

Care And Maintenance Of Rod Pumps

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The rod and tubing pumps of today are far advanced over the oil well pumps of twenty and thirty years ago.

Wells were shallow and the popular pump at that time consisted of common working barrels and the old bow-spring cups. As wells were drilled deeper; longer runs were required to lower lifting costs, metals were experimented with to assemble the forerunner of the present day precision rod and tubing pumps. The original metal pumps were built with plungers turned down in lathes to fit each individual barrel so that interchange-

ability was impossible. In recent years the American Petroleum Institute committees, in collaboration with manufacturers and oil producers, have established basic dimensions on all pumps which will allow any pump shop to stock API parts to repair all types of pumps.

The modern pump shop is equipped with the finest tools available. A list of tools and equipment would generally consist of:

- (1) Vacuum ball and seat tester.
- (2) Micrometer caliber (inside and outside).
- (3) Heavy flat topped work bench with pump vises.
- (4) Full set of wrenches to fit API wrench flats (one manufacturing company recently made wrenches with flats to fit torque wrench).
- (5) Friction wrenches
- (6) Bore gauges with tips for all bore sizes.
- (7) Cleaning rods (usually brass) for cleaning barrel tubes.
- (8) Adjustable stands to support the portions of a pump not contained in the vise.
- (9) Bench grinder with grinding wheel and wire buffing wheel.
- (10) Vats for cleaning fluids.
- (11) Hydraulic hand pump to force plungers out (in areas where sanded up pumps are common).
- (12) Seat-puller to remove rib type seats from seat frames.
- (13) Full range of aligning mandrels (would be necessary in case of fields where liner inserts and tubing pump are being used).

For the convenience of discussion let us start at the well site with the pump as it clears the pumping tee. When pulling any type pump from a well bore, caution must always be used in lowering the pump to the ground to prevent bending. The pump, if an insert type, is generally extended. The unit operator will set the pump down either on the rig floor or on a piece of wood across the pumping tee in the vertical position and close the pump. If the pump is "tight," bumping is permissible. If the pump is stuck, as they often are, the pump must be laid down in the extended position. Extreme care should be taken at this time so as not to bend the pull rod or pull tube. This can be avoided by supporting the pump as it is being lowered to the rig floor. Most producers like to break the pump down on location, assuming that the well is being pulled for loss of production, this would be to find out if the pump had failed or if there was a tubing leak. Special friction wrenches are available to accommodate all API outside barrel diameters. If friction wrenches are not used any pipe wrenches are used, the common result is flattened barrel tubes and crimped cages.

When the pump is laid on the ground and checked for failure, it is at this time small trouble to pour the well fluid out of the pump and pour new lube oil into the bore, also lubricating the outside of the pump. This should be done especially in the case of metal to metal pumps. Most metals after being pulled from submergence in well bore fluids and exposed to open atmosphere tend to rust very fast. The ideal method to prevent atmospheric change failures would be to immerse the pump in fluid upon removal from the well bore. In some formations a gyp deposit is formed on

the pump while in operation, and if the pump is allowed to lay out on location in a dry state this deposit will set up until it is virtually impossible to remove. As it is impractical to submerge the pump after pulling, the use of lube oil will prevent the gyp deposit from drying and it can generally be removed in the pump shop.

In transporting the pump from the location to the pump shop or from the pump shop to the location, extreme caution must be practiced in handling. The supply companies have equipped their field cars with specially built racks to accommodate pumps in lengths from eight to twenty feet. Longer pumps can be hauled but whip results if roads are rough and possible damage would result unless the car is driven slowly. The point we wish to get over is that a pump when hauled on a pickup or truck should never be head-ached or allowed to whip in hauling. A chain and boomer should never be used to bind a pump down. Mashing the barrel tube or liner packet would almost be a certainty if this practice is used.

When the modern pump shop men receive a used pump to repair they generally try to repair it as soon as possible. This is to prevent pumps piling up on them and also to save the operator money. A pump just pulled from a well is easier to clean up and repair than one which has set up for several days. As a pump is broke down all parts are cleaned in vats which contain fluid that would present a minimum of fire hazard and would not be injurious to the workmans hands, then dried and buffed to remove rust, sand and dirt. Parts are then inspected for mashed or pulled threads, washed out threads or joints and cracks or pin holes in cages. Excessive wear on pulled rods or pull tubes on the O.D. should be watched for. The plunged should be miked for wear and bore gauges used for finding the wear on the inside diameter on the liners or barrel tubes.

Balls and seats must be checked for surface cracks, fluid washes, and although appearing good to the naked eye, should be put on a vacuum tester and should hold twenty eight points of vacuum for at least thirty seconds while the ball is being rotated by hand. All questionable parts and those showing excessive wear must be replaced with new API material. If failure due to corrosion is evident and the operator is not aware of it, the operators attention should be called to the corrosion so that he may have the opportunity to replace the damaged parts with non-corrosive materials.

In reassembling a pump, experienced knowledge as well as common sense should prevail. There are some tapered threads in the API pump of today, but most threads are straight with shoulder joints. Making parts up against each other with proper wrenches, shouldering them and then

jarring once with a mallet should suffice. Any further force will only tend to pull threads or fracture the metals, leading to early failure. Cheaters except in the case of tubing pumps should never be used in the making up process, and the use of torque type wrenches is coming more and more common.

In assembling the common cup pump caution must be used in not making the cups up so tight that the cup spacer will cut or bruise the heel of the cups. This could also cause the cup lip to be expanded to such an extent that the pump would stick in service. "Make it up tight and give it a half turn more" is a general oil field rule. In the case of precision metal pumps this does not apply. Metals will stretch and fracture and if abused will lead to early failures and expensive operating costs.

The proper lubricants applied to threads when making up will add service to all pumps. A good thread lubricant is generally a good all purpose shop lubricant. Zinc compound is very beneficial to prevent galling on stainless or monel threads.

After pump is properly assembled it should be tried on the bench to see if it will pull a vacuum. There have been occasions where the best of repair men get a ball and seat in a cage upside down. The fewer men assigned to work on the pumps in the pump shop, the less the chance of error. It is very easy for each man to think the other tightened a joint and this might not be noticed until an irate operator has a pump back off in the hole.

Some operators like to check a pump before going in the hole to see if it will pick up fluid. If this practice is used, care should be taken to see that the fluid being used is free from foreign matter, such as sticks of wood, gravel or shredded seating cups. Any foreign matter such as mentioned can jam a blind cage to the extent that the ball will not close, or will not open, and cause failure after running in the well. If a gas anchor is not used, all pumps should be equipped with a strainer nipple to screen possible well trash.

When picking a pump up on location, a 2" pony rod is generally used. This pony rod should be perfectly straight. If in picking the pump up it is bent, this will cause wear on the outside of the pump when seated in the tubing string and cause excessive wear on either the O.D. of the barrel tube, the pull rod, or the pull tube.

Pounding fluid with any pump can lead to failures, splitting liners, barrel tubes and tubing collar leaks could be expected. Reducing the bore of the pump or slowing the prime mover down will eliminate these failures.

The API has an excellent article on this subject in Appendix A to their API Standard No. 11-A entitled "Care and Use of Oil Well Pumps," which should be required study for those concerned.