MOST
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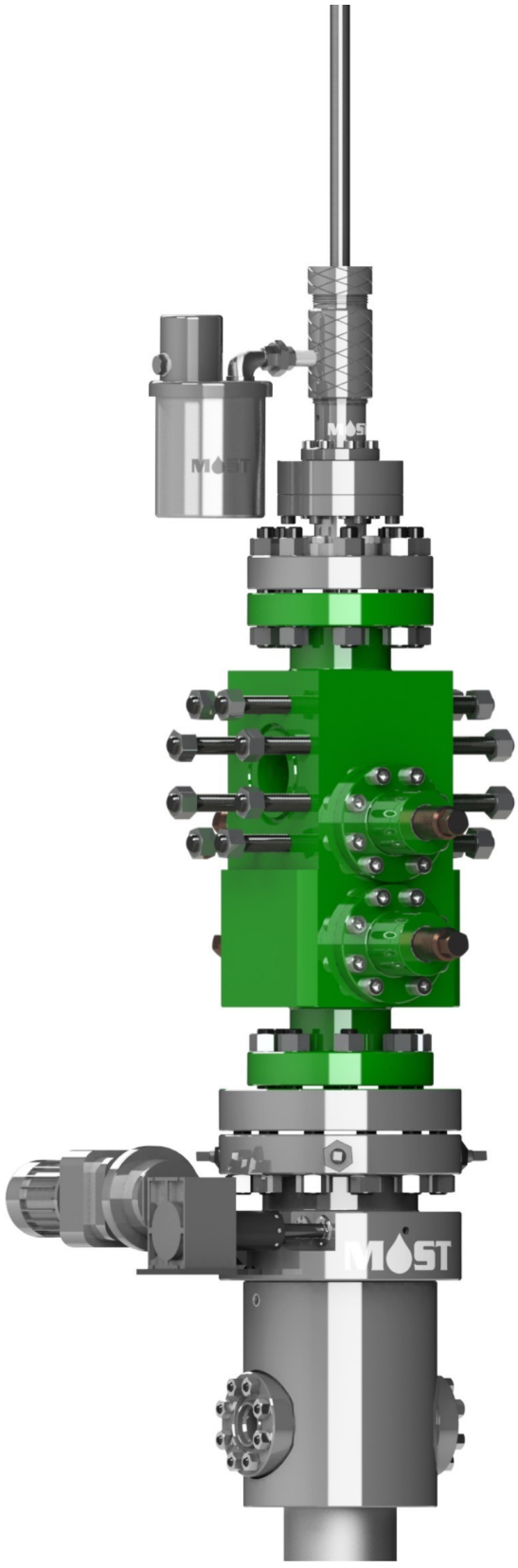

Operation and Maintenance Manual for MOST Production Blow-out Preventors (BOPs)

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 production BOPs are designed to perform specific functions and should only be used for those applications.

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Description

Production BOPs are a safety equipment on the wellhead that is used to control wellbore fluid pressure while the well is in production. This is achieved by using rams that close to seal around a polished rod (Rod-Rams) or an open hole (Blind Rams).

MOST has almost 2 decades of experience in manufacturing production Blow-out Preventers (BOPs) 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 BOPs are of the highest quality and are fully compatible with API equipment.

MOST production BOPs are available in various pressure ratings, including 1,500 PSI, 3,000 PSI, 5,000 PSI and 10,000 PSI. Based on the application, MOST BOPs can be configured with balanced or non-balanced rams and the rams can also be used to hold the weight of the rod string (if equipped). Lastly, in order to reduce the height of the Christmas tree, MOST BOPs can also be ordered with side outlets.

Verify the pressure rating, ram type and configuration of your BOP to ensure that it fulfills the requirements of the application.

Blow-Out Preventor (BOP) Exploded View

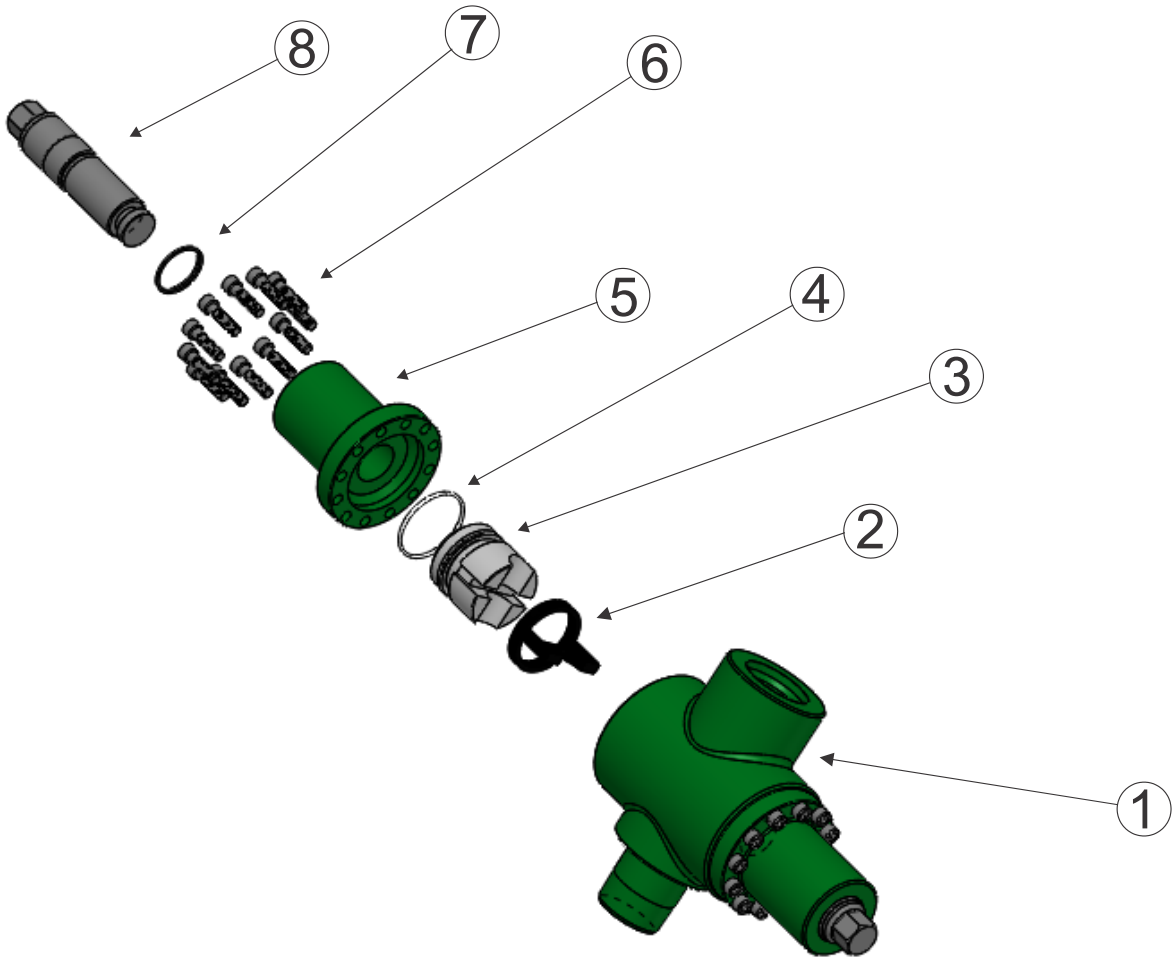

Figure 1: Sample BOP with non-balanced rams

1. BOP body
2. Ram Rubber
3. Ram
4. O-ring
5. Ram Cap
6. Cap Screws
7. Stem Wiper
8. Stem

Parts may vary depending on BOP model. Please refer to specific sales drawings and Bill of Materials for part numbers and quantities.

Pressure Balanced Ram Cap Exploded View

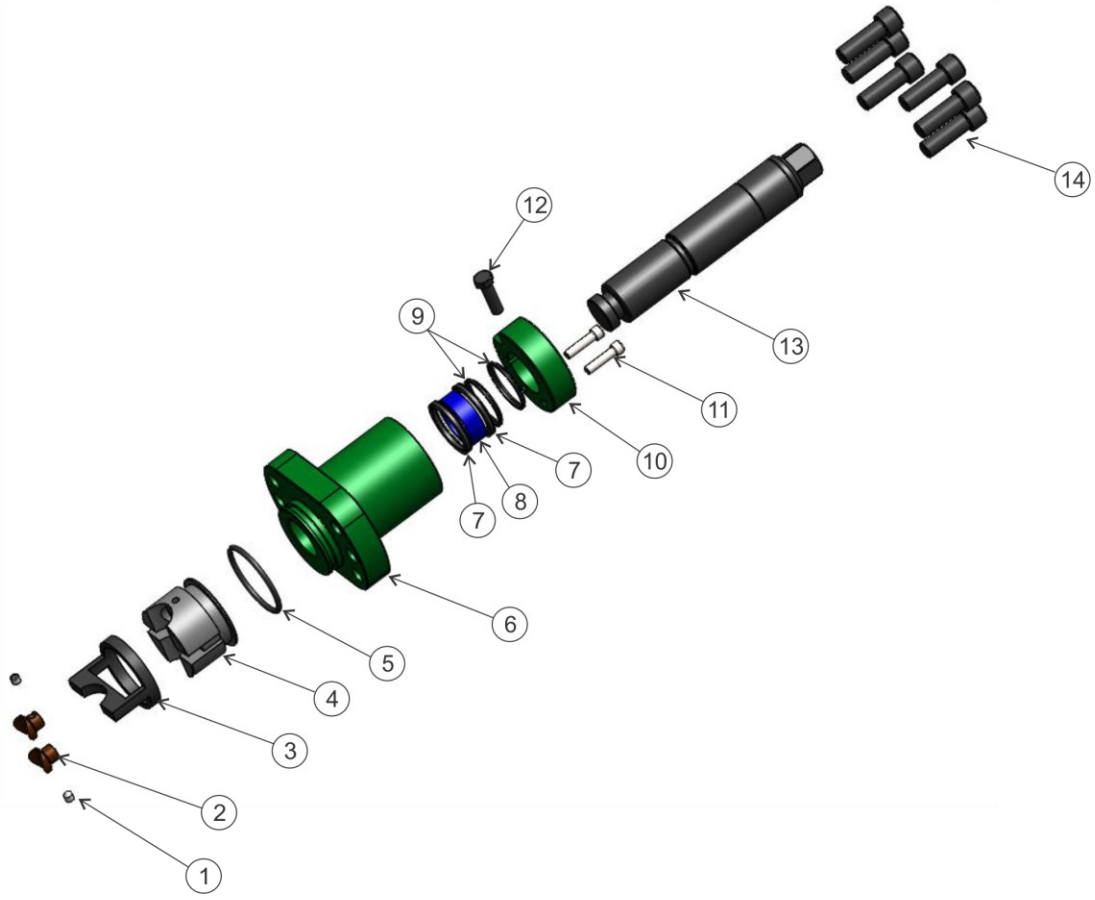

Figure 2: Sample Balanced Ram

1. Cone face set screw (clamping models only)
2. Ceramic coated rod clamping inserts (clamping models only)
3. Ram rubber
4. Balanced ram
5. O-ring
6. Ram cap
7. Polypack
8. Powerband
9. Wiper
10. Stem lock
11. Bolt
12. Cap screw
13. Stem
14. Cap crews

Parts may vary depending on BOP model Please refer to specific sales drawings and Bill of Materials for part numbers and quantities.

Installation

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

Pre-Installation Inspection:

MOST BOPs 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 BOP 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 BOP are compatible with the equipment and hardware that are going to be connected.
5. Confirm that the rams move smoothly.

Installation:

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

1. Ensure that the BOP is installed right side up.
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.

Operation

Closing the Rams on a MOST BOP:

Before closing the rams, clean exposed portion of the stems.

1. If equipped, loosen the stem locks before closing the rams. Tighten the stem locks again when the rams are closed.
2. To close the rams, tighten the stems evenly (turn the stem clockwise using a suitable tool on the hex head of the stem). When the outer indicator line starts to disappear into ram cap, that ram is closed. The rams incorporate a positive stop and will not go over-center. A final tightening torque of 50 to 75 ft-lb ensures a tight seal.
3. Do not use tools on the stem cylinder as it may affect the sealing of the ram cap. Only use tools on the hex head of the stem.
4. If the rams do not close to the indicator line, the polish rod is off center and is blocking the rams, or the rams are not matched to the polish rod.

The rams are specific to the polish rod size. Rams designed for a 1.5" rod will not seal on 1.25" rod, and vice versa.

Closing the Rams on a MOST “Rod Lock” BOP:

The rod clamping BOP operates the same as a regular BOP, with the exception of the final tightening torque. A final torque of 800 – 1000 ft-lb to each ram allows for clamping a hanging load of non-coated polish rods.

Be sure to loosen the stem locks before closing the rams, and tighten the stem locks after the rams are closed.

Opening the rams on a MOST BOP:

1. To open the rams simply loosen the stems evenly (turn counterclockwise) until the full open indicator lines are visible on the stems.
2. If the full open lines are not visible, the rams are not fully retracted and may be partially blocking the vertical bore of the BOP.

If the rams are not fully retracted, it is possible to mechanically damage the ram seals.

3. If equipped, be sure to loosen the stem locks before opening the rams, and to tighten the stem locks when the rams are open.

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Preventative Maintenance

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

Inspection of an Operating BOP:

1. During operation, the BOP must be visually inspected for leaks and seepage.
2. If a leakage is noticed, then the source must be identified.
3. If the leakage is from the bolted flanges, the bolts should be checked for correct torque, as the ring gasket may not be seated properly.
4. Replace the ring gasket if re-torquing the bolts does not correct the leak.

Ring gaskets should not be reused

5. If the leakage or seepage is behind the ram caps or on the stem, the BOP needs to be serviced.

Ram Function:

1. When a well is shut down, the BOP should be checked for ram function.
2. The rams should be operated through the full stroke (fully in to fully out) in order to ensure that the BOP is functional.
3. The stems will always have some resistance to movement.
4. Regular torque to seal a BOP is 50ft-lb at closure.
5. If it requires more than 150ft-lb to operate the stems the BOP should be inspected for damage.
6. This would require removing the BOP from the wellhead for servicing.

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

Protective Coatings:

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

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 of the BOP.

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.

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Five Year Maintenance

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

1. The BOP 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 BOP 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 BOP is installed on the wellhead.

- Follow all applicable field safety requirements while installing, uninstalling or servicing a MOST BOP.
- Do not remove the ram caps or attempt to service the rams on a pressurized or operating well.
- The refacing of flange surfaces should only be done in a controlled environment using precision equipment.

Ram Removal:

1. Retract the ram fully by turning the stem counterclockwise.
2. Remove the socket-head cap screws holding the ram cap to the BOP body.
3. Rotate the stem clockwise, this should lift the ram cap from the BOP body.
4. Pull the ram cap away from the body. This will pull the ram from the ram bore.
5. Once the ram cap is loose from the body, the stem may dislodge from the keyway in the back of the ram.

It may be necessary to put a spacer or wedge between the ram cap and the BOP body and then turn the stem counterclockwise to pull the ram from the ram bore.

Any damage to the ram bore may cause the BOP to not function correctly.

Ram and BOP assembly:

1. The ram rubber and O-ring on the ram must be replaced if there is any visual damage to the ram rubber or O-ring, or if the BOP is over 5 years old.
2. The O-rings and seals in the ram cap must be replaced if there is any visual damage to the ram rubber or O-ring, or if the BOP is over 5 years old.
3. Ensure that all surfaces are clean and lightly lubricated.
4. Insert the ram into the ram bore.
5. The wide end of the keyway in the ram must be at the bottom.
6. Fully screw the stem into the ram cap.
7. Insert the end of the stem into the ram keyway and turn the stem counter clockwise to pull the ramcap towards the BOP body.

8. Align the holes and insert the cap screws.
9. Alternate tightening the screws to ensure the face of the ram cap mates flat with the BOP body. Tighten to 27 ftlb.
10. Turn the stem fully clockwise and fully counter clockwise to ensure smooth movement of the ram.

Any damage to the rams or the ram bore may cause the BOP to not function correctly.