# Why start-up support is critical to efficiency

Let's dig into the actual reason 80% of startup failures happen...

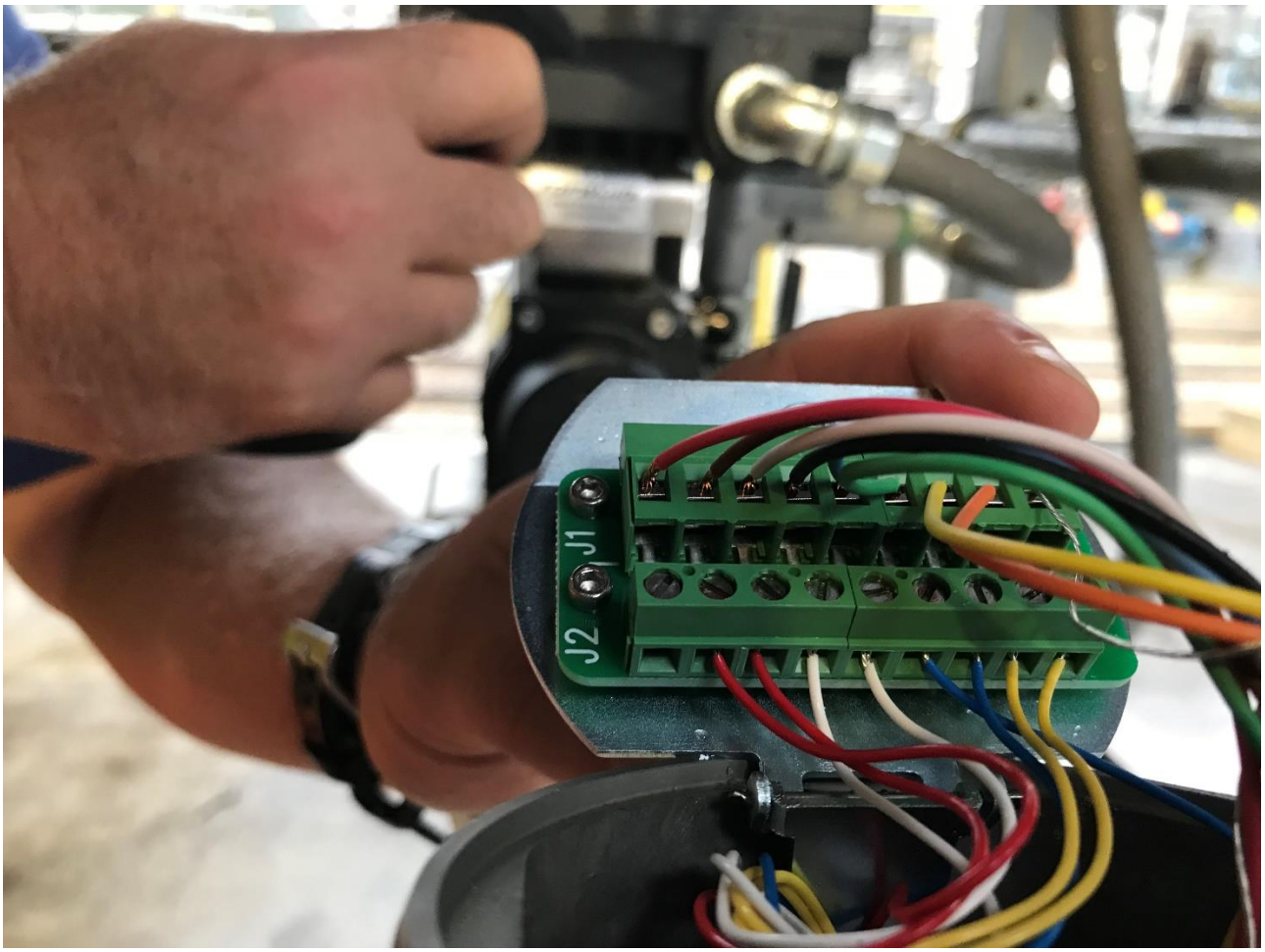


*Figure 1: Thermal flow meter mis-wired from the factory causes costly delay during startup.*

The most common way in which the flow measurement accuracy of any flow meter becomes compromised is due to **incorrect installation**. In 36 years of working in and around electronic instrumentation, there is one shortfall that sticks out above the rest, lack of startup support expertise to quickly identify installation issues. To optimize efficiency, it becomes critical to have a technologist form a plan of attack to combat installation issues.

The following list shows some of the details one must consider in start-up support of a flow meter element and electronics:

- Technical people involved in application or project start-up
- Preparation, delivery and start-up
- Straight pipe run requirements both upstream and downstream
- Electronic transmitter location in relation to the pipe
- Power requirements for sensor and electronics
- Validating instrument in the field

## Engineer v. Instrument Technician

The first problem that occurs is when Engineers and Technicians are not communicating well. Engineers have the theory and design from a conceptual development basis to very detailed analytical drawings and schematics of the P&ID loop.

However, both mechanical and electrical engineers constantly have footprint vs. efficiency issues. Mechanical engineers are typically required to tying all process control designs together while electrical engineers typically are tasked with power, instrumentation and PLC/DCS Systems design. The fight typically starts and ends with footprint design vs. efficiency design with the mechanical engineer normally winning.

The Instrument Technician fights complex wiring issues and consistent design flaws that in theory should work. The problem is real world designs do not receive enough input from techs so they typically have to marry design flaws with instruments and make the best of undesired outcomes.

*Figure 2: Common issues amongst engineers and technicians create stressful work environments.*

The solution is an easy but sometimes an overlooked answer. Plants have downsized dramatically, requiring more of the engineers and techs alike. The best alternative more often than not is either hiring an **Electronic Technologist** or consulting with an independent one. Both offer immediately resolution and a good technologist marries the two disciplines together well.

See these key people on a project or an application for what they are, an arbitrator. They normally have backgrounds in both disciplines which works well in resolving issues.

## Preparation, Delivery and Start-up

Preparation is 50% of the battle in most everything in life, including flowmeter installation. Your technologist should be knowledgeable and have safeguards in place to protect your application. Keys to their successful completion of a job include: detailed on performance expectation, co-ordinate delivery time, start-up and project completion times.

Something as simple as having the technologist delivering your product(s) can eliminate costly shipping/product issues and help to facilitate keeping a project on schedule. Projects don't always start on time, and many jobs have equipment warranties expire prior

to installation. Pay particular attention to expected project start-up and projected completion times. Jobs and projects only run over when poor preparation is the accepted norm.

Make sure you have a technologist on hand for preparation and installation who will communicate clearly between engineers and technicians to meet expectations and facilitate a productive stress-free work relationship (Figure 2).

## Straight Pipe Run Requirements

Sharp turns in piping introduce large-scale turbulence into the flow stream. Elbows, tees, valves, fans, and pumps are some of the most common causes of large-scale turbulence in piping systems. Successive pipe elbows in different planes are some of the worst offenders in this regard.

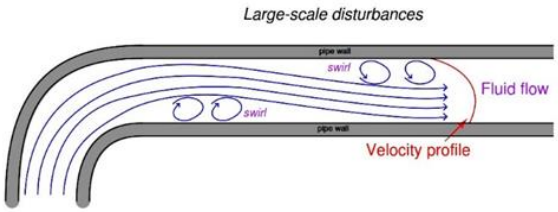


*Figure 3: Eddie currents in a flow stream after an elbow.*

When the natural flow path of a fluid is disturbed by such piping arrangements, the velocity profile of that fluid becomes distorted; e.g. the velocity gradient from one wall boundary to the other will not be orderly (see Figure 3).

Large eddies in the flow stream (called swirl) will appear. This will cause problems for flow elements which rely heavily upon laminar flow (the bullet shape as in Figure 4) to accurately measure flow rate. Discussing a flow conditioner to eliminate turbulent flow alleviates performance concerns due to lack of straight run and extends equipment life by eliminating these vortices and eddy currents.

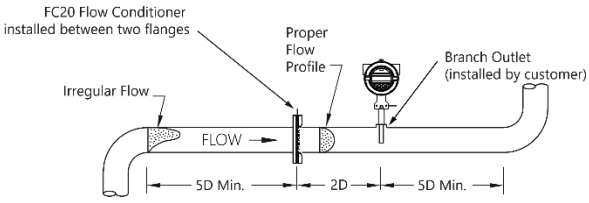


*Figure 4: Flow conditioning greatly reduces piping straight run requirement*

If the flow profile is distorted enough, the acceleration detected at the element may be too great or too little, and therefore not properly represent the full fluid flow stream. For this reason, a flowmeter should always be located with plenty of piping upstream and downstream of major disturbances such as control valves and pipe elbows wherever possible.

Recommendations for minimum upstream and downstream straight-pipe lengths vary significantly with the nature of the turbulent disturbance, piping geometry, and flow element.

Ultimately, you should consult with a technologist on the flow element for a more detailed recommendation appropriate to any specific application.

## Electronic Transmitter location

Flow transmitters and in particular their displays should be located in ideal locations for ongoing diagnostics and verification. This allows the trained personnel to easily check ongoing diagnostics, verifying flow meter performance and comparing it to the original calibration certificate.

A flow element should only have an integral display if it can be easily accessed, otherwise remotely locating

an electronics transmitter from its element will save time, energy and provide a safer environment to perform necessary diagnostic and verification checks.

A factory trained technologist can quickly identify installation issues to include helping identify a wiring issue from the manufacturer (as seen in Figure 1). Without an experienced technologist on-site could have cost lost production of two weeks or more if the metering had to be removed and sent back to the factory for diagnosis.

*Figure 5: On-site startup support quickly corrected a flowmeter installed in in the wrong direction.*

A major emphasis is being placed upon engineers and techs to ensure they have a preventative maintenance program in place. This allows for calibration verification checks within individual applications. A local display allows both the techs and engineers to perform these preventative checks. A good technologist should be proficient enough in performing such checks to help alleviate workload issues for both engineering and technical disciplines.

**Power Requirements**

Determining where and how to power a flow transmitter can be a complex issue. Knowing the available sources of power inputs can help determine which would be most beneficial to the application. The three costs associated with a transmitter are product cost, installed cost and operational cost. Having a technologist examine these costs becomes beneficial to the overall performance of the application.

*Figure 6: Wellhead transmitter powered by Solar Panel*

Some transmitters only require a lithium battery without the need for an output. The photograph (Figure 6) shows a transmitter on a gas wellhead installed with a 40-Watt Solar Panel providing primary charging power to the battery with an additional backup.

Keep in mind most flowmeters require 24 VDC input. Confirm with help whether the device can be loop powered or needs an external power source for the sensor (shown in Fig. 5). On some applications, transmitters will need dual power input, 110 VAC to

power the electronics and then an internal power supply (6-30 VDC) for a remote sensor. Not all applications are this complex, but a technologist should be able to walk you through this challenge.

*Figure 7: Remote sensor with local display*

Additionally, determining the output signal and whether the transmitter provides the power for the signal or it comes from a PLC/DCS can confuse the most experienced tech as was the case in Figure 1. Having a technologist on-site during startup, especially if they are an independent consultant means they have quick access and key relationships with manufacturers beneficial to successful startup on a job.

**Validating the Instrument in the Field**

Crucial to start-up support in the field is the ability to validate the flowmeters performance. Built-in diagnostics along with calibration validation help to verify flowmeters accuracy. In-Situ checks allow for an initial inspection that a meter is tracking correctly and when the need arises service at a future time.

A technologist should be proficient at both diagnosing and verifying the process conditions and accuracy. Calibration software should be easy to use and allow for independent evaluation of a flowmeter for critical monitoring or control. A visual indication of raw data can be extracted to help with diagnosing an issue.

**Conclusion:** Nevertheless, it is sad to see how a flowmeter installation could have been so easily improved with just a simple on-site visit from a technologist. Don't underestimate the importance of a start-up service call. As the old saying goes, *"A stitch in time saves nine".*

You should always ensure start-up support is budgeted into an installation to identify issues as simple as re-location of the flowmeter due to improper piping length.

Poor installations such as this are surprisingly common, owing to the ignorance many piping designers have of flowmeter design and operating principles. Of all the criteria which must be balanced when designing a piping layout, good communication with a technologist is critical to success.

Check what K&I Instruments can offer you for **start-up support service** or at the following link: **https://www.k-iinstruments.com**

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