Level made easy

In the October 2008 issue of *PACE*, Jonas Berge explained how EDDL has helped make advanced set-up and diagnostics of pressure transmitters easy. Now, he explains some recent roadway the standard has made with setting-up radar level transmitters.

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MOST plants have several types of level transmitters to monitor the levels or volumes of liquids and solids for different applications, including control and custody transfer. The radar level transmitter is becoming one of the most important. The newest instruments communicate digitally using protocols such as HART or Foundation fieldbus. Maintaining a mix of level transmitters can be a challenge if they are based on different principles of operation and require different setup procedures. However, setup of modern transmitters is guided by 'wizards' providing step-by-step instructions. Embedded self-diagnostics allow for more effective maintenance schemes that help keep level loops and plants running with minimum downtime.

Advanced setup made easy

A process industry plant may have dozens of level transmitters including a mix of different brands, different models, and even different protocols. Mastering various transmitters presents a challenge to technicians tasked with device setup. For the plant to perform at its best, the setup must be done correctly for each transmitter. Yet, the required setup procedure is different depending on the principle of operation such as non-contacting radar, guided wave radar, differential pressure, ultrasonic, or displacer. Therefore, technicians require proper guidance to do it right.

Non-contacting radar level transmitter.

False echos and tuning

Radar level transmitters are mounted so that disturbing objects inside the tank such as heating coils and ladders are not within the path of the radar signal. These objects may cause false echoes resulting in reduced measurement accuracy. However, a radar level transmitter has built-in functions designed to reduce the influence of such objects in case they cannot be totally avoided. Echo tuning is used to handle special situations when disturbing echoes from objects in the tank are stronger than the surface echo. Each radar echo is displayed as a peak in the signal waveform plot. This is curve a useful tool for obtaining a view of the tank conditions. EDDL (Electronic Device Description Language) IEC 61804-3 standards technology permits echo tuning to be done with any IEC 61804-3 compliant device management software.

Measure & learn wizard

Several early versions of configuration and calibration software did not support wizards to guide the technician, so setup was difficult. This was particularly true with early fieldbus devices that required mode and many other parameters to be set in order to configure the transmitter. Later, the parameters had to be returned to their original values for the level transmitter to be operational. This required expert knowledge.

An EDDL file is a compressed text document loaded into device management software and other tools that communicate with intelligent devices. The EDDL file tells the software which commands to send, how to decode the device information, and how to display it. Wizards, officially known as 'methods', have been part of EDDL technology since 1992 and are now seeing wider support in software. These wizards enforce the correct setup sequence and thus take the mystery out of radar level transmitter setup. These wizards remind technicians to inform operators to put the loop in manual, and then they provide step-by-step instruction on verifying the tank is empty, and so on. They also remind the technician to inform operators to put the loop back into automatic when done. The wizards also take care of mode switching, helping to hide the complexity of fieldbus.

In a radar level transmitter, the setup wizard works with the microprocessor in the transmitter to guide instrument commissioning, automatically registering false echoes. An Amplitude Threshold Curve (ATC) is automatically created to filter out disturbances with amplitude smaller than the amplitude of the product surface echo. This makes tracking of the product surface more precise in the presence of noise and weak disturbing echoes.

EDDL wizards work in both software on Windows computers and in handheld field communicators that can be taken to the field for on-the-spot commissioning. These rugged, yet light-weight tools are highly valued by technicians.

The wizard is embedded with the EDDL file supplied together with the radar level transmitter from the factory, with the manufacturer's know-how built-in to ensure that steps unique to that level transmitter are taken in the right order. EDDL wizards thus reduce mistakes and ensure correct setup of any level transmitter. The field work is easier

since all technicians will follow the instructions and do the setup the same way.

False echo cancellation

When the surface is close to a horizontal surface of a stationary object in the tank, the measurement could be disturbed. However, the False Echo function is used to prevent the disturbing object from interfering. It also allows technicians to register false echoes caused by disturbing objects in a tank. When the surface is passing by a disturbing object, the transmitter can measure with higher reliability if the position of the object has been registered. This makes it possible to detect a product surface close to a disturbing object even if the surface echo is weaker than the false echo.

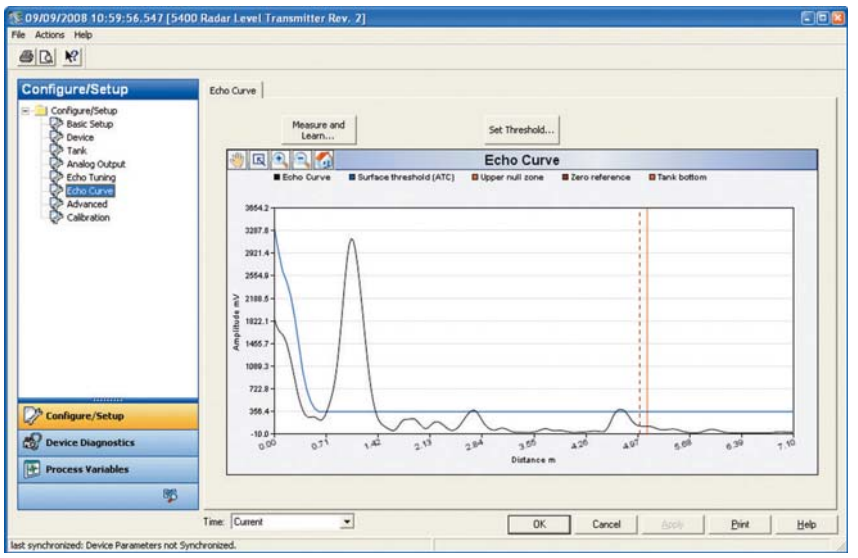
The technician can compare the list of interfering echoes with the tank drawing or by visual inspection of the tank, checking for interfering objects like beams, heating coils and agitators corresponding to the found echoes. Because EDDL is also used in portable handheld field communicators, it is easy to do this visual comparison of a tank with a handheld.

Tank shape and size

Configuration of a tank's shape, bottom type, and dimensions is simplified and less error prone thanks to clear illustrative images embedded in the EDDL file. A volume strapping can be edited in an Excel-like grid format.

Diagnosing problems

Early level transmitters had only rudimentary diagnostics, and even when they were available, the control system often did not display any of that information on the operators' consoles. The operators were unable to take proper action upon failures, and diagnostics could not become part of daily work practices.



Echo curve and surface threshold waveforms etc. rendered from EDDL graphical elements.

Today, some radar level transmitters have sophisticated diagnostics that perform continuous self-checks to detect failure online. In case of failure, the technicians and operators were alerted along with the measurement.

Device displays in the computer are rendered by the device management software, based on content and layout from the EDDL file. They highlight alerts using the same indication for all kinds, protocols, and brands of devices. For example, red is for failure. There is no difference from one type to the other. This consistency in look and feel is inherent in EDDL technology and doesn't even require the device manufacturers to follow a style guide. This unique consistency makes devices easy to use. The device manufactures control display content and structure of their own products, while the consistent look and feel comes from the system.

Intuitive graphics

Graphics were not part of the original Device Description (DD) technology from 1992. Other device integration solutions based on software components provided rich Windows graphics but brought with them IT-world issues of long-term management problems. Companies challenged the industry to come up with a device integration technology including graphics to unleash the full functionality of all devices, yet retain the robustness, ease of system management, and consistent look and feel of the original DD.

Engineers from the Fieldbus Foundation, HART Communication Foundation, Profibus Nutzerorganisation e.V. (PNO), and OPC Foundation collaborated to solve this human interface problem. The result of their effort is the new IEC 61804-3 standard for EDDL, which includes graphical enhancements, such as trend charts and gauges. EDDL is an integral part of the HART, Foundation fieldbus, and Profibus standards, so it benefits all transmitters around the plant.

The resulting graphics used to display setup information and diagnostics results are designed by the transmitter manufacturer in such a way as to make all their transmitter features as intuitive as possible.

EDDL provides an additional advantage of being the only device integration technology decoupled from Windows, thus avoiding version compatibility issues and obsolescence, while supporting rich and familiar Windows graphics on a computer screen.

Smart diagnostics

Intelligent device management software is permanently networked to the control system in order to continuously monitor self-diagnostics in level transmitters and other field instrumentation. All are managed from the same single tool. In addition, EDDL-based device management software can be integrated with modern control systems so that when a transmitter fails, the diagnostics – displayed at a central location – will pinpoint the problem. This information is available to plant operators at their workstations without them having to manually check the device or another computer. EDDL is the only technology that integrates with the control system to display diagnostic detail directly on the operator consoles, showing failures affecting process operations. Predictive diagnostics, those not yet affecting the process, are usually not routed to operators and only go to maintenance technicians.

No one normally watches over the maintenance station continuously because the technicians are out in the field, so if diagnostics are only displayed in the maintenance console, the device management software will fall into disuse. Diagnostics must go to those that will see and use them. Critical diagnostics must go to operator consoles because they are watched continuously. Instead of flooding the operator console with all alarms, field diagnostics alerts from the devices are prioritised so only critical alerts such as genuine failures of critical devices that will impact the process are brought to the operators' attention, not predictive alerts that have not yet materialized. This is smart diagnostics. Operators cannot repair transmitters, but after a failure occurs, they may have only minutes or hours to take evasive action, such as putting loop in manual, before the process is

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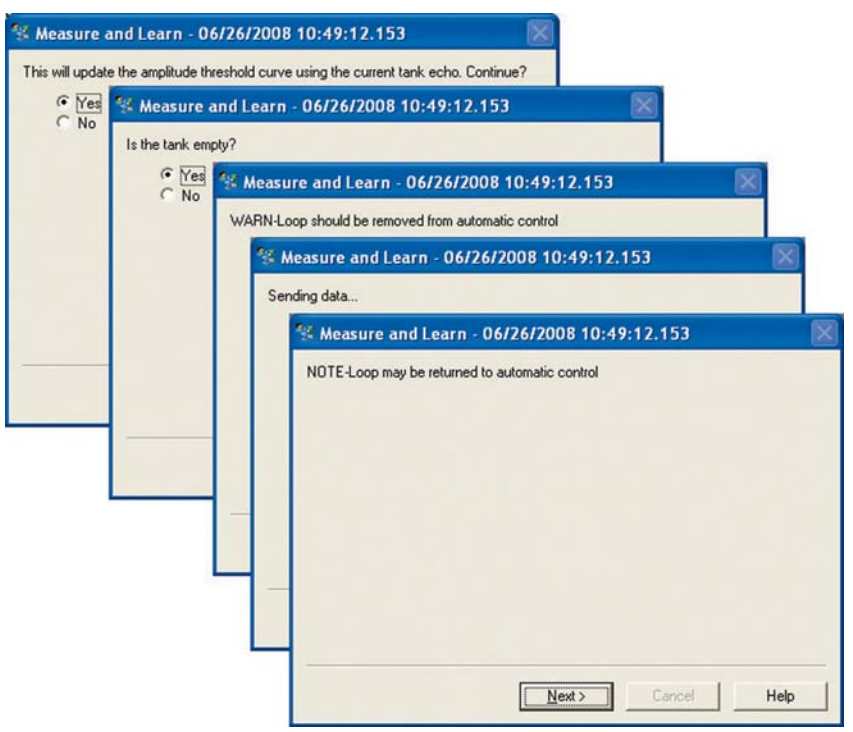

An example of the radar setup wizard based on EDDL 'methods'.

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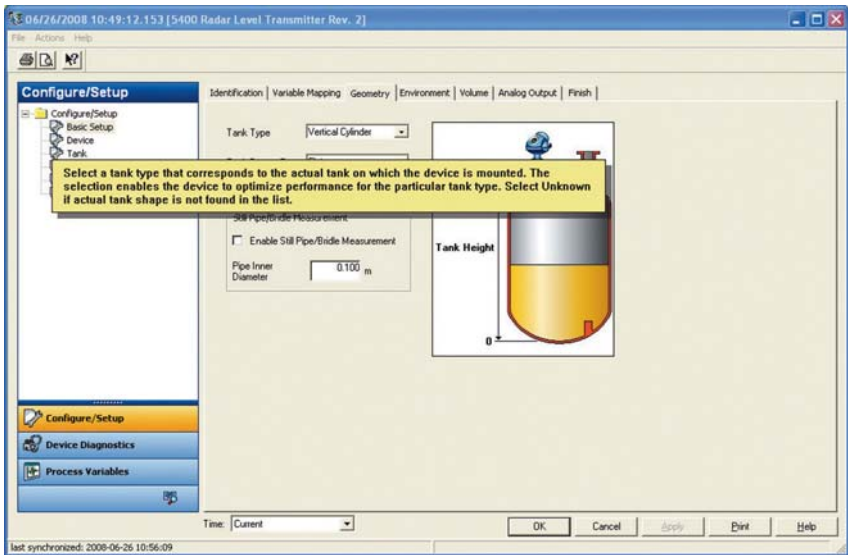
affected. It is a form of early warning of impending process problems. Operators can radio technicians in the field, asking them to fix the device. Such practices are possible with an integrated system as per NAMUR NE 91.

Because problem areas are quickly and clearly highlighted on operator consoles, repairs can be completed rapidly, reducing measurement downtime.

EDDL is the only non-intrusive device integration technology allowed to be loaded in the DCS itself; there is simply no other way to achieve comparable results. Likewise, only EDDL files are independent of Windows versions, leaving no comparable solution for system investment protection.



The system provides a help utility which can be used for geometry setup.

Radar level expert know-how

With many different kinds of transmitters and other instruments for the technicians to master, expert help is needed.

In the past, instructions were only available in hardcopy manuals in which finding the needed information could take a very long time. Softcopy manuals are an improvement, yet they have hundreds of pages of contiguous text to wade through, and searching can result in hundreds of suggestions.

A better solution is device management software based on EDDL, which not only gives access to softcopy manuals but also context-sensitive help provided by the transmitter manufacturer's level radar expert for parameters, wizards, and diagnostics. Rather than searching through the entire manual, the technician clicks the help icon followed by the function in question, and the know-how from the transmitter manufacturer's expert is immediately displayed, dramatically improving the productivity of technicians.

Thanks to context-sensitive help, the technicians can quickly get an explanation of the functions they are viewing without extensive page flipping or screen scrolling. The transmitter manufacturer's help is available in any system, including handheld field communicators and laptop software.

EDDL architecture

As transmitters grow increasingly sophisticated, they improve plant performance by providing more accurate measurements, supporting greater plant availability, and leading to lower maintenance costs. EDDL uses the power of field intelligence to improve plant performance by integrating not just transmitters but all devices around the plant.

Large client-server systems with multiple clients can be built, where operators and technicians can work simultaneously to setup and commission devices. The same single tool supports devices of all kinds, including those from different manufacturers and using different protocols. A key advantage is that new device types and versions can be supported without having to install software.

Predictive maintenance can be realised at your facility by incorporating radar level transmitters with communication protocols that make their diagnostics easily available. EDDL capabilities then make the information easy to interpret by your operators. Now they will know more about what is going on in the plant and will be more pro-active and effective in carrying out their maintenance responsibilities.

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(This is a downsized version of author Jonas Berge's original article, called Level Made Easy, which can be found in full on the PACE Today website at www.pacetoday.com.au, by clicking on the Features tab.)