CONTROL VALVE TERMINOLOGY

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

ACTUATOR:

A fluid -powered or electrically powered device that supplies force and motion to a *valve closure member*.

AIR SET:

Also *supply pressure regulator*. A device used to reduce plant air supply to valve positioners and other control equipment. Common reduced supply pressures are 20 and 35 psig.

AIR-TO-CLOSE:

An increase in air pressure to the *actuator* is required to cause the valve to close. This is another way of saying the valve is *fail open* or Normally Open.

AIR-TO-OPEN:

An increase in air pressure to the *actuator* is required to cause the valve to open. This is another way of saying the valve is *fail closed* or Normally Closed.

ANSI:

An abbreviation for the American National Standards Institute.

ANTI-CAVITATION TRIM:

A special trim used in *control valves* to stage the pressure drop through the valve, which will either prevent the *cavitation* from occurring or direct the bubbles that are formed to the centre of the flow stream away from the valve *body* and *trim*. This is usually accomplished by causing the fluid to travel along a torturous path or through successively smaller orifices or a combination of both.

API:

An abbreviation for the American Petroleum Institute.

ASME:

An abbreviation for the American Society of Mechanical Engineers.

ASTM:

An abbreviation for the American Society for Testing and Materials.

BALANCED TRIM:

A trim arrangement that tends to equalise the pressure above and below the valve plug to minimise the nett static and dynamic fluid flow forces acting along the axis of the stem of a *globe valve*. Some regulators also use this design, particularly in high pressure service.

BELLOWS SEAL BONNET:

A *bonnet* which uses a *bellows* for sealing against leakage around the valve plug stem.

BENCH SET:

The proper definition for bench set is the *inherent diaphragm pressure range*, which is the high and low values of pressure applied to the diaphragm to produce rated valve plug travel with atmospheric pressure in the valve body. This test is often performed on a work bench in the Instrument shop prior to placing the valve into service and is thus known as Bench set.

BODY:

The body of the valve is the main pressure boundary. It provides the pipe connecting ends and the fluid flow passageway. It can also support the seating surface and the valve *closure member*.

BONNET:

The bonnet or bonnet assembly is that portion of the valve pressure retaining boundary which may guide the stem and contains the *packing box* and *stem seal*. The bonnet may be integral to the valve body or bolted or screwed. The bonnet if it is detachable, will generally provide the opening to the valve body cavity for removal and replacement of the internal TRIM. The bonnet is generally the means by which the actuator is connected to the valve body.

BOOSTER:

A pneumatic relay that is used to reduce the time lag in pneumatic circuits by reproducing pneumatic signals with high-volume and or high pressure output. These units may act as volume boosters or as amplifiers. A 1:2 booster will take a 3 to 15 psig input signal and output a 6 to 30 psig signal. It has also been shown that a booster may improve the performance of a control valve by replacing a positioner. It can provide the same stroking speed and can isolate the controller from the large capacitive load of the actuator.

BUBBLE TIGHT:

A commonly used term to describe the ability of a control valve or regulator to shut off completely against any pressure on any fluid. Unfortunately it is completely unrealistic. Control valves are tested to ANSI B16.104 and FCI70-2-1976 which is the American National Standard for Control Valve Seat Leakage. This standard uses 6 different classifications to describe the valves seat leakage capabilities. The most stringent of the these is Class VI which allows a number of bubbles per minute leakage, depending on the port size of the valve. The correct response to the question "Will that valve go "Bubble Tight"? is to say this valve is tested to meet Class VI shutoff requirements.

BUTTERFLY VALVE:

A valve with a circular body and a rotary motion disk closure member which is pivotally supported by its stem. Butterfly valves come in various styles including eccestric and high-performance valves. Butterfly valves are *high recovery* valves and thus tend to induce *cavitation* in liquid services at much lower pressure drops and fluid temperature than the globe style valves, many people limit the travel of the valve at 60 degrees of rotation on throttling services. This can also help keep the valve out of *cavitation* problems.

CAGE:

A hollow cylindrical trim element that is sometimes used as a guide to align the movement of a *valve plug* with a *seat ring*. It may also act to retain the seat ring in the valve body. On some types of valves, the cage may contain different shaped openings which act to characterise the flow through the valve. The cage may also act as a *noise attentuation* or *anti-cavitation* device.

CAGE GUIDED VALVE:

A type of *globe style* valve trim where the valve plugs with the seat.

CAVITATION:

Occurs only in liquid service. In its simplest terms cavitation is the two stage process of vaporisation is simply the boiling of a liquid which is also known as *flashing*. In a control valve this vaporisation takes place because the pressure of the liquid is lowered. Instead of the more common occurrence where the temperature is raised. As fluid passes through a valve just downstream of the orifice area, there is an increase in velocity or kind of energy that is accompanied by a substantial decrease in pressure or potential energy. This occurs in an area called the *vena contracta*. If the pressure in this area falls below that of the vapour pressure of the following fluid, vaporisation (boiling) occurs. Vapour bubbles then continue downstream where the velocity of the fluid begins to slow and the pressure in the fluid recovers. The vapour bubbles then collapse or implode. Cavitation can cause a *Choked Flow* condition to occur and can cause mechanical damage to valves and piping.

CHOKED FLOW:

Also known as *critical flow*. This condition exists when at a fixed upstream pressure the flow cannot be further increased by lowering the downstream pressure. This condition can occur in gas, steam or liquid services. Fluids flow through valve because of a difference in pressure between the inlet (P1) and outlet (P2) of the valve. This pressure difference (Delta-P) or pressure drop is essential to moving the fluid. Flow is proportional to the square root of the pressure drop. Which means that the higher the pressure drop is the more fluid can be moved through the valve. If the inlet pressure to a valve remains constant, then the differential pressure can only be increased by lowering the outlet pressure. For gases and steam, which are compressible fluids, the maximum velocity of the fluid through the valve is limited by the velocity of the propagation of a pressure wave which travels at the speed of sound in the fluid. If the pressure drop is sufficiently high, the velocity in the flow stream at the *vena contracta* will reach the velocity of sound. Further decrease in the outlet pressure will not be felt upstream because the pressure wave can only travel at sonic velocity and the signal will never translate upstream. Choked flow can also occur in the liquids but only if the fluid is a *flashing* or *cavitation* condition. The vapour bubbles block or choke the flow and prevent the valve from passing more flow by lowering the outlet pressure to increase the pressure drop. A good Rule of Thumb on Gasses and Steam service is that if the pressure drop across the valve equals or exceeds one half the absolute inlet pressure, then there is a good chance for a choked flow condition.

Example: P1 = 100psig
P2 = 25psig
Delta P = 75
P1 (ABS) = 100 + 14.7 or 114.7
½ of 114.7 = 57.35
Actual pressure drop = 75
Choked Flow is probable.

The style of valve (that is whether it is a *high recovery* or a *low recovery* style) will also have an effect on the point at which a choked flow condition will occur.

CLOSURE MEMBER:

The movable part of the valve which is positioned in the flow path to modify the rate of flow through the valve. Some of the different types of closure members are the Ball, Disk, Gate, and Plug.

COEFFICIENT FLOW:

A constant (Cv) that is used to predict the flow rate thorough a valve. It is related to the geometry of the valve at a given valve opening. See Cv.

CONTROL VALVE:

Also known as the *final control element*. A power operated device used to modify the fluid flow rate in a process control system. It usually consists of a *body* or *valve* and an *actuator*, which responds to a signal from the controlling system and changes the position of a *flow controlling element* in the valve.

CONTROL VALVE GAIN:

The relationship between valve travel and the flow rate through the valve. It is described by means of a curve on a graph expressed as an *installed* or *inherent characteristic*.

CONTROLLER:

A device which tells a *control valve* what to do. Controllers can be either pneumatic or electronic. There are pressure temperature, ph, level, differential and flow controllers. The job of the controller is to sense one of the above variables and compare it to a set point that has been established. The controller then outputs a signal either pneumatic or electronic to the control valve, which then responds so as to bring the process variable to the desired set point.

CRITICAL FLOW:

See the definition for *choked flow*.

Cv:

The *valve flow coefficient* is the number of US. gallons per minute of 60 degree F water that will flow through a valve at a specified opening with a pressure drop of 1 psi across the valve.

DELTA-P:

Differential Pressure. The inlet pressure (P1) minus the outlet pressure (P2).
Example:
P1 = 100psig
P2 = 25psig
Delta-P = 75

DIAPHRAGM:

A flexible pressure responsive element that transmits force to the diaphragm plate and actuator stem.

DIAPHRAGM ACTUATOR:

Is a fluid (usually pneumatic) pressure operated, spring opposed diaphragm assembly which positions the valve stem in response to an input signal.

DIAPHRAGM PRESSURE:

See Bench Set.

DIAPHRAGM VALVE:

A valve with a flexible linear motion *closure member* that is forced into the internal flow passageway of the *body* by the *actuator*. Pinch or Clamp Valves and Weir type valves fall into this category.

DIRECT ACTING:

This term has several different meanings depending upon the device it is describing. A *direct acting actuator* is one in which the actuator stem extends with an increase in diaphragm pressure. A *direct acting valve* is one with a *push down to close* plug and seat orientation. A *direct acting positioner* or a *direct acting controller* outputs an increase in signal in response to an increase in set point.

DIRECT ACTUATOR:

Is one in which the actuator stem extends with an increase in diaphragm pressure.

DUAL SEATING:

A valve is said to have dual seating when it uses a resilient or composition material such as TFE, Kel-F, or Buna-N, etc. For its primary seal and a metal to metal seat as a secondary seal. The idea is that the primary seal will provide tight shut off Class VI and if it is damaged the secondary seal will backup the primary seal with Class IV shut-off.

DYNAMIC UNBALANCE:

The total force produced on the valve plug in any stated open position by the fluid pressure acting upon it. The particular style of valve, i.e. single ported, double ported, flow to open, flow to close, has an effect on the amount of dynamic unbalance.

EFFECTIVE AREA:

For a *diaphragm actuator*, the effective area is that part of the diaphragm area that is effective in producing a stem force. Usually the effective area will change as the valve is stroked - being at a maximum at the start and at a minimum at the end of the travel range. Flat sheet diaphragms are most effected by this, while moulded diaphragms will improve the actuator performance and a rolling diaphragm will provide a constant stem force throughout the entire stroke of the valve.

ELECTRIC ACTUATOR:

Also known as an Electro-Mechanical Actuator uses an electrically operated motor driven gear train or screw to position the actuator stem. The actuator may respond to either a digital or analogue electrical signal.

END CONNECTION:

The configuration provided to make a pressure tight joint to the pip carrying the fluid to be controlled. The most common of these connections are threaded, flanged, or welded.

EQUAL PERCENTAGE:

A term used to describe a type of valve flow characteristic where for equal increments of valve plug travel the change in flow rate with respect to travel may be expressed as a constant percent of the flow rate at the time of the change. The change in flow rate observed with respect to travel will be relatively small when the valve plug is near its seat and relatively high when the valve plug is nearly wide open.

EXTENSION BONNET:

A bonnet with a packing box that is extended above the body to bonnet connection so as to maintain the temperature of the packing above (cryogenic service) or below (high temp service) the temperature of the process fluid. The length of the extension depends on the amount of temperature differential that exists between the process fluid and the packing design temperature.

FACE-TO-FACE:

Is the distance between the face of the inlet opening and the face of the outlet opening of a valve or fitting. These dimensions are governed by ANSI/SA specifications.

The following Uniform face-to-face Dimensions apply.

SPECIFICATION VALVE TYPE:

ANSI/SA S75.03 INTEGRAL FLANGED GLOBE STYLE CONTROL VALVES.
ANSI/SA S75.04 FLANGELESS CONTROL VALVES
ANSI/SA S75.20 SEPARABLE FLANGE GLOBE STYLE CONTROL VALVES

FAIL CLOSED:

Or *normally closed*. Another way of describing an *air-to-open* actuator. Approximately 80% of all spring return diaphragm operators in the field are of this construction.

FAIL-IN-PLACE:

A term used to describe the ability of an actuator to stay at the same percent of travel it was in when it lost its air supply. On *spring return actuators* this is accomplished by means of a *lock up valve*. On *piston actuators* a series of compressed air cylinders must be employed.

FAIL-OPEN:

Or *normally open*. Another way of describing an *air-to-close* actuator.

FAIL SAFE:

A term used to describe the desired failure positioner of a control valve. It could *fail closed*, fail open, *fail-in-place*. For a spring return operator to fail in place usually requires the use of a lock up valve.

FEEDBACK SIGNAL:

The return signal that results from a measurement of the directly controlled variable. An example would be where a control valve is equipped with a positioner. The return signal is usually a mechanical indication of valve plug stem position which is fed back into the positioner.

F: Or PRESSURE RECOVERY FACTOR.

A number used to describe the ratio between the pressure recovery after the *vena contracta* and the pressure drop at the vena contracta. It is a measure of the amount of pressure recovered between the vena contracta and the valve outlet. Some manufacturers use the term Km to describe the pressure recovery factor. This number will be high (0.9) for a *globe style valve* with a torturous follow path and lower (0.8 to 0.6) for a *rotary style valve* with a streamlined flow path. On most rotary products the F^1 factor will vary with the degree of opening of the *valve closure member*. Note F^1 does not equal Km.

FLANGELESS:

A valve that does not have integral line flanges. This type of valve is sometimes referred to as a Wafer Style valve. The valve is installed by bolting it between the companion flanges with a set of bolts or studs called line bolting. Care should be taken that strain hardened bolts and nuts are used in lieu of all thread, which can stretch when subjected to temperature cycling.

FLANGELESS BODY:

See *flangeless* for a definition. this type of valve is very economical from a manufacturing and stocking standpoint because a valve that is rated as a 600# ANSI valve can also be used between 150# and 300# ANSI flanges thus eliminating the need to manufacture three different valve bodies or stock three different valve bodies. The down side is that valves with flangeless bodies are not acceptable in certain applications - particularly in refinery processes.

FLASHING:

Is the boiling or vaporising of a liquid. See the definition of *cavitation*. When the vapour pressure downstream of a control valve is less than the upstream vapour pressure, part of the liquid changes to a vapour and remains as a vapour unless the downstream pressure recovers significantly, in which case *cavitation* occurs. Flashing will normally cause a *choked flow* condition to occur. In addition the vapour bubbles can also cause mechanical damage to the valve and piping system.

FLOW CHARACTERISTIC:

The relationship between valve capacity and valve travel. It is usually expressed graphically in the form of a curve. *Control valves* have two types of characteristics *inherent* and *installed*. The *inherent* characteristic is derived from testing the valve with water as the fluid and a constant pressure drop across the valve. When valves are installed into a system with pumps, pipes and fittings, the pressure dropped across the valve will vary with the travel. When the actual flow in a system is plotted against valve opening, the curve is known as the *installed* flow characteristic. Valves can be characterised by shaping the plugs, orifices, or cages to produce a particular curve. Valves are characterised in order to try to alter the valve gain. Valve gain is the flow change divided by the control signal change. This is done in an effort to compensate for nonlinearities in the control loop.

FLOW COEFFICIENT:

See the definition for C.

GAIN:

The relationship of input to output. If the full range of the input is equal to the full range of the output, then the gain is 1. Gain is another way to describe the sensitivity of a device.

GLOBE VALVE:

A valve with a linear motion, push-pull stem, whose one or more ports and body are distinguished by a globular shaped cavity around the port region. This type of valve is characterised by a torturous flow path and is also referred to as a *low recovery valve* because some of the energy in the flow stream is dissipated and the inlet pressure will not recover to the extent that it would in a more streamlined *high recovery valve*.

HANDWHEEL:

A manual override device used to stroke a valve or limit its travel. The handwheel is sometimes referred to as a hand jack. It may be top mounted, side mounted, in yoke mounted or shaft mounted and de-clutchable.

HARD FACING:

A material that is harder than the surface to which it is applied. It is normally used to resist fluid erosion or to reduce the change of galling between moving parts. Hard facing may be applied by fusion welding, diffusion, or spray coating the material. Alloy #6 or Stellite is a common material used for this purpose.

HARDNESS:

A property of metals that is discussed frequently when speaking of various component parts used in valve construction particularly valve trim. There are two hardness scales which are commonly used, Rockwell & Brinell.

HARDNESS COMPARISON

Rockwell Brinell
316 SST 76B 137
17-4 PH 34-38C 352
Hardened Inconel X-750 38-42C 401
#8 Stellite (Alloy 6) 40-44C 415
Chrome plating 59-67C 725
Note that 316 SST is on the Rockwell B scale which means it is a much softer material than the others shown.

HIGH RECOVERY VALVE:

A valve design that dissipates relatively little flow stream energy due to streamlined internal contours and minimal flow turbulence. Therefore, pressure down stretch of the valve *vena contracta* recovers to a high percentage of its inlet value. These types of valves are identifiable by their straight through flow paths. Examples are most rotary control valves, such as the eccentric plug, butterfly, and ball valve.

HYSTERESIS:

The difference between up scale and down scale results in instrument response when subjected to the same input approached from the opposite direction. Example: A control valve has a stroke of 1.0 inch and we give the valve a 9 psig signal. The valve travels 0.500 of an inch. We then give the valve a 12 psig signal, and the valve travels to 0.750 an inch. When the valve is then given a 9 psig signal, the stroke is measured at 0.501. That represents hysteresis. Hysteresis can be caused by a multitude of variables, packing friction, loose linkage, pressure drop, etc. If someone asks you what the hysteresis of your control valve is, it is a bum question because hysteresis is more aptly applied to an instrument than to a control valve. There are simply too many variables in the valve and the system to answer the question properly. The control valve only responds to the controller signal and will move to a position to satisfy the controller - thus negating the effects of hysteresis.

INCIPIENT CAVITATION:

Is a term used to describe the early stages of *cavitation*. At this point the bubbles are small and the noise is more of a hiss, like the sound of frying bacon. There is normally no mechanical damage associated with Incipient cavitation although it could have an effect on the corrosive properties of some fluids.

INHERENT DIAPHRAGM PRESSURE:

The high and low values of pressure applied to the diaphragm to produce rated valve plug travel with atmospheric pressure in the valve body. This is more commonly referred to as *bench set*.

INHERENT FLOW CHARACTERISTIC:

It is the relationship between valve capacity and valve travel and is usually expressed graphically. It is derived from testing a valve with water as the fluid and with a constant pressure drop across the valve. The most common types of inherent flow characteristics are *linear, equal percentage, modified parabolic, and quick opening*.

INSTALLED DIAPHRAGM PRESSURE:

The high and low values of pressure applied to the diaphragm to produce rated travel with stated conditions in the valve body. The "stated conditions" referred to here means the actual pressure drops at operating conditions. Example: A control valve may have an *inherent diaphragm pressure* or *bench set* of 8 to 15 psig. But when subjected to a 600 psig. Inlet pressure, it may start to open at 3 psig and be full open at 15 psig. It is because of the forces acting on the valve plug and the direction of flow through the valve (*flow-to-open* or *flow-to-close*) that the installed diaphragm pressure will differ from the inherent diaphragm pressure.

INSTALLED FLOW CHARACTERISTIC:

The flow characteristic when the pressure drop across the valve varies with flow and related conditions in the system in which the valve is installed. The purpose of characterising a control valve is to help compensate for non linearities in the control loop.

INSTRUMENT PRESSURE:

The output pressure from an automatic controller that is used to operate a control valve. It is the input signal to the valve.

INTEGRAL SEAT:

The flow control orifice and seat that is an integral part of the valve body or cage. The seat is machined directly out of the valve body and is normally not replaceable without replacing the body itself - although some can be repaired by welding and re-machining.

INTEGRAL FLANGE:

A valve body whose flange connection is an integral or cast part of the body. Valves with integral flanges were traditionally known to have the ANSI short *face-to-face* dimension ANSI /ISA S75.03. However many manufacturers now produce valve bodies with both integral and *separable flanges* that will meet both the ANSI short and long face to face dimensions.

I/P:

An abbreviation for current to pneumatic signal conversion. This term is commonly used to describe a type of transducer that converts an electric (4 -20 ma) input signal to a pneumatic (3 - 15 psig.) output signal.

LANTERN RING:

A rigid spacer used in the packing with packing above and below it. The lantern ring is used to allow lubrication to the packing or allow access to a leak off connection. On some of the new fugitive emission packing systems, it also acts as a stem guide.

LAPPED-IN:

A term that describes a procedure for reducing the leakage rate on metal to metal seated valves and regulators. The plug and seat are lapped together with the aid of an abrasive compound in an effort to establish a better seating surface than would normally be achieved by means of machining.

LEAKAGE CLASSIFICATION:

A term used to describe certain standardised testing procedures for *control valves* with a *flow coefficient* grater then 0.1 (C). These procedures are outlined in ANSI Standard d 815.104-1976, which gives specific tests and tolerances for six seat leakage classifications. It should be remembered that these test are used to establish uniform acceptance standards for manufacturing quality and are not meant to be used to estimate leakage under actual working conditions. Nor should anyone expect these leakage rates to be maintained after a valve is placed in service. There is no standard test for *self contained regulator* at this time. Note! You will see many instances where regulators are specified using the above criteria.

LEAK OFF:

A term used to describe a threaded connection located on the *bonnet* of a valve that allows for the detection of leakage of the process fluid past the packing area.

LINEAR FLOW CHARACTERISTIC:

A characteristic where flow capacity or (c) increases linearly with valve travel. Flow is directly proportional to valve travel. This is the preferred valve characteristic for a control valve that is being used with a distributive control system (DCS) or programmable logic controller (PLC).

LINEAR VALVE:

Another name for a *globe valve*. It refers to the linear or straight line movement of the plug and stem.

LIQUID PRESSURE RECOVERY:

See (F).

LOADING PRESSURE:

The pressure used to position a pneumatic actuator. It is the pressure that is actually applied to the actuator diaphragm or piston. It can be the *instrument pressure* if a valve positioner is not used or is by passed.

LOCK-UP VALVE:

A special type of regulator that is installed between the valve *positioner* and the valve *actuator* where it senses the supply air pressure. If that pressure fails below a certain level, it locks or traps the air loaded into the actuator causing the valve to *fail-in-place*.

LOW RECOVERY VALVE:

A valve design that dissipates a considerable amount of flow stream energy due to turbulence created by the contours of the flow path. Consequently, pressure downstream of the valve *vewna contracta* recovers to a lesser percentage of its inlet value than a valve with a more streamlined flow path. The conventional *globe style* control valve is in this category.

MODIFIED PARABOLIC:

A *flow characteristic* that lies somewhere between *linear* and *equal percent*. It provides fine throttling at low flow capacity and an approximately linear characteristic at higher flow capacities.

NORMALLY CLOSED:

See *air-to-open*

NORMALLY OPEN:

See *air-to-close*.

P1. Is used to designate Inlet pressure.

P2. Is used to designate Outlet pressure.

PACKING:

A sealing system that normally consists of a deformable material such as TFE, graphite, asbestos, etc. It is usually in the form of solid or split rings contained in a *packing box* that are compressed so as to provide an effective pressure seal.

PACKING BOX:

The chamber located in the *bonnet* which surrounds the stem and contains the *packing* and other stem sealing components.

PACKING FOLLOWER:

A part that transfers a mechanical load to the *packing* from the packing flange or nut.

PISTON ACTUATOR:

A fluid powered normally pneumatic device in which the fluids acts upon a movable cylindrical member, the piston, to provide linear motion to the actuator stem. These units are spring or air opposed and operate at higher supply pressure than a *spring return actuator*.

PLUG:

See *closure member*.

PORT GUIDED:

A valve plug that fits inside the seat ring, which acts as a guide bushing. Examples: Splined Plug, Hollow Skirt, and the Feather Guide Plug.

POSITION SWITCH:

A switch that is linked to the valve stem to detect a single, pre-set valve stem position. Example: Full open or full closed. The switch may be pneumatic, hydraulic, or electric.

POSITION TRANSMITTER:

A device that is mechanically connected to the valve stem and will generate and transmit either a pneumatic or electric signal that represents the valve stem position.

POSITIONER:

A device used to position a valve with regard to a signal. The positioner compares the input signal with a mechanical feed back link from the actuator. It then produces the force necessary to move the actuator output until the mechanical output position feedback corresponds with the pneumatic signal value. Positioners can also be used to modify the action of the valve (reverse acting positioner), alter the stroke or controller input signal (split range positioner), increase the pressure to the valve actuator (amplifying positioner), or alter the control valve *flow characteristic* (characterised positioner).

POST GUIDE:

A guiding system where the valve stem is larger in the area that comes into contact with the guide bushings than in the adjacent stem area.

PUSH-DOWN-TO-CLOSE:

A term used to describe a *linear* or *globe style* valve that uses a *direct acting* plug and stem arrangement. The plug is located above the seat ring. When the plug is pushed down, the plug contacts the seat, and the valve closes. Note! Most control valves are of this type.

PUSH-DOWN-TO-OPEN:

A term used to describe a *linear* or *globe style* valve that uses a *reverse acting* plug and stem arrangement. The plug is located below the seat ring. When the plug is pushed down, the plug moves away from the seat, and the valve opens.

PRESSURE RECOVERY FACTOR:

See (F)

QUICK OPENING:

A *flow characteristic* that provides maximum change in flow rate at low travels. The curve is basically linear through the first 40% of travel. It then flattens out indicating little increase in flow rate as travel approaches the wide open position. This decrease occurs when the valve plug travel equals the flow area of the port. This normally happens when the valve characteristics is used for on/off control.

RANGEABILITY:

The range over which a control valve can control. It is the ratio of the maximum to minimum controllable *flow coefficients*. This is also called *turndown* although technically it is not the same thing. There are two types of rangeablility - Inherent and installed inherent rangeablility is a property of the valve alone and may be defined as the range of flow coefficients between which the gain of the valve does not deviate from a specified gain by some stated tolerance limit. Installed rangeablility is the range within which the deviation from a desired *installed characteristic* does not exceed some state tolerance limit.

REDUCED TRIM:

Is an undersized orifice. Reduced or restricted capacity trim is used for several reasons;

1. Adapts a valve large enough to handle increased future flow requirement with trim capacity properly sized for pressure needs.
2. A valve with adequate structural strength can be selected and still retain reasonable travel vs. capacity relationships.
3. A valve with a large body using restricted trim cannot be used to reduce inlet and outlet fluid velocities.
4. It can eliminate the need for pipe reducers.
5. Errors in over sizing can be corrected by use of restricted capacity trim.

REVERSE ACTING:

This term has several different meanings depending upon the device it is describing. A *reverse acting actuator* is one in which the actuator stem retracts with an increase in diaphragm pressure. A *reverse acting valve* is one with a *push-down-to-open* plug and seat orientation. A *reverse acting positioner* or a *reverse acting controller* outputs a decrease in signal in response to an increase in set point.

REVERSE FLOW:

Flow of fluid in the opposite direction from that normally considered the standard direction. Some *rotary valves* are considered to be bi-directional although working pressure drop capabilities may be higher in reverse flow.

ROTARY VALVE:

A valve style in which the *flow closure member* is tested in the flow stream to modify the amount of fluid passing through the valve.

SEAT LOAD:

The contact force between the seat and the valve plug. When an actuator is selected for a given control valve, it must be able to generate enough force to overcome static, stem and dynamic unbalance with an allowance made for seat load.

SEAT RING:

A part of the flow passageway that is used in conjunction with the *closure member* to modify the rate of flow through the valve.

SELF CONTAINED REGULATOR:

A valve with a positioning actuator using a self generated power signal for moving the closure member relative to the valve port or ports in response and in proportion to the changes in energy of the controlled variable. The force necessary to position the *closure member* is derived from the fluid flowing through the valve.

SEPARABLE FLANGE:

Also known as a *slip on flange*. A flange that fits over a valve body flow connection. It is generally held in place by means of a retaining ring. This style of flange connection conforms to ANSI / SA 275.20 and allows for the use of different body and flange material. Example:
A valve with a stainless steel construction could use carbon steel flanges. This type of valve is very popular in the chemical and petrochemical plants because it allows the use of exotic body materials and low cost flanges.

SOFT SEATED:

A term used to describe valve trim with an elastomeric or plastic material used either in the *valve plug* or *seat ring* to provide tight shutoff with a minimal amount of actuator force. A soft seated valve will usually provide CLASS VI seat leakage capability.

SPLIT BODY:

A valve whose body is split. The design allows for easily plug and seat removal. Split bodied valves are made in both the straight through and angle versions.

SPRING RATE:

A term usually applied to *self contained regulators* describing the range of set point adjustment available for a particular range spring.

STATIC UNBALANCE:

The nett force produced on the valve stem by the fluid pressure acting on the *closure member* and *stem* within the pressure retaining boundary. The closure member is at a stated opening with a stated flow condition. This is one of the forces an actuator must overcome.

STELLITE:

Also called #6 Stellite or Alloy 6. A material used in valve trim known for its hardness, wear and corrosion resistance. Stellite is available as a casting, barstock material and may be applied to a softer material such as 316 stainless steel by means of spray coating or welding.

STEM:

The *valve plug stem* is a rod extending through the bonnet assembly to permit positioning of the plug or *closure member*. The *actuator stem* is a rod or shaft which connects to the valve stem and transmits motion or force from the actuator to the valve.

STEM GUIDE:

A guide bushing closely fitted to the valve stem and aligned with the seat. Good stem guiding is essential to minimising packing leakage.SUPPLY PRESSURE:The pressure at the supply port of a device such as a controller, positioner or transducer. Common values of control valve supply pressure are 20 psig. for a 3-15 psig output and 35 psig. for a 6-30 psig output.

STROKE:

See *travel*

TRANSDUCER:

An element or device which receives information in the form of one quantity and coverts it to information in the form of the same or another quantity. (See *I/P*).

TRAVEL:

The distance the plug or stem moves in order to go from a full- closed to a full-open position. Also called *stroke*.

TRIM:

Includes all the parts that are in flowing contact with the process fluid except the body, *bonnet* and body flanges and gaskets. The plug, seats, stem, guides, bushings and cage are some of the parts included in the term trim.

TRUNNION MOUNTING:

A style of mounting the disc or ball on the valve shaft or stub shaft with two bushings diametrically opposed.

TURNDOWN:

A term used to describe the ration between the minimum and maximum flow conditions seen in a particular system. Example: If the minimum flow were 10 G.P.M and the maximum flow were 100 G.P.M the turndown would be 10.1. This term is sometimes incorrectly applied to valves. See *rangeability*.

VALVE:

A device which dispense, dissipates, or distributes energy in a system.

VALVE BODY:

See *body*

VALVE FLOW COEFFICIENT:

See *Cv*

VALVE PLUG:

See *closure member*

VENA CONTRACTA:

The location where the cross sectional area of the flow stream is at its minimum size, where fluid velocity is at its highest level and where fluid pressure is at its lowest level. The vena contracta normally occurs just downstream of the actual physical restriction in a control valve.