

Ultrasonic Level Technology

Installation considerations

Ultrasonic measuring technology operates on the simple principle of measuring the time it takes sound to travel to and from an object. Siemens Echomax® transducers are Ultrasonic Transducers used to send and receive sound signals that determine the distance from the face of the transducer to the material surface. There are many factors that have to be considered when installing and using an ultrasonic transducer. The information below is intended to give a brief overview of how to install Ultrasonic Level products. You should refer to the supplied instruction manual for all installation related considerations and guidelines.¹

1 – Typical installation and mounting considerations

- These statements are intended to be general guidelines and not hard and fast rules.
- The optimal Ultrasonic Level transducer installation is 1/3 the distance from the side wall and consists of the following:
 - 10:1 Rule – Typical rule-of-thumb is 1 foot from the sidewall for every 10 feet of bin height.
 - Consider location of the fill stream as well to ensure that is not intersecting the beam path.
 - For obstructions inside the vessel, you should be 1 foot from the obstruction for every 10 feet of distance from the transducer.
- All material levels should be considered when selecting the mounting location.
- The sound path should be perpendicular to the monitored surface.
 - For liquids, perpendicular to the material surface. This usually means aiming the transducer straight down. (Figure 1.1).
 - For solids, perpendicular to the angle of repose. This usually means aiming the transducer toward the silo or bin outlet. (Figure 1.2).
- Avoid mounting the transducer and/or transducer cable in proximity to high voltage or current wiring, high voltage or current contacts and to variable frequency motor speed controllers.
- Installation shall be done in accordance with the National Electrical Code and for the area classification.

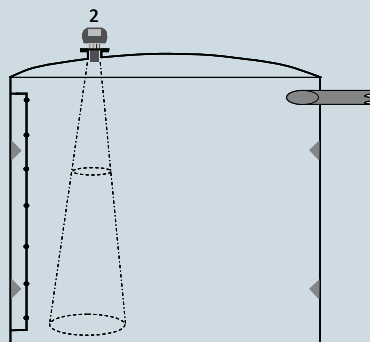


Figure 1.1

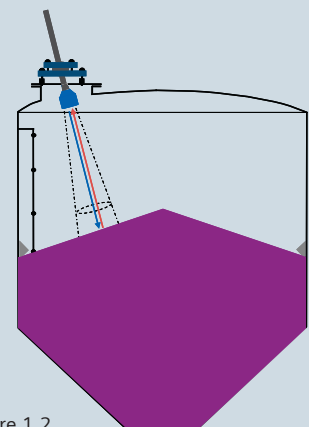


Figure 1.2

2 – Installation in a standpipe or nozzle

- The minimum recommended height-to-diameter ratio is 2:1.
 - The minimum standpipe diameter is 3 inches.
 - The standpipe height should be less than 3 times the diameter.
- If the overall standpipe height is 6 inches or less, then the factory default blanking distance can be used.
- If the overall standpipe height is greater than 6 inches, increase the factory default to 4 inches beyond the standpipe bottom.
- When considering the height to diameter ratio, ensure the standpipe inside the vessel is included (Figure 2.1).
- Ideally, the standpipe nozzle should be cut at a 45° angle as shown in Figure 2.1.
- Standpipe side wall should be seamless and free of welds or burrs (Figure 2.2).

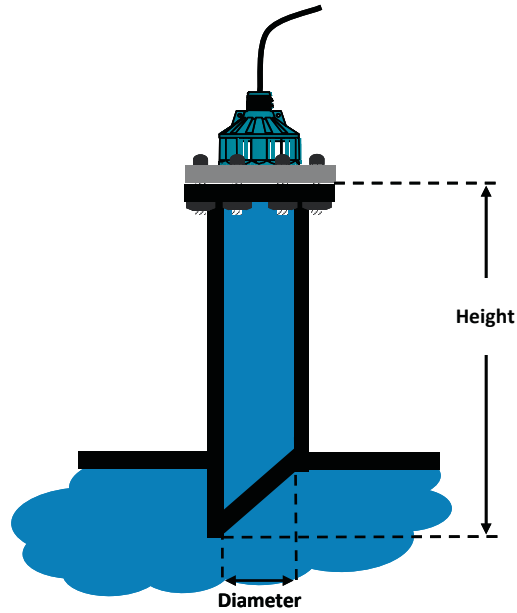


Figure 2.1

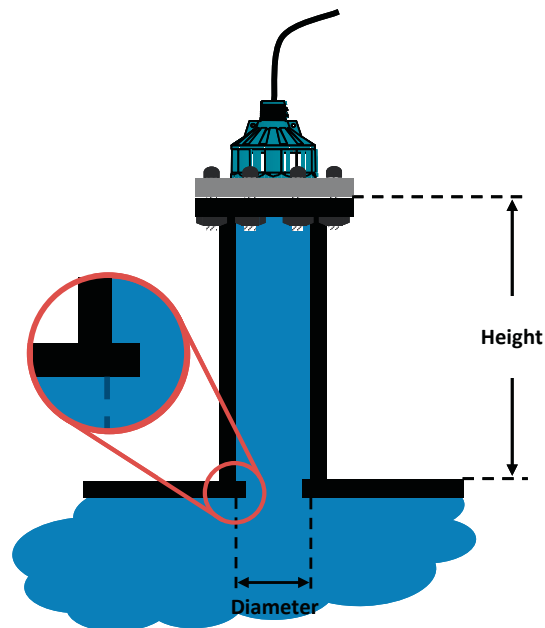


Figure 2.2

3 – Installation locations

When installing any continuous level device, there are several issues that you need to consider. We will look at several key issues that will help you to install the ultrasonic level transducer or level transmitter in the correct location.

■ Parabolic top tanks pose several installation challenges: (refer to Figure 3.1)

- Position 1 is not the best location.
 - There are obstructions and it is too close to the tank side-wall.
- Position 2 is the most ideal location for installing the transducer or transmitter.
 - Not too close to the side wall.
 - Away from obstructions and fill point.
- Position 3, though it looks ideal, is not the best location.
 - Problems with secondary echoes are introduced since the top of the tank acts like a parabolic antenna and can focus the energy back especially at higher material levels.
- Position 4 is not a good location.
 - Too close to the fill stream.
 - Too close to the side wall and obstructions.

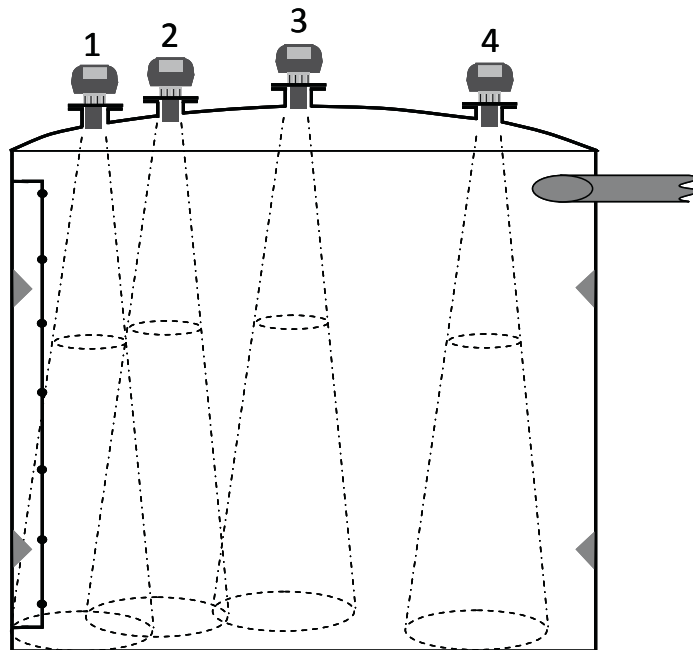


Figure 3.1

4.1 – Troubleshooting new installations

Most issues are associated with the following factors:

- **Wiring Issues**
 - Verify wiring against schematics and wiring diagrams located in the associated product manual and/or included manual CD.
 - Follow proper grounding procedures.
 - For twisted pair transducers, only ground the shield at the electronics.
 - Use grounded metallic conduit.
- **Installation errors**
 - Ensure mounting to factory specifications as defined in the associated product installation manual and/or included manual CD.
 - Transducers should be installed hand tight. Do not over torque flange mounting bolts or conduit mounting couplings.
 - Do not use PTFE tape if sealing is required. Use a suitable compound.
 - Protect the unit and associated cables from sources of electrical noise.
 - Use grounded metallic conduit.
- **Programming Errors**
 - Perform a factory reset.
- If Auto False Echo Suppression has been used, this parameter is NOT reset by performing the factory reset. If you suspect this parameter may be causing the problem, then you will have to “reset” the Auto False Echo Suppression to zero and learn the device to that zero distance.
- Refer to the associated product manual for specifics on how to perform this task.
 - Program Quick Start Parameters.
 - Check for proper level reading before proceeding with additional programming.
- **Transmission Path Errors**
 - If possible, look into the vessel to ensure there is a clear path to the material surface.
 - Auto False Echo Suppression will not work if there is an obstruction directly in the path of the ultrasonic signal.

4.2 – Troubleshooting existing installations

- What has changed since the unit was started up?
 - Has the noise level increased?
- New equipment installed in the area?
- New VFD installed in the area?
 - Has the Echo Strength decreased?
- Has something changed in the aiming of the transducer?
- Has the material surface changed?
 - More turbulent?
 - Foamy surface?
- Is there water in the conduit?
- Have the parameters been altered?
 - Review the parameter setting as recorded from start-up or last point of reference.
- If all else fails, gather the following information and contact Siemens 24 hour Technical Support hotline at 1-800-333-7421.
 - Record the Quick Start parameters.
 - Record the Noise Parameter values.
 - Record the Echo Strength parameter values.
 - Record the Confidence parameter value.

¹ Milligan, Stephen; *Understanding Ultrasonic Level Measurement – Siemens Milltronics Process Instrumentation – 2006.*

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