

While level applications can be found in countless industries and applications, there are certain key elements that should be considered as part of any level control solution.

Best Planning Practices for Level Solutions: Design for Operator Safety, Efficiency, and Expectations

Level applications can range from managing pump operation in a simple underground sump to the displaying of storage levels in a massive outdoor tank farm. In all of these applications, local display and control is critical to the success of the application solution. The best practices listed below will improve the safety, efficiency, and operator confidence in any level application.

1. Safety First

Safety is the most important element of your level display and control solution. While it may not seem obvious at first, the decision of how to best implement this solution will have an immediate and daily impact on the safety of the workers and operators that interact with the display and controls.

Planning Display Placement

The level transmitter placement is determined by the technology used. There is little choice for system planners.

However, more than likely an operator will need to interact with some kind of display or control interface. The use of a remote display or controller, and the decision of where to place it, will have a major impact on operator safety and efficiency. There are two important questions involved with level display placement. 1) How will an operator interact with the equipment. 2) How vital is the level information.

Understanding how will an operator interact with the equipment will dictate the need for a remote display or controller, and reveal where it should be located. A device that operators will be interacting with often must be placed somewhere the operators can access easily. This can be accomplished with a remote display device, such as a panel meter or field mounted display.

For example: If it is important for operators to be able to check the level of a tank weekly, using the display on a level transmitter mounted on the top

of a tank makes little sense. A major safety concern can be removed by adding a remote display at grade level next to the tank. This will remove the risks present when operators are climbing up tanks.

Remote displays can also be used to bring the display up to major walking paths or roadways; potentially removing the hazards of climbing over pipes or over other obstacles to see the information.



PD765 Trident and Trident X2 Panel Meters.
“The size and placement of a remote display can help the most critical information stand out.”

The other critical concern is to understand how vital the level information is. This knowledge will determine the importance of the data standing out and getting noticed. The size and placement of a remote display can help the most critical information stand out. The more vital the information, the more critical a large, easy to read display is. Failing to notice level information may cause errors managing inventory, increase risk of tank overflow, or otherwise put operators at risk. Wherever there is important level information, a large, bright, conveniently located display should be used. With the vast amount of equipment found in most process applications, it is very easy

for the critical information to get lost next to a multitude of other displays.

Know Your Marking Requirements

Some areas require equipment with special governmental or insurance agency related approvals due to the explosive, flammable, or otherwise dangerous materials in the area. Common approval related agencies include FM, CSA, ATEX, and IEC. Referred to as hazardous areas, these areas require special class, division, or zone approvals on all equipment used within the area. Protection schemes can include explosion-proof, intrinsically safe, dust-proof, etc. If the solution is to be used in one of these areas, it greatly affects the devices that will be available, and what kinds of precautions must be taken.



FM, CSA, ATEX, and IEC Marks Found on Some Hazardous Area Equipment

Other installations may require certain general safety approvals, such as UL Listing or CSA approval. A CE mark is required for European process instrumentation.



Samples of Common Marks Such as UL, CSA, and CE Marks

Knowing up front what marks, approvals, and certifications are required for your solution will insure proper safety requirements and prevent costly refits and re-specification later in the process.

Backup Control

Local backup control systems help prevent dangerous or costly situations should something fail with the primary control equipment.



PD6000 Process Meter/Pump Controller
"It is often inexpensive and useful to have local backup display and control interfaces."

Should a centralized control system be used, a local backup can provide needed level control should a failure occur. It is often inexpensive and useful to have local backup display and control interfaces. Should there be a failure in the central control system, these often inexpensive backup pump controllers, level monitors, and alarm systems can prevent tank overflows, dry pump conditions, or loss of material transfer information.

2. Daily Operator Activities

Too often, the technician installing level controls focuses only on getting the equipment mounted *somewhere*, and not on making it easy for the operators who work with the level information. Engineering schematics, process drawings, and consultations with control manufacturers are almost always about the technical specifics of the control application. The effectiveness of the installation and its integration into operator routines is often only considered once the equipment is onsite.

Display placement, equipment location, labeling, and reducing the potential for errors all play a large part in making an effective level control solution. While there are no hard and fast rules related to these criteria, it is important to spend time considering how operators will interact with the level controllers and equipment. The following may illustrate the advantages of understanding the operator preferences and the impact a display can have on the final installation effectiveness.

A liquid transfer terminal tank farm consists of 16 large storage tanks. The levels are measured with a radar level transmitter mounted on the top of each tank. Over 100 yard away, operators fill or dispense batches. The batch controllers near the operators control the pumps filling or draining the tanks.

In this application, the operators like to confirm the volume in the tanks before batching begins. It would be helpful for the operators to read the volume in the tanks at the filling station, not just the control room or tanks. Knowing the level of the tanks via a remote display located by the batch controllers will save them a long and potentially hazardous trip to either the top of the various tanks or to the control room.

3. Accuracy Needs

Failure to consider the necessary accuracy of the equipment installed in an application may result in a system that operators do not trust, or one that can potentially damage equipment.

Be Realistic During Setup...

Device specifications can be very deceiving. Terms such as “0.01% FS accuracy”, “ ± 0.001 mA”, or “ ± 1 count” can sound as though the device achieves near absolute accuracy. However, this is often not the case due to a number of factors unrelated to the equipment itself.

From turbulent materials to nearby sources of signal noise, most real-world applications do not achieve the incredible accuracy the device datasheets would imply. However, because of the incredible accuracies promised, installers often program the displays and controls with a number of display decimal places and required accuracy that is unnecessary for their application.

In most applications, it is unnecessary to display the level in a 40 foot tank down to 0.0001 feet. Just because the level display may have six digits,

not all of those digits need to be used. This level of accuracy may cause the digits to jump, or appear unsteady. Similar, pump control set points programmed with set and reset points too close together can cause relay fluttering, and damage the pumps or controller.

The amount of accuracy needed in a system varies application to application. For those specifying or installing level control equipment, it is important to understand what kind of level accuracy can be expected from the system. To push the limits of what is possible and necessary in a given application will result in display and control issues that are unnecessary and difficult to resolve.

...But Meet Accuracy Needs

Other applications will require extremely accurate devices. These applications require that every device be able to support their high accuracy needs.

To select the appropriate level transmitter, a system designer must know what the nature is of the level application. Is it a bulk solid or a turbulent fluid? Is there foam, or an interface level to manage? Only by understanding the specifics of a level measurement application, and selecting an appropriate level transmitter technology, can very tight accuracy tolerances be achieved.



PD6830X Modbus Scanners

“For accuracy critical applications, consider other technologies, such as Modbus serial communications.”



Similarly, the transmitter output can be a source of inaccuracy and noise pickup in the system. The traditional 4-20 mA output may have accuracy and noise immunity limitations. For accuracy critical applications, consider other technologies, such as Modbus serial communications. Modbus is a digital communication signal, eliminating inaccuracy and noise issues related to the transmitter output and display input.

Knowing the Application is Key

The best practice suggestions above, and many others, rely on a simple concept. The level display and control system designer must fully understand the application. The materials, storage medium, role of the operator, and all other aspects of the project should all be understood in advance of planning the solution. Only with this understanding can the system designer assure operator and plant safety, efficient processes, and effective display and control.

*Author: Joe Ryan
Product Engineer
Precision Digital Corporation*

For more information about level displays and controls; or any flow, temperature, or pressure process meter application, contact Precision Digital.

*Voice: 800-343-1001
E-Mail: sales@predig.com
support@predig.com
Web: www.predig.com*