reliability and established track record. By understanding the principles of FMCW and pulse radar, adhering to strict installation guidelines, and recognizing the limitations of dielectric properties, engineers can successfully implement these devices to improve process control. When selecting a device, always verify the process temperature, pressure, and chemical compatibility to ensure the chosen instrument meets the long-term demands of the application.