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*Liquid Level Measurement Using Guided Wave Radar Approach*

In many industrial processes, measuring and monitoring liquid level in tanks definitely ranks high in importance above many other parameters measured in the seal environment. Over time, mechanical level detection devices have given way to newer technologies, with accurate readings, wide rang of detection capability, and wide variations in operating temperature and pressure and low dielectric constants. With many of these features, microwave-based technology now has become firmly established and improved mainly consisting in the development of the excitation and data acquisition electronics. Guided Wave Radar (GWR) is one of the applications using microwave radar technology detecting liquid level changes. The basis for GWR is TDR (Time Domain Reflectometry). In this application, TDR technology achieves its non-mechanical level detection by measuring the flight time of a single sharp waveform. When the pulse of radar energy reaches the liquid level where a change in impedance occurs, part of the signal is reflected back to the transmitter. At the data acquisition stage, sampling electronics employs ETS (Equivalent Time Sampling), obtain repetitive signals data and measure the duration between transmitter and reflected signal. In the meantime, system must be sensitive to small level changes (less than 5mm).

The project involves designing a prototype level sensor including the excitation and data acquisition electronics to meet specifications and requirements aforementioned. Some basic mathematical analysis of the behavior of electrical transmission lines (GWR) is discussed. The distance versus resolution relationship is developed, as well as the verification in simulation models. The excitation circuit is designed and also simulated using SPICE software together with some measurement results presented to show the resolution and accuracy.