MOST
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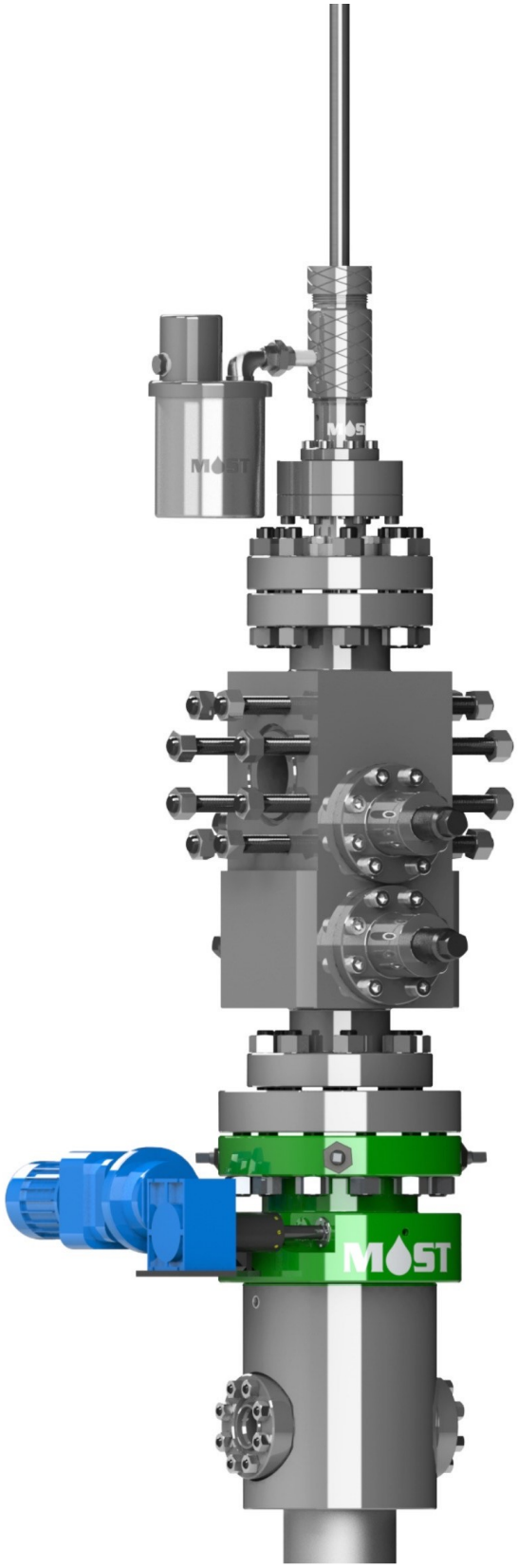

Operation and Maintenance Manual for MOST Tubing Rotators

Revision 1 – May 2020

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About This Manual

Notes, Cautions, and Warnings

Notes, cautions and warnings are used throughout this manual to provide readers with additional information and to advise the reader to take specific action to protect personnel from potential injury or lethal conditions. They are also used to inform the reader of actions necessary to prevent equipment damage. Please pay close attention to these messages.

Notes provide useful information and tips that can make the operator's job easier. Those are identified with

Cautions are identified with the caution symbol (symbol), this indicates that the potential damage to equipment or injury to personnel exists. Extreme care should be taken when performing operations or procedures preceded by this caution symbol.

Warnings are identified with the warning symbol (symbol), this indicates a definite risk of equipment damage or danger to personnel. Failure to observe and follow proper procedures could result in serious or fatal injury to personnel, significant property loss, or significant equipment damage.

Illustrations and Photographs

The illustrations and photographs in this manual provide graphical examples of equipment. These examples are not intended to represent every possible situation and will vary in appearance to the actual equipment.

Safety Guidelines

Observe the minimum safety precautions listed below and all safety precautions provided throughout this manual. Following these precautions will protect you and others from injury or death and prevent equipment damage and environmental impact.

- Follow all customer safety guidelines.
- Stand upwind when installing or dismantling equipment.

Hydrogen sulfide gas (H_2S) may be present in high concentrations. You must have proper H_2S detection equipment with you and practice all recommended safety precautions when working around wellheads.

- Live or discharging equipment possess certain hazards that require the awareness and vigilance of operators.

You MUST avoid conducting any repair or maintenance work while the equipment is in operation. Follow proper lockout / tagout procedures before staring any work on the equipment. Failure to heed this warning can result in severe injury or death.

Installation, repair, or maintenance of equipment should only be done while wearing proper PPE. Failure to do so could result in severe injury or death.

- Equipment should be used for its intended purpose only.

MOST Tubing Rotators are designed to perform specific functions and should only be used for those applications.

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Description

A Tubing Rotator is a device to prevent early tubing wear in a tubing well string by rotating the tubing at a slow rotation. The Tubing Rotator is installed above the casing bowl or casing head which anchors the tubing hanger in place for tubing rotation.

MOST has almost 2 decades of experience in manufacturing Tubing Rotators for oilfield service. MOST is certified with ISO and API under ISO 9001-2015, API Q1, and API6A Wellhead and Christmas Tree Equipment. This ensures that MOST Tubing Rotators are of the highest quality and are fully compatible with API equipment.

MOST tubing rotators are available with pressure ratings of 3,000 PSI or 5,000 PSI. Based on the application, MOST tubing rotators can be configured with manual, pumpjack or electric drives. Lastly, the tubing hangers are available in all standard threaded connections and can also be ordered with a BPV thread.

Verify the pressure rating, tubing hanger thread and configuration of your tubing rotator to ensure that it fulfills the requirements of the application.

The Tubing Rotator will rotate the entire tubing string. If the pump is anchored or locked in place, a tubing swivel must be used above the anchor and pump when the pump is anchored or if a torque stop toll is in place.

Tubing Rotator Exploded View

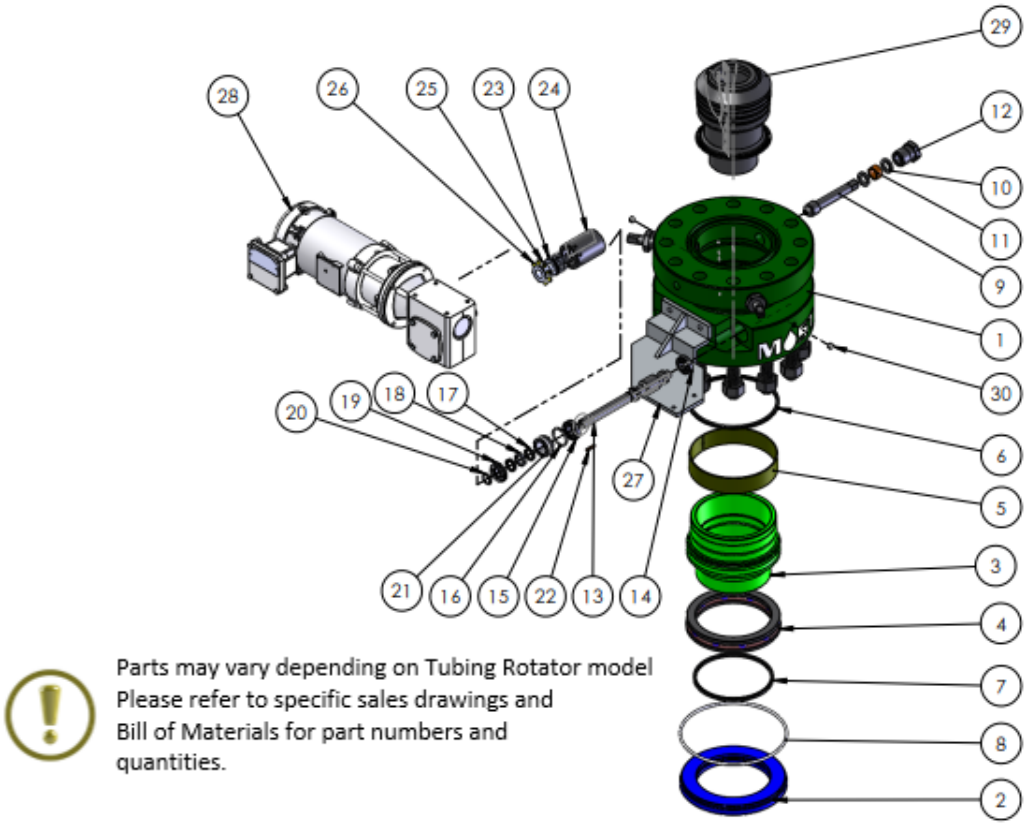

Figure 1: Tubing Rotator – Exploded View

1. Rotator Body
2. Bottom Ring
3. Rotor/Bull Gear
4. Main Bearing
5. DU Bushing
6. Polypack
7. Polypack
8. O-Ring
9. Hold Down Bolt
10. Junk Ring
11. Packing
12. Packing Nut
13. Worm Shaft
14. Inner Bearing
15. Outer Bearing
16. O-Ring
17. Polypack
18. Seal Ring
19. Lock Nut
20. Wiper
21. Seal Nut
22. Worm Shaft Key
23. Male End Coupling
24. Shear Coupling
25. Torque Sleeve
26. Brass Shear Screw
27. Motor Bracket
28. Electric Motor
29. Tubing Hanger
30. NPT Plug

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Installation

This manual provides a guideline for installation and use of a MOST Tubing Rotator. Always follow local and company safety requirements when working around an oil well.

Pre-Installation Inspection:

MOST Tubing Rotators are manufactured according to the requirements of API 6A and are fully tested before leaving the factory.

1. Prior to installation, it should be confirmed that all required installation materials are on hand.
2. Carefully inspect the Tubing Rotator to ensure that there is no damage or missing parts.
3. Visually inspect the ring grooves and threaded connections (as applicable) for damage prior to installation.
4. Confirm that the flanges and connections on the Tubing Rotators are compatible with the equipment and hardware that are going to be connected.

Installation:

Follow appropriate safety procedures for lifting, moving, and working around the Tubing Rotator and related equipment.

1. Ensure that the Tubing Rotator is installed right side up.

For Tubing Rotators with electric drive motors there are no orientation requirements. However, for pump jack cable installations, the rotator must be installed with the wrench in line and facing the walking beam for proper operation.

2. Make flanged/studded connections as per standard company API procedure.

Only use new ring gaskets. Ring gaskets deform during installation, and there is no guarantee that a used ring gasket will function correctly.

3. Perform visual inspection to ensure the installation was successful.

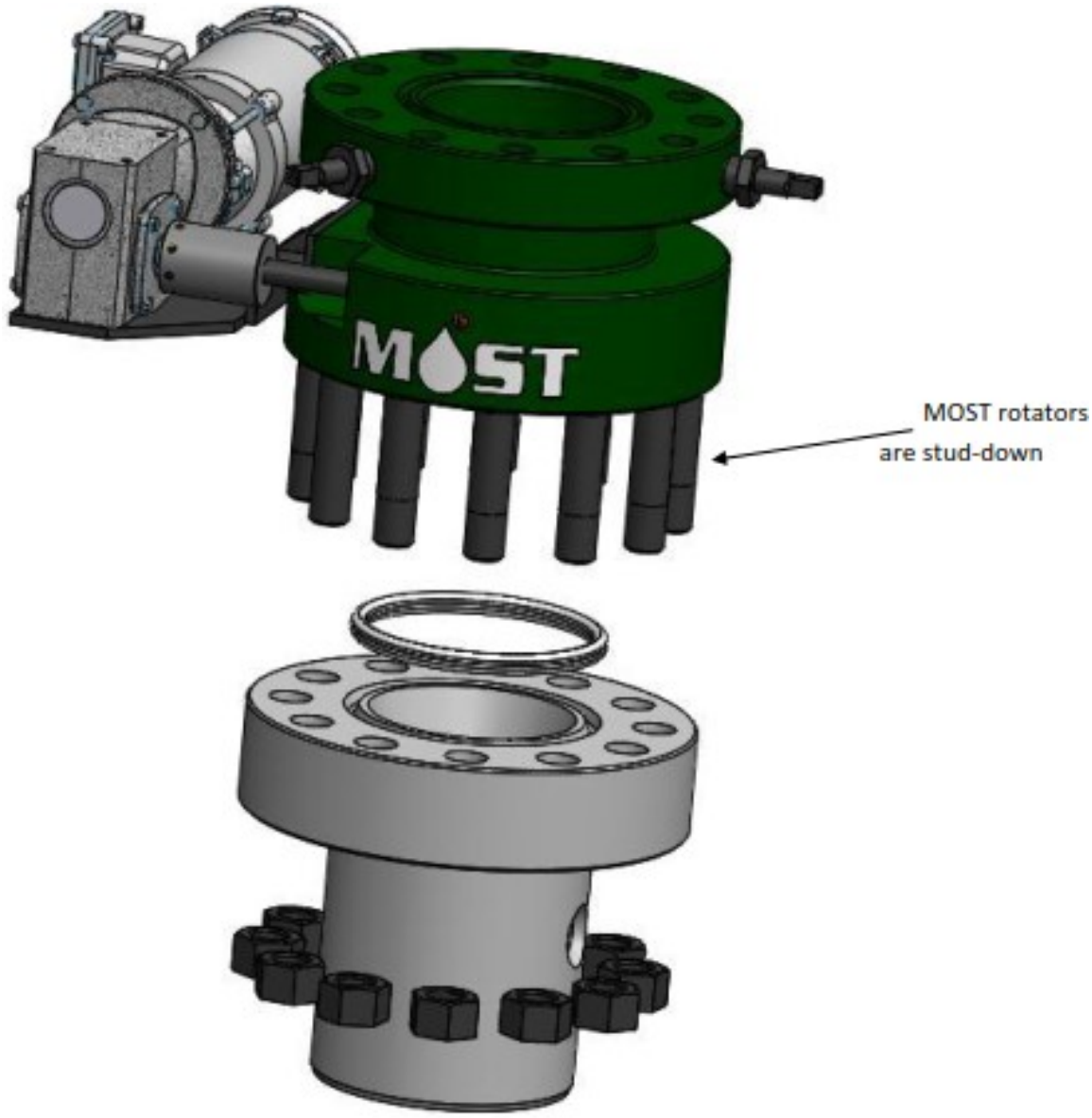

Figure 2: Tubing Rotator on Casing Head

Operation

Installing the Tubing Hanger:

The lockdown screws must be fully backed out when installing the tubing hanger otherwise the tubing hanger may catch on the lock down screws.

1. Install the tubing hanger as per standard procedures.

Remember to correct the calculations because the tubing hanger now sits in the rotator, not in the casing head or tubing head.

2. Lower the hanger through the work-over BOP then rotate the tubing clockwise to lock the anchor at the depth required. Once the shear screws shear, the swivel is designed to free rotate clockwise, but will lock if rotated left (less than 90 degrees required to lock). This allows the tubing to become rigid in order to free the anchor. The swivel uses shear screws and cannot be reset without replacing the screws.

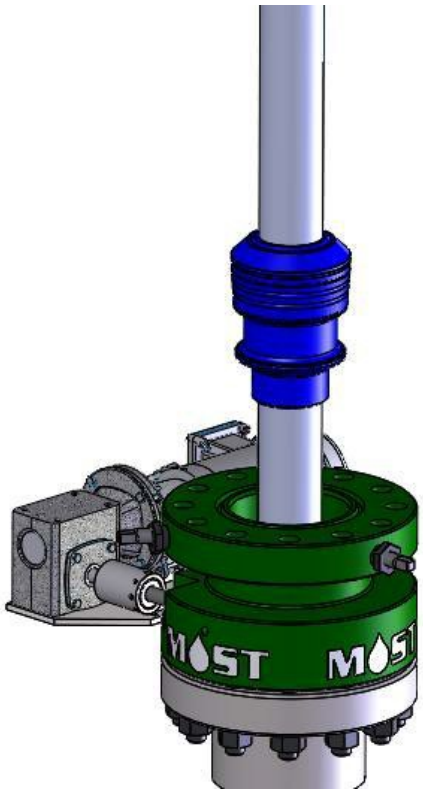

Figure 3: Tubing Hanger Install

The tubing hanger has a pickup thread on top, so no locking keys or pins are required to lower or retrieve the tubing.

3. Lower the hanger the rest of the way and seat the hanger. The hanger will automatically align with the rotator, no adjustments are required.

4. Tighten lockdown screws as per standard procedures. The MOST tubing hangers are designed such that the top of the hanger is held stationary by the lock down screw, while the lower portion of the hanger is rotated by the rotator.

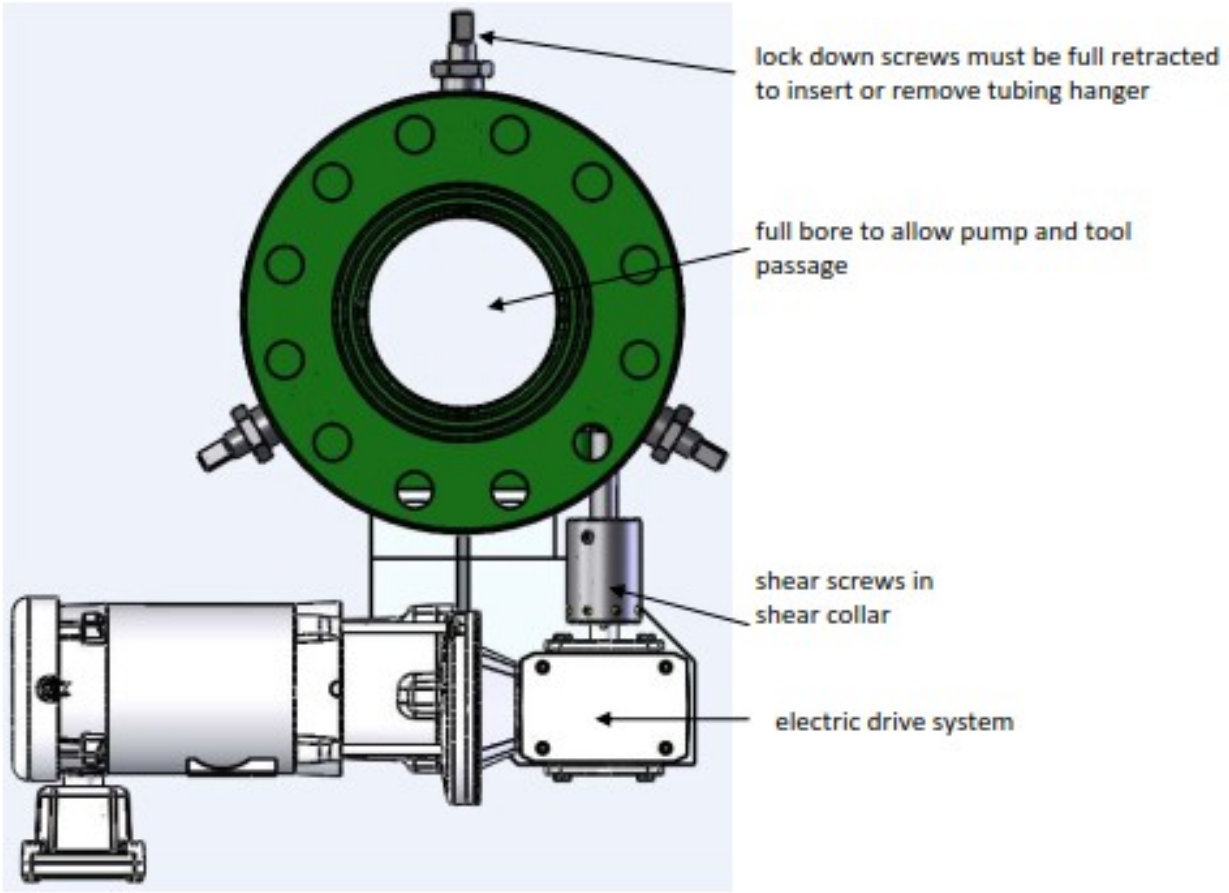

Figure 4: Tubing Rotator - Top View

Installing the Electric Motor (If equipped):

The correct electrical connections and wiring diagrams are shown on the inside of the wiring box cover on the motor. Any unused wiring should be capped off and isolated.

1. Installation and wiring should only be completed by properly trained personnel and installed according to local standards.
2. If the motor was removed during rotator spool install, the motor can now be remounted to the rotator.
3. Once wired, check rotation. Rotation should be in the direction of the arrows on the shear coupling. It should take ~12 minutes for a complete rotation.

Installing the Pump Jack Drive (If equipped):

1. The wrench on the gear box should lock when pulled up, and ratchet (click) in the downward motion.
2. The cable should be connected to the wrench on one end and up to the walking beam on the other end.
3. The cable should be located along the beam such that the ratchet in the wrench clicks twice when the beam lowers.
4. Two clicks and a stroke rate of 5-6 strokes per minute gives a tubing rotation rate of ~1.5 rotations per day.

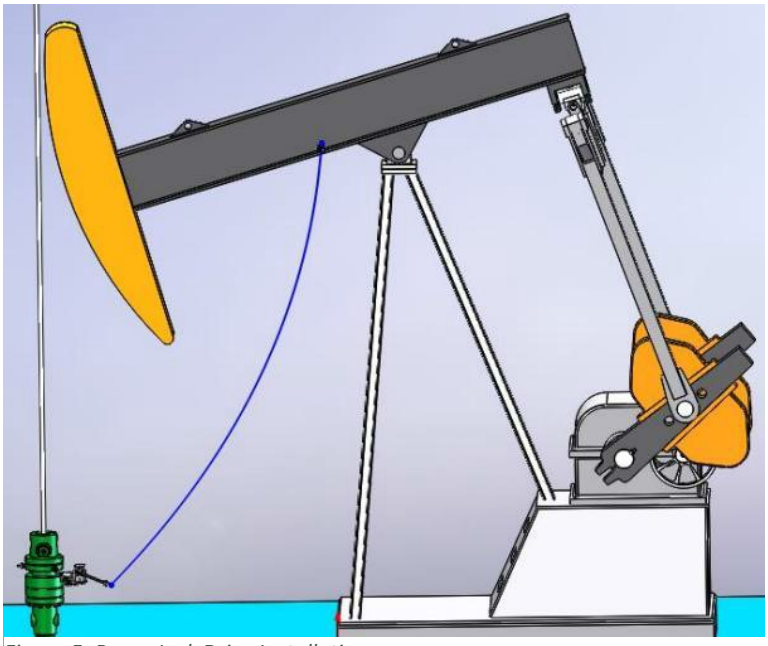

Figure 5: Pump Jack Drive Installation

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Preventative Maintenance

MOST offers a low maintenance tubing rotators that provide customers with years of service.

To Check Rotation:

1. The directions of rotation are clearly marked on the electric drive motors at the factory.
2. Once power is connected, the rotation of the shear collar and worm shaft can be seen.
3. Rotation is approximately 1.5 revolutions per day.
4. A full rotation of the shear coupling will take about 11.5 minutes.

To Manually Rotate:

1. The pump jack drive can be manually rotated by disconnecting the ratchet and manually using the ratchet.
2. The electric rotators would require the motor to be removed.
3. Once the motor is removed, the shear collar and worm shaft should turn easily by hand if there is no tubing installed yet.
4. If the tubing is installed, a pipe wrench can be used on the shear collar to rotate the tubing.

Any servicing, testing or inspection must be performed by qualified personnel.

Protective Coatings:

1. Every MOST tubing rotator ships with protective coatings applied, as per API 6A requirements. Protective coating is applied and protects the tubing rotator prior to installation.
2. The main body of the tubing rotator is also painted.
3. During installation, the surface coating on the surfaces can be worn off. If the tubing rotator is removed from service, the tubing rotator should be cleaned and a surface protectant reapplied to prevent any surface corrosion if the tubing rotator is to be reused.

Internal Threads:

All internal threads (EU, Line Pipe, etc, depending on model), should be inspected for damage before and after use.

Damaged threads can compromise the sealing integrity.

External Threads:

External threads are highly susceptible to damage during transit or from poor storage conditions. These threads should be inspected for damage before and after use.

Damaged threads can compromise the sealing integrity.

Bolts and Flanges:

1. Studded outlets and flange surfaces should be inspected before and after use.
2. Damaged studs should be replaced with equivalent API spec studs.
3. All ring grooves should be inspected for damage prior to and after use.

Ring Gaskets:

1. Only use new ring gaskets.
2. A ring gasket is deformed during the torquing procedure.

No previously used API ring gasket will provide a reliable seal.

Spares and Replacement Parts:

Use only genuine spares and replacement parts.

Five Year Maintenance

A five year maintenance should be performed on all MOST Tubing Rotators at a MOST or an authorized repair facility.

1. The Tubing Rotator is fully disassembled, cleaned and inspected.
2. All elastomers and soft parts are replaced.
3. All other parts are repaired or replaced as required.
4. The Tubing Rotator is repainted.
5. A full hydrotest is performed and the assembly is recertified.

Servicing

All servicing is recommended to be completed at a workshop and not while the tubing rotator is installed on the wellhead.

- Follow all applicable field safety requirements while installing, uninstalling or servicing a MOST tubing rotator.
- Do not service a tubing rotator that is operating.
- Do not service a tubing rotator on a pressurized or operating well.
- The refacing of flange surfaces should only be done in a controlled environment using precision equipment.

Shear Collar:

1. The rotator is equipped with a shear collar between the motor and the rotator body.
2. If the torque required to turn the tubing is too high, the shear screws in the collar will break.
3. If the shear collar rotates but the worm shaft does not, check the shear screws.
4. The core of the shear coupling has reverse threads, so if the screws have sheared, the center of the shear coupling will back out.

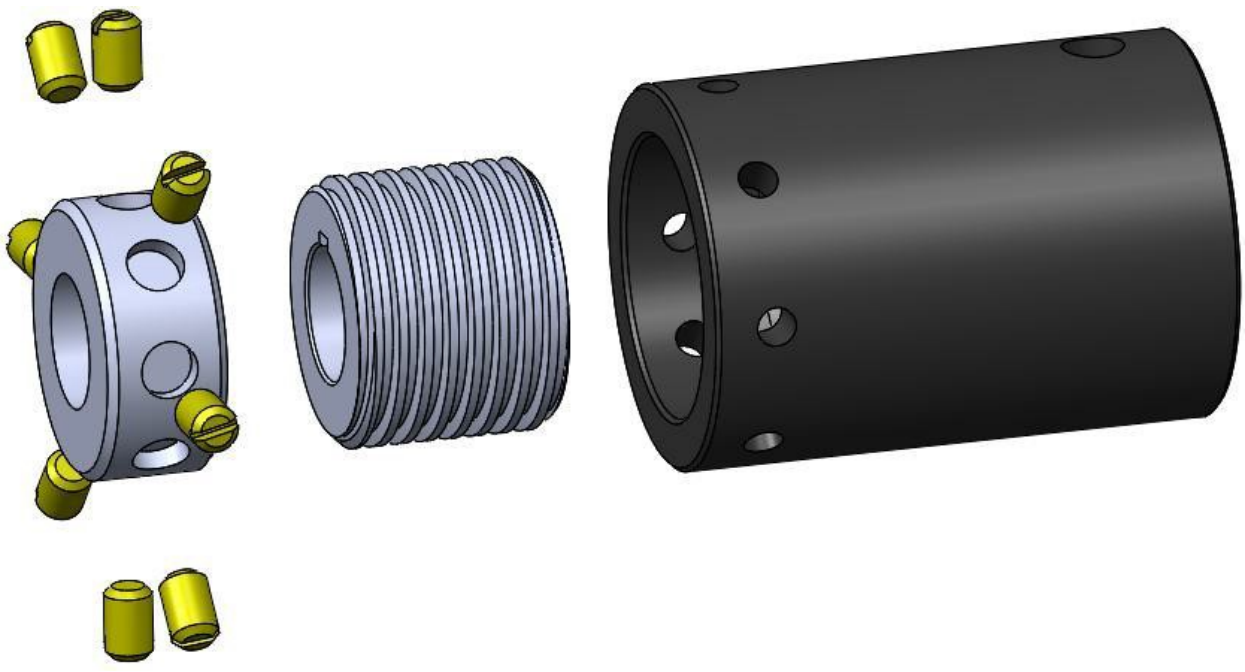

Figure 6: Shear Collar - Exploded View