ABB MEASUREMENT & ANALYTICS | APPLICATION NOTE

Level measurement - pulp and paper industry

Pulp stock chest

Pulp stock

Level measurement application in the pulp and paper industry where the design is intended to retain pulp consistency before being pumped to the head box

Measurement made easy

Introduction
Pulp chests are essential for paper plants to maintain production. They come in either round or rectangular construction and can either be agitated from the top or the side. This presents a challenge for ensuring that the level is correct inside.

The Challenge
Traditionally the level measurement inside these applications has been done using a single differential pressure transmitter located at the bottom of the chest. The operational theory on this style of measurement is that the static head pressure from the weight of the pulp and liquid can derive a level measurement.

Generally, this is an acceptable form of level measurement, but in this application, the installation requires that the diaphragm is mounted through a nozzle and in some cases is near the outlet for the pulp. The natural effect of liquid channeling through the pulp fiber in addition to its proximity to the outlet is known to create a dea zone in front of the pressure transmitter. This is compounded with the fact that it's extremely difficult to service and it makes a major reliability issue for the plant.

Modern technology
There have been a couple notable advances in modern technology to help overcome the issues known from differential pressure measurement. Though due to the age of many of these chests, access points are often less than ideal for it. Through air radar is one of the more common methods of measurement for this application. However, it has its own set of challenges too.

First the higher dielectric constant liquid is often below the pulp fluff and thus this signal must travel through this "foamy" layer. This can cause false readings due to the signal traversing from the upper layer to the lower layer and back again. Next the physical location of this must be mounted away from side walls, agitator blades, inlets, and avoid nozzles. This can prove to be a cumbersome obstacle to overcome due to the high cost of modifications needed to the chest.

01 DP transmitter and nozzel mounted to pulp stock chest

02 LLT100 installed with P910 air purge

03 LLT100 installed on tall nozzle

04 Median filtering feature

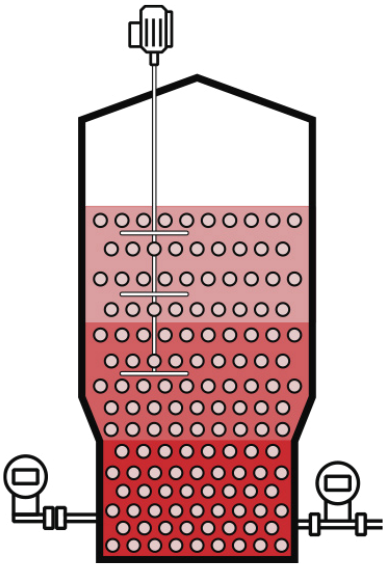

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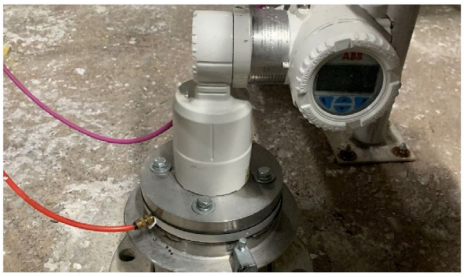
ABB Solution

Laser technology is rising in popularity in these applications as the <0.3° beam angle allows for installations in close proximity to the known obstacles that through air radar faces. ABB uniquely addresses issues with reliability by offering the only laser in the world with HART protocol. Instead of going through cumbersome menus for “false echo suppression”, “echo mapping” and “false echo tracking”, the LLT100 Pv and Sv can be set for level and amplitude. The signal amplitude can be trended over time and offer predictive maintenance as it is a simple measurement of how much signal is received back to the transmitter.



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Rationalization

Utilizing an infrared laser versus a radio frequency has an impact on the sensitivity of reading in changing environments. When the pulp consistency changes it won’t have an impact on the reading for laser measurement as its optical meaning that it will register a reading from the first thing it “sees”.

Readings using radio frequency are also impacted by temperature swings as it will decrease the accuracy over the length of measurement. Infrared light is not impacted by temperature changes and the accuracy of the reading +/-5mm is consistent no matter the distance. That said, the high air moisture content can have an impact on the laser’s performance due to condensation.

It’s recommended to deploy a two-fold method of compensation to overcome this. First, the laser comes equipped with a lens heater that can be activated and performs similar to a rear defroster. Second, is a purge ring that’s inserted between the laser’s flange and the process connection. Nozzles are encouraged for the laser as they act as an area of positive displacement for the instrument air to force out the external environment.

To address the pulp chest agitator blades, most manufacturers offer software features like dampening for mitigating high levels when the blades are “seen”. ABB brings simplicity to the equation with median filtering in addition to traditional dampening. Measurements from 2 to 25 are kept in internal memory and the sensor returns the median value of the group.

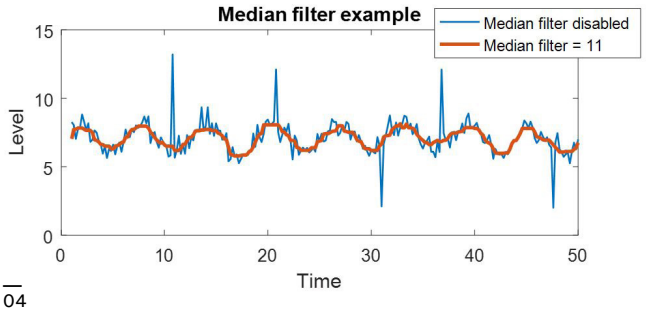

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ABB Measurement & Analytics

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