Care Of Tubing And Tubular Goods On The Lease

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You men as users and myself representing a pipe manufacturer are both vitally interested in getting satisfactory service from our tubular goods. Engineering wise, there are three major factors which control this:

1. Proper manufacture.
2. Proper design.
3. Proper use.

Correct manufacture of the tubular material is our responsibility, and I hope you will admit that we (meaning all the pipe manufacturers) do our best at it. It is my own personal opinion, the quality is rather high although there are occasionally a few glaring defects which seem to escape detection until noticed in the field, either on the ground or, unfortunately, sometimes underneath. However, we are not here today to talk about this although I would like to point out that sometimes the most horrible looking defects are not always dangerous. For instance, we recently had an example of a pit in tubing which had a measured depth of .145 inches. As a matter of curiosity, we subjected this to an internal pressure test; and it finally failed by splitting through the pit at 13,300 pounds per square inch. On the other hand, there are some quite innocent looking defects, such as internal plug scores, which—if they happen to have a sharp bottom—can fail at quite low pressures.

Design is a mutual responsibility between maker and user of some complexity, and of course the soundest material can be made to look bad by exposure to service conditions for which it was not designed. As an example, H-40 grade might have been used where the strength of N-80 was required or non-upset specified instead of upset. Again, we are not here to talk about that.

The term "proper use" brings us to the subject at hand: "Care of Tubing and Tubular Goods on the Lease." Both of us are equally interested in this phase of obtaining long service from our pipe. For your consideration, I am going to make a few specific statements as to recommended practice. Your natural assumption will be that I, to protect the material, am going to lean over backward to specify long drawnout and accurate procedures for the care of tubing. Nothing I have to say, however, will violate common sense care, and the recommendations I have to offer are a consensus not only of the manufacturer but also of the large users:

Care Prior to Running

Inspection of the connections before going into the hole can be very important. Just before running remove the protectors from both field and coupling ends of a number of lengths. A visual inspection of the threads even though covered with thread dope will show whether they are properly coated with adequate lubricant and air borne dust or sand has not sifted into the connection. In case of doubt, clean the pipe and coupling threads; and when fully dry reapply fresh compound to all mating surfaces. If the threads are apparently clean and undamaged, it is probably better to run tubing as received from the mill than attempt to perform a haphazard job of cleaning and redoping. However, in any case it is believed good practice to apply additional thread compound just before stabbing.

Before running the first time or if it is believed the tubing has been exposed to excessive pulling or bending stresses, check with an A.P.I. drift to insure free passage of pumps, swabs, etc. An A.P.I. drift is 42" long and for tubing 2-7/8" O.D. and smaller is 3/32" less than the nominal inside diameter of the tubing which gives an exact decimal value of:

1.901 inches for 2-3/8" O. D. upset or nonupset.

2.347 inches for 2-7/8" O. D. upset or non-upset.

2.867 inches for 3-1/2" O. D. upset or non-upset.

You will realize there are a number of reasons why tubing may not permit passage of a drift bar beside improper manufacture, such as dinges due to transportation, tong crushing, and short kinks due to handling damage.

The above remarks on thread and drift inspecting are not intended primarily as a guide for checking the pipe manufacturer's inspection, but rather to be sure the material has not suffered subsequent damage since leaving the mill.

Before running the pipe to not neglect inspection of the handling tools. The elevators should be in good condition and have links of equal length. Heavy safety elevators and spiders are recommended for long strings. Tubing tongs (properly fitting) and not pipe wrenches are recommended, the reason being we wish to be extra careful not to crush the pipe surface.

When tubing is pulled into the derrick care should be taken the pipe is not bent or couplings or protectors bumped; and, above all, *handle the tubing with thread protectors in place until ready to stab.*

Care During Running

When actual running is involved, the recommended series of operations would proceed something like this:

When the length of tubing is ready to stab, *then* remove the protector from the field end. If necessary, apply thread compound. The compound should be kept in a closed container and the brush kept clean. Never thin the compound. As far as kind of compound is concerned, I would certainly hesitate to make specific recommendations. It may be noted, however, the A.P.I. has tested and made available to the industry a compound recommended for high pressure service. Remember a satisfactory compound should possess at least two properties:

1. Ability to lubricate the thread surfaces facilitate joint make-up and breakout without galling.

2. To seal voids between the mating thread to surfaces and prevent leakage. Obviously, if the lubricant is dirty or adulterated with sand it can do neither of these.

While on the subject of leakage, it can be demonstrated properly cut A. P. I. threads are quite resistant to leakage when properly made up. Under adverse field working conditions this is not always true, and considerable trouble is encountered in high pressure wells. Several patented tubing joints have been designed in which there is a positive metal-to-metal or gasket seal. These do not depend on a lubricant to prevent leakage, and have been used successfully for many years. Objections to their use revolve around their greater cost and the fact they have never become an A. P. I. standard, hence not interchangeable one mill with the other.

In stabbing, lower tubing carefully in order to avoid injury to the threads. Stab vertically, preferably with the assistance of a man on the stabbing board. If the tubing tilts to one side after stabbing, lift up, clean and correct damaged threads with a three-cornered file, then carefully remove any filings and reapply compound over the thread surface. Care should be exercised especially when running doubles or thribles to prevent bowing and resulting errors in alignment when the tubing is allowed to rest too heavily on the coupling threads. Intermediate supports may be placed in the derrick to limit bowing. This may even be advisable in running single lengths, if high winds are present.

After stabbing, the tubing should be screwed slowly by hand or applying regular or power tubing tongs slowly. Power tubing tongs are recommended for high pressure or condensate wells to insure uniform make-up and tight joints.

One major oil company, operating largely on the Gulf Coast, has adopted an interesting technique for improving leakage in high pressure wells. This operator orders his couplings on tubing "handling tight," which is approximately one turn beyond hand tight, or else orders the couplings separately. Then to insure tight joints, just before running, the couplings are removed and both the pipe and coupling threads thoroughly cleaned and inspected. Thread compound is applied to both the external and internal threads and the coupling reapplied handling tight. When this procedure is used, the coupling will "float" or make up simultaneously at both ends until the proper make-up is obtained.

One very common question has been, "What are recommended torque figures using power tongs?" A proper answer to this might be as follows:

On an A.P.I. connection, tightness is achieved when the face of the coupling covers the pipe threads. Experience might indicate a tight joint with one or two threads exposed, but any great variation from one joint to another in the same tubing shipment

should be cause for investigation. In other words, in such cases back out the joint and examine the threads for damage.

To reach the ideal tightness on a connection with power tongs, no *maximum* torque has been or can be established. However, field observation of a number of strings has indicated the following torques usually produce satisfactory results:

Size	*Minimum*	*Maximum*
2-3/8" O.D.	1000 ft. lbs.	1400 ft. lbs.
2-7/8" O.D.	1200 ft. lbs.	1600 ft. lbs.
3-1/2" O.D.	1500 ft. lbs.	2200 ft. lbs.

This will vary with (among other things) the type of thread dope used.

The above has been stated in a little different way by a prominent service outfit who reported its practice to an A.P.I. committee as follows:

"Torque is not the sole measure of joint make-up, but should be used in conjunction with make-up position.

(a) If the average torque is reached at the time the coupling is at the last scratch, that is ideal.

(b) If the average torque is not reached when covering the last scratch, cover two turns if necessary.

(c) If covering the last scratch two turns does not develop the minimum torque, we recommend the connection be broken out.

(d) If the average torque is reached and several threads of the pipe remain exposed, proceed to the maximum torque. In the event the maximum torque leaves more than three threads exposed, we recommend the joint be broken out. It has been our observation that regular mill joints make up remarkably uniform."

Care During Pulling

There are many precautions which should be used in pulling tubing. In the first place, position the breakout tongs close to the coupling. When a jar or shock of some kind is necessary to start the unscrewing do not pound the coupling, especially near the ends. Using the flat face of a ball-peen hammer, *tap* the coupling at the center and completely around its circumference.

Great care should be exercised to disengage all of the threads before lifting out of the coupling. Do not jump the tubing out of the coupling.

Tubing stacked in derricks should be set on a wooden platform as steel or concrete may damage the threads. Protect all threads with compound and thread protectors unless the tubing is to be rerun immediately.

When tubing is stuck, the best practice is to use a calibrated weight indicator. Tubing can be stretched an amazing amount and unless a load indicator is used you cannot be sure the bottom end is free. The amount of load which will cause a permanent set in the tubing for both upset and non-upset material may be found in A.P.I. Bulletin 5C2.

While the above recommendations have been written largely with tubing in mind, they can be applied equally well to casing. Remember that casing is heavier and larger, but the threads are not proportionately more rugged; so even more care in handling is indicated. Furthermore, casing is easier to dinge and should not be unloaded by dropping.

It is believed if the foregoing remarks are adhered to as standard operating procedure the operational difficulties and maintenance will be kept to a minimum.