



An 8-Point Checklist Of Pressure Gauge Application Best Practices

As electronic measurement, microprocessor or computerized control, and wireless networking have worked their way deeper into industrial processes, new opportunities for accuracy, convenience, and cost-saving efficiency have multiplied. Electronic accuracy and communication have delivered performance advantages down to even the simplest functions — including pressure readings.

Among the many types of pressure gauge designs — from Bourdon tube to diaphragm, to capacitance/inductance, to piezoelectric sensing technology — each comes with its own range of accuracy and advantages. Getting maximum value from an instrumentation purchase is not simply a matter of choosing the lowest price, but rather choosing the performance characteristics that best fit specific application needs. Here are some considerations for maximizing value and avoiding unpleasant surprises in water/wastewater treatment plant (WTP/WWTP) pressure measurement applications.

Take A Smarter Approach To Instrument Management

Plant operators faced with a need to retrofit or an opportunity to add new pressure gauges now have more choices than they did when their plants were initially built. Newer gauge technologies with networking capabilities offer advantages for improving plant performance and streamlining operating efficiency:

- **Make Reading Convenient In**



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Any Environment. Pressure gauges that provide accurate electronic output based on piezoresistive measurement principles, plus an analog dial that is easily readable from a distance, provide the best of both worlds.

- **Work Smarter, Not Harder.** Wireless or hardwire-networked gauge options relieve plant workers from having to make the rounds to monitor key pressure readings, especially in hazardous or hard-to-access areas. Automated readings — captured

as frequently as once per minute — also reduce data recording errors.

- **View Operations Dynamically.** Integrating pressure gauge readings into a central asset management system tailored to WTP/WWTP requirements keeps operators informed and simplifies integrated long-term recordkeeping for better performance analysis.
- **Simplify Local Operator Access.** A good local operator interface (LOI) built right into

the instrument makes it easy for operators to save time and money by configuring and commissioning pressure gauges without additional hardware or software.

- **Gain Mobile Access To On-line Gauges.** Mobile apps for interacting with on-line gauges speed initial commissioning as well as subsequent troubleshooting.

A Checklist Of Considerations

Whether pressure gauges are being designed as part of a new installation or are being retrofit into an existing layout, take care to address specific conditions that can affect the accuracy or long-term performance of the application.

1. **Compare Accuracy.** Digital and analog technologies each offer their own levels of accuracy — with the plus-or-minus accuracy of electronic designs ranging as low as 0.1 percent to 0.5 percent of full span and mechanical designs ranging as high as 1.0 percent to 5.0 percent of full span.
2. **Assure Application-Appropriate Accuracy and Safety.** Choose a gauge where the anticipated readings are as close to the middle range of the scale as possible. This will accommodate actual readings with minimal error rate. Check the plus-or-minus tolerances across the full range of the unit's scale and ensure that the overpressure ratings are high enough to prevent damage in testing or operation. Multiple levels of process isolation can provide overpressure ratings up to 150x of scale.
3. **Evaluate Repeatability.** The ability of a gauge to provide the same reading under the same condition, whether that pressure is rising, falling, or at

a relatively high or low range, makes a big difference in real-world applications. Gauges that respond quickly and reliably will not be affected by hysteresis.

4. **Assess Speed of Response.** Upgrading from conventional sight-read dial gauges to electronically connected sight-readable gauges puts up-to-the-minute data at a plant operator's fingertips without need for personnel to set foot in the plant environment. At the same time, having a large, highly visible dial still provides a quick visual point of reference when operators are in the area of the gauge.
5. **Satisfy Operating Demands.** Choose physical designs that will not suffer from harsh operating environment conditions, extreme temperatures, corrosion, etc. For example, avoid Bourdon tubes in environments subject to shock and vibration or add compensating features — such as buffers — in the mounting design. Specify gauge materials, coatings, chemical resistant seals, or special housings as needed to satisfy material or environment demands. Choose a temperature-resistant design or use temperature compensation where necessary to accommodate extreme process or ambient temperatures (Figure 1).

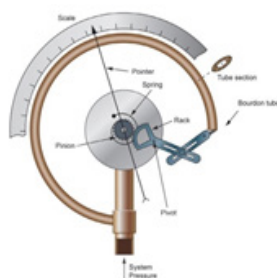


Figure 1. Pulsating or rapidly increasing pressure can put extreme mechanical stresses on Bourdon-tube-style gauges, making them susceptible to unsteady readings or even permanent physical damage.

6. **Calculate Mounting Location Accessibility.** Choose a gauge display/dial size that provides maximum readability, where needed, and mount it for easy visibility in the application environment. Keep impulse piping as short as practical, but be sure to provide the necessary access for maintenance and ease of installation or replacement in the built-out environment.
7. **Standardize Communications.** When accommodating gauges and instruments using a mix of analog and digital communication, look for interoperability with accepted industry standards. The Highway Addressable Remote Transducer ([HART](#)) communication protocol uses both one-direction analog signals and two-way digital signals with process field devices, providing accurate readings every minute in operation. Readings can be transmitted from a transducer to the control system while configuration and control signals can be transmitted from the control system back to the transducer. This open standard is not limited to vendor-specific communication protocols and is not regulated by a single proprietary source.



Figure 2. An analog display pressure gauge with wireless transmission capabilities can automate pressure data collection with digital data convenience in water plant operations, while maintaining high-profile visibility for workers on the plant floor.

8. **Consider Total Cost Of Ownership.** Before investing in a switch to wireless solutions,

look for [tools](#) that can help with planning, configuring, troubleshooting, and optimizing the value of wireless systems according to industry best practices once the switch is made.

Don't Forget Post-Installation Protections

Evaluating new pressure gauge purchases is no longer limited only to specifying a pressure range, a port size, and any special construction materials. With today's smart gauges and instrumentation, every buying decision is as much about after-the-sale support

as it is about up-front product features and capabilities. Look for pressure-gauge alternatives that deliver a total solution:

- **Warranty And Lifecycle Services.** Consider both the length of the warranty (1-year, 5-year, or 10-year) and the value-added services that are available as part of the purchase decisions.
- **Online Training.** Getting started on the right foot can make all the difference. Look for suppliers who provide training that fits plant personnel schedules.
- **Technical Support.** Includes physical repair services as well as reliability services — shutdowns/turnarounds/outages, start-up & commissioning, lifecycle services, calibration & verification, site evaluation, long-term service agreements, etc.
- **Scheduled Onsite Support.** Ensure that critical maintenance and backup services are performed on a regular basis to maintain plant operation and minimize the likelihood of surprise shutdowns. ■