



PDHonline Course M164 (3 PDH)

Terminology of Valves Used in the Oil & Gas Industry

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Appendix E

VALVE GLOSSARY

There are a variety of terms used in the valve industry and the purpose of this appendix is to assist the reader. This valve glossary is a list of definitions, describing the types of valves, their functions, individual components, their materials of construction, and their design characteristics.

Accessory. A device attached to the actuator which provides an additional function, for example manual operation, positioner, etc.

Actual pressure drop. The difference between the inlet pressure and the outlet pressure of a valve.

Actuator. A device used to open/close or control the valve. Key types include electrical, hydraulic, and pneumatic. Movement may be quarter-turn or multi-turn. Actuators may be used when

- valves are remotely located (e.g., on pipelines)
- valves are located in hazardous areas
- manual operation would be time-consuming (e.g., with larger valves)

Actuator stem. A rod used in linear designed valves connecting the actuator with the stem of the valve.

Actuator stem force. The amount of force that is required to move the actuator stem to either open or close the valve.

Air filter. An accessory added to an actuator to prevent oil, dirt, or water in the air supply from entering the pneumatic actuator.

Air valve. Valve that is used to control the flow of air. Flows are normally small, so solenoid valves are suited.

Angle valve. A valve body where the inlet and outlet ports are at 90° to each other.

Arithmetic average roughness height. The measurement of the smoothness of a surface. In the case of valves refers to the flange faces and is usually given in microns or AARH: the smaller the value the smoother the surface is.

Back flow. When the normal process is reversed.

Back pressure. The pressure exerted on the downstream side of a valve seat.

Back seats. In linear valves, the area of the stem that enters the valve bonnet is sealed to prevent process fluid from entering the packing box and to prevent deterioration of the sealing materials.

Ball valve. A quarter-turn valve with a spherical closing element held between two seats. Characteristics include quick opening and good shut-off. Ball valves are widely used as on/off valves in the chemical process and other industries. Special designs (with V notches or fingers) are available for throttling applications. Larger valves with heavier balls (e.g., on pipelines) may use trunnions to help support the ball and prevent damage to soft internals. Designs are typically one, two, or three piece.

Bellows. A sealing device that prevents line media leaking between the stem and the body.

Blowdown. The discharge of process fluid to reduce the pressure in a piping system. This is usually done through a pressure relief device.

Body. The main pressure-containing component; contains the closure device.

Bonnet. The pressure-containing component that contains the packing box and the stem. It can be screwed, flanged, or welded to the body of the valve.

Breakout torque. The torque required to open or unseat a rotary valve.

Brinell hardness number. A number from 111 to 745 that indicates the relative hardness of a material. As the number increases the harder the material is said to become.

Bubble-tight. When there is no measurable seat leakage over a certain period of time during test conditions.

Butterfly valve. A quarter-turn valve, which has a circular disc as its closing element. The standard design has the valve stem running through the center of the disc, giving a symmetrical appearance. Later more complex designs offset the stem, so that the disc “cams” into the valve seat. Advantages include less wear and tear on the disc and seats, and tighter shut-off capabilities. Many design types are available including inexpensive Teflon[®] or resilient seats for use in water (treatment) plants, etc. More expensive metal seats can be used where high temperatures or aggressive chemicals are encountered. So-called “high-performance” butterfly valves offer zero leakage designs and have been applied in both the chemicals and hydrocarbon processing sectors.

Butt-weld end connection. A special end connection that is beveled to allow welding to a similarly beveled piece of pipe to allow a full penetration weld to be made.

Bypass valve. A valve smaller in diameter that is fitted in parallel to a larger main valve. Bypass valves are used to reduce the differential pressure across the main valve before this main valve is opened (as otherwise this larger, more expensive valve, may suffer damage to internal components). In some services they are used to warm up the downstream side of the valve, before opening the larger valve.

Certified dimensional drawing. A drawing that guarantees the overall dimensions of the valve that are required for installation. Sometimes called the general arrangement or GA.

Certified material test report. Information on the component that covers its chemical composition and its mechanical properties.

Chainwheel. A handwheel design that has sprockets that allow a chain-wheel to be wrapped around a semicircle section of the handwheel and used as a pulley to turn the stem. This is installed on valves that are installed at an elevated position where it is not possible to erect a platform or add a ladder.

Check valve. A valve that is designed to allow the fluid to flow in a given direction but closes to prevent back flow. Types include swing check, tilting-disc check, and wafer check, non slam (piston type). Check valves (also called non-return valves) are usually self-acting.

Class. The class is used to describe the pressure rating of the piping system. For example Class 150 lb, 300 lb, 600 lb, 900 lb, or API 3000, API 5000. This relates to the maximum allowable design pressure that a flange of certain dimensions and made of a certain material can be used with in a piping system.

Concentric butterfly valve. A butterfly valve with the disc installed in the center of the valve.

Control valve. A valve that regulates the flow or pressure of a fluid. Control valves normally respond to signals generated by independent devices such as flow meters or temperature gauges. Control valves are normally fitted with actuators and positioners. Pneumatically actuated globe valves are widely used for control purposes in many industries, although quarter-turn types such as (modified) ball and butterfly valves may also be used.

Corrosion. The deterioration of a metal that is caused by a chemical reaction. This is sometimes called “weight loss.”

Cryogenic valves. Valves suited for use at temperatures below -45 degrees Celsius. A cryogenic valve should have a cold box as an integral part of the body to allow a vapor barrier to form between the packing box and the liquified gas.

C_V . The C_V of a valve is defined as 1 U.S. gallon of 60°F water during 1 minute with a 1 psi pressure drop. Also known as the valve coefficient or the flow coefficient.

Cylinder. A pressure-containing component and the part of an actuator that houses a piston that will be powered either pneumatically or hydraulically.

Design pressure. The pressure used during the design of a piping system, and defines the criteria for pipe wall thickness, fittings, flanges, valves, bolt torque, and threads.

Design temperature. The temperature used during the design of a piping system, and defines the criteria for pipe wall thickness, fittings, flanges, valves, bolt torque, and threads.

Destructive test. A test during which all or part of a component is destroyed by mechanical or chemical means to discover its properties.

Diaphragm valve. A bi-directional valve that is operated by applying an external force to a flexible element or a diaphragm (typically an elastomer). Diaphragm valves may be used for slurries (where other valve designs might clog) or in hygienic applications.

Differential pressure. The pressure difference between the upstream and the downstream ports of a valve. Also called the delta P.

Direct-acting actuator. A diaphragm actuator that allows the actuator stem to extend.

Disc. The closure component in a butterfly valve (rotary) or a globe valve (linear).

Diverter valve. A valve that can change the direction of the flow of a medium to two or more different directions.

DN. The ISO standard abbreviation for the nominal diameter of the line pipe size in metric units. 4" = 100 DN.

Double-acting positioner. A positioner that has the facility to supply and exhaust air on both sides of the actuator piston or diaphragm at the same time.

Double block and bleed. A valve configuration in which positive shut-off is achieved at both the inlet and outlet sides. A small port is fitted to discharge fluid in the intermediate space. Fitting a gas detector to the port provides assurance of the integrity of the upstream seal. This configuration is often required to isolate high-pressure sections of a system to facilitate safe maintenance, etc.

Double disc check valve. A check valve with two semicircular discs that are hinged together and that fold together when the flow is in the correct direction and swing closed when the flow is reversed. Also known as a split disc check valve.

Downstream. The process stream after it has passed through the valve.

Drop tight. A bubble-tight test that involves a water-under-air test.

Ductility. The characteristic of a metal to deform when placed under force. Ductility is measured by the percentage increase of a stretched test piece, just prior to fracture.

Dye penetrant. A bright red or fluorescent dye that is used to detect surface cracks, pitting, or porosity. It is applied by spray and the excess dye is wiped away to expose surface flaws that can be detected by natural or fluorescent light.

Eccentric butterfly valve. A butterfly valve where the shaft that carries the closure disc is slightly offset and creates an elliptical motion as it leaves the sealing surface. This effect reduces friction and wear to the closure disc.

Elastomer. A polymer that is both flexible and resilient when used as a seal.

Electric actuator. An actuator that uses an electric motor to operate the valve stem.

Electrohydraulic actuator. An actuator that supplies hydraulic power to control the valve, but has an electric power source.

End connection. The part of the valve that joins to the piping system. This could be screwed, socket weld, flanged, butt weld, clamped, soldered.

End to end. The extremities of the valve. One connection to the other end connection.

Erosion. Material weight loss inside a piping system, caused by the process flow. This is not a consideration in process flows that have been adequately filtered and where entrained solids are not present.

Examination. The review of a complete valve or its individual components to confirm that it complies with the user's requirements.

Explosion proof. An assurance that an electrical device can be used in an area that is potentially explosive. This device must be detached from any electrical source that might arc.

Extended bonnet. Used when the medium is at high or low temperatures, to avoid damage to the sealing elements.

Fail closed. An actuator facility such that in the event of power failure the valve will move to the fully closed position.

Fail open. An actuator facility such that in the event of power failure the valve will move to the fully open position.

Fail-safe. An actuator facility such that in the event of power failure the valve will move to a predetermined position, which could be open, closed, or an intermediate position.

Fire resistant. The ability of a valve to withstand a fire and maintain the failure position. Such a valve will be equipped with devices to achieve this status.

Fire-safe. The ability of a valve to minimize the amount of process lost downstream or to the atmosphere after a fire test.

Flashing. Caused when the pressure at the vena contracta falls below the vapor pressure, followed by a pressure recovery that is maintained. This creates vapor bubbles that continue downstream. The liquid/gas mixture increases the velocity of the process stream, which can result in excessive noise.

Flat face. A flange that has no raised face or a ring groove surface. These flanges are generally used in lower piping pressure classes such as ASME 125 lb or 150 lb in cast iron and carbon steel. The mating gasket will be flat and extend to the circumference with holes to accommodate the flange bolting.

Flat gasket. A circular, flat sheet with an inside and outside diameter. An annulus.

Floating ball. A ball valve where the closure ball is not attached to the body of the valve.

Floating seat. A seat ring that is not attached to the valve body and can move to suit the closure element and improve the shut-off.

Float valve. A valve that automatically opens or closes as the level of a liquid changes. The valve is operated mechanically by a float that rests on the top of the liquid.

Fluid. A material that can flow; includes gases, liquids, slurries, pellets, and powders.

Full bore. Term used for example of a ball valve, to indicate that the internal diameter of the valve opening is the same as that of the piping to which it is fitted.

Full-bore valve. Any valve where the closure element has the same inside diameter as the inlet and outlet of the valve. Also called a full-port valve and has a lower pressure drop than a reduced bore.

Full closed. The position of the valve when the closure element is fully seated.

Full lift. When a pressure relief valve is fully open upon overpressurization of the piping system.

Full open. The position of the valve when the closure element is fully open allowing maximum flow through the valve.

Full trim. The area of the valve's seat that can pass the maximum flow for that particular size.

Galling. The damage of two mating parts when microscopic portions impact and make a temporary bond. When effort is made to separate these two surfaces, tearing of the two components can occur. This usually happens when the two materials are the same or possess several very similar mechanical characteristics.

Gasket. A soft or a hard sealing material used in conjunction with flanges.

Gate valve. A multi-turn valve that has a gate-like disc and two seats to close the valve. The gate moves linearly, perpendicular to the direction of flow. This type of valve is normally used in the fully opened or fully closed position; it is not suited to throttling applications. Gate valves provide robust sealing, and are used extensively in the petrochemicals industries. This class of valve also includes knife gate valves, conduit gate valves, and wedge gate valves. Knife gate valves have much thinner gates with a knife-like edge, making them suited to use with floating solids, for example as in the pulp and paper industries. Conduit gate valves have a rectangular disc as the closing element. One half of the disc is solid, to close the valve, the other half has a circular port, which can be used to open the valve. Wedge gate valves have a wedge-shaped gate, which "wedges" between floating seats to close the valve tightly.

Gearboxes. Used to ensure easier operation of larger valves, particularly ball valves.

Gland bushing. Or the packing follower. Located at the top of the packing box, it acts as a barrier, protects the packing from the atmosphere, and transfers a force from the gland flange bolting to the packing.

Gland flange. Part of the valve used to compress and retain the internals in the packing box.

Globe valve. A multi-turn valve with a closing element that moves perpendicularly to the valve body seat and generally seals in a plane parallel to the direction of flow. This type of valve is suited to both throttling and general flow control.

Graphite. A carbon-based gasket or packing material, suitable for ambient and high temperatures.

Hardfacing. The welding of a harder alloy over a softer base metal to create a more resistant surface.

Hardness. A material's ability to resist indentation.

Hardness Rockwell test. Method of testing and registering a material's hardness based on the depth of indentation. The higher the number the greater the hardness. This hardness is identified as HRB or HRC depending on the scale used.

Heat treating. The metal-producing process that involves heating and cooling to predetermined temperatures in a particular order and with specific holding times.

High-performance valves. A valve specifically designed for accurate throttling applications.

Hydraulic actuator. A device fitted to the valve stem which uses hydraulic energy to open, close, or regulate the valve. The hydraulic fluid may, according to the configuration, both open and close the valve, or just open the valve. In the latter case, a spring will typically be fitted inside the actuator to return it (and the valve) to the closed position.

Hydrostatic test. A test using water under pressure to detect any leaks through the body, sealing joints, or closure element. Generally this test pressure is 1.5 times the design pressure at ambient temperature.

Impact. A test that will determine the toughness of a particular material by measuring the force necessary to fracture the test piece.

Inclusion. A foreign object or particles found in a weld, forging, or casting that will have a detrimental effect on the component and cause failure or create a leak path.

Inlet. The port where the fluid enters the valve.

Inspection. The examination of a valve or a component by the end user or an authorized third party inspector. This is to confirm that the valve or component meets the user's requirements.

Integral flange. A flanged connection that is either fabricated or cast to the body of the valve.

Integral seat. A seat that is actually a machined part of the valve body and not one that is inserted into the valve.

Intrinsically safe. An electrical device that is not able to produce sufficient heat to cause ignition in the atmosphere.

Jacketed valve. Valve designed to incorporate a so-called jacket around the valve body. Steam is introduced into the jacket to keep the fluids being controlled at the required temperature.

Leakage. Process fluid that passes through a valve when it is fully closed.

Lever operator. A manual method of operating a valve that comprises a pivot handle.

Lift check valve. A non-return valve that prevents back flow by having a free floating element, either a ball or a poppet. The design incorporates a piston to damp the disc during operation.

Limit stop. A device in an actuator that limits the linear or rotary motion of an actuator; can be adjusted.

Limit switch. An electromechanical accessory that is attached to an actuator and used to identify the position of a valve's closure element.

Linear valve. A valve that has a sliding stem that pushes the throttling element up and down. See multi-turn.

Line blind. A pipeline shut-off device, whereby a flat disc is forced between two flanges. Line blinds are less expensive than valves, but require much more time to operate.

Locking device. A device that can be attached to a valve or an actuator and that will enable it to be locked closed or locked open. Prevents accidental operation as only authorized personnel can operate the valve.

Lug body. A body of a flangeless wafer butterfly valve that requires bolts to pass through the body to flanges on either side of the valve. These holes can be tapped to allow the line to be dismantled without "dropping" the valve. Tapped lugged valves are sometimes called "end of line" valves.

Magnetic particle inspection. Iron filings are spread over the area under examination. On passing an electric current through the examination piece, the filings will collect where there are imperfections.

Manual handwheel. A handwheel to open, close, or position a closing element, which does not require an actuator to make it function.

Manual valve. A valve that is worked by manual operation, such as a handwheel or a lever. These valves are generally used for on-off service.

Maximum allowable operating pressure. The maximum pressure that can be safely held in a piping system, expressed in bar (kilopascal) or psi. Determined by the material of construction, the maximum operating temperature, and the piping class. Also called the *Maximum allowable working pressure*.

Metal seat. A seat design where the fixed mating surface with movable closure component is made of metal. Metal-to-metal seats have greater leakage rates than soft seated valves, but they can be used at higher temperatures and pressures.

Mill test report. Report of the chemical testing and physical testing performed on a base material. This documentation is normally produced by the manufacturer and is often requested by the purchaser to confirm compliance to the specification.

Multiported. Multiported valves include additional inlet/outlet ports, to allow fluids to be directed. The ball and plug valve types are ideally suited to multiport designs.

Multi-turn. Category of valves (such as gate, globe, needle), which require multiple turns of the stem to move the valve from the fully open to the fully closed position. Also known as linear valves. See also *Quarter-turn*.

National pipe thread. A tapered thread that is used for pressure connections for piping.

Needle valve. Multi-turn valve that derives its name from the needle-shaped closing element. The design resembles that of the globe valve. Typically available in smaller sizes, they are often used on secondary systems for on/off applications, sampling, etc.

Non-destructive examination. A test to determine a characteristic of a piece of material or its reliability in use, without causing any damage or destruction to the material.

Non-return valve. A valve that allows the flow of a process fluid in only one direction. It will not allow any flow reversal.

Non-rising stem. A valve where the stem is threaded and the turning of a stationary operator will result in the closure element rising to open and lowering to close.

Normally closed. A valve that is normally closed during operation. In many cases these valves are locked closed by using a mechanical device.

Normally open. A valve that is normally open during operation. In many cases these valves are locked open by using a mechanical device.

On-off valve. Basic operation for a manual valve used to start or stop the flow of a process fluid.

Operating medium. The power supply used to operate an actuator: can be pneumatic, hydraulic, or electric.

Operating pressure. The pressure at which a valve usually operates under normal conditions. This is lower than the design pressure.

Operating temperature. The temperature at which a valve usually operates under normal conditions. This is lower than the design temperature.

Operator. A device, handwheel, lever, or wrench used to open, close, or position the closing element of a valve.

O-ring. An elastomer ring that forms a sealing material for the internals of a valve.

Packing. A soft sealing material that is used to prevent leakage of process fluid from around the stem. It is located in the packing box.

Packing box. A chamber through which the stem passes. This chamber houses the packing material, packing spacers, lantern rings, guides, and other seal accessories necessary to prevent leakage of process fluid.

Parallel gate valve. A gate valve that has a flat disc gate that slides between two parallel free floating seats.

PEEK. The abbreviation for polyether ether ketone. A robust soft seating material.

Penstock valve. A type of simple gate valve, used to contain fluids in open channels. Often found in waste water treatment plants.

Pilot valve. Small valve requiring little power that is used to operate a larger valve. See also *Solenoid valve*.

Pinch valve. A valve in which a flexible hose is pinched between one or two moving external elements to stop the flow. This valve is often used in slurry and mining applications, as its operation is not affected by solid matter in the medium. It is also used with certain gases, as the absence of possible leak paths to the atmosphere ensures good emission control.

Piping and instrument diagram. A schematic that indicates the process system, and includes items of equipment, valves, and associated instrumentation. Not to scale.

Piping schedule. A method of noting the wall thickness of a pipe, for example Sch 40, Sch 80, Sch 160. The larger the number the thicker the wall thickness of the pipe at a given nominal diameter.

Pitting corrosion. Surface corrosion that appears as small holes or cavities. Over time these cavities will increase in size and join to create larger cavities.

Plug. In globe valves the closure element can be a tapered plug that extends into the seat.

Plug valve. This multi-turn valve derives its name from the rotating plug that forms the closing element. The plug may be cylindrical or truncated. In the open position, the fluid flows through a hole in the plug. Lubricated plug valves rely on a sealing compound injected between the plug and the valve body, whilst sleeved plug valves are fitted with a “soft” insert between the plug and the body.

Pneumatic actuator. A device fitted to the valve stem which uses pneumatic energy to open/close or regulate the valve. The compressed air may, according to the configuration, both open and close the valve, or just open the valve. In the latter case, a spring will typically be fitted inside the actuator to return the valve to the closed position.

Polyethylene. A flexible thermoplastic that is used for valve seats.

Polypropylene. A thermoplastic that is not as flexible as polyethylene.

Poppet. A closure element in a check valve that is held in place by a spring.

Porosity. Small air bubbles that were created in the casting when the metal was molten. When the metal has cooled, these trapped bubbles weaken the structure and can cause failure in the component.

Positioner. A device that receives a signal—pneumatic or electric—from a controller and compares it to the actual position of the valve. If the signal is not correct then the positioner sends pressure to, or bleeds pressure from, the valve so that the correct position is achieved.

Positive material identification. A testing process that will identify the material specimen. It is possible to determine the approximate chemical composition.

Pressure drop. The difference between the upstream pressure and the downstream pressure of a valve.

Pressure reducing valve. A self-operating valve used to reduce any excess pressure in a system, for example steam. Also known as a PRV. The valve opens if the internal pressure exceeds that holding the closing element onto the seat.

Process flow diagram. A schematic that outlines the process in a plant, and which will include major in-line instrumentation and equipment. Pipe sizing and utility piping might not be shown.

Proximity switch. A limit switch that indicates the valve position without making mechanical contact. The switch will use a magnetic or an electronic sensor to determine the valve position.

psi. The abbreviation for pounds per square inch.

psia. The abbreviation for pounds per square inch absolute. The psia unit is used when the pressure is expressed without taking into account ambient pressure.

psig. The abbreviation for pounds per square inch gauge. The psig unit is used when the pressure is expressed to standard atmospheric pressure (noted 14.7 psia).

PT. The abbreviation for penetrant test.

PTFE. The abbreviation used for polytetrafluoroethylene.

Quarter-turn. The 90° angle through which a valve's closing element must move from the fully open position to the fully closed position. Examples are ball, plug, and butterfly valves.

Rack and pinion actuator. An actuator used in conjunction with quarter-turn valves. This actuator will supply either a pneumatic or a hydraulic force to move a flat-toothed rack that turns a gear to open and close the closure element.

Radiography. A method of examination that uses X-rays to produce an internal image of a test piece. The radiographic results on a film will reveal porosity, inclusions, and cracks within the material.

Raised face flange. A flange face that has a raised section on the mating surface. This raised section can come with various types of serrated finish. This allows greater loadings to be applied to the gasket and creates a more efficient seal than a flat face flange.

Reduced bore. Indicates that the internal diameter of the valve is lower than that of the piping to which the valve is fitted.

Reduced-port valve. A valve that has a smaller internal bore than those of the inlet and the outlet. A reduced-port (bore) ball valve will have a greater pressure drop than a full-port (bore) ball valve.

Regulating valve. Valve type used to regulate flows to provide a constant pressure output.

Ring type joint. A flanged end connection with a circular groove on the mating face, where a softer metal ring is placed before mating up to a similar flange face and bolting up. The softer ring, usually oval or hexagonal, will deform when the flanges are bolted up and create a tight seal. Ring type joint connections are used on higher-pressure piping systems, ASME 900 lb and above. The abbreviation is RTJ.

Safety valve. A pressure relief valve that is designed to reduce overpressurization in a gas or steam service.

Sampling valve. A valve that is fitted to a reactor or pipeline to allow small samples of a fluid to be withdrawn for further testing. In simple cases a standard gate or needle valve, for example, may be used. The disadvantage is that inappropriate use may result in spillage. As an alternative, valves are available which “trap” a small quantity of fluid in a chamber and only this small amount of fluid is released when the valve is operated.

Screwed bonnet. A valve bonnet with male threads to join a valve body with female threads.

Screwed end connections. End connections that have female national pipe thread (NPT), which mates with male NPT on a pipe.

Seal load. For linear valves, the force that must be generated by an actuator on a stem to overcome the various forces acting on the shaft during the opening, closing, or positioning of the closure element.

Seal weld. The fillet type weld required for socket weld fittings to prevent leakage.

Seat. A circular ring into which the closure element of a globe valve enters. This element is a plug, needle, or disc. The plug/needle/disc enters the circular ring (seat).

Seat pressure differential. The difference between the operating pressure and the set pressure for the system; the set pressure is the higher.

Seating torque. The torque value produced by a rotary actuator to open or close the valve.

Shaft. The rod that connects the closure element and the closure operator (handwheel or actuator).

Shut-off. When the valve is in a closed position and flow ceases.

Shut-off valve. The valve to achieve shut-off.

Single-acting actuator. An actuator in which air is applied to one chamber. This air pressure acts against and pushes a plate.

Sliding gate valve. A gate valve that has a flat rectangular plate as a closure element. Sometimes called a sluice valve and used for large bore irrigation and waterworks systems.

Slurry. A process fluid that contains undissolved solids.

Soft seat plug. An elastomer that is placed within a metal ring at the seating area of a globe valve. This will provide a bubble-tight shut-off.

Solenoid. An accessory to an actuator that acts as a control device. It can regulate the air supply to an actuator for on-off or throttling of the valve.

Solenoid valve. Valve, typically of the needle globe type, that is operated by an electrical solenoid. Such valves are often deployed as pilot valves, that is, fitted to actuators that in turn control larger valves.

Speed of response. The speed provided by an actuator to operate a valve. Sometimes called the stroking speed.

Spiral wound gasket. A gasket that contains hard and soft elements to create a seal. A stainless-steel strip is coiled to create a circular disc with small spaces that are then filled with graphite or another soft non-metallic material. A spiral wound gasket is held between two flanges and bolted up.

Split body. Usually refers to a ball valve that comprises more than one piece and houses the closure element.

Spring. In diaphragm actuators, this is the component that applies the force to act against the piston in the chamber. It provides the force necessary to move the closure element to the correct failure position.

Spring rate. The amount of force generated by a spring when it is compressed to a certain measurement.

Spring return. See *Pneumatic actuator*.

Stroke. The travel required by a valve, either linear type or rotary type, generally from fully open to fully closed.

Sub sea valve. A valve that is designed for use in seawater. For example, installed in a pipeline on the seabed.

Swing check. Non-return valve that has a hinged disc as the closing element.

Swing check valve. A check valve with a single plate pivoted at the top and secured to the body of the valve. The flow of the process fluid pushes the plate open and in the event of flow reversal the plate swings to the closed position.

Tank valve. A valve arranged for fitting at the bottom of a tank or process vessel.

Tensile strength. The maximum amount of force that can be applied to a piece of material, before failure occurs. Also called the ultimate tensile strength, UTS.

Thermoplastic. A common term for plastic used for piping that loses strength as the temperature rises. Such plastic is used for utilities and fluids of a corrosive nature, usually operating at ambient temperatures.

Three-way valve. A diverter type valve that has three ports and allows the flow path of the process fluid to be switched, or two different flow paths to be combined.

Throttling. The regulation of the process fluid by positioning the closure element of the valve between open and closed to create the desired flow regime.

Through-conduit gate valve. A full-bore gate valve that has a very low-pressure drop and allows for the passage of pipeline pigs or scrapers for cleaning, de-watering, batching, etc.

Thrust. The force generated by any type of actuator to open, close, or position the closure element of a valve.

Top mounted handwheel. An accessory handwheel that is mounted on top of the actuator and used if there is a power failure.

Top works. Any number of parts that are located above the bonnet of the valve. They could be the yoke, the handwheel, the positioner, the actuator.

Torque. The rotational force applied to the shaft of a valve.

Toughness. A material's ability to remain undamaged when a force is applied. A tough material will deform first, before failure occurs.

Trim. The trim of the valve is the parts of the closure element that are exposed to the process flow, sometimes called the wetted parts.

Trunnion mounted ball valve. A robust ball valve, where the closure element ball is supported at the base by a shaft. This design is more common on larger valves and higher ratings, because of the weight of the ball.

Tubing. Small bore piping used to supply air or hydraulic fluid to an actuator.

Turbulence. A flow characteristic that is created when higher velocities and obstructions are experienced in a valve or a process system.

Ultrasonic testing. A testing method that requires the material to be bombarded with high frequencies to detect inclusions, pits, and cracks within the material. These reflected sound waves will find the depth at which the flaws occur.

Upstream. The process fluid before it reaches the valve.

Velocity. The speed at which the process fluid passes through the valve.

Vent. An opening in a piping system that can be exposed to the atmosphere and allows fluid to be released.

Viscosity. The resistance of a process fluid to flow. The "thickness" or "thinness." Highly viscous fluids (thicker) require more energy to move through a piping system.

Visual examination. Surface examination of a specimen that is carried out with the human eye without any supplementary test.

V-ring packing. A stem packing that is V shaped in cross section. Radial forces that are applied will force out the packing radially and create a tight seal against the wall of the packing box and the stem/shaft.

Wafer design. The construction of wafer design valves allows them to be "sandwiched" between flanged sections of pipeline. The benefit is lower bolting requirements. Typically used with certain butterfly and check valves.

Wall thickness. The thickness of the pressure-retaining shell of a valve. It must be designed to satisfy all the necessary tests that the valve will be subjected to during examination.

Waterhammer effect. The reaction when a valve is suddenly closed and a shock wave is transmitted through the piping system. This is generally caused by under sizing of the piping system. It is not only noise, but it can also cause mechanical damage to the piping system and associated equipment.

Weir. An obstruction in a diaphragm valve, against which the elastomer liner is compressed to prevent the flow of the process fluid.

Wellhead valve. Used to isolate the flow of oil or gas at the takeoff from an oil or gas well. The design is usually a plug or gate valve.

Yield strength. The force at which a material will begin to deform or stretch.