



Recommended Installation Procedures

SAFETY:

IT IS THE RESPONSIBILITY OF EVERYONE INVOLVED WITH WORK AT THE WELL SITE TO STOP AN UNSAFE ACT OR TO IDENTIFY ANY POTENTIAL HAZARD AND BRING IT TO THE ATTENTION OF THE SUPERVISOR OR COMPANY MAN.

It is recommended that an authorized representative of TRC | Fiberflex® is on location to ensure proper handling and make-up for all new rod installations.

When arriving on location, the service personnel should check with the company man and get the running procedure of the rod string. Rod string components should be inspected upon delivery to verify quantity, size, length, type or grade, pin size, guide size, style and/or load capacity. The sucker rods should also be examined to verify that the components were not damaged during the delivery process. **NEVER** assume that the sucker rods or other equipment delivered to the location match the rod string design.

PREPARING FIBERFLEX® SUCKER RODS

Packaging and thread protectors should not be removed from the sucker rods until the string is ready to be installed.

Unscrew the rod thread protectors by hand or with an air impact wrench and 4-point socket. Knocking off the thread protectors will leave plastic remnants on the threads that can cause damage to the threads on the end fitting and/or coupling during the make-up process. The plastic left behind can keep the rod/coupling make-up from being complete which could cause a failure. If the couplings arrive on location already installed on the sucker rods, **DO NOT** engage the coupling threads with a screw driver when removing the coupling's thread protectors. This action almost always results in thread crest damage and can cause failures downhole.

Clean the threads, pin shoulder and coupling faces. Always remove all debris during cleaning. Visually inspect the threads, pin shoulder and coupling faces for indications of damage. Nicks, deformations, or foreign materials on the end fitting contact surface, coupling faces, or either thread may cause improper make-up and premature failure.

After removing the thread protectors and cleaning the threads, apply a small amount of thread lubricant to the first 2-3 threads of each sucker rod before the coupling is applied. Sucker rod thread-lubricants need to be smooth, with a grease-like consistency, and contain corrosion inhibitors and anti-oxidants to reduce the interference-fit between the threads.

INSTALLING SUCKER RODS

Many improper activities can cause rod damage so severe that failure can result in just a few days following initial installation. The proper and consistent procedures of running sucker rods into a well takes time and should not be a race against the clock. Time spent wisely is sure to pay off in terms of longer run times without unnecessary downtime and rod replacement.

When running Fiberflex® fiberglass sucker rods, it is necessary to use elevators and rod wrenches that are the right size and in good condition. The elevator and rod wrenches should be inspected regularly for wear and other damage, and should be repaired or replaced when their continued use might result in damage to the rods.

Do not use pipe wrenches or other tools not specifically designed for use with sucker rods.

Use a TRC | Fiberflex® displacement card to ensure accurate displacement calibration. Use of mismatched displacement values

will result in improper make-up. Install couplings onto sucker rods. The sucker rod coupling is designed as a rotary-shouldered, friction-loaded, fluid-free connection between sucker rods. The end fitting shoulder and the box face requires friction to maintain proper make-up. Be sure not to let the thread lubricant come into contact with the contact faces of the end fitting or the coupling. If thread lubricant gets between the contact faces, the connection will back off while in service which will cause premature failure. A clean rag should be used to remove any lubricant from the pin shoulder and coupling face. The faces must remain clean and dry throughout this procedure. Do not dump the couplings out on the ground for faster access to them. The threads will gall if not kept free from solid material such as dirt or sand.

The rod bundles that are ready to be installed should be broken open in a safe manner that will not cause rod surface damage. This can be accomplished using side cutters or tin snips to cut the steel or nylon banding. The rod bundles are not designed to be used as a work surface.

Do not place tools, pipe, or other equipment on the rod bundles. Do not stand or walk across loose sucker rods.

Inspect the rod elevators. Ensure that the seats are smooth and round in shape, that the latch opens with resistance and snaps shut, and that the bail moves back and forth freely.



It is extremely important that the well servicing rig be correctly positioned over the wellbore. The rod hook must be positioned directly over the tubing bore in order for the sucker rods to feed into the tubing without creating friction or drag on the sides of the running nipple. Any friction will damage the surface of the rod and could result in premature failure.

Be sure the pulling unit crew warms up the hydraulic system to thermally stabilize the hydraulic oil temperature. It is recommended that the hydraulic oil system be circulated until a normal operating temperature is reached and that this temperature be maintained within a reasonable level through calibration and installation of the rod string. Changes in temperature will affect hydraulic oil viscosity and pressure causing the tongs to drift off the pressure setting. This will cause over or under torquing (displacement).

Run the pump and other necessary downhole equipment into the well. (pump subs, sinker bars, on-off tools, shear tools, etc.) **ALWAYS** follow the manufacturer's recommendations for all downhole equipment.

To avoid damaging the end fitting or rod body, **ALWAYS** utilize two people to carefully pick up and tail in Fiberflex® rods to the floor. Rods that run down the bundle damage every rod they hit. Rods that are dragged on the ground in the dirt have contaminated threads and may cause threads to gall.

With the rod string design in mind, pick up the first sucker rod, latch one end into the rod elevator and hand carry the other end until the sucker rod is hanging freely in the derrick. Elevators should **NEVER** be thrown on a rod for any reason. Forcing the elevators onto the rod without manually opening the jaws can damage the fiberglass sucker rod. Should any cut or gouge be deep enough to break the glass fibers, the rod should be laid down.

When stabbing the rod pin into the coupling, the rod should hang straight, without slack, to avoid cross threading of the connection. If the threads are damaged, due to cross threading or galling, the threads cannot be reconditioned and the rod and coupling should be discarded. **DO NOT** use taps and dies to repair damaged threads.

Make-up the rod and the coupling connections by hand or rod wrench, spin the connection together until the pin shoulder and the coupling face touch, which is the hand-tight assembly. **DO NOT** over tighten. The connection is hand-tight when the pin shoulder and the coupling face touch without extraneous pressure applied. Scribe a vertical line on the coupling and lower rod shoulder. This line represents zero displacement. Unscrew the lower connection until 2-3 pin threads are left engaged by the coupling. Backing off the rod allows the tongs time

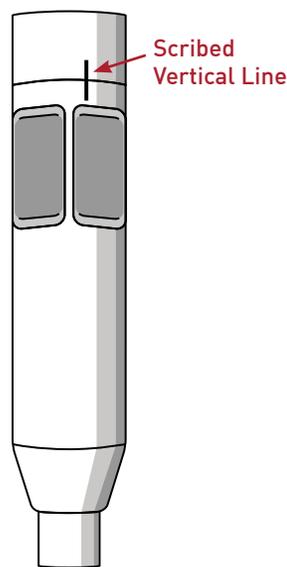
to reach full speed during make-up.

Power tongs are the recommended tools for making up joints of virtually all sucker rod strings. They must be set up properly to provide the circumferential displacement specified by the manufacturer and grade of rods being installed. Most operators are familiar with the make-up process and their equipment and can closely approximate the correct setting or "starting point."

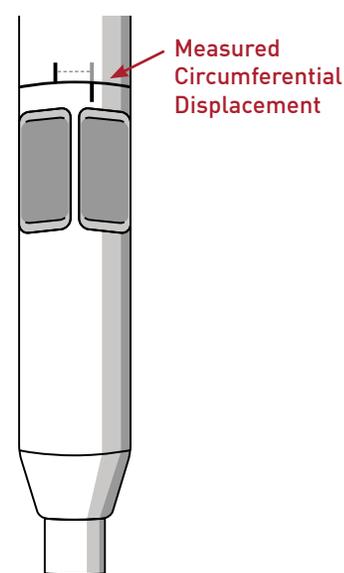
Make sure the engine RPMs are at full throttle. Then have the crew pull the rod tongs onto the connection. Maintain full engine RPM's throughout makeup and stall the rod tongs and do not "bump" the connection. Back away the rod tongs and idle down the engine RPMs.

Match the circumferential displacement on the rod coupling connection to the proper displacement card. Check the pin shoulder and coupling marks for the correct displacement. Displacement must accurately match or slightly exceed the marked distance on the card, with no exceptions. Do not exceed 1/16" past the recommended mark.

HAND-TIGHT JOINT



MADEUP JOINT



INSTALLING SUCKER RODS CONT'D:

If displacement is incorrect, adjust the power tongs, break and remake the connection and check the next connection for proper displacement.

Once the correct displacement is obtained, run this connection in the well. Do a mechanical integrity check of the rod tongs by checking the next 3 to 5 joints to verify the pressure adjustments are correct and maintained. Check every 20th connection as you go downhole with the sucker rods and adjust the power tong pressure accordingly.

Note: Cross threaded connections are not acceptable. Each make-up should be initiated by hand and care should be taken to ensure the threads are fully engaged by 2-3 threads prior to placing power tongs on the rods. The tongs are capable of cross threading the joint. If a joint is cross threaded it will fail. If the rod will not screw on by hand there is already threading issues.

Every change in rod size requires a new hydraulic pressure "starting point" adjustment, displacement card selection, and displacement measurement and verification. **ALWAYS** use the current tong pressure setting for changeover couplings, crossover couplings, and combination couplings.

PUMP SPACING:

Pump spacing with steel sucker rods normally requires only one to two feet of clearance between the plunger and the standing valve or the bottom of the pump. But because of the elasticity of the Fiberflex® fiberglass sucker rods, it is necessary to allow sufficient spacing to accommodate the rod stretch.

Care must be taken not to space the pump plunger too far from the bottom of the pump or too close to the top of the pump. As the fluid level decreases, the pump spacing also decreases.

A tested formula for pump spacing with Fiberflex® fiberglass sucker rods is as follows:

$$\frac{(9" \text{ X Footage of Fiberglass Rods})}{1000} + \frac{(2" \text{ X Seating Nipple Depth})}{1000}$$

When spacing a pump, it is important to stack-out the rod string to ensure the pump is properly seated. The rod string should be raised (15 ft.) to lift the plunger from the bottom of the pump. Then lower the rod string a few inches at a time until the plunger tags the bottom of the pump. A mark should be made on the rods each time a tag is made. It is recommended this procedure be done several times to ensure proper spacing.

As the rod string is carefully raised, measure the distance, which was calculated using the pump spacing formula. This is the lowest point of the pumping cycle, and the polished rod should be attached to the pumping unit at the lowest point in the down stroke. Measure the amount of pony rods that will be needed at this time. When connecting polished rod to sucker rod or pony rod be certain a polished rod coupling is used.

Hang on head, then turn on the pumping unit. Check for tags. Some oil operators want a slight tag to occur in the pump at the bottom of the down stroke to avoid gas lock or to dislodge any foreign material which may cause the ball and seat valve to malfunction. This should be avoided. Fiberflex® fiberglass sucker rods will dampen the shock wave before it reaches the surface and what may seem to be a slight tag is actually a severe pound. This not only damages the pump pull rod, clutch and the top cage, but it also causes a dynamic compression load on the fiberglass sucker rods. There should never be a light tag on the up stroke or down stroke.

Keep complete records.

If there are any questions about running Fiberflex® sucker rods or spacing a well, contact:

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