

What Sensors Should I Purchase for Conveyor Systems

A practical guide to what sensors should i purchase for conveyor systems, covering the reader intent, the relationship to what sensors should i purchase for conveyor systems, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



Main topic: Main Page
<https://www.level-meters.com/>

In the landscape of industrial automation, conveyor systems serve as the primary arteries of material movement. Whether transporting bulk solids in a mining operation, managing grain in an agricultural facility, or moving packages in a logistics center, the efficiency of these systems depends heavily on the data provided by integrated sensors. When engineering teams ask, "what sensors should i purchase for conveyor systems," the answer is rarely a single device but rather a suite of instruments designed to monitor flow, prevent blockages, and manage inventory levels.

Selecting the right instrumentation requires a deep understanding of the material being moved and the environmental conditions of the facility. This guide explores the measurement principles, selection criteria, and practical applications of level and flow sensors specifically tailored for conveyor environments.

| Understanding Measurement Principles

Before deciding which sensors to purchase, it is essential to understand how different technologies interact with the materials on a conveyor or within the hoppers they feed. Level measurement is generally divided into two categories: point level detection and continuous level measurement.

| 1. Radar Level Measurement (Non-Contact)

Radar sensors, particularly those utilizing Frequency Modulated Continuous Wave (FMCW) technology, are often the gold standard for conveyor applications involving bulk solids. They emit high-frequency electromagnetic waves (typically 26 GHz or 80 GHz) that reflect off the material surface. By measuring the frequency shift or time of flight, the sensor calculates the distance to the material.

Advantages: Radar is unaffected by dust, air temperature, or pressure changes, making it ideal for dusty environments like cement or flour conveyors.

Considerations: The dielectric constant (ϵ_r) of the material affects the strength of the return signal. Materials with low dielectric constants, such as plastic pellets, may require high-sensitivity radar units.

| 2. Ultrasonic Level Measurement

Ultrasonic sensors function by emitting high-frequency sound pulses. The sensor measures the time it takes for the echo to return from the material surface.

Advantages: Highly cost-effective and reliable for liquid-based conveyor systems or non-dusty solids.

Limitations: Sound waves can be scattered by heavy dust or absorbed by soft, uneven surfaces. Furthermore, since the speed of sound varies with air temperature, integrated temperature compensation is required for accuracy.

| 3. Point Level Switches

Unlike continuous sensors that provide a 0-100% reading, point level switches detect the presence or absence of material at a specific height. Common types include tuning fork (vibration) switches and rotary paddle switches.

Vibration Switches: These use a fork-shaped sensing element that vibrates at its resonant frequency. When covered by material, the vibration is dampened, triggering an electronic signal.

Rotary Paddles: A small motor rotates a paddle. When material obstructs the paddle, the torque increases, tripping a switch to stop the motor and signal a high level.

| What Sensors Should I Purchase for Conveyor Systems?

To determine the specific sensor package for your conveyor setup, you must identify the critical monitoring points in your process.

| Chute Blockage Detection

One of the most common causes of conveyor downtime is a clogged discharge chute. If a downstream conveyor stops but the upstream belt continues to feed, the chute will overflow. For this application, point level switches (such as vibration or capacitance switches) should be installed on the side walls of the chute. When material backs up to the sensor level, the system can automatically trigger an emergency stop (E-stop).

| Hopper and Silo Inventory

Conveyors often feed into storage hoppers or silos. To manage the supply chain effectively, continuous radar level meters are recommended. These provide real-time data on how much material is available, allowing for automated replenishment. For large silos, an 80 GHz radar is often preferred due to its narrow beam angle, which avoids interference from internal structural reinforcements.

| Belt Loading and Profile Monitoring

To prevent uneven wear on the belt and ensure optimal throughput, sensors can monitor the height of the material profile on the belt itself. Ultrasonic sensors mounted above the belt can provide a cost-effective way to measure the "heap" height of the material, ensuring the conveyor is not being overloaded beyond its rated capacity.

| Key Evaluation Criteria

When evaluating what sensors should i purchase for conveyor systems, use the following criteria to narrow down your options:

1. **Material Characteristics:** Is the material a fine powder, a granular solid, or a slurry? Powders generate dust (favoring radar), while slurries may require hydrostatic level transmitters if measured in a collection sump.

2. Environmental Conditions: Consider the ambient temperature and the presence of moisture. In outdoor conveyor systems, sensors must have an IP67 or IP68 rating to withstand rain and wash-down procedures.
3. Measurement Range: Ensure the sensor’s "blind zone" (the area directly below the sensor where measurement is impossible) does not interfere with the maximum fill level. For a typical small hopper (2m to 5m / 6.5ft to 16.4ft), a standard ultrasonic or short-range radar is sufficient.
4. Output Requirements: Do you need a simple relay output for an alarm, or a 4-20mA / Modbus signal for integration into a PLC (Programmable Logic Controller)?

Practical Selection Table

Application	Recommended Sensor Type	Primary Benefit	Potential Limitation
Chute Blockage	Vibration Level Switch	High reliability, no calibration	Only provides On/Off signal
Bulk Solid Silo	80GHz Radar Meter	Penetrates heavy dust	Higher initial cost
Liquid Sump	Hydrostatic Transmitter	Accurate in turbulent liquids	Contact-based measurement
Belt Profile	Ultrasonic Sensor	Low cost, easy installation	Sensitive to heavy dust
Aggregate Hopper	26GHz Radar	Robust against vibration	Wider beam than 80GHz

Installation Considerations and Best Practices

Proper installation is just as critical as selecting the right technology. Even the most advanced sensor will fail if poorly positioned.

Avoid the Fill Stream: Never mount a level sensor directly in the path of the falling material. This will cause erratic readings and may physically damage the sensor. Position the sensor at a distance of at least 1/6th of the diameter from the silo wall for optimal results.

Vibration Mitigation: Conveyor structures are prone to significant vibration. Ensure that sensors are mounted on rigid brackets. For radar and ultrasonic units, use rubber gaskets or vibration-dampening mounts to prevent mechanical noise from affecting the electronics.

Beam Angle Awareness: Every non-contact sensor has a beam angle. Ensure the beam does not hit the conveyor belt edges, internal ladders, or structural beams. A narrower beam angle (found in higher frequency radar) allows for more flexible placement in tight spaces.

Aiming for Solids: For bulk solids, the material surface is rarely flat; it forms a cone (angle of repose). Using an adjustable mounting flange allows you to aim the sensor toward the middle of the material slope to get a more representative average level.

| Limitations and Challenges

While modern sensors are highly capable, they are not without limitations.

Acoustic Noise: In extremely loud environments, such as near a rock crusher, ultrasonic sensors may experience interference. Radar is immune to this noise.

Material Build-up: If the material is sticky or has high moisture content, it may build up on the sensor face. While many radar units can "see through" a thin layer of dust, significant buildup will eventually attenuate the signal. Regular maintenance or the use of a PTFE-coated antenna can mitigate this.

Dielectric Minimums: If you are measuring extremely light materials like dry wood chips or expanded polystyrene, the radar signal may pass through the material rather than reflecting. In these specific cases, a guided wave radar (GWR) or a specialized ultrasonic sensor may be required.

| Frequently Asked Questions (FAQ)

Q: Can I use one sensor for both blockage detection and inventory?

A: It is generally not recommended. Inventory sensors are mounted at the top of a vessel for continuous tracking, while blockage sensors must be located at the narrowest point of the discharge chute to provide a rapid safety response.

Q: How often do these sensors require calibration?

A: Most modern digital radar and ultrasonic sensors are factory-calibrated. However, a "field check" or mapping of the tank (to ignore internal obstructions) should be performed during commissioning. Once set, they typically require very little maintenance unless the material properties change significantly.

Q: Is radar safe for food-grade conveyor systems?

A: Yes. Non-contact radar is excellent for food applications because it does not touch the product, preventing contamination. Many sensors are available with stainless steel housings and hygienic connections.

| Conclusion

Investing in the correct sensing technology is a fundamental step in optimizing conveyor performance and safety. By prioritizing radar for dusty environments and point-level switches for critical blockage points, operators can significantly reduce unplanned downtime. For those looking to explore a comprehensive range of industrial measurement tools, you can [Main Page](#) to review product options and application support.

When determining what sensors should i purchase for conveyor systems, always start with the physical properties of your material and the specific geometry of your mechanical setup. A well-planned instrumentation strategy ensures that your conveyor system remains a reliable component of your industrial process.