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# Rosemount Easy-to-Use Level Measurement

## Intuitive Design Simplifies Setup and Operation

### 1.0 Abstract

The process industry is facing a skills shortage as experienced and knowledgeable workers head into retirement. This document explains how the impact of this can be mitigated by advanced measurement devices offering greater ease-of-use. Emerson™ is increasingly embracing Human Centered Design when developing new products. The Rosemount™ 5408 Non-contacting Radar Level Transmitter and Rosemount 2140 Vibrating Fork Level Detector are two examples of this design principle, with both providing greater ease-of-use, which leads to improved worker efficiency and increased plant safety.

### 2.0 Introduction

With competition in the process industry becoming fiercer, plants are increasingly focused on reducing inefficiencies wherever possible. However, a generational shift is taking place with many experienced workers heading into retirement, resulting in a significant loss of the industry's operating and commissioning knowledge. This dwindling of experience within the industry increases the challenge for workforces to install and maintain technology that is constantly evolving within today's Industrial Internet of Things.

Automation technology has an important role to play by helping optimize processes and production and supporting greater worker efficiency. It is vital for industrial automation vendors to find ways of reducing complexity within devices involved in critical measurements. By reducing complexity, even novice workers can install and operate these devices easily, therefore minimizing the potential for inaccurate or unreliable readings. These faulty readings could contribute to a potential safety incident, such as an overflow or spill. Functionality that enhances ease-of-use in Emerson's latest generation of Rosemount level measurement devices is an excellent example of the industry trend towards reduced complexity.

## 3.0 Human Centered Design

There have been considerable advances in process automation over the past 40 years, yet much of the investment in this area has centred on technology enhancement, rather than creating designs around the way people use the technology. In recent years, more focus has been on developing technology that serves people, rather than the other way around. This forms the basis of the Human Centered Design concept, which Emerson is increasingly adopting when developing new technology.

The latest Rosemount level measurement devices are designed to support plant workers by considering the nature of their tasks, different scenarios they must deal with, and their final goals. Product designers are fully cognizant of plant managers' increasing demands for reduced complexity within technology, so intuitive design is at the heart of these devices. Making a device easier to install, configure and operate can save significant time and help counteract the loss of experienced workers.

## 4.0 Rosemount 5408 Non-Contacting Radar Level Transmitter

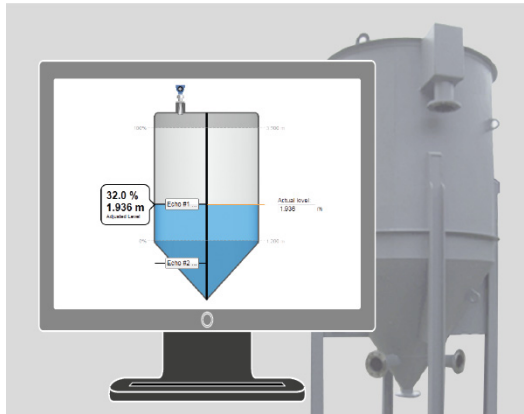
Emerson's SIL 3-capable Rosemount 5408 Non-Contacting Radar Level Transmitter provides a major step forward when it comes to ease of implementation and operation. This enables it to not only deliver accurate and reliable measurement, but also help improve worker efficiency and increase plant safety.

Figure 1-1. 5th generation Rosemount level transmitter



As their broad range of applications includes safety-critical tasks such as overflow prevention, it is essential that these radar transmitters simplify operator tasks wherever possible. Consequently, the Rosemount 5408 is now designed to deliver outstanding ease-of-use, starting with clear and precise pictorial instructions displayed on a highly intuitive software interface, guiding the operator through installation, commissioning, proof-testing, operation, and maintenance.

Figure 1-2. Intuitive set up with dynamic, informative graphics



The Rosemount 5408 provides enhanced on-board diagnostics that support preventative maintenance and provide actionable information to streamline the troubleshooting process making it easier to understand. An onboard data historian allows operators to go back seven days to see what has happened during a specific event in their process. Stored echo profiles and alerts provide troubleshooting data, enabling analysis of measurements from the time of the event. There is also the capability for in-process partial proof-testing and remote performance of site acceptance tests.

The Rosemount 5408 can be remotely proof-tested using the dedicated Rosemount Radar Master Plus software. This enables an operator to easily perform the proof-test by inputting a straightforward sequence of settings and commands from their interface. This remote method of proof-testing brings considerable benefits in terms of:

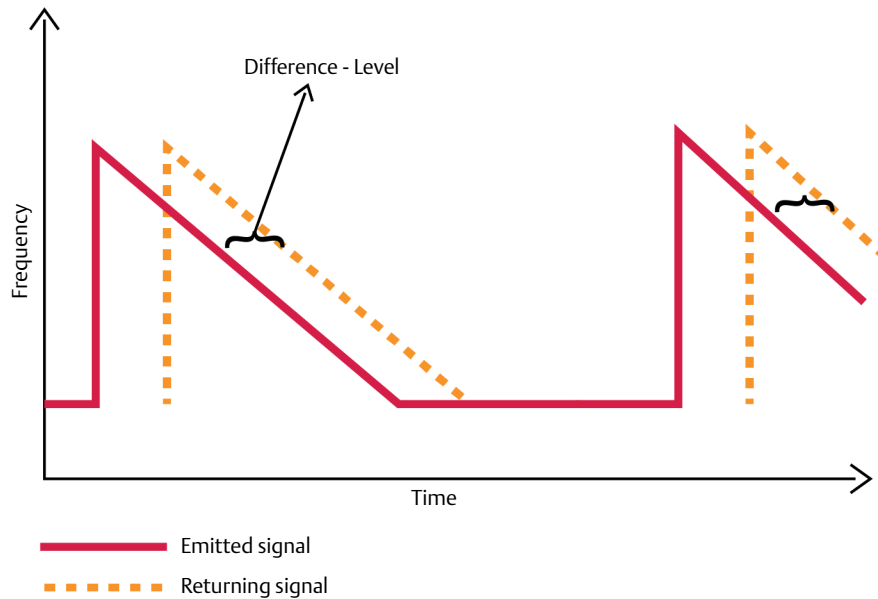
- Reducing risk and errors
- Saving time
- Increasing safety and efficiency
- Reducing the reliance on more experienced workers to carry out the task

## 4.1 Increased functionality

The ease-of-use designed into the Rosemount 5408 has not been achieved at the expense of functionality. In fact, the reverse is true, as it offers increased functionality and provides greater measurement accuracy and reliability.

Among these enhancements is two-wire fast-sweep Frequency Modulated Continuous Wave (FMCW) technology, which uses a continuous echo to maximize the radar signal strength and produce a more robust and reliable measurement. There is also radar on-chip technology, which removes sources of EMC noise that can cause signal disturbance and improves the accuracy and reliability of measurements.

Figure 1-3. FMCW Theory



Further enhancing measurement reliability, unique embedded power back-up functionality eliminates vulnerability to intermittent power losses. If a power failure lasts for a short time, devices with this capability can remember past echo profiles, which enables measurements to resume immediately after the power returns, without the need for a boot-up sequence.

## 5.0 Rosemount 2140 Vibrating Fork Level Detector

As with radar transmitters, designers of vibrating fork switches understand the requirement for these devices to be as straightforward as possible to operate, while at the same time delivering outstanding safety and reliability. Emerson's Rosemount 2140 is the world's first wired HART® vibrating fork level detector, and it not only provides reliable level detection and overfill prevention, but also offers greater ease-of-use and flexibility. It delivers the benefits of advanced smart diagnostics that provide greater insight into the switch condition and support predictive maintenance practices. Identifying potential problems before they become serious helps increase the safety and efficiency of plant and workers.

Ease-of-use throughout installation, commissioning, and operation is integral to the design of the Rosemount 2140, which performs in applications with high temperatures and harsh conditions unsuitable for other level monitoring devices. It is easy to install and maintain as there are no moving parts, and the device is virtually unaffected by flow, bubbles, turbulence, vibration, coating, changing liquid properties and product variations. It can be used to monitor both liquids and liquid-to-sediment interface, which enables the build-up of sand or sludge deposits in a tank to be detected.

**Figure 1-4. Rosemount 2140 Wired Hart Level Detector**



Easy integration into HART 5 and HART 7 systems allows the Rosemount 2140 to take advantage of the latest HART communications functionality. This supports the device's smart diagnostics capabilities, enabling operators to continuously monitor its electronic and mechanical health. Local configuration can be performed via the integral push buttons and LCD display. Remote configuration is also possible from the control room, meaning operators can spend less time in hazardous areas when commissioning. Data is presented on the operator's interface in a clear and easy-to-understand way.

## 5.1 Increased functionality

The Rosemount 2140 also features a range of additional enhanced functions to help solve complex process challenges. *Frequency Profiling* functionality, for example, enables detection of gradual build-up or corrosion to the forks. This provides a significant benefit for plant managers, because once you have an indication that maintenance may be required, it can then be scheduled during downtime, to optimize process availability.

A further enhancement in the Rosemount 2140 is *Power Advisory* functionality, which enables any potential problems with a device's power supply or connectors to be identified. The voltage and current drawn over the device's lifetime is monitored, with a process alert for potential issues that could become a problem, such as corrosion. *Adjustable Media Density* functionality, meanwhile, enables appropriate density settings to be configured to ensure a consistent switching point. Again, this functionality can be accessed remotely, making life easier for operators as they no longer need to climb tanks and access the device for configuration or routine inspections.

Further enhancing ease-of-use and reducing complexity for less experienced operators, device intelligence has been developed in the Rosemount 2140 to enable automatic selection of optimum switching points on commissioning if media properties are unknown. This is a very simple process and provides operators with increased peace of mind about switching reliability.

## 5.2 Safety enhancements

As with the Rosemount 5408, remote in-process partial proof-testing capability is available in SIL 2-certified versions of the Rosemount 2140, for installations within safety instrumented systems. Performing a remote partial proof-test reduces the PFD (probability of failure on demand), enabling the time interval between full proof-tests to be increased. This enables this complex, expensive and potentially risky procedure to be fitted according to the plant's scheduled shutdowns when the device needs to be removed.

The Rosemount 2140 can be remotely proof-tested by issuing a HART command. Upon receiving the command, the device enters test mode. This cycles the output through wet, dry and fault states before returning to normal operation. The process is continually monitored during this time and any change will be reported immediately when the test is complete. If the partial proof-test detects an issue, this is also reported upon test completion. Since the test can be performed in-process, it can take less than one minute to complete although the duration is user-programmable in case a longer test is required.

## 6.0 Conclusion

Process plants need to adapt to meet the challenges they face. Ensuring automation technology becomes as user-friendly as possible is one way the impact of lost workforce skills and experience can be mitigated. Through the adoption of Human Centered Design, new measurement technology such as the Rosemount 5408 Non-contacting Radar Level Transmitter and Rosemount 2140 Vibrating Fork Level Detector are easier to install and operate. Reducing complexity contributes to improved worker safety and efficiency.

**To find out more about the latest generation of Rosemount level measurement devices, go to [www.Emerson.com/Rosemount-Level](http://www.Emerson.com/Rosemount-Level).**



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