

EXXON EXXON ENGINEERING	<i>INSTRUMENTATION</i> PRESSURE MEASUREMENT AND CONTROL PROPRIETARY INFORMATION - For Authorized Company Use Only	DESIGN PRACTICES	
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		Date December, 1999	

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Revision Memo

12/99	Updated; rationalized, deleted self-contained pressure regulator since typical of Industry Standard. Reference to hysteresis of switches no longer an issue with new static o-rings in use on most pressure switches (item deleted).
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DESIGN PRACTICES		INSTRUMENTATION	
Section XII-D	Page 2 of 4	PRESSURE MEASUREMENT AND CONTROL	
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SCOPE

This section covers aspects of pressure measurement and control that are useful for the preparation of a Process Design Specification. Pressure control recommendations for specific applications are covered in applicable Design Practices. For example: pressure control of fractionation (covered in [DP Section XII-H, Fractionator Control](#)), pressure control of boilers, (covered in [DP Section XII-I, Boiler Control](#)); and pump or compressor suction / discharge control (covered in applicable [Section XI DPs](#)).

REFERENCES

DESIGN PRACTICES

[Section X](#) Pumps
[Section XI](#) Compressors
Other sections of [Section XII](#)

INTERNATIONAL PRACTICES

[IP 3-6-1](#), Piping for Instruments
[IP 15-3-1](#), Pressure Instruments
[IP 15-6-1](#), Electronic and Pneumatic Instruments

PRESSURE MEASUREMENT

In process design and operation, pressure measurement gives few problems. Any problems encountered are usually of an instrument engineering nature, rather than of a process nature. The measuring elements are available in a number of types that cover the full range of pressures encountered in refineries and chemical plants. Modern "smart" transmitters typically include microprocessor components to improve accuracy and to allow range changes remotely. Smart transmitters are often preferred on new projects because of remote programming capability, improved accuracy, and good diagnostic features. Some new projects are now using the smart transmitter in its fully digital version, doing away with conventional 4 – 20 mA analog signal.

Two considerations in which designers and operators may become involved are over-range protection and tower differential pressure measurements.

PRESSURE GAUGES

The most frequently used pressure measurement device is the local pressure gauge. In the past, when pneumatic and early electronic transmitters were in use, they had no built-in pressure indicator and the general practice was to locate a pressure gauge adjacent to each pressure transmitter – as well as at any location where a pressure reading was desired for the local operator, but not required in the control room. Today, electronic pressure transmitters are highly accurate and dependable, and available with local electronic indicators, eliminating the need for a duplicate, local pressure gauge.

Pressure gauges should be installed only where there is a real need for a local pressure indication, such as for startup, local manual operations, such as switching pumps, or other special applications.

PRESSURE SWITCHES

A problem frequently overlooked when specifying pressure switches for PL(CO/CI) or PH(CO/CI) during process design is the need for a reasonable range between the pressure switch set point and the normal operating pressure. Many pressure switches have a significant dead band, and cannot be used in these situations.

OVER-RANGE PROTECTION

In many applications, the pressure measuring element is subject to two quite different sets of conditions. The first set is the range of pressures during normal plant operations. The second set is the range of pressures during abnormal but foreseeable times, such as during a regeneration period, safety valve venting or shutdown. An example of the latter is a vacuum tower pressure transmitter, 0 – 100 mm Hg absolute pressure range, that must withstand atmospheric pressure (760 mm Hg abs) on shutdown; a 660% over-range. Obtaining suitable over-range protection is usually not difficult. The procurement engineer specifies the needed protection, based on normally available information in the design specification. In any event, the connected pressure device (gauge, switch, transmitter) should be specified to withstand the maximum allowable working pressure of the piping or vessel to which it is connected.