

# DATEM ECHO PROCESSING

Ultrasonic level measurement  
& digital echo processing  
using Digital Adaptive  
Tracking of Echo Movement

## Superb Echo Discrimination Making It the Most Accurate Ultrasonic Level Measurement System in the World

As a technique, ultrasonic level measurement has been around for decades, working on the 'time of flight' principle. If you know the speed of sound, then the time that a sound pulse takes to travel from a transducer and back again may be used to calculate the distance that pulse has traveled. Divide by two and you have the distance to the 'target.'

### **How Does Digital Echo Processing Work?**

Early analog instruments, while they were fine for simple applications, were easily 'confused'. They had to be carefully set up and the path to the target had to be clear and unobstructed. The success of the measurement depended on



## RIGHT FOR

- Cluttered Wet Wells
- Stone Silos
- Applications with a High Level of Noise
- Obstructed Level Surfaces
- Applications Requiring High Accuracy Level Measurement

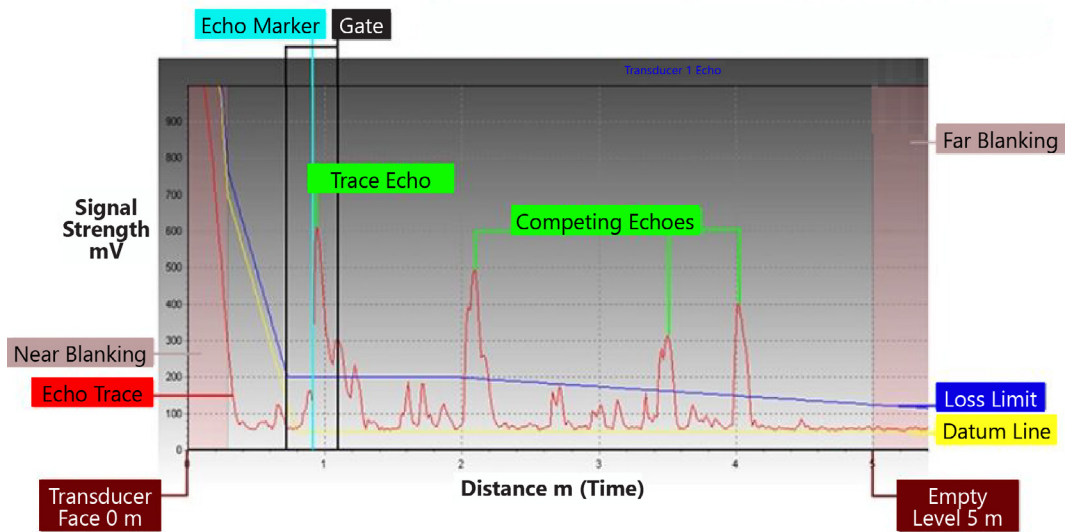
the true echo returning from the target being 'louder' than any competing echo. As time went on, more sophisticated digital signal processing allowed for more discrimination of echoes, but still depended on blocking out competing responses and using software to identify the true echo.

Pulsar Measurement is a pioneer in ultrasonic level echo processing technology. As microprocessors have improved, Pulsar Measurement has continued to develop and improve echo processing software. It is now possible to make successful measurements in situations that would have been far beyond the capabilities of instrumentation that were in use a decade ago.

Pulsar Measurement's Digital Adaptive Tracking of Echo Movement (DATEM) is an echo discrimination system that works on the basis that it identifies the true moving echo from the background noise, then follows it, ignoring all of the competing echoes as it does. This, therefore, allows Pulsar Measurement's equipment to work in a cluttered sewage wet well, a noisy stone silo, an agitated tank, or even through a grid. DATEM also looks for echoes within a very small frequency range, which helps to make it especially good at ignoring both acoustic and electrical noise. The high power of the dB Ultrasonic Transducer range makes sure that all the echoes from an application can be easily monitored. The result is a highly reliable level measurement in applications that previously could not be considered.



A dB6 transducer looking through a metal grid with the power of DATEM



Anatomy of an echo trace



## Anatomy of an Echo Trace

**Echo Trace:** Signal returned to the transducer mapping the application

**Echo Marker:** Echo that the software is analyzing as the level to be measured

**Gate:** Set distance on either side of the echo marker which is the 'normal' area that an echo will change within.

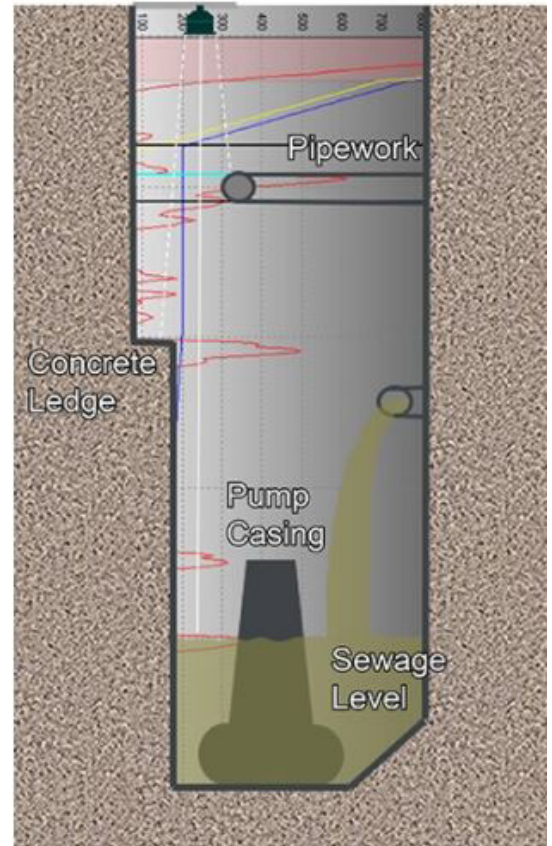
**Near Blanking:** Distance from the transducer face in which no echo signal can be recorded

**Far Blanking:** Distance further than the measurement range of the transducer

**Loss Limit:** Threshold that indicates the echoes to be ignored because they are below this line

**Datum Line:** Indicates the noise threshold calculated e.g. the base echo line

**Empty Level:** The maximum distance that can be measured if the application was empty



Example of a cluttered wet well

## Echo Discrimination within DATEM Software

Echoes over the loss limit line are considered and the echo from the 'pipework' (example) is selected because it is large and nearest the transducer face. However, the correct level to measure should be the sewage level.

Using the DATEM software, specifically parameter 21, we can input the approximate distance to the sewage level. The controller then adjusts the blue 'loss limit' line around the unwanted echoes to mask them. Now the correct echo is selected and it is tracked as the level moves up and down. DATEM will also adapt to changing conditions such as the build-up of fat rings and debris. In most applications, DATEM automatically finds the true level and locks on to it so you don't need to enter a distance in P21.

DATEM gives the 'highest value' to echoes within the 'gate' which allows the 'echo marker' to follow the selected echo as the level changes. For the 'echo marker' to jump outside of the gate, the new echo must be above the loss limit and persistent (this effectively deals with noise spikes and echoes from nearby transducers).



Perfect application for DATEM Echo Processing Software



Another noisy wet well successfully measured by DATEM Echo Processing Software

## Delivering the Measure of Possibility

Pulsar Measurement offers worldwide professional support for all of our products, and our network of global partners all offer full support and training. Our facilities in Malvern, UK and Largo, USA are home to technical support teams who are always available to answer your call or attend your site when required. Our global presence, with direct offices in the UK, USA, Canada, and Malaysia, allows us to create close relationships with our customers and provide service, support, training, and information throughout the lifetime of your product.

By taking a step forward in echo processing technology, Pulsar Measurement addresses applications previously thought to be beyond the scope of ultrasonic measurement. This technology improves signal processing at the transducer head which has made it possible to increase resistance to electrical noise, enabling the transducer to 'zone in' on the true echo.

For more information, please visit our website:

[www.pulsarmeasurement.com](http://www.pulsarmeasurement.com)



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