
Thermoflex Installation Guide

Ø1.00" Thru Ø1.75" Velocity Strings



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Preface:

This manual provides the basic tools, preparation, installation and start up procedures for installing Thermoflex tubing in gas well environments. This document is intended to provide the gas well operator and the installer with the key considerations required for installation and operation of the tubing, and is not intended to be the sole training for installation. New installers should contact Polyflow, Inc. for training.

Intended Use:

Liquid loading is a problem in many older and even some newer gas wells, resulting in decreased production. Thermoflex[®] tubing is designed to provide continuous removal of fluids from gas wells experiencing liquid loading problems. By utilizing Thermoflex[®] tubing, gas flow can be increased above the critical velocities needed to lift fluids without creating excessive back pressure against the reservoir.

Wells requiring the injection of chemicals or additional gas to enhance the ability to lift fluids from the well can also utilize Thermoflex[®] tubing. Polyflow Inc. should be contacted to verify the operating performance requirements of the tubing and the chemical compatibility of the tubing material components.

It is critical to have enough gas production below the bottom of the Thermoflex[®] tubing to lift the influx of fluid. Please consult a PolyFlow representative to determine the suitability of Thermoflex[®] tubing for a well candidate. PolyFlow will assist in the sizing and modeling of the tubing to determine the proper configuration required to continuously lift fluid from the well.

Well Preparation:

Removal of Existing Steel Tubing

All existing steel tubing should be removed prior to insertion of the Thermoflex[®] tubing.

Determining Landing Depth

For single perforation zone wells, the landing depth for the bottom of the Thermoflex[®] tubing should be approximately 10 feet above the top perforation. For multiple zone perforations, contact PolyFlow for a suggested depth.

Swabbing the Well

The well **must** be swabbed immediately prior to installation of Thermoflex[®] tubing. Wells should be swabbed to a depth that will permit the proper installation of the tubing without landing the bottom of the tubing into fluid. To accomplish this, one must know the intended landing depth for the bottom of the tubing, an approximate time required for the installation, casing volumetric capacity, and the fluid influx rate into the well bore. The fluid influx rate can be determined during the swabbing process. Once this rate is known, the depth for swabbing should be at least the sum of the landing depth plus 1.5 times the height of the fluid column generated by the fluid influx during installation.

For wells that have been soaped in the past, a defoaming agent should be added to the well prior to swabbing to enhance swabbing and to minimize the formation of foam plugs in the well after swabbing.

After swabbing the tubing should be immediately installed. The well should not be shut in for any period of time. If for some reason the tubing cannot be immediately installed after swabbing, the well should be open flowed to a fluid tank until the tubing is ready. If the well is shut in prior to installation of the tubing, the swabbing process will need to be repeated.

Installation Options:

Installation of Thermoflex[®] tubing can be performed with a coil tubing truck or a direct drive spooling truck. Figures 1 & 2 display each type of unit.



Fig. 1 Coil Tubing Truck



Fig. 2 Direct drive Spooling Truck

When using coil tubing units, the size and type of injector blocks need to be reviewed with PolyFlow personnel prior to the installation to assure proper sizing, clamping pressure control at the injectors and maximum pulling force controls. PolyFlow is available to assist in the suggestion of installers for specific regions.

Assembling Pipe and Couplings:

Couplings must be installed on both ends of the Thermoflex[®] tubing to ensure proper performance.

Coupling Installation Procedure

1. Cut end of pipe square and deburr ID and OD.
2. Slip the ferrule onto the end of the pipe.
3. Insert ferrule until the end of the pipe butts against the tapered edge of the ferrule.
4. Use a pen to mark the location of the back edge of the ferrule on the pipe.
5. Pull the ferrule off the pipe and screw onto the stem to assemble the coupling.

6. If ambient temperature is below 50°F:
 - a. Place end of pipe into 160°F – 200°F water (preferably inside a thermos).
 - b. At least 6 inches of the pipe should be immersed into the hot water.
 - c. The end of the pipe should be immersed for at least 2 minutes. (See Figure 3)
 - d. After immersion, proceed quickly through steps 7 to 18.



Figure 3: Warming Pipe

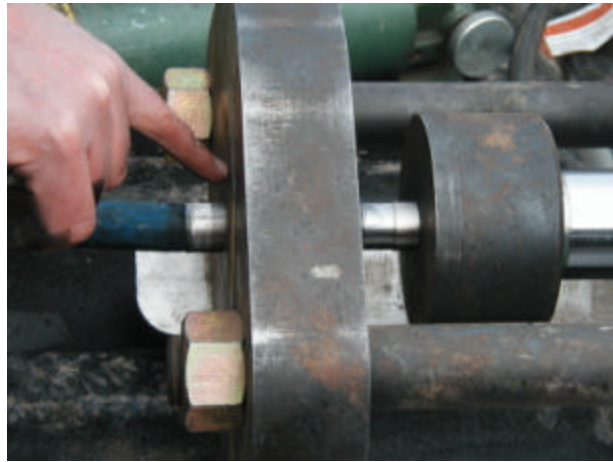


Figure 4: Swaging Process

7. Using your hands, push the assembled coupling onto the end of the pipe.
8. Make sure the back edge of the ferrule aligns with the previous mark. If not, use a rubber mallet to tap the coupling into place.
9. Install lower half of swaging die into the hydraulic swaging machine.
10. Lubricate inside of die with Molybdenum Disulfide lubricant.
11. Feed the pipe & coupling through the yoke of the hydraulic swaging machine.
12. Coupling should be seated into the hydraulic ram adapter plate.
13. Lubricate inside of top half of die with Molybdenum Disulfide lubricant.
14. Slip the top half of the swaging die into place. Make sure it is flush with the bottom half.
15. Place molybdenum disulfide grease onto the ferrule of the coupling.
16. Make sure ram valve is in the proper position for swaging.
17. Turn on the ram.
18. Run about 1/3 of the way through the die and stop. (See Figure 4)
19. Move the ram valve into the reverse position and then back to the swaging position to relieve pressure on the coupling. This will allow the coupling to re-center in the ram.
20. Go another 1/3 of the way and repeat the above step.
21. Push the coupling all the way through the die.
22. Reverse ram position.
23. Remove the coupled pipe. The coupling should be smooth without bulges in the ferrule. (See figure 5)



Figure 5. Finished Coupling

Performing the Installation:

Once the well is swabbed and prepared for Thermoflex[®] tubing installation, the following guidelines should be used for installation.

1. The installation truck should be backed over the well with the alignment of the shive directly over the well bore.
2. The casing/tubing annulus should be vented to the sales line or the fluid tank during installation to minimize pressure and flow through the wellhead.
3. The tubing hanger should be screwed onto the wellhead using good service crew practices. (See wellhead sketch figure 6)
4. When using a stripper head or a stuffing box for blow back relief, the tubing and termination coupling should be fed through stripper or stuffing box. The deadweight cone should then be screwed onto the bottom termination coupling. Tighten the deadweight cone with a pipe wrench making sure that a second wrench or clamp is holding the stem of the termination coupling to eliminate the potential for twisting of the tubing. **DO NOT** place a wrench on the swaged ferrule. (See Figure 7)

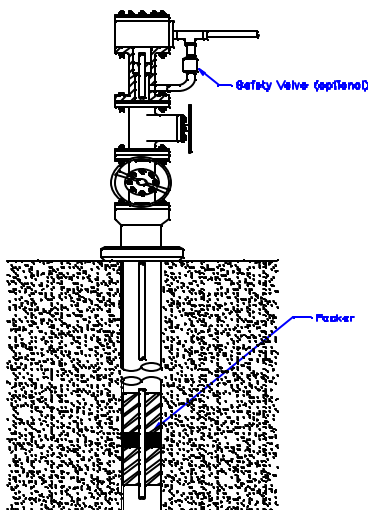


Figure 6. Wellhead Sketch



Figure 7. Deadweight Prior to Installation

5. The tubing should be inserted into the well and the stripper or stuffing box screwed upon the tubing hanger assembly. Make sure the seals in the tubing hangers are not engaged. Engage the seals on the stripper or stuffing box to seal off the annulus. To prevent tubing from being crushed, DO NOT use pneumatic or hydraulic powered pumps to engage the seals.
6. The tubing may be too light to immediately fall into the well and may have to be manually pushed in a short distance until the tubing is coil heavy. Once the tubing is coil heavy, the direct drive spooler or the injector will regulate the descent of the tubing into the well. The rate of the installation is up to the installer, but should not exceed 120ft/min.
7. The annulus can be blow to the tank during installation to minimize gas blow up the tubing.
8. If there is a union in the tubing string, care should be taken remove the risk of kinking the pipe near the union. If the shive radius is too small for the union, the tubing should be temporarily hung with a set of slips and the union moved through the shive without any tensile load on the tubing. This can be accomplished by raising the shive height until the union passes through, releasing the slips and lowering the shive back to its original position.
9. As the tubing is approaching the well depth desired, the installation speed should be slowed. If the tubing is going through any restrictions in the well, the installation should be slowed to assure the termination coupling does not hang up while passing through the restriction.
10. When the tubing is approximately ten to twenty feet from landing depth, the spooling truck should stop, and slips should be set around the tubing at the wellhead to hold the tubing while the tubing is cut to its final length and the top termination coupling is installed.
11. A threaded eye hook should be screwed onto the top termination coupling and attached to a crane or gin pull to lower the remaining footage into the well and land the tubing.
12. The installer has the option to hang the tubing off the top termination coupling or screw the top termination coupling into a longer piece of steel tubing for hang-off. DO NOT HANG-OFF ON THE PLASTIC TUBING. If a longer steel segment is attached to the top termination coupling, this must be performed in step 10. As the tubing is lowered into the well, segmented tubing slips provided with the tubing hanger must be tightened around the steel pipe at the desired location.
13. Once the tubing is set in the tubing hanger assembly, the annulus can be shut in and the tubing turned into the sales line. DO NOT SHUT IN THE WELL AND TRY TO U-TUBE THE FLOW. THIS CAN CAUSE A POTENTIAL FOR COLLAPSE. Care should be taken to slowly close the annulus and not slam the valve shut to minimize any hydraulic shocks to the well.

Precautions:

Thermoflex[®] tubing is delicate as compared to steel tubing, and special precautions must be followed to ensure an acceptable record of success.

1. Never attempt installations in temperatures below 10°F.
2. Never attempt to “U-Tube” fluid up the Thermoflex[®] tubing by applying pressure to the casing annulus. This can cause the tubing to collapse.
3. Never exceed rated pressure, depth, or temperature of tubing.

Equipment Required:

Tools Required:

1. Coupling swaging machine (rented from Polyflow or provided by installer)
2. Swaging dies for the required pipe diameter (rented from Polyflow or provided by installer)
3. Molybdenum Disulfide grease
4. Hack saw/ pipe cutting tool
5. Grease pencil
6. Tape measure
7. Wrenches for wellhead assembly and disassembly

Service Equipment Required:

1. Installation rig and crew
2. Swab or bailing truck and crew

Equipment Required:

1. Thermoflex[®] tubing of sufficient length to land at the depth required for the applications. Installers should be contacted to determine any excess pipe required for spooling or installation.
2. Termination couplings
3. Union coupling (for applications where the length of pipe required is in excess of the individual lengths supplied)
4. Deadweight cone
5. Pressure differential valve
6. Tubing Hanger
7. Miscellaneous pipe fittings for the wellhead assembly

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Thermoflex[®] tubing installation utilizing a direct drive spooling unit.

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