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INTRODUCTION

When installing and commissioning a valve it is important that safe working practices are employed. Before working on any valve, refer to all relevant safety instructions including **Safety With Valves.** Some information in this bulletin is duplicated from the **Safety With Valves** bulletin.

GENERAL DESCRIPTION

Valves are used on process plant as a means of providing the correct distribution, isolation, relief and control of the flowing liquids or gases.

Control Products

In a control environment the valves enable the exchange of energy, reduction of pressure, or the control of temperature and flow. Used in a broad range of systems the control valve is often subjected to severe conditions of temperature, pressure, corrosion and contamination, but yet must still perform satisfactorily with a minimum amount of attention.

The control valve functions as a variable resistance in a pipe. It provides pressure drop by changing the turbulence in the process. This converts the pressure energy into heat, resulting in a small rise in temperature.

Control valves can either be rotary or linear and operate by means of axial motion provided by an actuator. Movement of the valve internals is achieved via the stem, operated by an actuator in response to an air or electrical supply signal.

On pneumatically operated positioning valves a positioner is used as a device to position, precisely, by the use of air, the moving parts of the valve. Using a positioner ensures that sufficient air is delivered to the actuator as is demanded by the process and any friction is overcome. The positioner will also overcome out of balance forces within the valve, thus allowing smaller actuator selection.

Isolation Products

Isolation type valves are produced in many forms such as ball, parallel slide, gate, none return, safety, etc. They can be automatically driven by spring or flow, manually driven using a suitable handwheel and gearbox or they can also be fitted with an actuator for ON/OFF control via a control system.

STORAGE

On receipt at site the container/packaging should be inspected for damage. If the valve has been shipped in a container, joints and seams should be checked for separation. If the container is undamaged it should not be opened until the valve is ready for installation.

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Once the container is opened, inspect the valve against the packing list to determine if there has been any apparent damage to the valve in transit. If damage has occurred please contact your contract administrator.

If the valve is to be stored for an extended period, desiccant in the containers should be changed periodically.

Although the valve is designed for outdoor use, the valve when shipped, is not suitable for storage outdoors as shipping covers etc, are not designed to protect against the ingress of water. The valves should therefore be stored in a covered weather tight, indoor environment which is clean and well ventilated. The valve should not be exposed to temperature extremes, below –29°C (-20°F) and above 48°C (120°F).

When a valve is to be stored for an extended period, remove the line covers and spray a light coating of machine oil on the internals. Replace the covers to prevent foreign matter from entering the valve body. To avoid damage to elastomers the valve should be stroked at least six times, from open to close, every four months.

Exposed parts should also be sprayed with a protective film of oil.

Actuators, instruments and control panels, where fitted, demand better storage conditions than the valves, and must be treated accordingly. Electrical entries that are not wired up, should be fitted with plastic transit plugs. Ensure that these are in place and that assemblies are water tight.

LIFTING

Good plant installation practices start with the proper handling of the valve from the time it is received at the site. It is important the personnel who handle the valve at all stages of its installation have fully read the installation instructions.

The valve will be shipped on/in a pallet/container designed to support the weight of the valve. When hoisting the valve, make sure that ropes or cables are of sufficient strength and are positioned so that any tubing or accessories will not be damaged.

When lifting a valve and actuator assembly only the valve superstructure and body should be used for attaching the lifting equipment. On no account should slings be attached to the actuator, handwheel or levers. Actuators should only be lifted when they are removed from the valve.

Always follow applicable lifting codes when handling the valve. Make sure:-

a) Slings are undamaged and free from kinks and twists
b) The load is lifted so that it is balanced and lifting hooks are positioned so that the valve does not swing.
c) Loads are not carried over people.

LOCATION

Ensure that the valve is located such that subsequent maintenance can be conveniently carried out, and that scaffolding can be safely erected around the valve.

The valve location should permit the erection and use of suitable lifting equipment capable of lifting the whole or part of the valve assembly.

The valve position indicators and handwheels, where fitted, should be accessible by the operator.

Ensure that connecting pipework is routed square and true and is adequately supported to prevent the valve being subjected to undue stresses.

The valve performs best when placed in a straight run away from pipe bends or sections of abnormal velocity.

Where the valve flow direction is critical, it must be installed in the pipe in the correct orientation. A flow marking is shown on the valve body where flow direction is critical.

A clearance of around 500mm should be allowed above the actuator for the removal of the actuator from the valve.

INSTALLATION

All valves are factory tested to ensure they meet the performance criteria as specified at the order stage. These tests include a seat leakage test and functional test. Other tests may also have been carried out in the factory as requested at the time of order.

Where applicable, the serial number or model number of the valve will be engraved on a plate either fastened to the actuator or wired to the

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valve. A note of the number should be made, and quoted when ordering spares.

By-Pass
A conventional three valve by-pass should be installed if it is necessary to continue operation during periods of valve servicing.

Weld Connections
All weld connections should comply with the appropriate specification, standards and codes and be suitable for the system, materials and application.

Ensure that the valve is in the part open position as this prevents heat transfer through the valve during the welding process.

Considerable valve distortion could occur if the welding is not carried out correctly and with care. Avoid slag splatter as its presence can be detrimental to the valve and adjacent plant items.

Where appropriate welding should be stress relieved.

Heat treat each weld separately. Keep the temperature of the seat area to a minimum and within the temperature rating of the valve. This is particularly important on pressed in type and soft seats.

Screwed Connections
Pipe threads should be clean and sharp. Use pipe compound on the male thread only.

Flanged Connections
When making flanged connections, tighten the bolts evenly, and progressively, to avoid placing strain on the body or cracking a flange.

Care should be taken not to exert undue stress on the valve body. While the body and connections are rugged structures, they are not intended to be a means of aligning improperly fitted pipe. Any stresses caused by improper pipe alignment should be relieved elsewhere in the pipe system.

Valve Orientation
Every effort should be made to install the valve so that on linear valves the stem travels in a vertical plane (unless the valve has been designed for horizontal service) with the actuator housing above the body of the valve. If the valve must be installed with the stem travelling in a horizontal plane please confirm with the sales engineer that it is suitable. It is also best to fit support braces to support the actuator assembly. An unsupported valve may have stem misalignment, resulting in unacceptable hysterisis and packing leakage.

Line Debris
Prior to start-up, determine whether the valve is likely to be a collection point for debris such as rust or weld scale. If so, temporary screens should be considered for installation immediately upstream. Alternatively if the system pipeline is being flushed out to remove line debris, removing the valve should be considered. The valve trim is a key component in the valve and the parts are precisely machined to close tolerances. Any line debris may cause damage to these parts and ultimately impede performance of the valve. Flushing kits can be provided if necessary.

Packing Adjustment
Tighten packing flange nuts evenly for optimum seal pressure on valve stem and packing box walls. Slightly more than hand tightening is adequate to stop any stem leakage. Over tightening will restrict stem movement. Refer to the valve operating instructions for more details.

Extended Bonnets
Valves are sometimes fitted with extended bonnets for extreme temperatures. The bonnets are designed to protect the stem packing from extremes of line temperature. Bonnets dissipate heat/cold and must not be wrapped with any form of insulating material.

Pipework Configuration
A major contributor to high external noise levels is poor pipework configuration or support. Even on the most innocuous duty high noise levels can be produced when care has not been taken with the piping layout. Elbows and T-junctions should be a minimum of 5 pipe diameters and preferably 10 pipe diameters downstream of the valve outlet. Further elbows immediately before the valve can in cases lead to vibration and noise problems and should be a minimum of 5 pipe diameters upstream.

Instruments
An air supply pressure regulator with filter should be installed in the airline ahead of any valve-mounted instruments. Mounted positioners are piped and adjusted at the factory, however these should be rechecked when the valve is installed. Air control instruments should be placed next to the valve to prevent excessive delays in response of the control system.

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Chemical Cleaning
If chemical cleaning has to be undertaken, ensure the chemicals are compatible with the materials of the valve.

Hydraulic Testing
Unless otherwise specified, valves are designed to ASME B16.34 and hydraulically tested in the factory, to 1.5 times the design pressure @ 100^0F. When hydraulically testing the pipeline ensure that the test pressure does not exceed 1.5 times the design pressure. For none ASME valves refer to the particular design standard to the hydraulic test pressure.

Corrosion inhibitor should be used when the system is being tested with water.

Pre-commissioning
In the event that the valves are installed and not operated for long periods of time prior to final commissioning, it is suggested that the valve, actuator and instruments are protected from environmental damage such as water, dust, etc., with a protective sheet.

To prevent dust and dirt dropping into the packing box ensure that the area between the stem and the packing is protected with tape or other suitable material.

COMMISSIONING

After the valve has been installed, make a final check of the following, where applicable:

Valve Travel
Vary the air supply to the actuator to ascertain that actual travel corresponds with the nameplate indication. Before the system is put into operation, check that the valve operates as desired and that it functions as required in the system design.

Air Lines

Check all air lines for leaks.

Valve Action
Check to be sure that the combined actions (direct or reverse) of controller, positioner (if any), and valve will provide the desired direction of valve movement, and will ensure the required valve position in the event of power (air or electric) failure.

Once the system is started up, check that the valve is performing as required and is responding to its control signals.

Valve Movement
Under operating conditions check that the movement of the valve is smooth and that the stem does not jump after a change in valve position.

Check that the valve does not start 'hunting' and remains in a fixed position when the control signal is unchanged.

Process Conditions
With the valve under operating conditions check that there is no excessive noise or vibration.

Check for leakage from valves joints and packings. Where packing leakage occurs then tighten as appropriate. Refer to the operating manual for details.

Intergate Over Pressurisation
Double seat valves such as wedge gate, parallel slide and ball valves can be subjected to a series of events which can cause a dangerous over pressurisation of the integrate space. Such over pressurisation can be extremely damaging to the valve and personnel. Over pressurisation is caused on a closed valve when the integrate cavity contains liquid which is then subject to heat. The expansion of the liquid/vapour causes high pressures to be generated in the integrate cavity. The problem can be prevented by bleeding pressure before it builds up, by opening the valve or by relying on other design safety features.

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FAULT FINDING

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
JERKY STEM	Packing	Graphite packing is often associated with jerky stem travel. Care should be taken not to over tighten the packing. Check the stem surface to ensure it is undamaged and smooth.
	Galling or scoring between plug and sleeve	Superficial scoring or galling may be removed with a light application of emery cloth; if more serious damage exists, contact factory. **CAUTION**: Trim parts are machined to close tolerances which are essential for correct functioning of the valve. Attempting to remove deep scratches could result in high leakage rates or improper functioning of the valve.
	Over tightened packing	Adjust the packing box nuts to just slightly over finger tight (over tightening will also cause excessive packing wear and high stem friction).
	Service temperature is beyond operating parameter of trim design	Reconfirm service conditions and contact the factory.
	Malfunctioning positioner	Refer to positioner maintenance bulletin
	Inadequate air supply	Check for leaks in air supply or instrument signal system tightening any loose connections and replace any leaking lines.
EXCESSIVE SEAT LEAKAGE	Insufficient tightened bonnet flange bolting	Refer to maintenance section for correct tightening procedure.
	Worn or damaged seat ring	Disassemble and replace or repair set ring.
	Worn or damaged plug seals	Disassemble and replace plug seals.
	Worn or damaged seat, bonnet or sleeve gaskets	Disassemble and replace gaskets.
	Inadequate actuator thrust	Check for adequate air supply to actuator; if supply is OK, reconfirm service conditions and consult factory.
	Incorrectly adjusted plug	Adjust plug as per maintenance instructions.
	Debris trapped between plug and seat	Strip down the valve and remove foreign objects. Check the condition of the seat faces and clean up if necessary.
EXCESSIVE CAVITATION DAMAGE	Worn or damaged plug seals causing excessive trim vibration	Disassemble and replace plug seals
	Severe corrosion service exceeds trim material limitations	Reconfirm service conditions and contact factory
	Improper flow direction	Reinstall with flow direction corrected
	Misapplication of trim design	Reconfirm service conditions and contact factory
INADEQUATE	Improper plug	Adjust plug as per maintenance instructions

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FLOW	adjustment limiting stroke	
	Malfunctioning positioner	Refer to positioner maintenance bulletin
	Blocked pressure balance plug vents or sleeve holes	Eliminate matter from line, disassemble and clean plug vents and sleeve.
	Severe conditions exceeding trim design capacity	Verify service conditions and consult factory
	Detached plug	Maintain the valve following the applicable maintenance instructions and consult factory to establish the reason for the failure.
PLUG SLAMS	Incorrect plug adjustment allowing incorrect cushion of air between actuator piston and yoke	Adjust plug as per maintenance instructions
	Inadequate air supply	Check air supply to actuator; repair leaks and remove any restrictions in the supply.
	Trim sized too large for flow rate	Install reduced trim to provide greater plug to seat clearance.
HIGH AIR CONSUMPTION OR LEAKAGE	Leaks through 'O' rings or gaskets	Replace faulty 'O' ring or gasket
	Leaks in air supply or instrument signal system	Tighten connections and replace any leaking air lines
ACTUATOR DOES NOT OPERATE, OR EXCESSIVE AIR EXHAUSTING FROM ACTUATOR	Spring failure	Replace actuator seals or diaphragm
	Internal valve problem	Refer to valve maintenance bulletin
	Burst Diaphragm	Replace diaphragm
JERKY OR STICKING STEM TRAVEL	Actuator stem 'O' ring is worn and actuator stem is galling on bushings	Replace 'O' ring; if galling has occurred on actuator stem, replace it.
	Internal valve problem	Refer to valve maintenance bulletin
LACK OF RESPONSE OF CONTROL SYSTEM	Inadequate air supply	Ensure that air supplies are piped through adequately sized pipe and that locally mounted instruments are not being starved of air.
	Instrument calibration	Ensure instruments are calibrated correctly. Consult the factory if there is any doubt.

Note: the above faults are generic across a range of valves. Not all actions are applicable to all valves.

WARNING

For valves on hazardous service ensure that the correct personal protective equipment (PPE) is worn when performing any commissioning checks.

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