HARDY
PROCESS SOLUTIONS
Measurement ▪ Automation ▪ Productivity

Level Measurement vs Weight and Industry 4.0

Intended Audience

- Plant Managers
- Process Engineers
- Control Engineers
- Maintenance Managers

Manufacturing Area

- Process
- Packaging

Applications

- Inventory Management
- Batching & Blending
- Dispensing

Focus

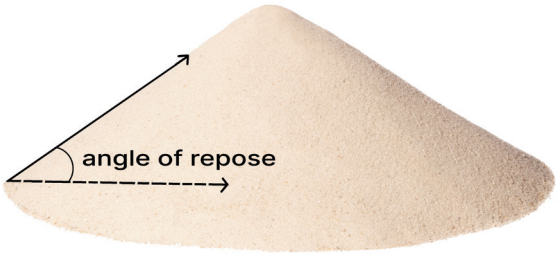
- Weight Measurement in Industrial Manufacturing

Level Measurement

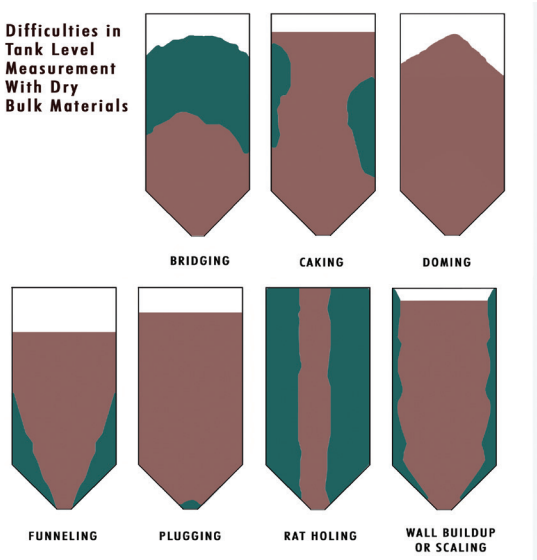
Point level sensors often are used to detect the level of material in a tank or silo. There are typically set points for high level (presence of material) and low level (absence of material). Typically, this is intended for processes where high and low levels need to be managed. Additional sensors can be used to signal half full, quarter full, etc.

A continuous level sensor is designed to provide level detection through every point in a tank or silo. The most popular continuous level technologies are microwave radar, guided wave radar, ultrasonics, capacitance, pressure, magnetostrictive, and weighing. All these technologies work accurately when installed correctly in liquid applications. Pressure and magnetostrictive are not used for measurement of solid materials. Most of the other technologies will have accuracy issues when measuring solids.

The issue for these technologies is the angle of repose and how that angle differs between filling and emptying. Webster defines the angle of repose as the angle of maximum slope at which a heap of any loose solid material will stand without sliding.



Like point level devices, continuous level technologies measure one point on the pile. The level indication provided is approximate and the accuracy can change with the process. An example would be when the process changes from filling to emptying. If the material bridges or begins to rat hole there will be no change in the level measurement until the pile caves in. It could be several minutes before this happens. If an operator was looking at trends in the tank level, they would have a stair step trend instead of a straight line.

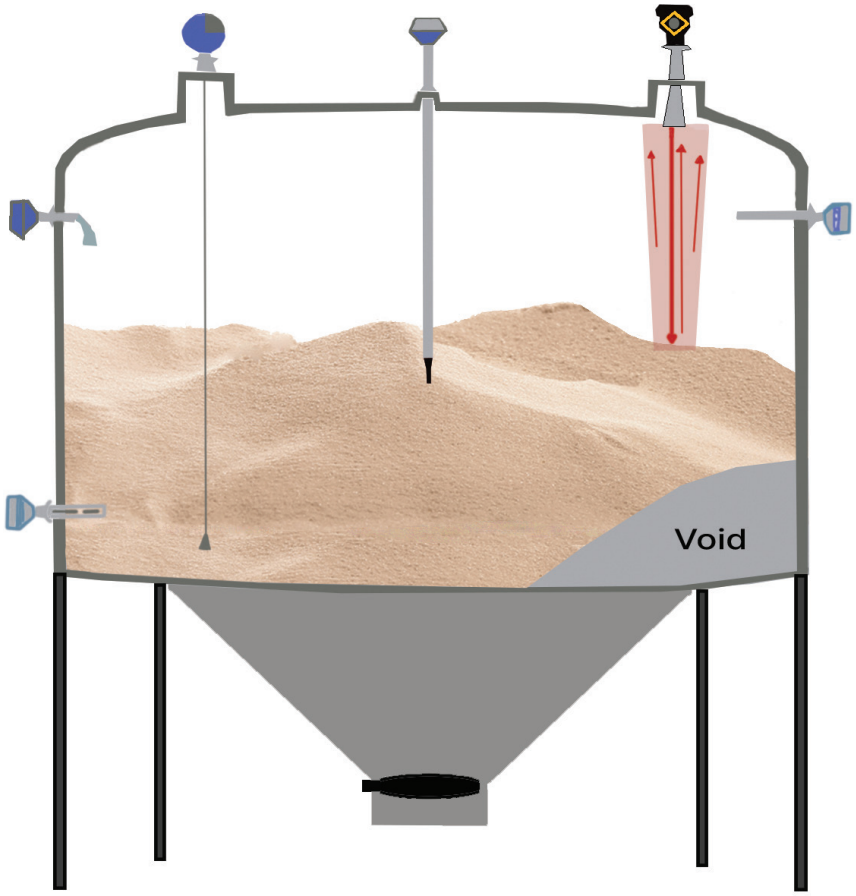


Hardy Process Solutions • 10075 Mesa Rim Road• San Diego, CA 92121
Tel 858.278.2900 • www.hardysolutions.com • hardyinfo@hardysolutions.com

This accuracy may be acceptable if the operator is only concerned with general knowledge of the level. Such as when a truck should be sent to refill the silo. But if the plant is trying to understand shrinkage or match raw materials to output an approximation will not be sufficient.

IIoT

This is part of the Industrial Internet of Things (IIoT). IIoT is the intersection of information technology (IT) and operational technology (OT). OT refers to the networking of operational processes and control systems such as programmable logic controllers (PLCs), human machine interfaces (HMIs), distributed control systems (DCSs), and supervisory control and data acquisition (SCADA) systems.



Several different methods of level measurement, shown in this example illustration, clearly show how dry bulk material is affected by angles of repose and shifting material contents as the tank empties.

In the context of the fourth industrial revolution, dubbed Industry 4.0, IIoT is integral to how physical systems and production processes are set to transform with the help of large amounts of accurate data and analytics. Real-time data from sensors and other information sources helps industrial devices in their "decision-making." Machines are further enabled to take on and automate tasks that previous industrial revolutions could not handle. In this scenario inaccurate data will result in poor decision making and inefficient processes.

The Most Accurate Level Measurement Method is Weighing

This is why weighing should be considered in all solid level measurement applications, as businesses transition to Industry 4.0. Weighing is not subject to the errors caused by angles of repose, rat holing, or bridging. Additionally weight is not concerned with chemical compatibility, dust, condensation, and process variables that cause inaccuracies in level detection technologies.

In a weight-based control system, the weighing instrumentation is at the core of the process. The primary function of the weighing instrument is to generate **accurate**, **stable**, **and fast weight data** and, in many cases, administer direct control over the process through the actuation of valves and solenoids, controlling motor speeds, and monitoring the state of inputs from other sensors such as photo-eyes, flow meters, and tachometers.

Weighing is the only accurate technology for solid level indication. In certain critical applications, level measurement must be conducted by two independent level technologies, which are based on different methods of measurement. If plants are using an existing level technology based on the examples above, the addition of a weight-based system will ensure there is no single point of failure. As we move into Industry 4.0, accuracy will be required for efficient processes and to allow machines to increase their "decision-making" capabalities.