



Vessels that contain materials that have process turbulence, substantial foam or limited space that may cause echo distortion can use ultrasonic sensors for continuous level measurement by installing a still-pipe to aid the ultrasonic sensor's signal. The use of a still-pipe isolates the sensor's transmitted signal and the return echo, providing for improved sensor performance. It can also be used to protect the nozzle from damage due to flying objects.

Choice of Sensor

The first consideration is the proper selection of ultrasonic sensor to be used for the application. There are several key considerations that should be made:

- Range of measurement
- Material to be monitored
- Environmental conditions in the vessel
- Refer to the Madison Company Specification Work sheet for Ultrasonic and Radar Sensors

Pipe Selection

Once you have selected the sensor best suited for your application, you will know the OD of the transmitter end of the ultrasonic sensor. This is important in the selection of the ID of the pipe to be selected for the still-pipe.

The pipe should have a minimum diameter that will fit around the transmitter OD without touching the sensor's nozzle. This is important because any contact between the sensor's transmitter face and the mounting or still-pipe will distort the sound wave signals being sent out.

If the material to be monitored has particulate suspended in it, or has characteristics that will coat the inside of the pipe, it is recommended that the ID be increased by at least one to two inches more than the minimum diameter.

If the material to be monitored has a viscosity high enough to clog the pipe, or the suspended particulate is large enough to clog the pipe, the use of a still-pipe is not recommended.

The inside wall of the pipe is to be smooth, as rough surface conditions will cause false echoes. The pipe material can be common plastic, like PVC, or metal. The primary consideration is compatibility with what is inside the vessel.

Madison Company 800-466-5383 www.madisonco.com

27 Business Park Drive, Branford, CT 06405 • 203-488-4477 • Fax: 203-481-5036 • E-mail: info@madisonco.com
Madison Europe – Phone: + 31 (0) 548 659 034 • Fax: + 31 (0) 548 659 010 • E-mail: madison@eurodev.com

Still-Pipe Use and Installation for Madison Ultrasonic Sensors

Pipe Preparation

Use a continuous length of pipe. Do not use one with breaks, weld beads or couplings as these can distort the signal and/or the return echo.

Install an appropriate pipe adapter and, if necessary, bushing or gasket on the sensor end, keeping a clearance around the entire OD of the sensor's nozzle.

The overall pipe length will be determined by measuring from the pipe's top mounting inside the vessel to the bottom of the inside of the vessel.

On the bottom end of the still-pipe, cut a 45° angle (not required if pipe is shorter than 6"). This angle cut will reduce the echo size and make the level inside the still-pipe less susceptible to changes in pressure induced by turbulence as the material enters the pipe. Place at least one vent hole as close to the top of the still-pipe as possible.

Still-Pipe Installation

Position the still-pipe so there is minimal exposure to mixer propellers, filling or discharge turbulence that could cause foaming or unusual agitation inside the pipe.

The pipe is to be perpendicular to the material to be monitored.

Ultrasonic Sensor Installation

Generally, the sensor must be located so that the signal path is free of obstructions from inside the still-pipe and the vessel's interior (side walls, ladders, pipes, propellers, etc.) The sensor should be mounted level and perpendicular to the surface of the material to be monitored. If the vessel has a sloped top, consider using a self-aligning bulkhead fitting or a flange fitting with a riser that will allow the sensor to be positioned relative to the material's surface. Madison's Swivel Mounts are a good choice in resolving this type of installation problem. The use of a mounting bracket would be for open-topped tanks, sumps or reservoirs. If the installation will have large electrical equipment situated near the sensor, then earthed steel conduit must be used.

The sensor selected will have a recommended mounting. Most of the Madison Ultrasonic Sensors have a standard thread size and type. These will mate to common threaded through holes and/or pipe adapters.

The mounting hole in relation to the vessel's top should be considered, as well as any possible interference with a clear line of sight to the bottom of the vessel. This, of course, will also be determined by the optimum positioning of the still-pipe. The use of various adapters, flanges, couplings, etc. are acceptable, but you must be sure that the transducer face extends beyond the end of the mounting configuration and into the still-pipe.

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