Advanced Ultrasonic Couplant for Long Term Probe Placement

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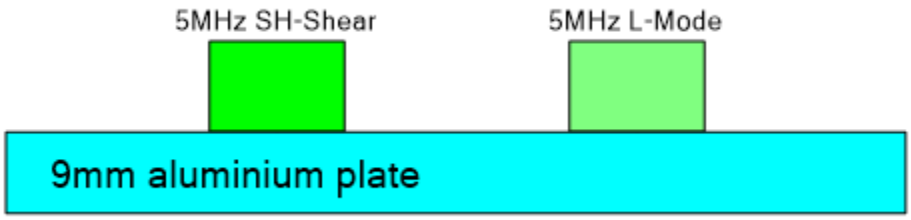
Applications exist where ultrasonic probes are required to be in place for long periods of time, sometimes in relatively extreme conditions. Typically, ultrasonic corrosion monitoring and ultrasonic flow metering place probes on a surface and take readings on a continuous or periodic basis. Water soluble gels eventually dry and the coupling effect is reduced and then lost.

Innovation Polymers has developed a new ultrasonic couplant that permits long term probe placement without significant coupling losses. The material is a high viscosity liquid polymer with virtually no evaporation at normal working temperatures. The tacky texture makes it an effective pressure sensitive adhesive i.e. it forms a bond when pressure is applied.

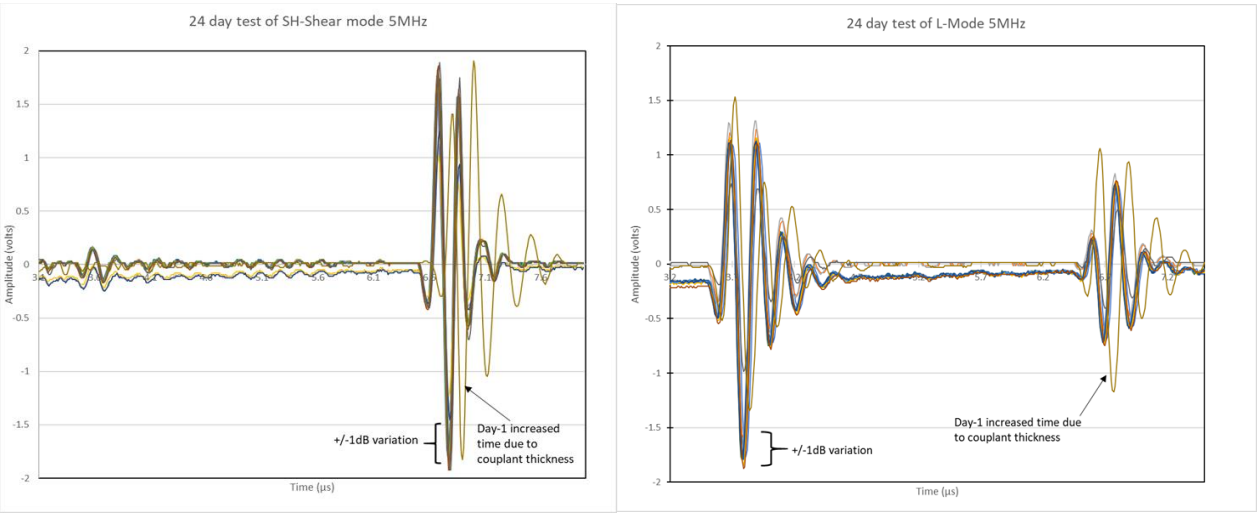
In addition to its long-term coupling capabilities, the new couplant is capable of supporting SH shear waves (i.e. it is a nonnewtonian viscous fluid). Because it is not water-soluble, the couplant was selected for application in the North Sea at 300m below the surface. The North Sea application included successful performance demonstration at temperatures from 5°C to 50°C.

To demonstrate the long-term stability of the couplant a test was configured that coupled a 5MHz compression mode probe and a 5MHz SH shear wave probe to a 9mm thick plate of aluminium.



For the compression mode probe the A-scan was gated to display two thickness multiples, whereas for the SH shear wave probe only a single backwall was gated. Over a four-week period, the only significant shift was seen to occur after Day 1 where the thickness of the couplant had gradually reduced to a steady state. Subsequent measurements indicated less than 1dB variation from the average peak value for both compression and shear modes.

At the time of the initial introduction of Aquabond, the test period was 30 days with the only significant change being at the transition from Day 1 as the thickness of the very viscous couplant thinned to a steady state. The test has continued and 120 days after the test started the results show no signs of instability or change. Both the compression mode and shear mode signals have remained constant.



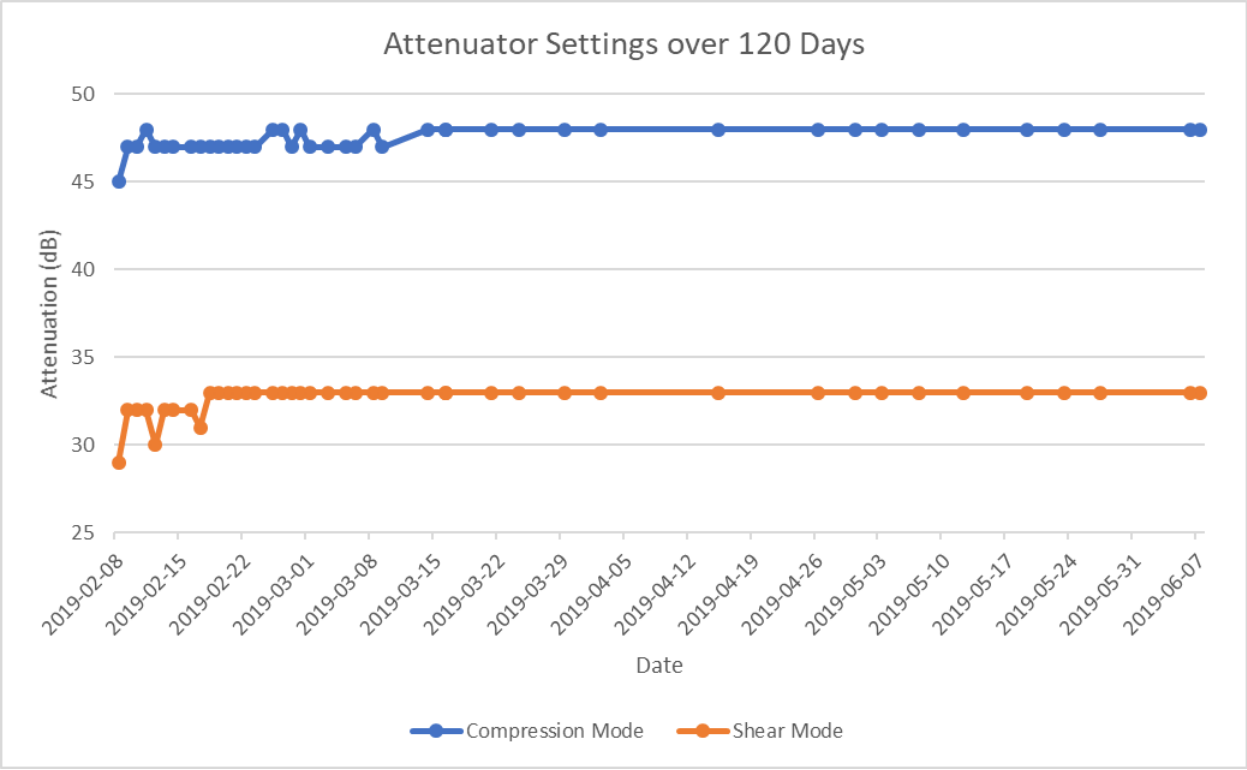


Figure – Attenuator settings used to obtain 80% signals from first backwall echo

Some suggested applications of Aquabond:

Clamp-on ultrasonic flow-meters

Long-term probe-to-wedge coupling (e.g. automated systems)

Underwater shear-wave stress testing

Long-term corrosion monitoring

Outdoor applications where weathering could remove water-soluble gels

Note: Because the liquid polymer is not water-soluble, its removal is made possible with a cloth dampened with naptha or mineral spirits.

Because the liquid polymer is highly viscous, its application is best made by spreading it onto the probe surface with a knife-like blade. Pre-heating to about 40°C helps to reduce viscosity for application. Because the liquid polymer is not water-soluble its removal is made possible with a cloth dampened with naptha or mineral spirits.

Some properties of the liquid polymer couplant:

Property	**Value**	**Unit**
Specific Gravity	0.91 g/cc	g/cc
Viscosity	*190 000	cps (centipoises)
Appearance	Clear amber liquid	NA
Flash point	150 (COC method)	°C
Glass Transition Temperature	-18	°C

*approximate value at 55°C. Note: for comparison thick molasses is about 10 000 cps and peanut butter is about 150 000cps.

The new couplant is available from Innovation Polymers (http://www.innovationpolymers.ca/) under the tradename “Aquabond” in 2 or 8 oz jars.

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