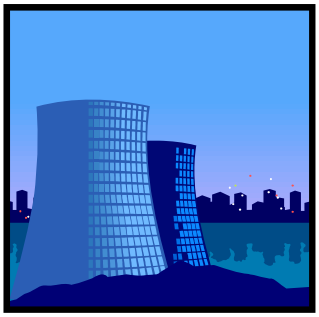
Application Note

Transducers Used in Monitoring Nuclear Waste Tanks



Customer Inquiry

A test lab was developing a process of monitoring the sludge levels in nuclear waste tanks. Transducers for emitting sound pulses are installed on the inside wall of the tanks. Testing the impedance (Z) of these devices is critical prior to installation since they cannot be removed or changed once the tanks are in use.

The waste tank transducers are used to send out sound waves at 28 kHz or 50 kHz. The integrity of the transducers is based on minimum impedance at or very near these frequencies. To save time and cost there was a desire to establish in-house testing capability rather than continuing to rely on outside testing laboratories. The solution was the 7400 Precision LCR Meter with multi-frequency stimulus capability which is able to make many measurements immediately below and above the desired frequency of test.

Measurement Procedure

Measurement of sound transducers at this lab is an R & D application of developing a new process of monitoring the sludge levels inside nuclear waste tanks. Prior to these transducers being inserted in the wall of a tank, they are connected to the 7400 and tested at the two frequencies of interest using the instrument sweep function. If the frequency of interest is 28 kHz, a sweep of 5 kHz either side (23 kHz to 33 kHz) is typical. In the ideal situation the parameter of interest is Z which will decrease in value as the frequency increases towards 28 kHz, reach a minimum very near this frequency and then increases again as the frequency continues its sweep upward.

This lab makes use of both the sweep plot on the 7400 instrument display and the table function. A table of results is often saved on disk and later transported to a computer for comparison and analysis in spreadsheet form. As the process evolves additional parameters such as resistance (R), capacitance (C) and phase shift angle are also being studied to help determine application quality transducers. The 7400 instruments ability to provide a sweep function and a heavy concentration of frequency points over a narrow range of interest was the selling point for this specific transducer application. Plotting the impedance magnitude and phase versus frequency helps characterize the transducers operating specifications.

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What's that look like?

Figure 1 illustrates the connection of the device under test (transducer) to the 7400 Precision LCR meter. The 7400 instrument's sweep capability and multiple point frequency range provide the R&D Transducer Engineers with the impedance characteristics they need to determine the transducers effectiveness in in-tank monitoring. The precise frequency is necessary to make this piece of the monitoring technology work like a scaled down sonar system. The environment inside a nuclear storage tank is highly radioactive and intensely caustic.

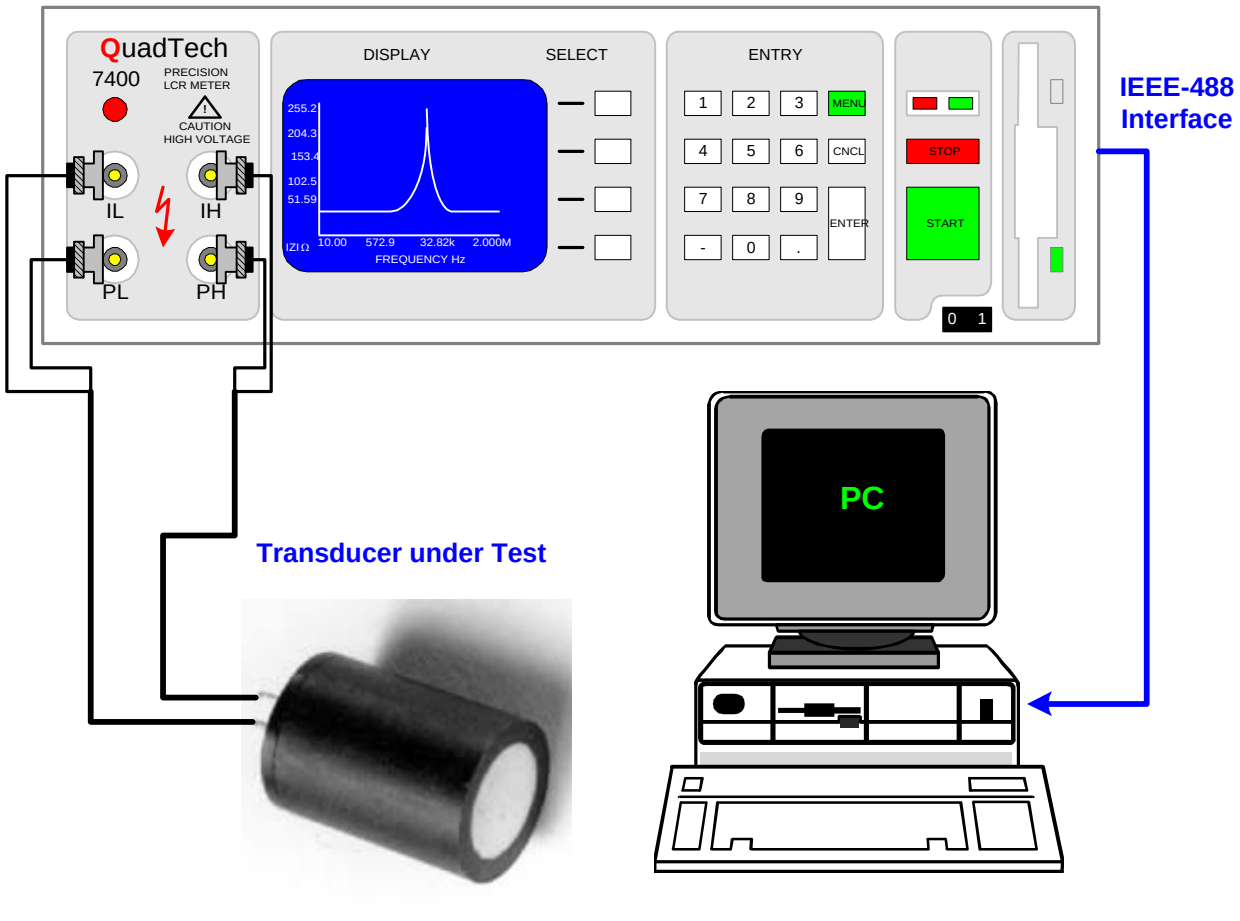

Figure 1: Connection of Transducer to 7400 Precision LCR Meter

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Summary

The 7400 Precision LCR Meters was replaced by the 7600 Plus which has the sweep capabilities and improved specifications.

For complete product specifications on the 7600 Plus Precision LCR meters or any of IET Lab's products, visit us at www.ietlabs.com. Do you have an application specific testing need? Call us at 516-334-5959 and we'll work with you on a custom solution. Put IET Labs to the test because we're committed to solving your testing requirements.

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