

Ultrasonic Technology
















































- Brief overview of Sonic Intelligence
- Mounting considerations when applying non-contacting level technologies
- Do and don'ts when applying ultrasonic level technology (Application challenges)
- Key products for small vessels (what's new?)
- Level applications in open and closed short range applications
- Review

November 19, 2015

Herman Coello

Level Marketing Manager

Siemens Process Instrumentation

<p>Chemicals</p> <p>Oil & Gas</p> <p>Water</p> <p>Mining Aggregates Energy</p> <p>Food Beverage Pharma</p> <p>OEM</p>		<p>Pressure </p> 	<p>Temperature </p> <table border="1"> <tr> <td>Rail</td> <td>Field</td> <td>Head</td> <td>Sensors</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Rail	Field	Head	Sensors					<p>Positioner </p> 	<p>Software </p> <p>SITRANS Library SIMATIC PDM</p> 					
	Rail	Field	Head	Sensors																	
																					
	<p>Level </p> <table border="1"> <tr> <td>Capacitance</td> <td>Radar and Guided wave radar</td> <td>Ultrasonic</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>		Capacitance	Radar and Guided wave radar	Ultrasonic				<p>Weighing </p> 		<p>Flow </p> <table border="1"> <tr> <td>Electro-magnetic</td> <td>Ultrasonic In-line & Clamp-on</td> <td>Coriolis</td> <td>Vortex</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>			Electro-magnetic	Ultrasonic In-line & Clamp-on	Coriolis	Vortex				
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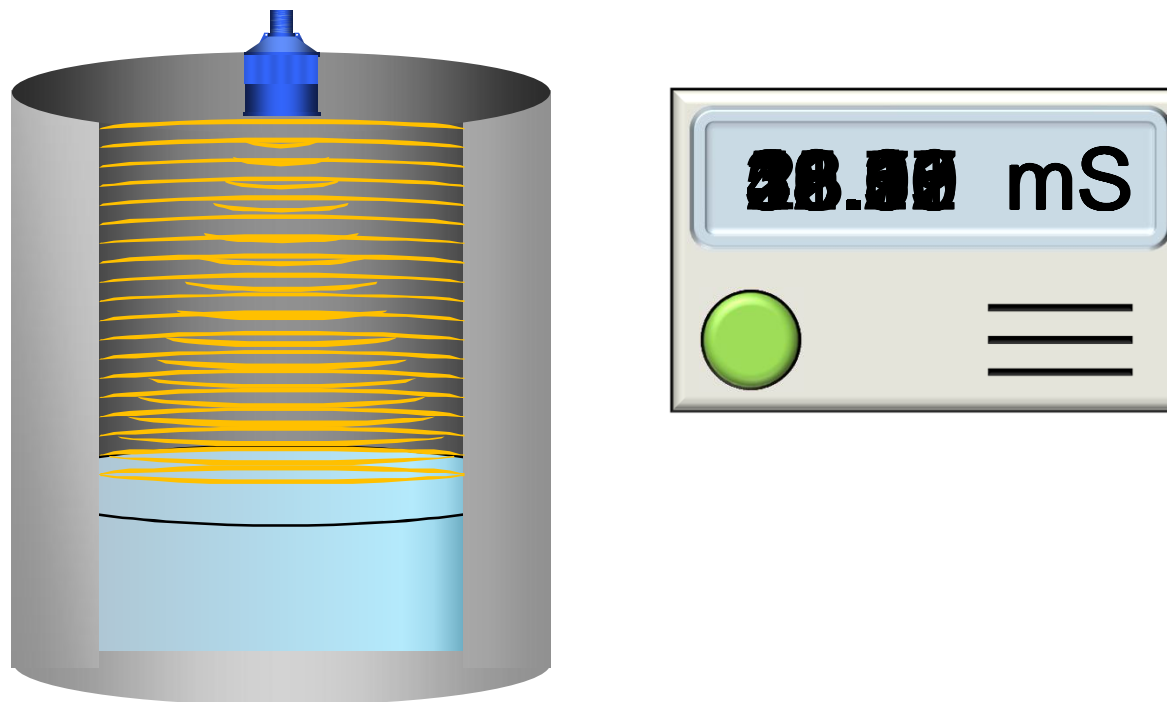
Sonic Intelligence

Echo Ranging and Time of Flight



Ultrasonic Level

Echo Ranging and Time of Flight

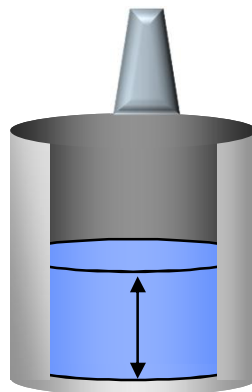


Sound travels at constant known velocity at a given temperature

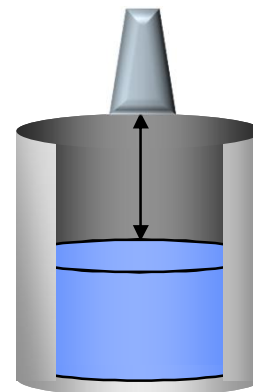
Siemens Non-contacting Level operations



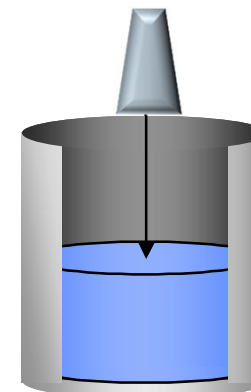
Level



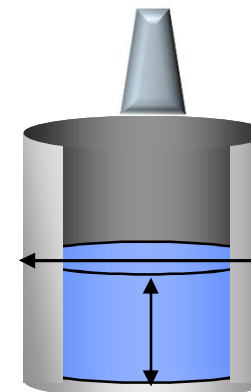
Space



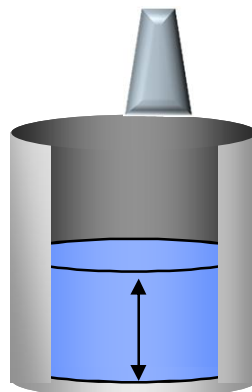
Distance



Volume



Distance



What are sonic intelligence and process intelligence?

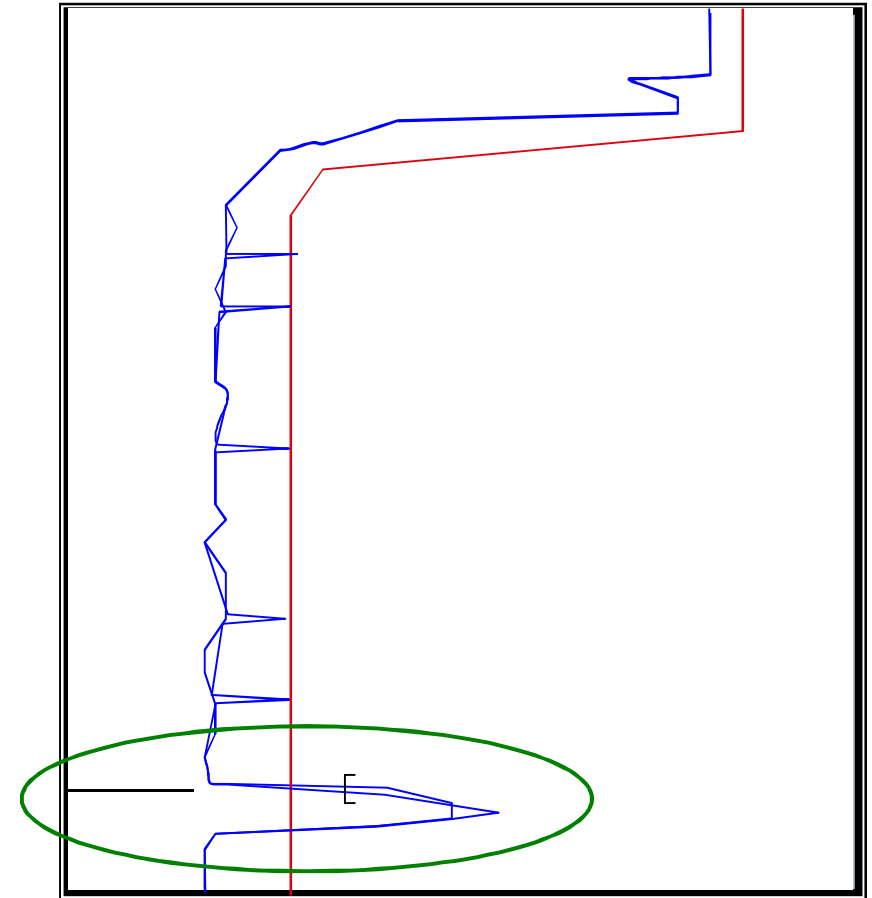
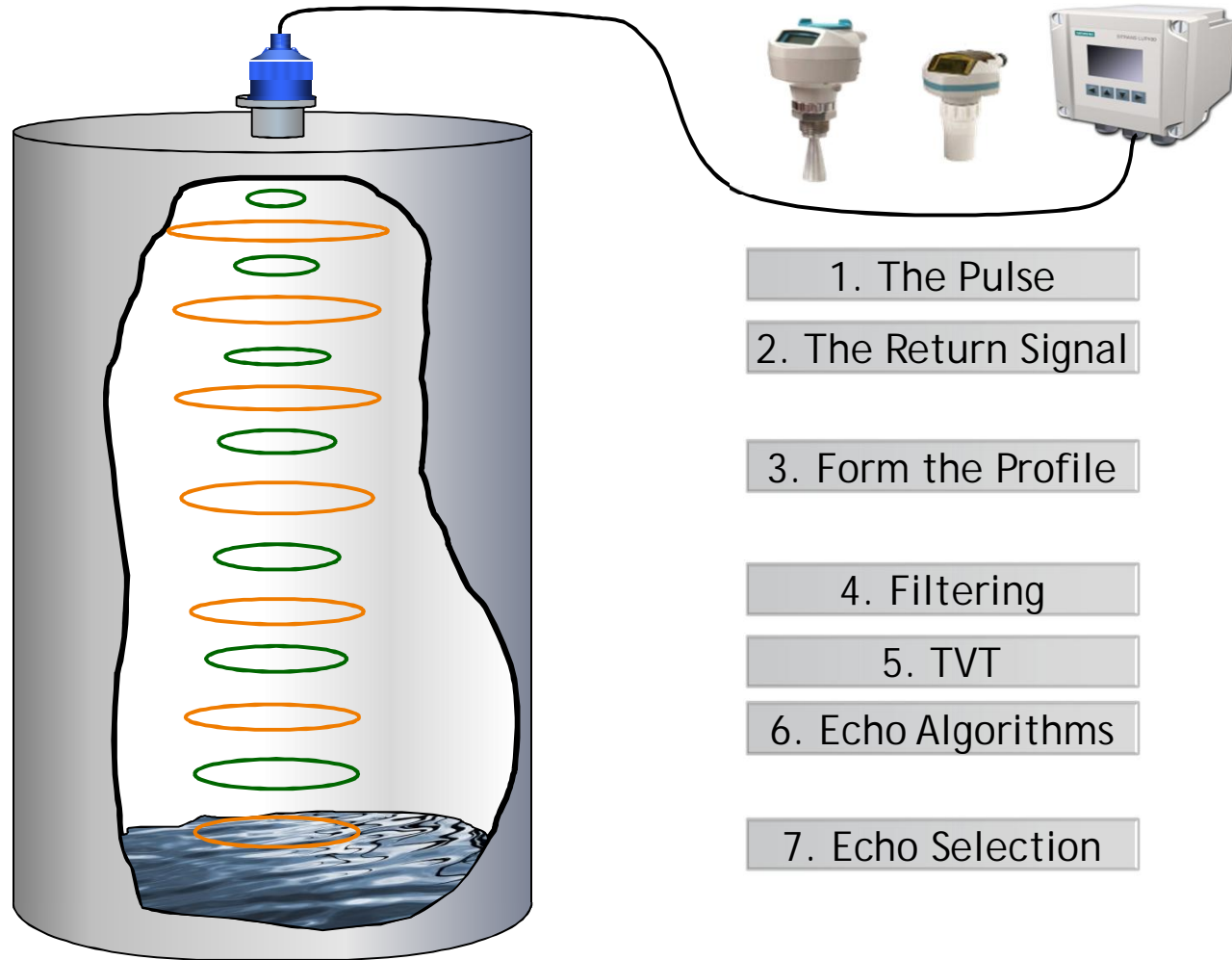
Sonic intelligence and process intelligence are embedded firmware that provide:

- Fast and easy product set-up
- Repeatable, accurate and reliable level detection
- Flexibility
- Sonic intelligence is used in our Ultrasonic devices
- Process intelligence is used in our radar devices



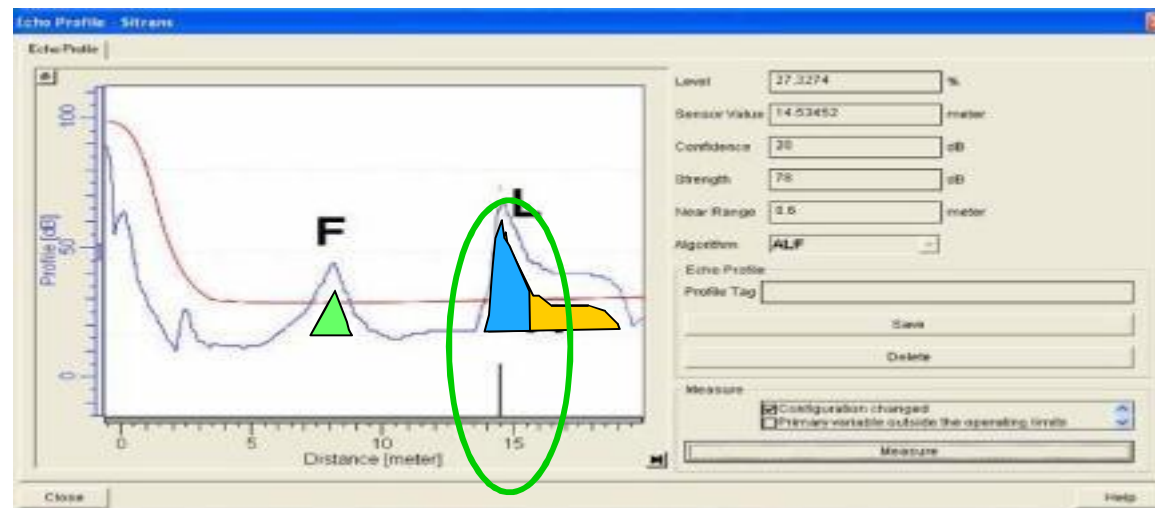
Siemens “Sonic & Process Intelligence”

How it works – radar and ultrasonic echo profiles



Siemens “Sonic & Process Intelligence” – ALF algorithm

- Echoes are evaluated by A, L, and F components (Area, Largest and First).
- Scores/ confidences are assigned to each echo based on these 3 criteria
- The highest score from the 3 criterion is selected for each echo.
- The echo with the largest net score is selected as the true echo.
- There are many variants of ALF, the most common being bLF (Best of Largest and First).
 - Only evaluates Largeness and Firstness – highest combined score wins



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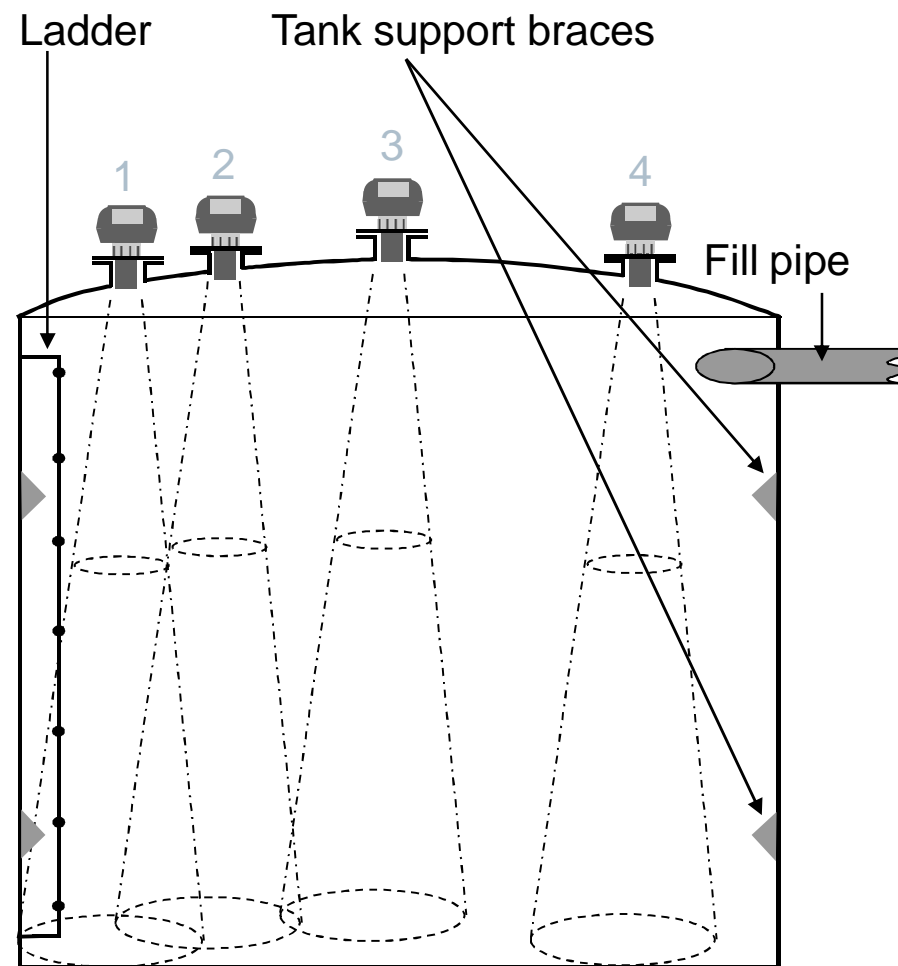


Ultrasonic Technology



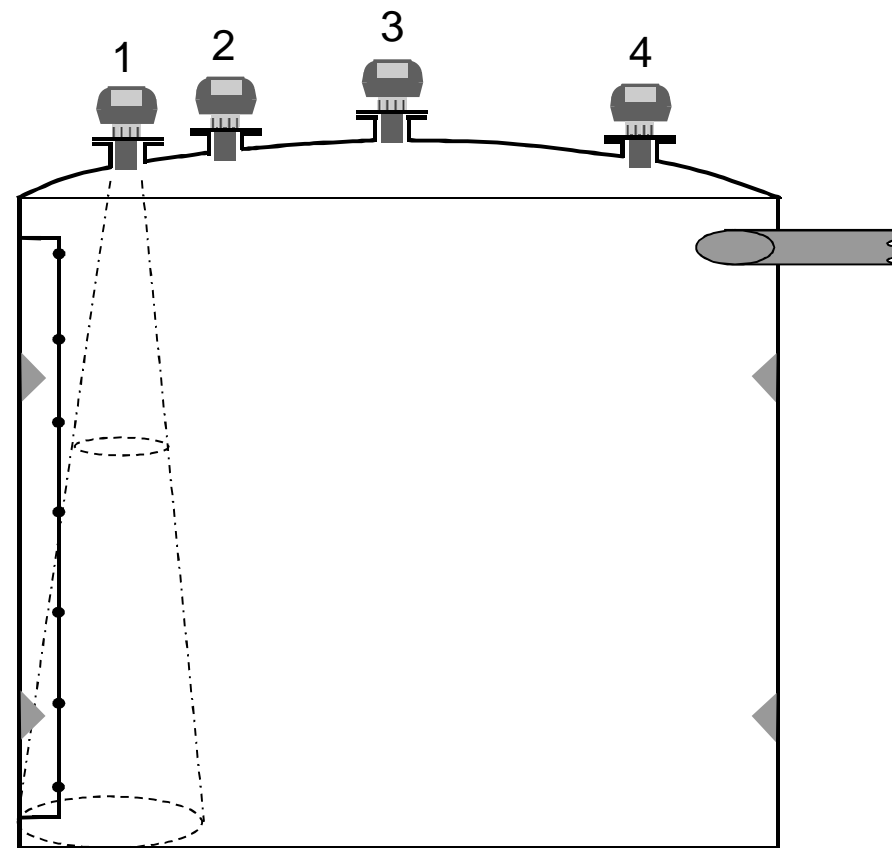
Mounting Considerations

Siemens Ultrasonics Mounting Considerations



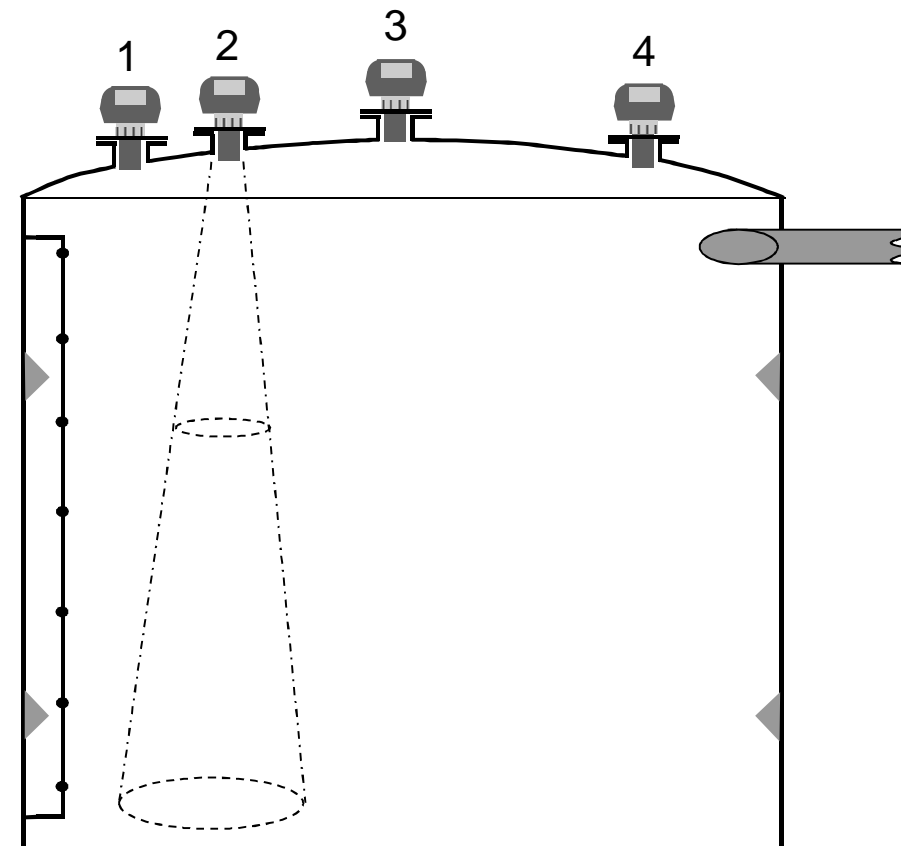
Siemens Ultrasonics Mounting Considerations

1. Too close to side wall – interference from ladder rungs and support braces



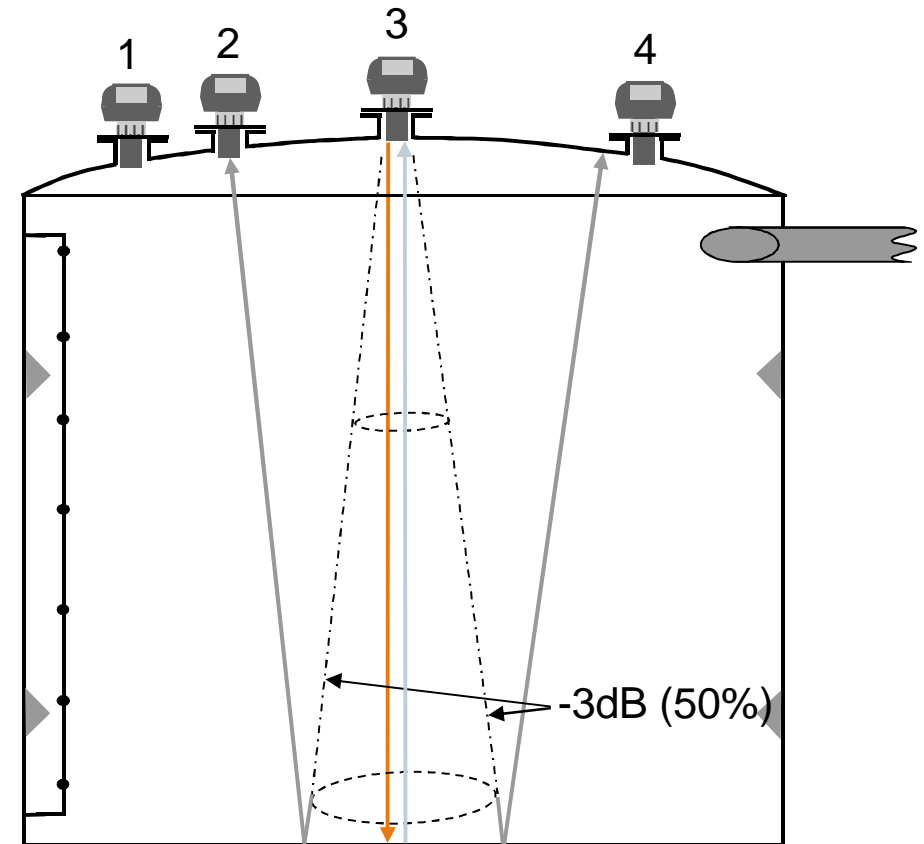
Siemens Ultrasonics Mounting Considerations

1. Too close to side wall – interference from ladder rungs and support braces
2. Correct installation – 1/3 the distance from the side wall, no obstructions

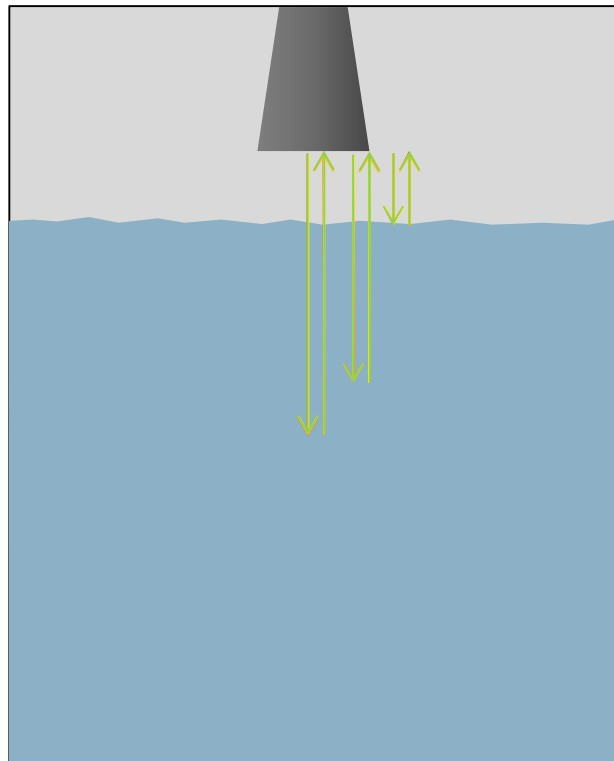


Siemens Ultrasonics Mounting Considerations

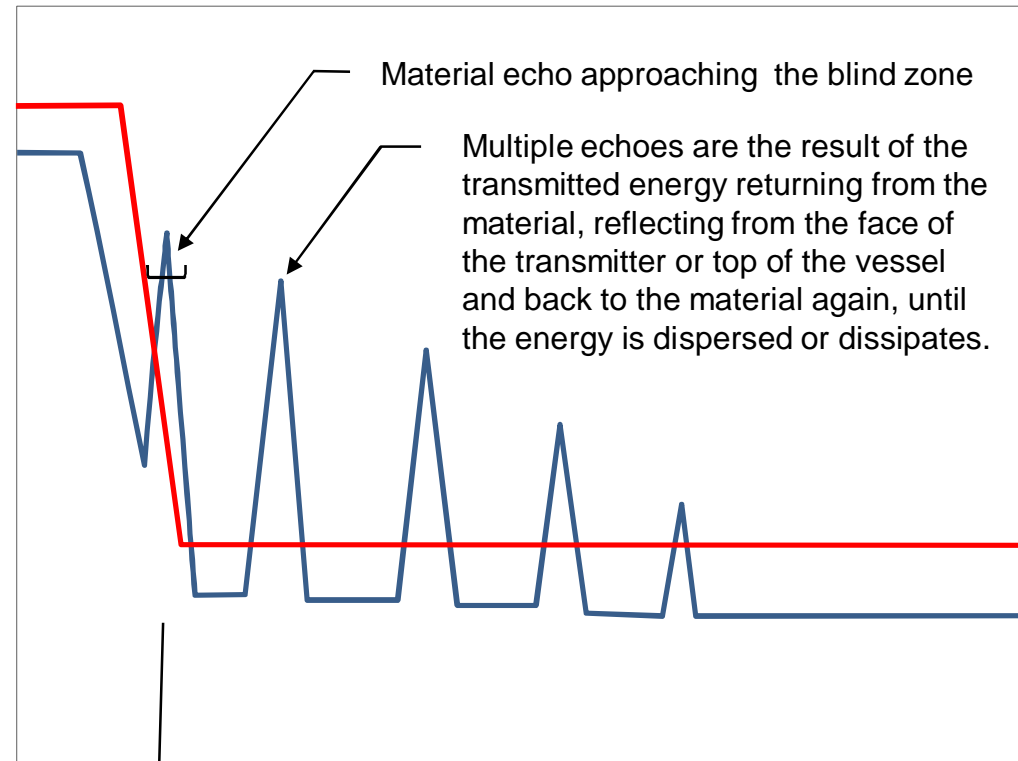
1. Too close to side wall – interference from ladder rungs and support braces
2. Correct installation – 1/3 the distance from the side wall, no obstructions
3. Center of a parabolic tank – problems with secondary echoes
4. Signal path too close to fill pipe



Siemens “Sonic & Process Intelligence” – Be aware of the blind zone



Actual Distance



Measured Distance

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Facts to Consider

Siemens Ultrasonics Application Challenges

- High Temperature (>212°F)
- Certain Vapors
- Severe Dust
- Light density Foam
- Absolute Vacuum
- **These are Radar applications**



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Ultrasonic Technology



Application Examples



-  Liquids
-  Solids
-  Slurries

Application Examples

- > MAC
- > Environmental
- > Oil & Gas
- > Chemical & Petrochemical
- > Food & Beverage
- > Others

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Technology

- Continuous non-contacting ultrasonic level measurement

Benefit

- Sonic Intelligence®
- Easy installation
- Fast programming with two buttons (set 4 and set 20)
- 2-wire, loop powered ultrasonic transmitter
- Range: 0.8 to 16.4 ft.
- Process Temps: -40 to 140 ° F
- Experienced product – over 20 years in operation

Where to Apply

- Level monitoring
- Chemical storage (acid, solvent, additives), floatation cells, fuel-oil storage (diesel), drilling mud, simple process vessels



SITRANS LU150

The ultrasonic solution for corrosive media



Application of diluted sulfuric acid in a water plant, highly corrosive media with lots of condensation..

Benefits:

- PVDF one piece sealed sensor, chemically resistant to harsh sulfuric acid environment
- IP68 protection, self cleaning action, handled the media with no problems

SITRANS LU150

The ultrasonic solution for environmental applications



Level measurement for open channel measurement

Flow conversion at PLC

Benefits:

- Easy to install & economical level solution

SITRANS LU150

Ultrasonic solution for environmental applications



Level measurement on a filter bed application
Flawless performance even while scum would occasionally accumulate under the sensor signal path

Benefits

- Quick and easy setup while providing dependable level measurement under changing conditions

The Probe - Drill Mud Level Application



Monitoring Fluid Level of Drilling mud pits and tanks


- Non-Contacting ultrasonic technology used to monitor fluid levels
- Quick and easy setup

Benefit – Eliminated mechanical devices prompt to fouling due to clogging or mechanical wear

Siemens Ultrasonics SITRANS Probe LU

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-  Liquids
-  Solids
-  Slurries

Application Examples

- > MAC
- > Environmental
- > Oil & Gas
- > Chemical & Petrochemical
- > Food & Beverage
- > Others

Technology

- Continuous non-contacting ultrasonic level measurement

Benefit

- Sonic Intelligence ® with Auto False Echo Suppression
- The greater of 0.15% of range or 6 mm (0.24")
- Non-contacting
- Easy to mount
- Reliable accurate measurement
- 20 ft. and 40 ft. range models
- 2-wire technology

Where to Apply

- Level, volume and flow monitoring
- Chemical storage (acid, solvent, additives), floatation cells, fuel-oil storage (diesel), drilling mud, process vessels

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SITRANS Probe LU Applications

Material: Alum

Application: Exothermically Heated Storage vessel

Unit Config.: Kynar, 2" NPT threaded flange

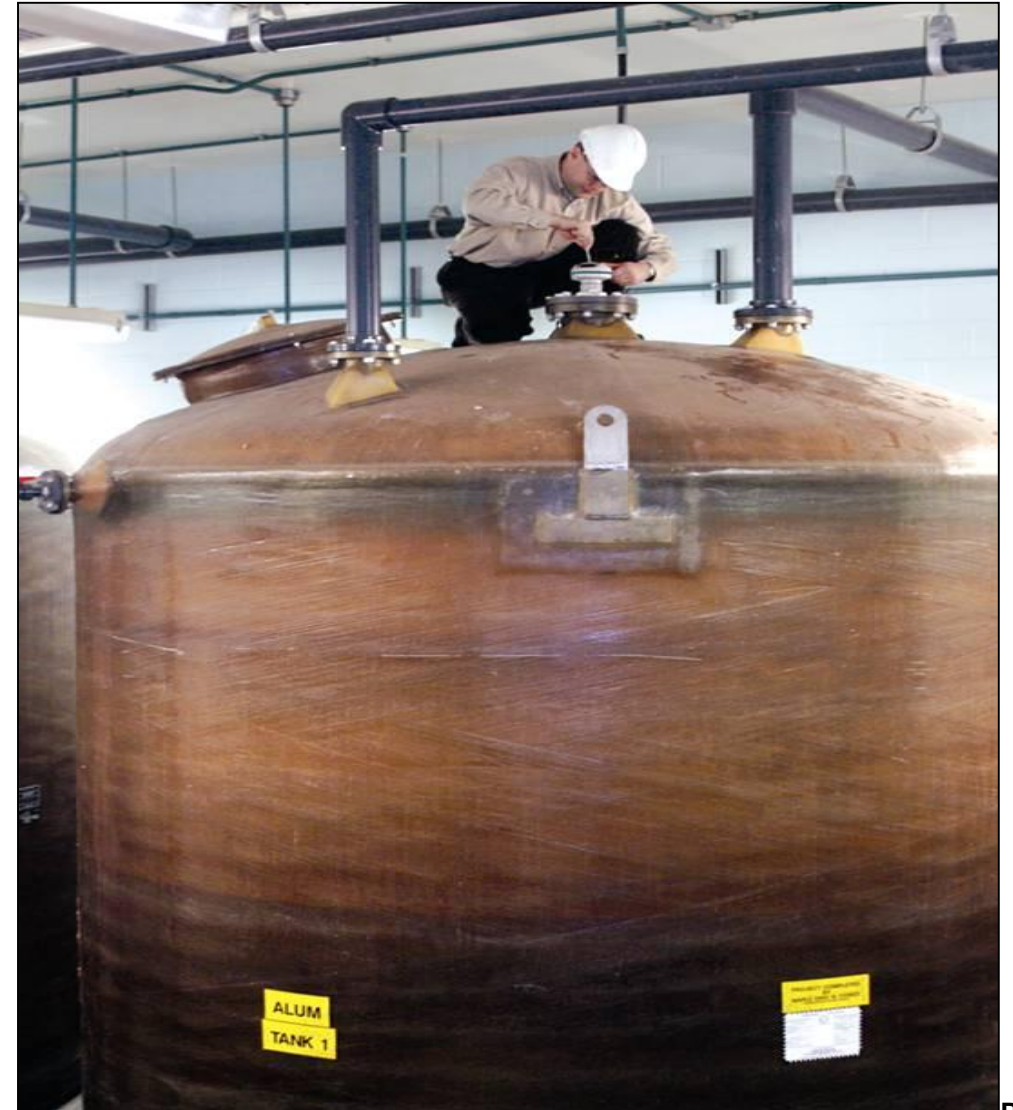
Pressure: Atmospheric

Temperature: Atmospheric

Measurement Range: 14.3 ft.

Comment:

Set Algorithm to First Echo



Probe LU OEM Applications

Material: Various chemicals

Application details:

Small tanks used in skid package

Process Conditions: Various, generally calm

Temp: Ambient

Range: 3.5 – 16 ft.

Issue with close in echo due to pipe mount and end of pipe echo resolved with Sonic Intelligence



Probe LU Applications – Oil and Gas USA

Material: Biodiesel

Application details:

Height: 25 ft.

Process Conditions:

Temp: -15°F to 95°F

Range: 2 to 25 ft.

Part of Profibus network



Chemical

Material: Ammonium Nitrate Emulsion

Application details:

Height = 15 ft.,

Diameter = 12 ft.

Process Conditions: Wax like product

Temp: Ambient

Replaced:

New Installation

Probe LU on long stand pipe and closed to wall

Also using CLS for additional overflow protection



Probe LU Applications

Automobile Manufacturer

Material: Sound dampening under-coating

Application details:

One application where Radar does not work due to Low Dk and material slope

Process Conditions: Slowly agitated

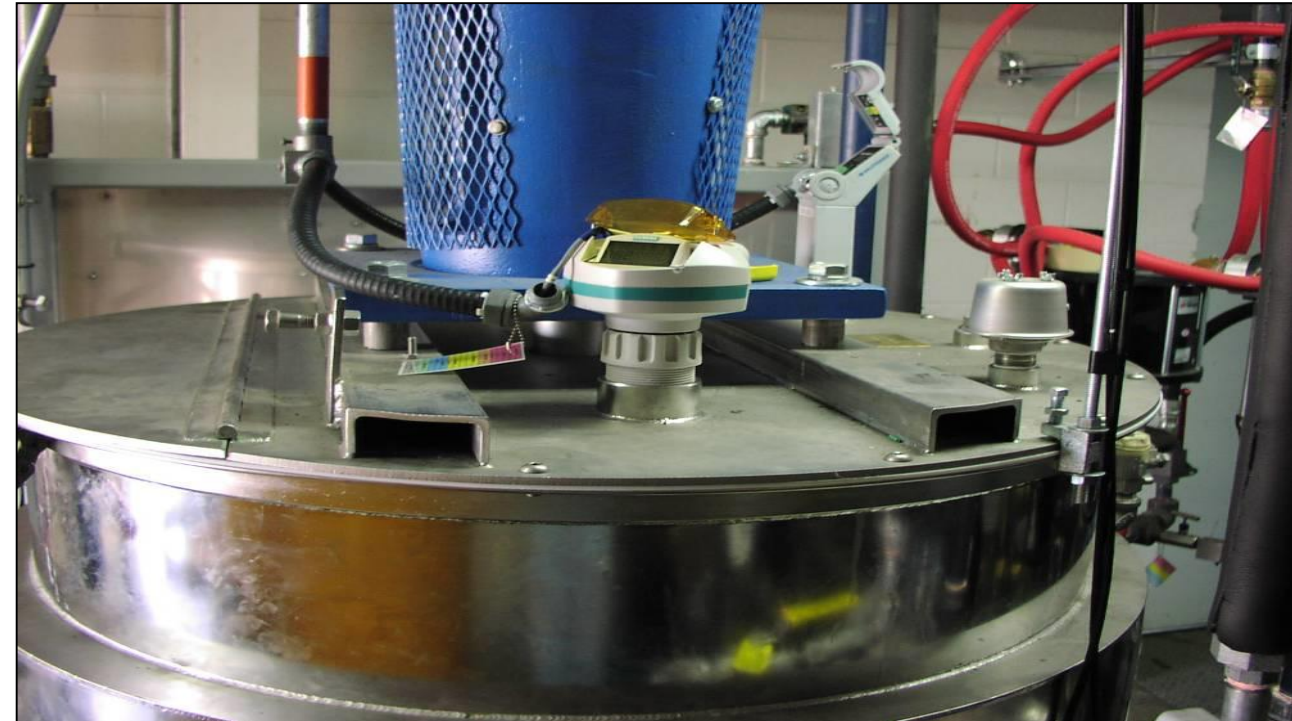
Temp: Ambient

Range: 3.5 ft.

Comment:

Took advantage of advanced parameters for near echo

Radar trial did not work because of low dielectric and slope of material.



Capacitance

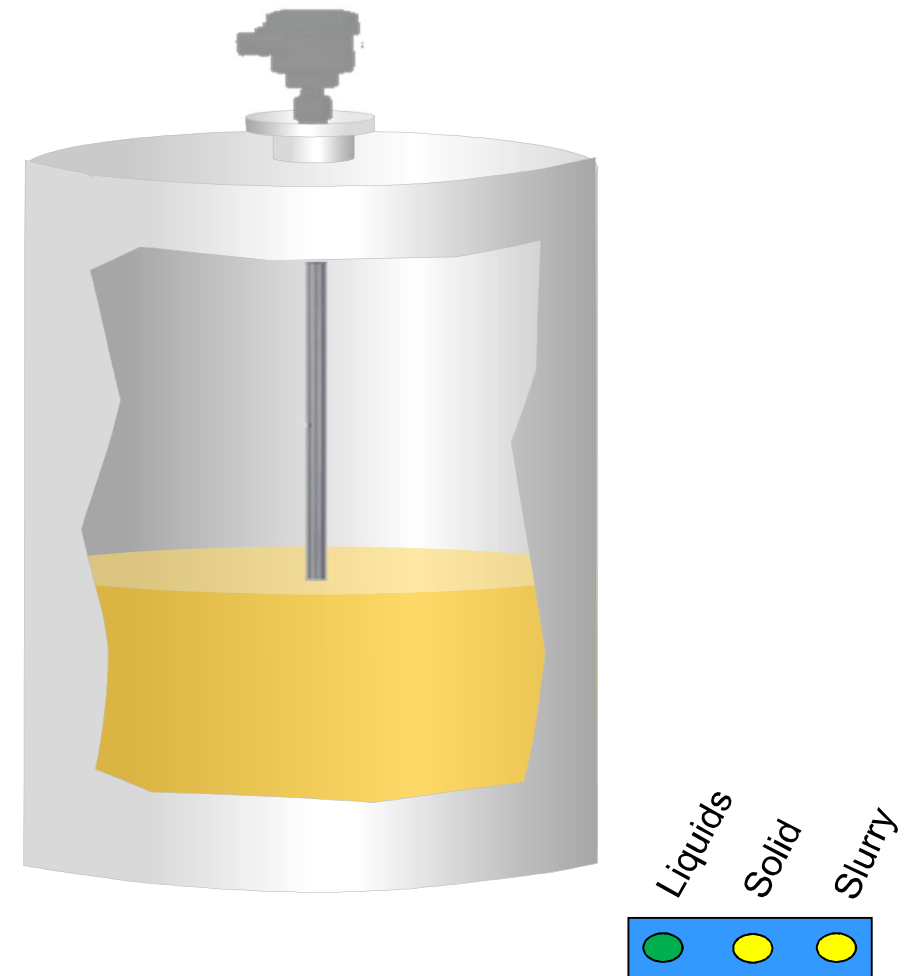
Measures capacitance between the electrode and the vessel, or a reference electrode, as the material level varies. The material serves as the dielectric between the electrodes.

Advantage

- Widely used and accepted
- PFA coating for cost effective chemical resistance
- Able to measure interface even with wide Boundary layer (measurement of high dielectric material)

Disadvantage

- Can be sensitive to build-up
- Material calibration required to span high and low
- Moisture changes (changing dK in solids)
- Dielectric changes when $dK < 20$
- Need ground reference (tank or ref electrode)
- Wear and pull forces need to be considered in solids



Siemens Guided Wave Radar (GWR) or Time Domain Reflectometry (TDR)

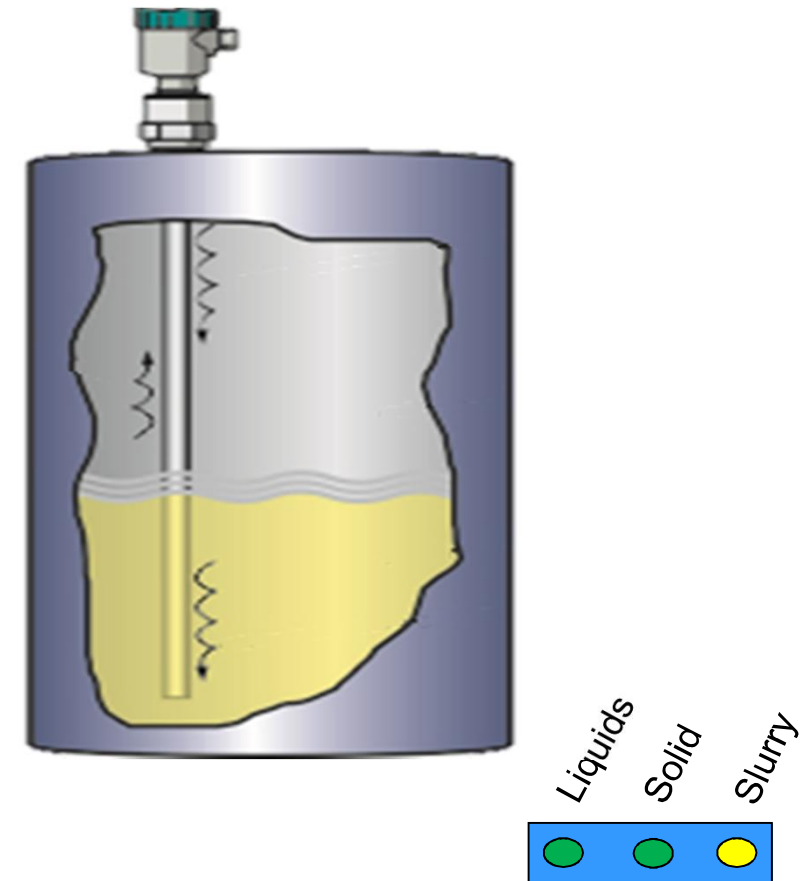
A high frequency signal is transmitted down an electrode. When the signal passes the material level, an interference signal is created and sensed by the receiver.

Advantage

- Unaffected by: density, temperature or dielectric constant (dK)
- Materials with a very low dK: ≥ 1.4
- Accuracy: 2 mm
- Very fast response
- Interface measurement (max dK of upper fluid is 5)
- Extreme environmental conditions,
 - up to 800° F) or up to 6250 psig

Disadvantage

- Contacting
- Build-up
- Wear in solids
- Pull forces on roof - solids applications
- Equipment damage from broken cables
- Shipping and installation concerns for solid rods



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Review

Ultrasonic Technology Review

- Time of flight technology
- Easy to install, program and maintain
- Accurate and reliable
- Patented Sonic Intelligence® echo processing (most installations need basic setup only)
- Integral temperature compensation

Questions?

Thank you for your attention!



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Product Marketing Manager,
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Upcoming Webinar:

Belt Scales 101

Thurs, December 10 9am CST



Featured Speaker

John Dronette

Product Marketing Manager,
Weighing and Feeding
Siemens

Webinar invitation e-mail coming soon...