YEARY SHARK TOV

Installation / Operation / Maintenance

Table of Contents

Note:

This manual is a general representation of the information required for correct usage of the industrial Yeary Shark TOV. More specific information is available, and can be supplied per customer request. Yeary Controls LP reserves the right to amend this document, with no prior notice. Please reference the applicable drawing and/or parts list when using this IOM manual.

VALVE DESCRIPTION

The YEARY SHARK TOV is a metal seated butterfly type which is designed and manufactured in a manner that allows the disc to rotate into and out of the seat with absolutely no interference. This results in a sealing system that, unlike butterfly valves that depend upon interference to achieve a seal, is not affected by the frequency of operating cycles.

Due to the unique conical surface of the YEARY SHARK TOV, the valve is considered to have a "preferred" and "non-preferred" sealing direction. The preferred sealing direction would be toward the shaft side of the disc, and is marked on the body with a directional arrow, and is referred to as the high pressure side of the valve. The system pressure area torque acting on the shaft side of the disc will force the seal deeper into the matching taper of the seat. The opposite occurs when pressure is applied to the other side of the disc. The torque required to maintain a secure seal increases with pressure rise.

STORAGE

When the valve is not put into immediate service, it is required that the valve be stored in a heated building that is weathertight and well ventilated. Storage area shall be situated and constructed so that it will not be subject to flooding. Any spare parts for the valve shall be stored in the original packaging and under the same conditions as the valve will be stored.

SHELF LIFE

* Grafoil, and equivalents, are indefinite

INSTALLATION

General Considerations Prior to Installations:

Since the opening torque of a YEARY SHARK TOV is normally greater than all other torque considerations, the YEARY SHARK TOV is less sensitive than other butterfly valves in regards to the effects of installation upon fluid dynamic torque requirements. The YEARY SHARK TOV, however, must still be installed with the exit velocity of the fluid in mind, if the flow rates are high. The typical installation for a butterfly valve connected to an elbow, would be to align the shaft axis to allow equal flow on each side of the shaft, minimizing dynamic torque requirements for the valve. The YEARY SHARK TOV, due to the available torque, may not be subject to the same orientation requirement, depending upon the resulting flow characteristics effect on the system.

Before installation of the valve into the piping system, the body seat and disc seal must be checked for dirt accumulation or damage due to transit or storage. For proper operation of the valve, the seat and disc seal must be undamaged and free of foreign material. Any rust preventative should be removed, using a commercial solvent.

Although the valve can be installed in a vertical or angular orientation for extended service life the valve should be installed with the shaft in the horizontal position and orientated so that the lower portion of the disc enters the downstream piping.

For optimum sealing performance and the lowest operating torques the valve should also be installed with the highest shutoff pressure applied against the shaft side of the shut disc. The valve body has an arrow that indicated this preferred shutoff direction.

The valve must be installed so that pipeline stresses are not transmitted to the valve body. Despite it's solid manufacture, such stress may affect valve operation. If pipeline stresses are severe, they should be cushioned by expansion joints or compensators. If supports are necessary for the valve, they should only support the dead weight of the valve and should not serve as base points for the pipeline.

The connecting flanges of the piping system shall be properly orientated, the flange bolts having the correct clearance, and the faces parallel to prevent the introduction of unwanted piping stresses.

DO NOT USE A PARTIALLY INSTALLED VALVE AS A BASE POINT TO ALIGN THE CONNECTING PIPELINE. When one side of the valve is secured to the pipeline, the opposite valve flange may not be used to draw the connecting pipe into alignment, with the exceptions as described later in this section. Any pipe supports that maintain the connecting pipe in place must be evaluated as to the restrictive nature of the support, in regards to correct flange alignment.

Two basic valve body configurations are considered for installation techniques. The lugged style valve is supplied with all flange holes tapped. The wafer style valve is supplied in two variations, one being the flange holes drilled through the body to allow the use of full length studs, the other being a combination of drilled through holes and blind tapped holes which use short bolting.

ABSOLUTELY NO LIFTING DEVICES SHALL EVER PASS THROUGH THE VALVE PORT WHEN RIGGING A VALVE FOR INSTALLATION OR REMOVAL, SINCE SEAT AND/OR SEAL DAMAGE MAY RESULT.

Basic Installation Techniques:

Note: The following is intended to assist the end user in developing procedures for installation.

The use of impact wrenches to install a YEARY SHARK TOV is not permitted. Use of impact wrenches can cause the valve body seat to change shape, increasing the possibility of valve leakage or internal binding.

All valves must be in the full closed position during installation or removal. It is not necessary to torque seat the valve, but the disc travel must be restricted to prevent seal damage.

Lugged or Flange Style Valves:

All standard Yeary Shark TOVs are designed to be installed between steel raised face flanges. Consult the factory if the valve will be installed between non steel flat faced flanges for proper valve facing.

Connect one side of the valve to a mating pipe flange. It is not important which side of the valve is connected first, providing all of the subsequent directions are followed.

Assure that each bolt is centered within the bolt holes of the flange. This can be critical, as any bolt touching a flange hole may increase the chance of stress introduction to the valve internals, either causing the valve to bind in rotation or the seat of the body to become distorted.

Tighten four equally-spaced bolts in the first flange.

Note: The final flange bolt pre-load is entirely dependent upon the type of gasket used, the pipeline media, operating temperature, and the working (or design) pressure of the system.

The pipe support(s) may now be required to be partially disengaged. A determination as to pipe flange alignment and space between the pipe flange and the valve face must be made at this time. The optimum spacing would be such as to only allow the flange gasket to be installed, at the maximum, and the flange bolt holes would be concentric.

The connecting pipe flange face may not be more than 1/4 inch away from the valve flange face. Alternate methods of alignment, other than using the flange bolts, must be utilized to conform with this requirement.

Install the remaining bolts in both flanges and assure that the correct clearance is maintained around the bolt diameters.

Seat the second flange by alternate tightening of four equally-spaced flange bolts no more than 1/4 turn per bolt, until the flange faces seat. During this operation, it is advisable to continually check the relative distance between the flange faces and adjust the tightening method to maintain the parallelism of the flange faces. Tighten the bolts.

Inspect the remaining bolts and assure correct alignment. Tighten to the same level as the first four bolts.

Wafer Body Valves: (No Tapped Holes)

Position and support the valve, contacting one flange.

The pipe support(s) may now be required to be partially disengaged. A determination as to pipe flange alignment and space between the pipe flange and the valve face must be made at this time. The optimum spacing would be such as to only allow the flange gasket to be installed, at the maximum, and the flange bolt holes would be concentric.

The opposite connecting pipe flange face may not be more than 1/4 inch away from the valve flange face. Alternate methods of alignment, other than using the flange bolts, must be utilized to conform with this requirement.

Install all studs, maintaining uniform clearance between the studs and the mating bolt holes. Additionally, the studs spanning the valve assembly should not contact the valve body.

The above step can be critical, as any stud touching a flange hole may increase the chance of stress introduction to the valve internals, either causing the valve to bind in rotation or the seat of the body to become distorted.

Seat the flanges by alternate tightening of four equally spaced flange studs no more than 1/4 turn per bolt, until the flange faces seat. During this operation, it is advisable to continually check the relative distance between the flange faces and adjust the tightening method to maintain the parallelism of the flange faces.

Note: The final flange bolt pre-load is entirely dependent upon the type of gasket used, the pipeline media, operating temperature, and the working (or design) pressure of the system.

Inspect the remaining studs and assure correct alignment. Tighten to the same level as the first four studs.

Complete the tightening of all flange studs, in a minimum of four increments.

Wafer Body Valves: (Tapped Holes)

Position and support the valve, contacting one flange, and install the bolts into the tapped flange holes of the valve body.

The pipe support(s) may now be required to be partially disengaged. A determination as to pipe flange alignment and space between the pipe flange and the valve face must be made at this time. The optimum spacing would be such as to only allow the flange gasket to be installed, at the maximum, and the flange bolt holes would be concentric.

The opposite connecting pipe flange face may not be more than 1/4 inch away from the valve flange face. Alternate methods of alignment, other than using the flange bolts, must be utilized to conform to this requirement.

Install the remaining bolts into the valve body tapped flange holes. Install all studs, maintaining uniform clearance between the studs and the mating bolt holes. Additionally, the studs spanning the valve assembly should not contact the valve body.

This can be critical, as any stud, or bolt, touching a flange hole may increase the chance of stress introduction to the valve internals, either causing the valve to bind in rotation or the seat of the body to become distorted.

Seat the flanges by alternate tightening of two equally-spaced flange bolts (in the tapped holes of the valve) and two equally spaced and opposite studs, no more than 1/4 turn per bolt and stud, until the flange faces seat. During this operation, it is advisable to continually check the relative distance between the flange faces and adjust the tightening method to maintain the parallelism of the flange faces. Tighten the studs.

Note: The final flange bolt pre-load is entirely dependant upon the type of gasket used, the pipeline media, operating temperature, and the working (or design) pressure of the system.

Inspect the remaining studs and assure correct alignment. Tighten to the same level as the first four studs and bolts.

Complete the tightening of all flange studs, and bolts, in a minimum of four increments.

ACTUATOR ASSEMBLY AND ADJUSTMENT

The Yeary Shark TOV is a quarter-turn, torque-seated butterfly valve. Any actuator capable of a minimum of 90° of travel that can provide the maximum torque output required for the valve size may be used on the valve.

ACTUATION PRECAUTIONS

All YEARY SHARK TOVS close in the clockwise direction and are torque seated.

Do not allow the valve to be position seated by the actuator.

Manual Gear and Electric Operated Gears:

Do not force the handwheel. Do not exceed the rim pull rating.

The use of an air motor tool to rotate the valve is permitted, provided that the valve is not seated with the tool.

Assure that the mechanical close stop screw does not restrict the valve from closing. The stop for the close position should be set to allow for valve seat wear.

Limit switches shall be set to indicate full valve travel. The closed limit switch must not control the motor, and should only be used as a general indication of disc position. The close torque switch must be functional and sized correctly.

Pneumatic Actuators

Do not exceed the maximum operating pressure indicated on the actuator. If the maximum operating pressure of the cylinder exceeds the calculated maximum in-put pressure for valve torque, provisions must be taken to limit the operating pressure of the cylinder.

Spring return units will fail open or closed upon loss of the air supply. Personal injury may result if body extremities are in the path of the disc travel.

Keyway location(s) in any adaptor bushing must allow for seat wear. Typical maximum travel of these actuators require close attention to the close key location.

The following procedure is intended for use with a manual gear actuator which utilizes a bored, keyed and 360° splined adaptor bushing. This actuator combination is considered as an example of a typical valve and actuator assembly. The use of the 360° splined adaptor bushing represents the worst case arrangement, due to the possible mis-alignment of the gear to the valve. Improperly actuated valves can cause valve problems.

The valve must be in the closed position to correctly install the actuator. All valves close in the clockwise direction, as shown in Section A-A on a typical assembly drawing.

Install the actuator mounting bracket. Align the actuator bolt pattern to center on the shaft and bolt in place.

Install the parallel key into the drive shaft.

Confirm the actuator rotation. When the actuator is at the valve closed position, (actuator's optimum stroke) the pointer cap will align with the actuator center lines, parallel and perpendicular with the worm shaft. Position the actuator aligning the pointer with the actuator center lines or closed indicator.

Rotate the actuator toward the open position approximately 2 to 5 degrees. Match-mark this position, from the pointer cap bolt pattern on the face of the actuator housing. This is now the range of travel the actuator is allowed for valve closure.

Rotate the actuator to a position midway between the two closed marked positions.

Apply a coating of anti-seize compound to the spline teeth of the adaptor bushing.

Install the splined adaptor bushing on the drive shaft.

CAUTION: The spline adaptor teeth may not be located in the center of the spline adaptor. The correct position should be visually verified by comparing the splined adaptor bushing to the actuator spline location inside the actuator.

Slide the actuator assembly onto the splined adaptor bushing in the desired orientation. Check the hole alignment for the mounting bolts.

It will be acceptable if there is no more than 1/2 hole misalignment of the mating holes when the actuator assembly is flush with mounting bracket.

When the alignment is in this range, turn the actuator handwheel, rotating the actuator on the splined adaptor bushing, until all the bolt holes are aligned. CAUTION: The disc must not be allowed to move when adjusting the actuator position.

When the initial bolt hole alignment exceeds the maximum allowed mis-alignment, remove the actuator from the valve. Do not remove the splined adaptor bushing. Rotate the actuator gear in the desired direction to correctly align the bolts. Re-install the actuator.

Insert the bolts and tighten, in a standard criss-cross pattern. Close the valve and confirm that the mechanical stop is not restricting actuator travel.

Confirm that the disc is fully closed. Check the close match-mark positions on the actuator face. The position of the actuator should be at the full-stroke position (maximum travel), between the marks, or at the 2 to 5 degree position, maximum.

If the actuator is not in the range described, repeat the above steps until the alignment is correct.

Adjustment for the actuator stops are as follows:

Actuators with stop screws: With the disc in the full closed position, rotate the close stop screw in until it touches the internal gear segment. Then rotate the screw out 1/2 to 2 turns and secure the screw with the locking nut.

Rotate the disc to the full open position, approximately 90 degrees from the valve body face. Rotate the open stop screw in until it touches the internal gear segment. Secure the screw in this position with the locking nut.

Actuators with sliding nut assemblies: With the disc in the full closed position, remove the limit stop housing cap and rotate the close hex stop nut in until it touches the inside of the limit stop housing. Rotate the nut out 1/2 to 2 turns and verify that a gap of 1/8th to 1/4 inch is present between the face of the nut and the limit stop housing, keeping a flat of the nut parallel with the limit stop housing cap. This will properly align the nut to the cover, which in turn, will keep the nut from rotating during normal usage. Replace the limit stop housing cover.

Rotate the disc to the full open position, approximately 90 degrees from the valve body face. Remove the limit stop housing cover. Rotate the open hex stop nut in until it touches the inside of the housing, or a point close to the housing, keeping a flat of the nut parallel with the limit stop housing cap. This will properly align the nut to the cover, which in turn, will keep the nut from rotating during normal usage. Replace the limit stop housing cover.

CAUTION: Failure to replace the limit stop housing cap during rotation toward the open position could cause the gear segment to disengage. The disc in a YEARY SHARK TOV can travel toward the open position far beyond the limits of the actuator.

OPERATION

Historically, the torque requirements for opening a YEARY SHARK TOV are considerably greater than the required torque to overcome fluid dynamic and hydrostatic torques are normally not a concern for open / shut operation or In throttling control applications as long as the controlling differential pressure is less than 50% of P_1 .

Use of a YEARY SHARK TOV as a control valve with the disc position less than 20 percent open can possibly cause serious cavitation to occur unless equipped with the SHARKTOOTH CONTROL CAGE, depending upon the media, temperature and flow velocities. Knowledge of the valve's inherent flow characteristics must be matched to the desired response goals of the system as a whole. Use of a butterfly valve for throttling will develop a region of lower pressure just downstream of the valve disc. The size of this region will be dependent upon the relative position of the disc, flow velocities and pressure. When the pressure drops to the vapor pressure of the liquid, cavitation bubbles develop. The pressure increase downstream of the valve causes these vapor bubbles to collapse, producing fluid shock waves. Continued operation in this condition can cause erosion of downstream piping components and particularly erosion of the immediate downstream side of the disc. If the flow is toward the shaft side of the disc, the potential for damage to the valve is considerably increased as all the disc bolting is present in this area of erosion.

Do not force the hand wheel to close the valve. Do not exceed the rim pull rating on the actuator handwheel.

The preferred sealing (high pressure side) direction is indicated by the arrow on the body.

If the arrow is missing, the preferred direction can be determined by observing the direction of rotation of the shaft, from the actuator side of the valve. The YEARY SHARK TOV rotates clockwise to close.

No normal valve maintenance schedule is required, with the exception of packing changes, due to service conditions. Refer to the applicable actuator manuals for periodic maintenance requirements of the actuators.

Since wear to the seal will change the closed position of the disc, a periodic check of the actuator close stop nut may be required.

MAINTENANCE

Yeary Shark TOVs are generally designed to require little maintenance; however, areas are covered in this manual for disc seal replacement.

Valve shaft orientation other than horizontal will require a preventive maintenance program to be developed, taking into account the media contents (solids), cycle frequency, and any other site-specific information that may have a detrimental effect on the valve assembly.

Normally, seat damage is very rare. Typical failure mode is wear or corrosion which results in performance degradation over time.

The disc seal requires replacement only when leakage exceeds the required levels.

Failure modes are crushing or deformation in local areas or wear over time. These modes would degrade leak tightness, but not result in catastrophic failure. Complete failure is not possible as long as the retainer ring remains intact.

The annular key is a very low stressed part with a failure mode of bearing wear on the flat faces over time. Normal usage is indefinite.

7.6 The bearings used in the YEARY SHARK TOV are a non-lubricated design and require no periodic preventative maintenance. Normally, the bearings will have a minimal amount of wear for the life of the valve. However, the system media should be evaluated as to the content of solids that may eventually become lodged between the bearings, drive shaft and the annular key. Standard bearings seals should prevent media intrusion. A program of inspection should be implemented to clean the valve internal components if debris build-up is a concern.

The packing usage is indefinite, dependent upon operating conditions.

Packing change instructions are as follows:

Note: The changing of the packing can be made without removing the actuator if split rings are used. However, if the rings are not split, the actuator will have to be removed from the valve.

De-pressurize the valve.

Remove all the nuts from the studs and pull back the gland follower to the adaptor plate.

Remove the packing with a flexible screw hook packing puller. Remove the packing from the bore one layer at a time.

Caution: Care should be taken to assure that the packing bore and the drive shaft are not damaged during packing removal.

Install the new packing one ring at a time in the same order as removed

Split packing should be installed at 90 degree intervals to minimize any potential leak path.

Use the packing gland follower to push each layer of packing evenly into the bore.

It is important that the packing gland follower is symmetrically mounted around the shaft. This will prevent galling on the shaft or binding during operations.

Once the packing has been installed, the gland can be tightened down with the nuts. The stuffing box studs are to be tightened opposite successively and proportionately, until no leakage can be detected. The gland follower should be checked to determine if is centered on the shaft diameter during packing consolidation. It is not allowed to contact the shaft at any time.

SPARE PARTS:

To order, Yeary Controls needs the following information:

Serial Number, Assembly drawing number, or Item number and description. Quantity of each part being ordered

Note: If at all possible, include all the information shown on the

I.D. name plate mounted on the valve body.

DISC SEAL REPLACEMENT

When the sealing system in the YEARY SHARK TOV is suspected of unacceptable leakage, the following simple visual checks can be made to determine if the disc seal must be replaced:

Check for nicks or gouges in the metal laminations.

Check for damaged, torn or broken fiber laminations.

Check the seal gasket for damage.

Check to determine if the disc seal is bent or dented.

IF ANY OF THE THESE CONDITIONS EXIST, IT IS RECOMMENDED THAT THE SEAL AND GASKET BE REPLACED.

The following procedure is intended to represent a typical YEARY SHARK TOV seal replacement.

NOTE: Before starting the disc seal removal operation, observe the retainer ring and disc seal orientation with respect to the disc. The long axis of the elliptical disc seal has one end that is angled slightly greater than the end located 180 degrees away. This orientation is intended to be located perpendicular to the shaft axis. The valve disc has the same elliptical machined edge as the disc seal, and is assembled in the valve to match the valve seat configuration. This is important to understand, as the seal could be installed upside-down and rotated in the wrong orientation.

Prior to seal replacement, the valve should be removed from the pipe line, cleaned and inspected. The actuator will need to be removed, in most cases.

Disc Position for seal replacement is as follows:

Position A is the disc assembly rotated as far from closed as the valve body will allow.

Position B is the normal full open position of the valve.

Position C is the valve in the full closed position.

Normal orientation of the disc will be in Position B for removal of the retainer ring and disc seal.

Various sizes of valves require the disc to be in Position A for seal removal, due to insufficient clearance between the seat and retainer ring.

A quick visual check of the disc in Position B will indicate if the disc should be rotated to Position A.

Note: Any actuator will have to be removed prior to moving the disc to Position A, as this travel path will exceed the limits of the actuator.

With the disc in the closed position, remove all of the disc bolts with the exception of two bolts located on the disc perpendicular to the shaft. These bolts should be located 180 degrees apart on this center line.

To remove the retainer ring, the valve disc will need to be in Position A or Position B.

When the disc is in position, remove the remaining bolts from the retainer ring.

Lift the retainer ring off the disc seal. A flat tool wedged between the retainer ring and seal may be required.

Remove the retainer ring from the drive shaft side of the body.

DO NOT ATTEMPT TO REMOVE THE RETAINER RING THROUGH THE SEAT SIDE OF THE BODY. CAUTION MUST BE TAKEN TO ASSURE THAT THE VALVE BODY SEAT IS NOT DAMAGED.

Remove the disc seal by lifting it away from the steps on the disc and remove the disc seal in the same manner as the retainer ring.

The disc seal may be stuck to the gasket located between the disc seal and disc. A flat scraper may be used to assist in removal. In all cases, this gasket will need to be replaced. For future reference, note the thickness and location of any gasket found in the disc assembly.

Remove any gasket material remaining on the disc before a new disc seal is used.

CAUTION: Exercise extreme care in handling and installing the new disc seal, as damage to the disc seal will result in valve leakage.

It is recommended to position the valve assembly with the body flange faces vertical, with the drive shaft center below the valve center line. Rotate the disc to Position A or Position B. Install the supplied gasket on the disc face.

Center the gasket around the hub. Mark the overhang on the gasket and trim the gasket to fit flush with the disc O.D. Any gasket that remains exposed after the seal is installed could interfere with proper seal function.

Install the new disc seal in the correct orientation on the disc, centering the disc seal.

Carefully close the disc manually. Maintain the disc in the closed position.

Check the clearance between the seal I.D. and the associated disc hub. There should be clearance completely around the disc seal I.D. This will allow the seal to float into place with no mechanical interference from the disc.

If diametral clearance on the seal I.D. is 1/16 inch (or less) from the disc hub, remove the seal from the valve and grind an appropriate amount of material from the seal I.D, as stated below. Repeat the process until the gap is greater than 1/16 inch, but no more than 3/32 inch, completely around the seal I.D. Normally; this step is not required with new disc seals.

Determine what the new diameter will be and mark a line around the seal I.D. Place the seal in a vise and protect the sealing edge of the disc from damage. With the use of a hand grinder, lightly remove the excess material from the seal I.D., taking care not to overheat the disc seal.

CAUTION: Exercise extreme care in removing material from the seal I.D. Do not allow the seal to overheat. Do not damage the sealing surface of the seal. Thoroughly de-burr all worked areas.

8When the seal I.D. is correctly sized, re-install the gasket and seal.

Open and close the valve three or four times, making sure that the valve closes fully each time.

On the last closing, hold the disc assembly in the full closed position.

Perform a light check (with the light source on the shaft side of the disc) for any gaps between the sealing surfaces.

When there is light indications present, open the disc and rotate (float) the disc seal slightly and repeat. Some experimentation will be required to determine the best direction to move the disc seal for centering.

When there is no light indication, match-mark the exact location of the disc seal position relative to the disc, on the A2 center line of the disc.

Install the retainer ring.

Inspect the retainer ring for full contact with the disc seal.

The retainer ring I.D. step must not be allowed to contact the disc hub before the retainer ring O.D. contacts the disc seal face, after compression. (Due to the material thickness variations of replacement disc seals, the seal may not be thick enough to allow clamping to occur.)

When there is a gap between the seal and retainer ring, a gasket will need to be added between the disc seal and retainer ring. Do not add the gasket between the disc and disc seal.

Any additional gasket(s) used in construction shall be the same material grade as the gasket between the disc seal and the disc, and be trimmed to fit.

Lubricate the bearing surfaces and install the bolting and the lock washers. Wrench tighten all bolts in a standard criss-cross pattern.

Manually close the valve to Position C. Install the actuator as indicated.

Apply approximately 1/4 of the rated torque to the valve.

Visually confirm that the assembled valve is in the correct configuration, is not binding, that all gaskets are trimmed flush, and that the valve disc seal is light tight.

Partially open the valve and tighten.

Close the disc to Position C and apply full rated torque to the valve shaft.

Open the valve approximately 5 degrees. Re-tighten the bolts.

Operate the valve from full close to full open several times, applying full rated torque at each close cycle.

With the valve fully open, inspect the sealing surfaces for any signs of damage.

Close the valve until the sealing members contact only, and place a flat ground bar across the A2 center line on the valve face closest to the retainer ring.

Perform a bluing check of the sealing surface by applying a thin coat of Prussian Bluing to the seat surface, closing the valve at full torque, and inspecting the resulting pattern.

No bluing indication left by the disc seal on the area of the seat that is located by the shaft bores means that the gasket used between the disc seal and the disc is not thick enough to allow the disc seal and seat machined cones to meet when the valve is closed. This is due to variations in the material thickness of the disc seal.

If this condition exists, replace the gasket with the next available thickness and repeat all of the previous steps.

Acceptance criteria for the bluing pattern is a 75% complete pattern. No interruptions of a single laminate is allowed. Additionally, some damage to the valve seat would be acceptable, provided the damaged areas do not cross the seal pattern.

Bench testing of the valve, after disc seal replacement, is recommended.

VALVE DISASSEMBLY

Place the valve on a bench or other suitable working surface with the drive shaft side of the valve up. Remove the pin from the disc.

Restrain the disc assembly from opening by clamping or bolting, a suitably sized square bar across the flange face directly above the edge of the disc that is furthest away from the center of the drive shaft. This bar should be perpendicular to the drive shaft.

Choose a correct length for a jack screw or hydraulic jack to place between the disc and bar. Place the jack screw in position and apply enough force to mechanically maintain the disc in place. It is not necessary to apply excessive force to maintain position. Remove the actuator from the drive shaft.

On the non-driven end of the shaft, remove the cover plate bolts, cover plate, and the O-Ring from the valve body.

On the driven end of the valve shaft, remove the hex nuts and the gland follower. Remove the packing rings. Place an appropriate sized block between each side of the disc ear and the valve I.D. to prevent lateral movement.

With a soft rod or hammer, move the shaft towards the non driven end of the valve body until the annular key is free. The annular key is a split ring installed in a groove machined on the end of the shaft. Because it is split, the annular key can fall away from the drive shaft easily. Caution should be taken so that the annular key does not become lost.

Remove the disc ear drive keys as the shaft moves.

Most valves will contain more than one drive key. Do not attempt to force the drive shaft out too fast as the clearance for drive key removal is small.

When all of the keys are removed, the shaft may now be withdrawn from either side of the valve body.

Remove any devices that were used to maintain the disc assembly in position during shaft removal.

Locate the edge of the disc. Carefully push down on the disc assembly at this point until the disc seal partially disengages from the seat. This will be moving the disc assembly in the open direction. Carefully lift the disc assembly and guide the disc assembly so that no damage can occur to the disc seal.

The disc assembly should be lifted at a greater angle than the closed position of the disc. A strap thru the ear bores to lift the disc assembly from the body may be utilized.

CAUTION: This will cause the disc assembly to move in a manner that tends to close the disc. Great care should be taken to prevent this movement. It is suggested that a crew of two be used when a disc is removed from the valve.

Unless there is evidence that the bearing I.D. is damaged, it is suggested that the bearings remain in the valve. If the bearings are to be removed from the valve body, use a soft rod and hammer from the body center out.

VALVE ASSEMBLY

Clean all valve components.

Inspect all components for damage before starting to assemble. Look especially for damage to the disc seal and valve body seating surface, and wear in the bearing areas of the body (or the bearing I.D. if not removed from the valve) and drive shaft.

Place the valve body on a suitable working surface with the seat side down.

With a soft rod or hammer, install the bearings toward the inside of the body until they seat fully against the bore shoulder. Note: Some valves have bearings of unequal lengths. Depth of bearing bores in the valve body should match the bearing lengths.

Carefully place the disc assembly into the valve body. It is recommended to install the disc assembly in a partially open orientation until the disc seal contacts the seat somewhere in the area of the shaft bores.

Insert the annular key end of the drive shaft thru the driven body bearing and disc bores into the non-driven side of the valve.

Assure that the disc assembly is closed. Place appropriate sized blocks between the disc ear and the body I.D.

Place the annular key in the shaft groove. Reverse the direction of shaft travel. Install the disc ear keys as the shaft moves and seat both the annular key and shaft keys at the same time.

When the annular key is fully seated, check the alignment of the dowel pin hole in the disc with the corresponding hole in the shaft. Adjustments to the disc position may be required.

Adjustments to the disc position can be accomplished by loosening the disc bolts, floating the disc seal, and repositioning the disc at the same time.

On the non-driven side of the body, install the O-Ring, the cover plate, the bolts and lock washers. Lubricate the bearing areas of the bolts and lock washers prior to assembly.

Tighten the bolts in a standard criss-cross pattern.

Install the new packing, one ring at a time, rotating the splices at 90 degree intervals to avoid setting up a leak path.

Use the gland follower to push the packing evenly into the bore.

Once the packing has been completely installed, run the gland follower studs into the tapped holes, if removed during disassembly, and tighten by lightly locking two of the correct size nuts together at the outside end of the stud. Use these nuts to tighten the stud until they slip on the studs. Install the follower.

Tighten the gland follower down with the nuts, in a cross bolt method, until tight.

It is important that the packing gland be symmetrically mounted around the shaft. This will prevent the shaft or gland from binding or galling when the valve is operated.

The final packing adjustment should be done when the valve is pressurized