Differences Between Gauge and Absolute Pressure Measurement

There's a natural tendency for people to want things to add up. When you take a measurement on one scale you expect it to be the same on a different scale. If you measure out five pounds of produce at the local grocery store, you're not going to be happy if you get charged for five and a half pounds at the checkout stand. You expect and need accurate measurement tools.

This applies to cable pressurization equipment as well. When a monitoring device indicates that cable pressure is 6.5 PSI and your C pressure gauge reads 6.15 PSI at the same location on the cable, it makes you wonder. Which reading is correct? You may be surprised to hear that both of them are correct. They're just reading pressure two different ways: one references absolute pressure and the other atmosphere (gauge) pressure.

Absolute Pressure vs. Relative (Gauge) Pressure
System Studies' High Resolution Transducers are different from most transducers in that they are calibrated at zero absolute pressure, or zero Pounds per Square Inch Absolute (PSIA). To understand the concept of zero absolute pressure, it is helpful to look at a known reference point. The most commonly used reference point is sea level. The absolute pressure at sea level, when not affected by changing barometric conditions caused by storm activity, is 14.7 PSIA (or one atmosphere). Absolute pressure transducers are zero calibrated at sea level relative to a perfect vacuum. The result is a device with a fixed reading scale and a true zero setting at 14.7 PSIA.

Most other pressure sensing devices used in the telephone industry are relative devices, measuring in Pounds per Square Inch Gauge (PSIG). These gauge devices indicate the difference between the pressure being monitored (inside a transducer housing or C pressure gauge, for example) and the air pressure outside the device—or atmospheric pressure. They are zero calibrated in a less controlled, more arbitrary manner, either in the factory or in the field. In either case, their zero reference is not fixed at sea level. The C pressure gauge, for example, is vented to atmosphere and can be manually adjusted to zero. Its zero setting depends on the barometric pressure and altitude at the point where it is being read.

Reading Differences
What this comparison means is that it is impossible to expect two devices to read the same if one is a gauge device and the other an absolute device. They are starting from two different reference points. To further illustrate the point, consider the difference between absolute pressure at sea level, which is 14.70 PSIA (the weight of one atmosphere) and absolute pressure at an elevation of 1,000 feet, which is 14.18 PSIA. At the higher elevation there is less pressure (less weight from the atmosphere). So if an absolute device is read at this altitude, its readings will be approximately .5 PSI less (14.70 - 14.18 = .52) than those from the gauge device.

Barometric pressure is also a factor. When a weather front moves into the area, barometric pressure drops, which is reflected by a drop in the barometer's level of mercury. Storm activity can cause changes of several inches in a barometer's reading. This equates to changes in pressure of over 1 PSIA.

System Studies' High Resolution Pressure Transducer is not affected by changes in altitude or barometric pressure. Readings are obtained by measuring the effect or force of measured air pressure against the transducer's internal vacuum. Because zero PSIA is fixed relative to the vacuum, the device's zero reference is always the same regardless of altitude or weather conditions.

Accuracy and Resolution

The design emphasis of the System Studies High Resolution Pressure Transducers is on monitoring change, as opposed to strictly measuring pressure. In this respect, a key term in describing the transducer's performance is resolution—the ability of the device to see or resolve subtle changes. This is the advantage of the absolute pressure device over the relative device. Because of its electronic capabilities and design characteristics, the High Resolution Transducer can see pressure changes down to .1 PSI over the range of 0 to 30 PSI. The relative pressure transducers are mechanical, stepped devices that can only read changes in .5 PSI increments. They typically operate in the ranges of 0 to 9.5 PSI and 5 to 14.5 PSI.

To provide true measurement capabilities, with compensation for both altitude and barometric pressure, the High Resolution Transducers can be used with one of System Studies' barometric pressure devices. One barometric device installed in an office enables the PressureMAP software to adjust the readings of absolute pressure transducers and compensate for altitude and changing weather conditions. The result is an incredibly accurate measurement device to compliment the high resolution capabilities of the absolute pressure transducer. With an absolute zero reference and the ability to have readings automatically adjusted on a daily basis for barometric conditions, the High Resolution Pressure device is much more precise than other transducers available today.

For more information regarding these devices and the difference between calibration references, please call System Studies Incorporated at (800) 247-8255.

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