

Brewdog Raw Material Detection

A practical guide to brewdog raw material detection, covering the reader intent, the relationship to brewdog raw material detection, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



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In the high-speed environment of modern craft brewing, maintaining precise control over inventory is essential for operational efficiency and product consistency. For a brand like Brewdog, which operates at a significant industrial scale, raw material detection involves the continuous monitoring of both solid and liquid ingredients. This includes grain silos filled with malt and barley, water storage tanks, yeast propagation vessels, and chemical tanks used for Clean-in-Place (CIP) processes.

Accurate level measurement ensures that production schedules are never interrupted by unexpected stockouts and that storage vessels are utilized to their maximum safe capacity. This guide explores the technical principles, selection criteria, and installation requirements for implementing robust brewdog raw material detection systems using industrial-grade level measurement technology.

| Core Principles of Level Measurement

Before selecting specific instruments for brewing raw materials, it is necessary to understand the physical principles that govern industrial level detection. Different materials—ranging from dusty grain to foaming wort—require specific sensing technologies.

| Radar Level Measurement (Non-Contact)

Radar transmitters operate on the Time-of-Flight (ToF) principle. The device emits a high-frequency electromagnetic pulse (typically in the 26GHz or 80GHz range) from the antenna toward the material surface. The pulse reflects off the material and returns to the sensor. The distance is calculated based on the time interval between emission and reception.

Radar is highly effective for brewdog raw material detection because electromagnetic waves are largely unaffected by dust, temperature fluctuations, or pressure changes within the vessel. High-frequency 80GHz radar is particularly advantageous for solids like malt, as the narrow beam angle avoids interference from internal tank structures and provides a strong reflection even from sloped grain surfaces.

| Ultrasonic Level Measurement

Ultrasonic sensors also use the ToF principle but utilize sound waves instead of electromagnetic pulses. The sensor emits an ultrasonic pulse that bounces off the surface of the liquid or solid. While cost-effective, ultrasonic measurement is sensitive to air temperature, heavy dust, and surface foam, which can absorb the sound signal. In a brewery context, these are often used for outdoor water storage where conditions are relatively stable.

| Hydrostatic Pressure Measurement

Hydrostatic transmitters measure the pressure exerted by a liquid column at the bottom of a tank. Since pressure is directly proportional to the height of the liquid and its density, the level can be calculated accurately. This is a contact-based method frequently used for water and finished beer tanks where the liquid density is well-defined and consistent.

| Point Level Detection (Switches)

Unlike continuous transmitters, level switches provide a binary signal (on/off) when material reaches a specific point. Tuning fork switches or rotary paddle switches are commonly used as high-level alarms to prevent overfilling or low-level alarms to protect pumps from running dry.

| Solid Raw Material Detection: Malt and Grain

The primary solid raw materials in brewing are malted barley and other grains. These are typically stored in large outdoor silos or indoor bins. Detecting the level of these materials presents unique challenges:

1. **Dust Generation:** During the pneumatic filling of silos, significant dust is generated. This dust can attenuate signals from ultrasonic sensors.
2. **Angle of Repose:** Solids do not form a flat surface; they form cones when filling and craters when discharging.

3. Dielectric Constant: Grain has a relatively low dielectric constant (Dk), meaning it reflects radar waves less efficiently than water.

For these applications, 80GHz radar is the industry standard. The narrow beam allows the sensor to be mounted near the silo wall without picking up false echoes from the sides. For a comprehensive look at available sensor configurations, engineers can visit the Main Page of industrial instrumentation providers to compare beam angles and range capabilities.

| Liquid Raw Material Detection: Water and Chemicals

Brewing is a water-intensive process, and raw water storage is the first stage of liquid handling. Additionally, caustic and acidic cleaning agents are stored for sanitation.

Water Tanks: Hydrostatic pressure sensors or ultrasonic transmitters are usually sufficient. If the tank is vented to the atmosphere, a simple hydrostatic probe provides high reliability with minimal maintenance.

Chemical Tanks: CIP chemicals can be corrosive and may produce vapors. Non-contact radar with a PTFE-coated antenna is recommended here to prevent chemical attack on the sensor and to ensure the electronics remain isolated from the process environment.

| Technical Comparison Table

The following table summarizes the suitability of different technologies for common brewdog raw material detection tasks.

Material Type	Recommended Technology	Advantage	Limitation
Malt/Grain	80GHz Radar	Penetrates dust; narrow beam	Higher initial cost
Water	Hydrostatic / Ultrasonic	Cost-effective; reliable	Ultrasonic sensitive to foam
CIP Chemicals	Non-contact Radar (PTFE)	Corrosion resistance	Requires dielectric reflection
Wort (Hot)	Radar	Unaffected by steam/temp	Steam can cause condensation
Yeast	Tuning Fork Switch	High hygiene; foam rejection	Point detection only

| Installation and Engineering Considerations

Proper installation is as critical as sensor selection for successful brewdog raw material detection. Engineers must account for the following factors during the design phase:

| Avoiding Obstacles

Internal structures such as ladders, agitators, or heating coils can create "false echoes." When installing radar or ultrasonic sensors, the beam path must be kept clear. Using sensors with a narrow beam angle (e.g., 3° to 6°) significantly reduces the risk of interference from these obstacles.

| Nozzle Design

The mounting nozzle should be as short as possible. If a nozzle is too long or narrow, the signal may reflect off the inside of the pipe before it even reaches the tank, creating a "dead zone" at the top of the measurement range.

| Condensation and Steam

In hot water or wort tanks, condensation can form on the sensor face. Modern radar sensors often feature a convex lens antenna design that allows droplets to run off, preventing signal attenuation. In extreme cases, an air purge system can be used to keep the antenna dry and clean.

| Hygienic Requirements

For materials that come into direct contact with the product (like wort or yeast), sensors must meet hygienic standards (such as EHEDG or 3-A). This involves using stainless steel (SS316L) housings and process connections like Tri-Clamps that do not have crevices where bacteria can grow.

| Common Risks in Raw Material Detection

Failure to implement accurate detection can lead to several industrial risks:

Silo Overfill: In solids handling, overfilling a silo can lead to structural damage or dust explosions. Redundant high-level switches should always be used alongside continuous radar measurement.

Pump Cavitation: If a liquid tank empties unexpectedly, pumps can draw in air, leading to cavitation and mechanical failure. Low-level interlocks are essential for pump protection.

Inaccurate Batching: If the detection system provides incorrect data, the ratio of water to grain (the grist ratio) may be off, resulting in inconsistent alcohol content and flavor profiles.

| Confirmation Checklist for Project Managers

Before procuring instrumentation for brewdog raw material detection, the following parameters should be confirmed with the equipment manufacturer:

1. **Material Characteristics:** What is the dielectric constant of the solid or the density of the liquid?
2. **Vessel Dimensions:** What is the total height and diameter? Are there internal obstructions?
3. **Process Conditions:** What are the maximum temperature and pressure? Is there heavy foam or steam?
4. **Integration Requirements:** Does the sensor need to output 4-20mA, HART, Modbus, or Profibus signals to the central PLC?
5. **Regulatory Compliance:** Are food-grade certificates or ATEX/Ex-proof ratings required for hazardous dust environments?

| Frequently Asked Questions (FAQ)

Q: Can one sensor type be used for all brewing materials?

A: While radar is the most versatile, it is often not the most cost-effective for every tank. A hybrid approach—using radar for grain and chemicals, and hydrostatic or ultrasonic for water—is typically the most balanced solution.

Q: How does foam affect brewdog raw material detection?

A: Foam is a significant challenge for ultrasonic sensors as it absorbs the sound waves. Radar is more resilient, but heavy, dense foam can still dissipate the signal. In such cases, specialized radar settings or a stilling well may be required.

Q: Is maintenance required for non-contact sensors?

A: Non-contact sensors generally require very little maintenance because they do not touch the material. However, periodic checks for heavy buildup on the antenna (in dusty grain silos) are recommended to ensure signal integrity.

| Conclusion

Effective brewdog raw material detection is a cornerstone of scalable brewing operations. By understanding the physics of radar, ultrasonic, and hydrostatic measurement, facilities can ensure that every liter of water and every kilogram of malt is accounted for. Selecting the right technology involves balancing the specific needs of the material against the environmental conditions of the vessel. For technical specifications and product selection guidance, reviewing the options on the Main Page of a specialized instrument provider will help ensure the chosen solution meets the rigorous demands of the craft beer industry.