An introduction to...

Pressure gauges

A part of the process instrumentation family, the pressure gauge is a significant safety device in gas and liquid pressure regulation.

Gas pressure regulators are used to reduce the pressure of gas supplied from a high-pressure vessel to a safe and workable level that can be safely used for operating equipment and instruments.

As part of this function, pressure gauges measure the pressure of a gas or liquid in a process and thereby ensure accurate pressure control over a wide range of pressures and flows.

Gas is stored in cylinders under high pressures that can go as high as 300 bar. Although this pressure drops as the gas is released from the cylinder, traditional valves do not generally control or have any effect on the pressure. Therefore, since most gas users require gas at pressures only up to about three bar, regulators and gauges tend to be introduced as an additional component of a supply system to monitor and adjust the pressure.

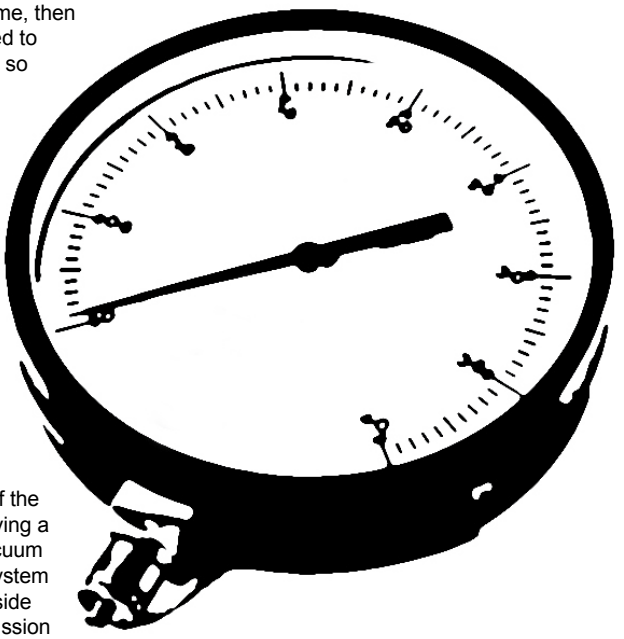
Gas control and regulation systems provide an optimised flow rate over a wide range of pressures and are particularly suitable to users that require constant gas pressure at the outlet point, even when consumption is fluctuating. With that in mind, pressure gauges can be considered to not just serve a crucial safety purpose, but also contribute to cost-efficiency benefits.

While pressure gauges are largely uniform in their remit, to measure the pressure of a given gas or liquid, a whole range of these devices is available. Various pressure gauges are developed for different applications and specifications. Identifying the right pressure gauge for an application depends on a number of factors, including the nature of the fluid or gas, the temperature and working pressure, and the external environment.

For operations with vibration the gauge head is filled with a liquid, usually glycerine, a very thick product that is reasonably safe and is both water soluble and edible – except when with products like chlorine gas,this would cause a violent reaction if the two liquids were to mix.

As for pulsation, a small restrictor commonly called a 'snubber' is fitted to the inlet of the gauge and this will restrict the flow and stop the needle or pointer bouncing and holds the gauge relatively stable. If the pulsation is extreme, then a diaphragm seal could be fitted to the gauge with a capillary tube so the gauge could be mounted remotely from the process pipework.

The diaphragm seal is a metal foil, with convolutions pressed into it, and it is the part that comes into contact with the process medium. It could made from stainless steel, hastelloy, Monel inconel or tantalum, and/or could be coated with ptfe, gold, or rhodium to suit a given process application. This foil would usually be fitted to a stainless flange,with the flange then fitted to the base of the gauge and the gauge itself having a restrictor fitted. A very high vacuum is now pulled on the internal system between the gauge and the inside of the foil. Then a thick transmission fluid fills the system, so that when the process medium makes contact with the foil diaphragm, it causes the gauge to read.



Diaphragms, though, are usually fitted to stop the process medium entering the gauge – for corrosive reasons. There is, however, another reason; that of a sanitary or hygienic seal. When this is needed, for example in process food or pharmaceutical applications, then the criteria is for bug free crevices, a high polish finish, and a suitable transmission fluid, usually to FDA specifications.

In terms of differential pressure gauges, these could be used for different reasons; for example you could fit this instrument to either side of an orifice plate (this is a metal plate with a specifically sized hole fitted between the jointing of two pipes to reduce the diameter of the tube. This causes a pressure drop to occur. A tapping is made either side of the orifice, one is connected to the high side and the other to the low side of the differential gauge,this in turn would allow for the reading of the flow of the gas or steam.

This gauge could also be used either side of a filter, allowing the user to see when the filter is starting to block. As another application, it could be used for tank contents.

As end-user applications and manufacturing environments continue to evolve themselves, greater emphasis is in turn placed on the gas supply chain/system and, therefore, the pressure gauge and regulator equipment. ❑

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WITH THANKS...

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