Non-Contact Radar Level Measurement
An examination of the various types

By Boyce Carsella
Product Manager Magnetrol International

Because of their efficiency, robustness and ease of use, Guided Wave contact-type radar level measurement systems such as Magnetrol's Eclipse® are often used in process applications. However, there are applications where a non-contact device is preferred. Non-contact devices which employ ultrasonic technology use a mechanical vibration, rather than an electrical signal (microwave), and are therefore used only in less demanding applications.

Historically, users have stayed away from non-contact radar, due to price and difficulty or complexity of use. Prices are dropping, and non-contact radar transmitter pricing is now in the same general range of other standard transmitters. The latest generation of devices has sought to address issues of high cost and complexity — to put non-contact radar on a level playing field with other methods.

An investigation of non-contact radar level transmitters yields acronyms such as FMCW and PTT — describing different types of non-contact radar. FMCW (Frequency Modulated Continuous Wave) is a technique that is somewhat complex (using Fast Fourier Transform analysis), a more expensive device historically used in inventory applications. It often requires line power to be run directly to the transmitter, and a separate pair of wires in a separate cable to carry the signal back. This can become expensive to install. In fact in some areas with a hazardous rating, the installation can cost more than the transmitter. In some cases they may duty cycle the device (intermittent operation) to reduce power consumption. However, for many applications in process plants, a more cost-effective, simpler approach is preferred. Hence the popularity of loop-powered radar, which uses only one pair of low voltage wires to carry both power and signal. These are usually PTT (Pulse Transit Time) devices that can even be installed intrinsically safe, eliminating the need for expensive explosion proof cable all together. Pulse devices are gaining popularity due to their relative simplicity and cost effectiveness.

The technically minded might wonder how you can run a radar device on such low power. A loop-power device has only about 3.5 mA (@ 24 VDC) of power to work with, and non-contacting radar (unlike GWR) loses a significant amount of energy to beam spread. There are two basic approaches. One is to operate the device intermittently to save power. This is sometimes called duty cycling, or interval operation. This approach does save energy, but can limit speed of response and the ability to handle fast changing levels. Another approach is to use PTT (Pulse Transit Time) combined with the latest impulse radar, and ETS (Equivalent Time Sampling) signal processing techniques, so the device can monitor your process continuously even during rapid level movement.

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What about ease of use? Some manufacturers promote software running on a PC to get the unit working effectively, particularly when objects in the vessel create numerous or difficult false targets. If you don't want to buy the software, the alternative is a service technician who will do the configuration and start up for you. It could be much easier than that. The newest units have a simple, linear menu for set up and diagnostics.

And what about serviceability if the unit needs repair? Do you need to take the tank out of service, or add expensive isolating valves? You should be able to simply disconnect the unit from the antenna and process connection, leaving the process vessel sealed.

You should also investigate issues of flexibility and “spares”. Some radar transmitters offer dozens of different models with different antenna configurations that are not easily interchanged. With others, one spare head backs up almost all types. Transmitters are available with either dielectric rod or horn antennas, depending on your application.

A note on safety: Many non-contact radar units are extremely safe to use, operating at such low power that they need no license. On Magnetrol’s Pulsar™, output at the antenna has a peak of 2mW. This is hundreds of times less energy than is emitted at the antenna of a cell phone.

In summary, here are some significant features to look for.

• Quick connect/disconnect fitting makes installation a snap
• Antennas are interchangeable
• Unit can be removed while leaving vessel sealed
• Simple, linear menu makes configuration simple
• False Target Rejection is simple, intuitive and effective
• Simplicity makes PC software unnecessary
• Ability to track fast moving level changes

This press release is issued by: Martine De Permentier, Marketing Assistant & PR Representative, Magnetrol International N.V., Heikensstraat 6, 9240 Zele – Belgium, phone: +32 (0)52 45 11 11, fax: +32 (0) 52 45 09 93, e-mail: mdepermentier@magnetrol.be, web site: www.magnetrol.com

Further details and product information is available from: Paul Sayers, Magnetrol International UK, Regent Business Centre, Jubilee Road, Burgess Hill – West Sussex RH159 TL, Phone: 01444.871313 - Fax: 01444.871317, E-Mail: paul.sayers@magnetrol.co.uk