Emerson Exchange: Americas "Expand your Horizon" – Emerson Global Users Exchange
October 5-9, 2020 – Phoenix Convention Centre – 100 N 3rd St, Phoenix, Arizona, USA

Lessons from Operations: Measuring Level in Elevated Water Storage Tanks for Municipal Water, Industrial and Fire Protection Applications

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Keywords:
Elevated Storage Tank, Water Tower, Level, Radar, Ultrasonic, Hydrostatic, Pressure, Barometric Pressure, Automation, SCADA, DCS, Availability, Installation Practices, Calibration, Maintainability, Redundancy, How To

Format: 30-45 minute presentation, plus written paper

Short Abstract (800 character limit):
Measuring level is storage tanks is one of the oldest instrumentation applications. However, effectively measuring level in elevated storage tanks does present several design challenges, many of which do not become apparent until the tank is put into service. This presentation provides a best practices guide on how to select which level measurement technologies to use, and how to best to install them to optimize operational availability, redundancy, and ease of maintenance. Technologies that will be discussed include pressure/hydrostatic level, radar, ultrasonic, laser-beam and other emerging technologies. The talk will also cover managing temperature/barometric pressure effects, instrumentation taps, sample ports, flushing connections, install details, and healthy/safety considerations.

Long Abstract:
Elevated storage tanks have a long history of use in the municipal water, fire protection, and various industrial applications. However, effectively measuring level in elevated storage does present several design challenges. Physical challenges include restricted access, extreme heights, confined spaces, and impacts from atmospheric temperature/barometric pressure. Traditional pressure-based hydrostatic level measurements are impacted by barometric pressure, temperature, and how most water towers use a single riser pipe. Other technologies such as ultrasonic, radar and laser-beam-based technologies have their own challenges as well.

This presentation provides a best practices guide on how to select which level measurement technologies to use, and how to best to install them to optimize operational availability, redundancy, and ease of maintenance. Technologies discussed will include pressure/hydrostatic level, radar, ultrasonic, laser-beam and other emerging technologies. The presentation will also focus how good installation practices, such as the placement of valves, instrumentation tap points, and mounting height, can have a significant impact on accuracy, repeatability and ease of maintenance.

What Problems / Challenges Were Resolved? (600 character limit)
Elevated Water Tanks, also known as Water Towers, play a vital role at water utilities. They provide a passive pressurized reservoir of water that is always available, even during power outages or equipment failures. Water Tower level measurements are typically used to control booster pumps, which can range for 30 to 2000 HP, thus it is important that level measurements be reliable, stable and accurate, and incorporate redundancy. The talk gives an overview of best practices used for new level instrumentation at the Verney Water Tower at Guelph Water Services in Guelph, Ontario, Canada.

Solution (600 character limit)*

For the Verney Water Tower, a combination of pressure-based hydrostatic level and radar level transmitters were used. For the pressure transmitters, multiple transmitters each with its own instrumentation and flushing ports was used. Additional pressure transmitters were put in each side of the isolation valve. Impacts from temperature changes and barometric pressure changes were considered and accounted for. For the radar level, a loop-powered radar transmitter was selected, with a remote read-out for the bottom of the tower. HART communication is used for accurate setup/diagnostics.

What Results / Benefits Were Realized? (600 character limit)*

We now have instrumentation that is ranged properly that can read the entire range of the water tower, that is from the riser being completely empty all the way to above the overflow. The use of two level technologies - pressure-based hydrostatic level and radar - allows for continuous verification of readings. Additional pressure transmitters on each side of the isolation valve, helps operators overfill incidents during tower manual tower filling operations. Having redundancy of readings also allows for maximum system availability and confidence when controlling very large booster pumps.

Track*

Measurement Instrumentation

Rosemount, Level Measurement, Instrumentation

What industry(s) does this abstract apply to?*

Engineering, Power & Utilities,

What job function(s) does this abstract apply to?*

Operator, Technician/Analyst/Specialist, Consultant, Engineering, Plant/General Manager, Project Manager/Lead

Mobile app metadata - List words (separated by commas) that would help attendees find your session when searched in the conference mobile app.

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About the Speaker

Graham Nasby, P.Eng, PMP, CAP, FS.Eng holds the position of Water SCADA & Security Specialist at City of Guelph Water Services, a publicly-owned/operated water utility located in Guelph, Ontario, Canada. Prior to joining Guelph Water in 2015, he spent 10 years in the engineering consulting community after completing his B.Sc.(Eng) at the University of Guelph. He is senior member of the International Society of Automation (ISA) and co-chair of the ISA112 SCADA System Standards Committee. His is also a named SCADA expert on the IEC-TC65 committee, a voting member of CSA committee P125 on Functional Safety, and a voting member of the ISA's Alarm Management and HMI Design committees. Mr. Nasby is a member of both AWWA and WEF, and currently sits on the Ontario Water Works Association's Automation Committee. In 2014, he was recognized with the "Mid-Career Achievement Award" from his alma mater, the University Of Guelph's School of Engineering. Contact: graham.nasby@guelph.ca