Lasers for level measurement - Review of applications and benefits
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We will take the questions at the end of the presentation
TechTalks
Lasers for level measurement - Review of applications and benefits
March 2021
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- Webinar recording will also be published on the ABB TechTalks webpage:
Speakers

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- ABB
- Based in Quebec City, Canada

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- Level North America Area Market Manager and Global Sales Manager – Laser Level Measurement
- ABB
- Based in Quebec City, Canada
Family of Laser Level Transmitters

**Laser level measurement products**

ABB has been using lasers for level measurement for more than 20 years

**LM80**
Bulk solids applications

**LM200**
Long range, for positioning applications

**LLT100**
Latest addition to the product line
Device made specifically for industrial applications
The Laser Level Transmitter

How does it work?

Laser pulse time of flight is measured to determine distance
The sensor has a narrow field of view: it only detects returns from the surface
The laser beam is narrow, it doesn’t interfere with surrounding objects
The real target is the last target, which makes it easy to detect

IR sensitive camera used to see the IR laser beam and a red laser pointer.

Liquid or solid surface

20cm @ 30m
Lasers are changing level measurement

A new way to perform level measurement

Advantages
- Flexible installation
- No echo mapping
- No onsite calibration
- Detects any liquid or solid

Specifications
- Up to 30 m (100 ft.) for liquid level applications
- Up to 100 m (330 ft.) for solid level applications
- Up to 400 m (1320 ft.) for positioning applications
- Operating temperature -40 °C to +65 °C (–40 °F to +140 °F)
Product benefits

Easy installation

Save on installation

No need to modify vessel or site
- Install anywhere, from the edge of the silo to the middle
- Shoot the laser beam at an angle if required (on solids)
- No echo mapping, no need to empty vessel
- Shoot the laser beam through an existing window

Long measurement range allows installing product away from falling materials or dangerous conditions

Easy configuration can be replicated in several identical vessels

Can aim beam at angle to measure all the way down vessel cone
Product benefits
Measure any material

### A single product for any material

**Solids:**
- Any type, even mix of solids and liquids

**Liquids:**
- Any type, from clear to dark
- Measures in the presence of waves, turbulence, bubbles

**Foams:**
- Measure the top of the foam
- Foam won’t make the signal unreliable

**Laser beam can detect low-dielectric constant materials**
- Oils
- Plastics
- Low-density materials in general
Lasers vs other non-contact level measurement - Technology Review

<table>
<thead>
<tr>
<th>Applications</th>
<th>ABB Laser</th>
<th>Open path-radar</th>
<th>Ultrasonic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long range</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Presence of obstructions, agitators</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Any type of vessel shape, even conical bottoms</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Presence of waves and turbulence</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Any solid material surface angle</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Presence of gases, foam</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Low dielectric constant materials</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Fast changes, abrupt changes &lt;1s</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
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<tr>
<td>Heavy dust &amp; fog</td>
<td>✗</td>
<td>✓</td>
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</table>
Lasers are used in a wide range of industries

Industries and applications

**Chemicals**
- Plastic pellets level
- Polymer tanks
- Agitated tank level
- Lube oil level

**Mining, power, metal**
- Crusher control
- Tripper car position
- Bin level monitoring

**Water & waste water**
- Lift station level
- Deep wet well
- Sludge level
- Biogas volume monitoring

**Oil & gas**
- Floating roof level
- API separator level
- Drilling mud level

**Food & beverages**
- Agitated tank level
- Bulk material inventory

**Pulp & paper and aggregates**
- Pulper control
- Impregnation tower level control
- Roofing granules level
- Wood chips level
A wide array of applications

- Process control
- Inventory monitoring
- Positioning & proximity detection
Plastic pellets, nylon pellets, and polymers

**Typical users**

- Polypropylene manufacturers
- Plastic object manufacturers

**Laser level benefits**

- Non-contact measurement means low maintenance, lower cost of ownership
- Works well even for low-dielectric constant
- Very little dust in typical application
Oil&Gas application

Sump tank

**Application**

Measure the level of a sump tank in an upstream application
Tank buried underground without access to it
Different types of liquids and gases as well as foam could be present
GWR and FSR presented erroneous measurements due to changes in dielectric constants and process conditions

**Laser Benefits**

A laser was tested for a month
It was measuring in parallel with the radar products
Application was solved successfully:
  - Client changed the radars for the laser because of its stability in the measurement and its high reliability
Control and measurement of foam level

Foaming is present in many industrial processes

Foaming can be present in many industrial processes:
- integral part of the manufacturing process
- undesirable side effect.

Source of costly problems:
- environmental pollution, reduced yields, production downtime, and cleaning costs in case of overfills

Reliability and simple installation reduce cost

Water&Wastewater: digesters, fermentation chamber
Oil&Gas: Knockout pot in Minox deoxygenation systems
Mining: Floating cells
F&B: Sugar production, Brewing process
Pulp&Paper: deaerator tank
Pharmaceutical: Crystallization process
Mining application
Crusher Level Control

**Laser level measurement benefits**

Crusher level must stay at optimal level, to increase performance and equipment lifetime

Lasers reliably detect the level in the crusher to control the speed of the conveyer belt.
Advanced software features allow the laser to measure within falling rocks and dusty environment.
Easy to align due to laser pointer
Surface angle has no impact
Liquid storage tanks

**Application**
- Measurement of liquids such as solvents or acids
- Fused glass configurations provide good barrier to tank
- Pressurize tanks

**Laser Benefits**
- Easy and flexible installation
- Can be installed on top of ball valve for isolation
- Can be installed on long pipe or spool piece
- Can measure in stilling well
Waste water process automation made easy
Measuring solids, muds, or liquids

Biomass level monitoring
Efficient solids level detection, not affected by build-up on walls
After successful installation, no need to reconfigure product: high uptime and low maintenance cost

Sludge monitoring
Solid/liquid ratio is not an issue
Lasers are not affected by material composition changes, can detect solids or liquids even low-dielectric constant materials

Deep water wet well
Positioned at the top of the wet well allowing easy maintenance.
Laser technology unaffected by sewer gas
Easy to aim in deep and narrow spaces
Positioning applications

**Applications**

Precise positioning of moving objects  
Tripper cars, wagon used for moving materials  
Must be well positioned to prevent spills

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**Laser measurement benefits**

Alternative: switches – high rate of wear and tear

Laser measurement leads to much higher lifetime  
- Instrument away from moving objects, no contact  
- Continuous measurement
Summary

**Laser technology has unique advantages**

- Measure all liquids
- Measures any solid at any angle
- Non-contact, maintenance free
- No vessel mapping
- Narrow beam
- Easy installation, configuration
- One device addresses wide array of applications
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