



A Unit of Robbins & Myers, Inc.

YALE® FIGURE 500 & 500R CLOSURE OPERATION AND MAINTENANCE INSTRUCTIONS

IMPORTANT INFORMATION

Note To Supervisor:

Please share this information with your employees and make sure they have received training on closures prior to operation and/or maintenance.

!/\ WARNING: Do not attempt to open the closure while under pressure. Failure to relieve all pressure will allow the contents to escape forcefully and may cause severe injury or even death. Follow all instructions below.

Closure Installation Instructions are available under separate cover and are included with each closure shipment. For a copy of these instructions, please contact the **Customer Service Department** at one of the following locations.

IN THE U.S.

1-800-654-5603 or (281) 315-2222

IN CANADA

1-800-661-5659 or (780) 437-6316

SECTION ONE: Opening the Closure

1. Bleed pressure from pipeline or vessel in a safe manner. Failure to do so may lead to a violent expulsion of pressure resulting in severe injury or even death.
2. If the closure is equipped with a Pressure Alert Valve (PAV), remove the PAV stem from the PAV body. Screw the stem into the retainer on the cap. See **FIGURE No. 1**.

NOTE: The PAV is intended to warn the operator of residual pressure in the pipeline or vessel. **The PAV is NOT intended to be used to bleed pressure from the pipeline or vessel.**

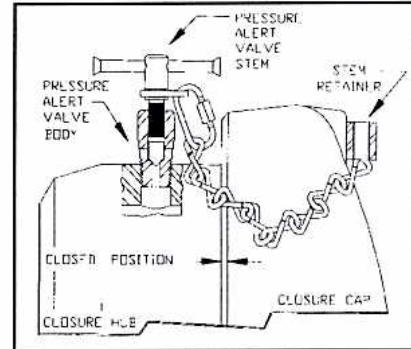


FIGURE No. 1

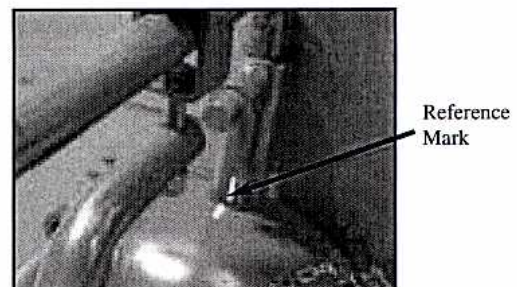
⚠ WARNING: Unrelieved pressure can cause severe injury or even death. If pressure bleeds from the PAV after the PAV stem has been removed, **DO NOT** open the closure. Replace the stem in the PAV body and tighten. Repeat Steps 1 & 2.

NOTE: A PAV is standard equipment on all 6" and larger closures and may be purchased as an option on smaller sizes.

3. Check that reference marks have been made indicating the "Closed Position" of the cap, as illustrated in **FIGURE No. 1** and **FIGURE No. 2**. If not, make a temporary mark across the back of the cap and hub. Then follow the "**Initial Start-Up**" in **Section Three** for marking the "Closed Position" of the cap. Closures equipped with a Closure Actuator Tool (CAT Tool) contain factory established closed tight reference marks on the hinge socket and cap, as illustrated in **FIGURE No. 2**.
4. The closure has right-hand threads. Loosen the cap by rotating it counter-clockwise, using an optional lug wrench or CAT Tool, as illustrated in **FIGURE No. 3** and **FIGURE No. 5**. **DO NOT** use a metal-faced hammer to loosen the cap. Excessive hammering will significantly deform the lugs as illustrated in **FIGURE No. 4**, and may initiate a crack in the cap or hub.

NOTE: Excessive torque to remove the cap may be an indication of unrelieved pressure.

5. Rotate the cap until it is free from the hub.
6. Swing the cap free of the hub to gain access.



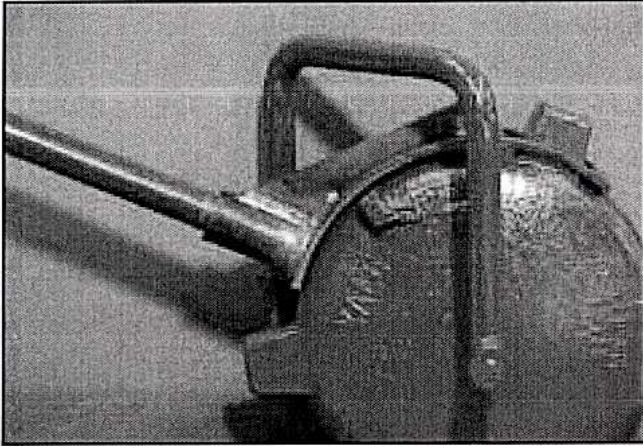


FIGURE No. 3



FIGURE No. 2
FIGURE No. 4



FIGURE No. 5
Proper Operating Position.

Always operate the closure from the side as illustrated in FIGURE No. 5.

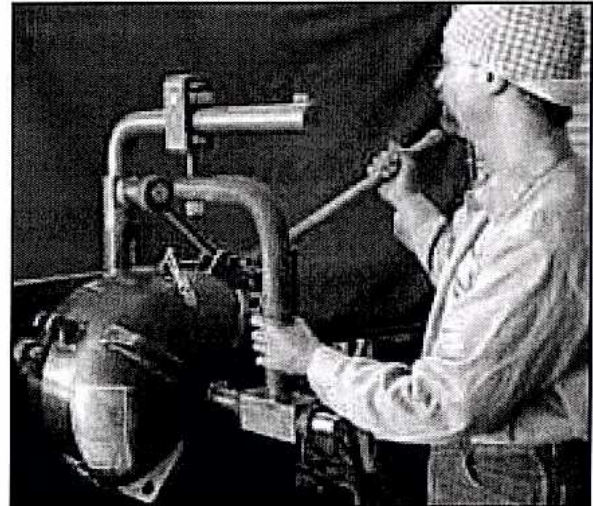


FIGURE No. 6
WRONG Operating Position!

NEVER operate the closure while standing in front of the cap as illustrated in FIGURE No. 6.

SECTION TWO: Closing the Closure

CAUTION: **DO NOT** overtighten the cap. Overtightening may result in damage to the closure threads and seal areas.

The cap can be tightened sufficiently using an optional lug wrench or Closure Actuator Tool (CAT). **DO NOT** use a metal-faced hammer to tighten the cap. Excessive hammering will significantly deform the lugs, as illustrated in **FIGURE No. 4**. It may also damage the closure threads and seal areas.

Tighten the cap until the reference marks are aligned as illustrated in **FIGURE No. 1**. This indicates metal-to-metal contact between the cap and hub sealing surfaces.

On closures with a Pressure Alert Valve (PAV), insert and tighten the PAV stem into the PAV body on the hub.

CAUTION: The PAV is designed to be hand-tightened. **DO NOT** use excessive force to tighten the PAV stem. Excessive torque may damage the PAV.

SECTION THREE: Initial Start-Up

1. Open the closure as instructed in **Section One**.
2. Remove the o-ring, clean and lubricate the cap and hub threads. An anti-galling lubricant, such as a lithium grease, is recommended for best results. Do not use a silicone type lubricant.
3. With the o-ring removed, tighten the cap until metal-to-metal contact is made between the hub and cap seal surfaces. (This can be determined by observing the cap movement. Stop tightening when the relative motion between the cap and hub has ceased.)
4. Mark this position on the cap and hub for future reference, as illustrated in **FIGURE No. 1**, to indicate the point at which the seal areas are fully engaged.
5. Open the closure and replace the o-ring as instructed in **Section Four**. **DO NOT** tighten the cap beyond the "Closed Position" reference point. Tightening beyond this point can result in damage to the closure threads and seal areas.

SECTION FOUR: Maintenance

1. Every time the closure is opened, visually inspect the o-ring and the threads of the cap and hub as instructed in **Section Six**. If tears, nicks, cuts or rough surfaces appear on the o-ring, replace it with an o-ring supplied by R&M Energy Systems to ensure the dimensional integrity.
2. Whenever foreign matter exists on the threads or seal areas, remove the o-ring and clean the threads, seal areas and o-ring groove. Lubricate the threads and seal areas with an anti-galling lubricant such as lithium grease. Do not use silicone type lubricant. Do not fill the o-ring groove with lubricant.
3. If cracks are visible on the cap or hub, replace the component.
4. Clean the o-ring and apply a light coating of lubricant to it. Install the o-ring in the groove.
5. Lubricate the cap pin bushing and hinge socket on hinged closures.
6. Refer to **Section 5-C** for necessary adjustments to the hinge.

SECTION FIVE: Disassembly and Adjustment of Closure

⚠ WARNING: Do not attempt to disassemble the closure while under pressure. Failure to relieve all pressure may lead to a violent expulsion of the contents. This may lead to severe injury or even death. Remove the PAV stem from the valve body to assure all pressure has been relieved and screw it into the retainer on the cap, as instructed in **Section One, Steps 1 & 2**.

A. Disassembly of Horizontal Hinge Closure

(Refer To Figure No. 7, 8, 11 & 12)

1. Use the optional lug wrench or closure actuator tool (CAT) to break the seal. Unscrew the cap from the hub.
2. On closures not equipped with a CAT tool, lift the cap until the hinge arm clears the hinge socket. (Figure No. 7 & 8)
3. On closures equipped with a CAT tool, wrap a lifting strap around the bend of the hinge elbow. (Figure No. 11 & 12)

- 3a. On closures equipped with a roller trolley, lift and pull the hinge elbow until the roller clears the stop on the jib arm and remove. Carefully and slowly place the cap face down on a clean, flat surface. (Plywood or a wood pallet is preferred.)
- 3b. On closures equipped with a dual wheel trolley, place an identifying mark (with a marker, paint, etc.) on the adjustment bolt just above the hinge elbow, or measure the distance from the bottom of the I-beam to the top of the hinge elbow. Lift just enough to take the weight off the vee-nut block and remove the adjustment nut and vee-nut block. Carefully and slowly lower until the hinge elbow is free of the adjustment bolt and place the cap face down on a clean, flat surface. (Plywood or a wood pallet is preferred.) Secure the trolley against the post of the jib arm with a clamp to avoid unwanted movement and possible injury while handling.

NOTE: Do not remove the dual wheel trolley from the jib arm.

- 3c. If the jib arm is removed from the hinge socket on sizes 20" and larger closures, be careful not to damage the bronze bushing in the hinge socket or the lower thrust bearing on the end of the jib arm.

Reassembly of Horizontal Hinge Closure

1. Assure that mating parts and bearings are free of all dirt, sand and debris prior to reassembly. On sizes 20" and larger, make sure all removable hinge parts (dust cover, top bronze bushing, bottom bearing) are installed in their respective locations. If removed during disassembly, insert the jib arm in the hinge socket and remove the clamp used in **Step 3b** of the disassembly section.
2. On closures not equipped with a CAT tool, insert the hinge arm into the hinge socket and proceed to **Step 4**.
3. On closures equipped with a CAT tool, wrap a lifting strap around the bend of the hinge elbow.
 - 3a. On closures equipped with a roller trolley, lift until the roller clears the stop on the jib arm and slide on. Ease down until the roller rests on the jib arm and remove the strap.
 - 3b. On closures equipped with a dual wheel trolley, lift and carefully slide the hinge elbow back onto the adjustment bole, install the vee-nut block and the adjustment nut. Tighten to the mark on the adjustment bolt made in **Step 3b** of the disassembly section and remove the strap.

Thoroughly clean the cap and hub threads, sealing surfaces and o-ring groove.

4. Lubricate the cap and hub threads, sealing surfaces, and all grease zerks. Apply a light coating of lubricant to the o-ring.

NOTE: Do not put lubricant in the o-ring groove.

Begin screwing the cap onto the hub while checking vertical and parallel adjustments.

5. The cap should screw onto the hub without thread drag.

B. Disassembly of Vertical Hinge Closure

(Refer To Figure No. 9, 10, 13 & 14)

Use the optional lug wrench or closure actuator tool (CAT) to break the seal.

1. Unscrew the cap from the hub.

On closures smaller than 16", lift the cap until the davit arm clears the davit base

2. socket. (Figure No. 9 & 10)

On closures 16" and larger, attach the hooks of a hook sling in the holes of a minimum of three (3) cap ribs. Carefully and slowly lift the cap until the davit arm is out of the davit base socket. (Figure No. 13 & 14)

- 3.

NOTE: On sizes 26" and larger closures, be careful not to damage the bronze bushing in the davit base socket and lower bearing on the end of the davit arm. Removal of the dust cover from the davit arm is not necessary. Place the cap face down on a clean, flat surface that will allow the davit arm to hang free. (Wood pallets are preferred.)

Reassembly of Vertical Hinge Closure

1. Assure that mating parts and bearings are free of all dirt, sand and debris prior to reassembly.

On closures smaller than 16", insert the davit arm into the davit base socket until

- 1a. fully seated.

On sizes 16" through 24" closures, lower the davit arm into the davit base socket

- 1b. until fully seated. Position the dust cover against the davit base socket.

On sizes 26" and larger closures, install the bronze bushing in the davit base socket, if removed during **Step 2** of the disassembly section, and carefully lower

- 1c. the davit arm into the davit base socket until fully seated. Position the dust cover against the davit base socket.

Thoroughly clean the cap and hub threads, sealing surfaces and o-ring groove.

2. Lubricate the cap and hub threads, sealing surfaces, and all grease zerks. Apply a light coating of lubricant to the o-ring.

NOTE: Do not put lubricant in the o-ring groove.

Begin screwing the cap onto the hub while checking the vertical and lateral

3. adjustments. The cap should screw onto the hub without thread drag.

C. Adjustment of Cap Relative to Hub

1. Horizontal hinge 8" and smaller: (Refer to Figure No. 7)
 - 1a. Vertical adjustment is made by loosening the set collar and moving it up or down the hinge arm. Retighten the set collar against the hinge socket after adjustment.
2. Horizontal hinge 10" through 14": (Refer to Figure No. 8)
 - 2a. Vertical adjustment is made by tightening or loosening the adjustment nut.
3. Horizontal hinge 16" and larger: (Refer to Figure No. 11 & 12)
 - 3a. The cap face must be parallel to the hub face. This can be determined by measuring the distance between the two faces at the top and bottom, or by using a level. Adjustment is made by moving the hinge elbow laterally along the cap pin after loosening one or the other of the two set collars. If the cap is closer at the top, loosen the inside set collar and move the hinge elbow closer to the cap. If the cap is closer at the bottom, loosen the outside set collar and move it out and retighten. Then move the hinge elbow away from the cap. After the adjustment, tighten both set collars against the hinge elbow.

CAUTION: Never leave the outer set collar loose. This makes it possible for the cap to slide off the cap pin and drop free.

Vertical adjustment is made by tightening or loosening the adjustment nut.

- 3b. Properly adjusted, all the weight of the cap will remain on the hinge elbow and jib arm without transferring any weight to the hub during the thread make-up, thus preventing thread drag.
4. Vertical hinge 8" and smaller: (Refer to Figure No. 9)
 - 4a. No adjustments should be necessary on these small closures.

5. Vertical hinge 10" through 24": (Refer to Figure No. 10 & 13)

The adjustment bolt is located on the bottom of the davit base socket. It adjusts
 5a. the height of the cap relative to the hub to minimize the thread drag while operating the closure. If excessive thread drag is noticed while turning the cap, adjust this bolt in small increments until minimum drag is obtained.

6. Vertical hinge 26" and larger: (Refer to Figure No. 14)

Lateral Adjustment - Center the cap with the hub laterally using the adjusting
 6a. nuts on top of the davit arm adjustment sleeve. Make sure both nuts are tight after completing the adjustment.

6b. Vertical Adjustment - Loosen the set screw in front of the yoke assembly. Slightly turn the nut on top clockwise to raise the cap, or counter clockwise to lower the cap. Turn the cap to evaluate the thread drag and repeat as necessary until minimum thread drag is obtained. Tighten the set screw after the final adjustment.

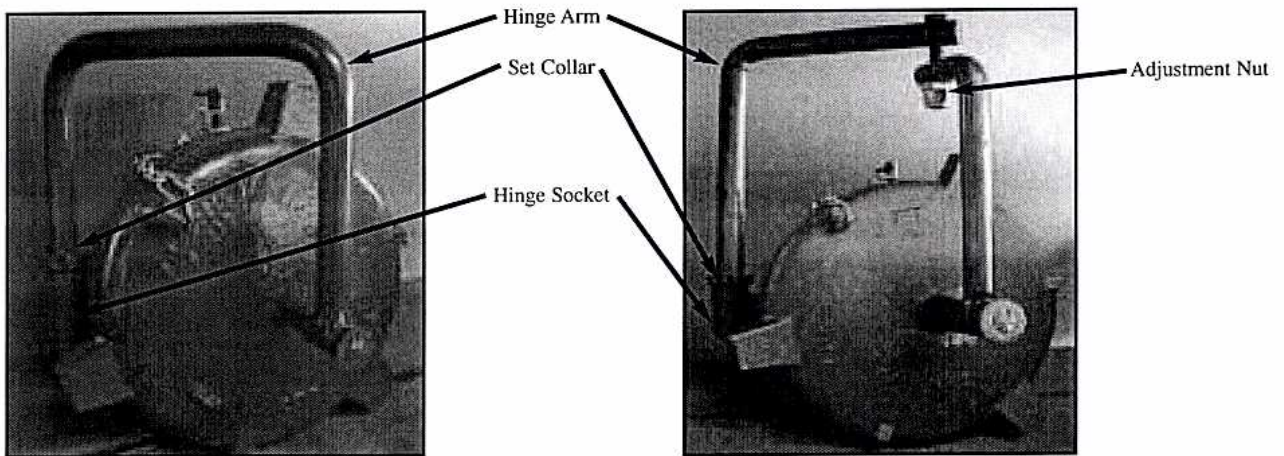


FIGURE No. 7

FIGURE No. 8

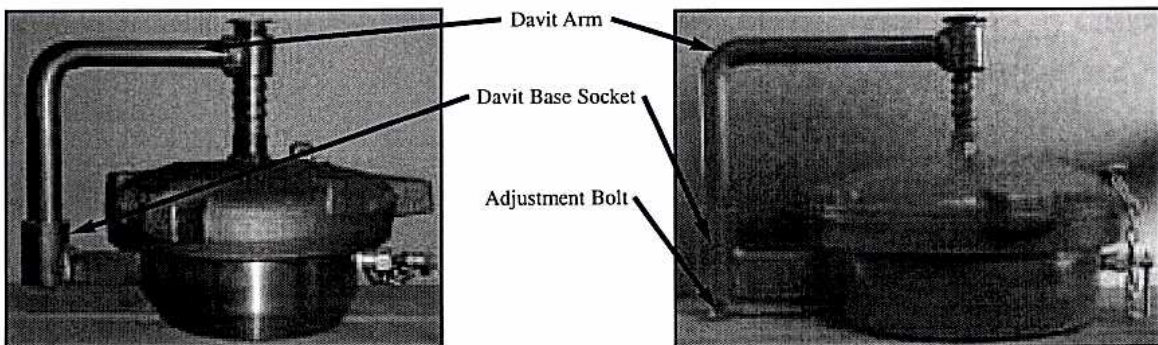


FIGURE No. 9

FIGURE No. 10

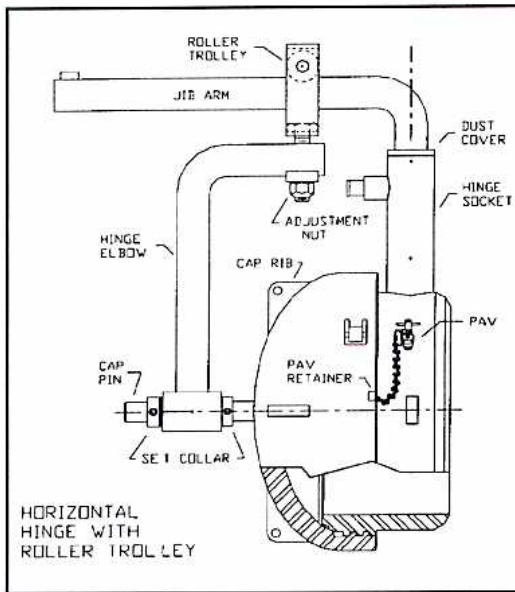


FIGURE No. 11

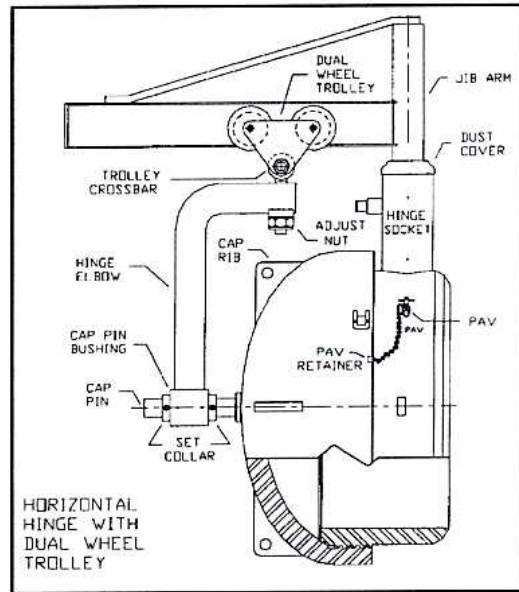


FIGURE No. 12

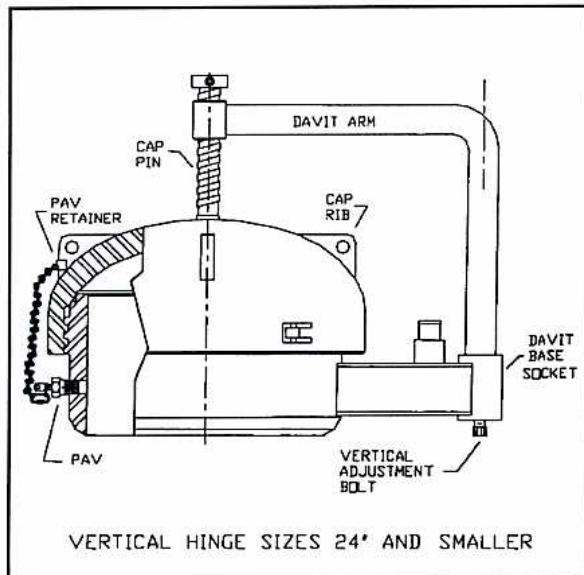


FIGURE No. 13

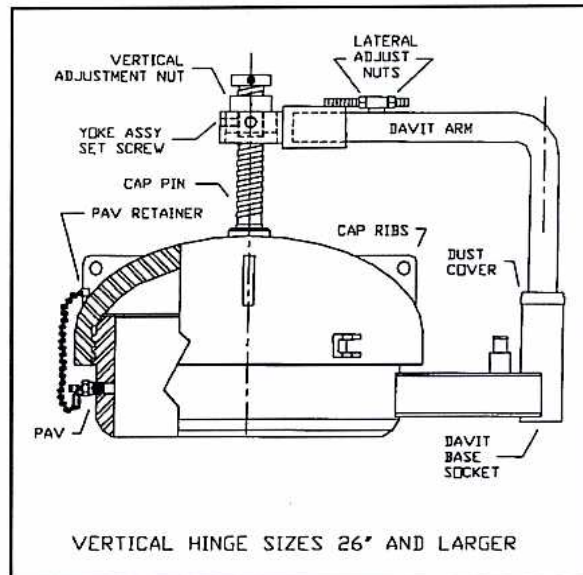


FIGURE No. 14

SECTION SIX: Inspection

A thread gauge is available from R&M Energy Systems. It is a template containing five different modified acme thread profiles. The gauge is intended to allow the user to estimate the extent of wear or damage to the closure threads based on a visual comparison of the thread form between the gauge and the closure component.

Procedure for Thread Inspection:

Determine the profile that matches the threads on your closure and snugly insert the gauge into the threads of the closure component. Make a visual comparison of the thread profile to the gauge. Inspect both cap threads and hub threads for the following:

- Worn thread flanks
- Rounded thread crests
- Galling
- Excessive corrosion
- Deformed thread profiles
- Gouges or nicks
- Cracks, especially at the thread root radius

This procedure should be performed, as a minimum, at the 12:00, 3:00, 6:00, and 9:00 o'clock positions on both the cap and hub.

Additional Inspections:

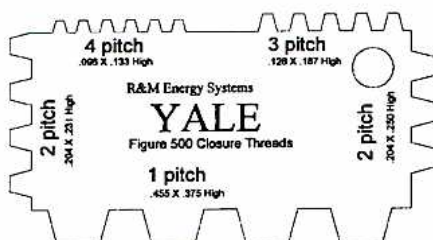
Inspect the cap and hub for the following:

- Gouges, nicks or cracks in the seal area
- Excessive corrosion or wear in the seal area
- Excessive deformation of cap lugs resulting from hammering, etc.
- Cracks on the cap exterior

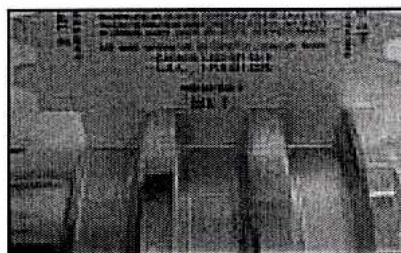
Important Considerations:

- 1) Equipment containing excessive wear, damage, or cracks should be replaced immediately.
- 2) "Acceptable" wear is dependent upon the closure's environmental conditions including pressure, temperature, media, frequency of use, etc.
- 3) NDE, such as PT, MT, UT and RT, provides a suitable means for detecting cracks.

Contact your nearest customer service representative with any questions or concerns.



Thread Gauge



Proper Thread Gauge Fit



A Unit of Robbins & Myers, Inc.

R&M Energy Systems

10906 FM 2920

Tomball, Texas, U.S.A. 77375

(800) 654-5603

(281) 351-2222

Fax: (281) 351-6557

E-mail: sales@rmenergy.com

R&M Energy Systems, Ltd.

9830 - 45th Avenue

Edmonton, Alberta, Canada T6E 5C5

(800) 661-5659

(780) 437-6316

Fax: (780) 435-3074