FIELD APPLICATION OF SUCKER ROD CARE & HANDLING

Mike Brock and Cort Visnieski
Lufkin LLC

ABSTRACT

There are multiple API Recommended Practices for the care and handling of tubing, sucker rods, and pumps. Additionally, there have been several papers written in support of these practices and documenting how they reduce downhole failures. However, in the past few years the field application of these practices has taken a step backwards for multiple reasons.

This paper will present some care and handling issues that have been observed in the field that often times would not be discovered without a good root cause investigation. Some of these issues are caused by the service rigs, but many are due to a lack of proper equipment and training for not only the rigs but support services as well. Some recommendations to improve compliance with the recommended practices will also be discussed.

INTRODUCTION

This paper is not a detailed review of the API Recommended Practices for care and handling of tubing, pumps, or rods. The intent is to highlight practices that we have observed not being followed consistently for various reasons and best practices implemented to improve adherence.

The recent boom has added multiple challenges to the industry such as a large number of new people, multiple well sites, crooked holes, and deeper wells. Add in continual issues such as a lack of training and understanding, limitations of tools and equipment, and/or a lack of tools often times makes compliance of various practices difficult at best.

A central message that should be communicated is to “minimize metal to metal contact” to prevent changing the characteristics of the equipment which can create stress risers or change the hardness of the metal. Either of these will make the metal less resistant to corrosion and reduce equipment life. However, this message has to be taught to not only rig crews, but also the manufacturers who bundle the equipment, truckers/delivery drivers who transport the equipment, fork lift operators, supply stores/warehouses, and the rig crews. All have an impact on care and handling.

TUBING

API 5C1 “Recommended Practice for Care and Use of Casing and Tubing” states that causes of tubing failures includes “careless loading, unloading, and cartage”. In the field, tubing is often tossed about, dropped, stacked on other joints, and equipment placed on top of the tubing. All in all, it has been and continues to be generally abused. We have perhaps “gotten away with it” in the past because we normally used J-55 tubing which is more forgiving of abuse than the L-80 that is being used in many areas today. Multiple well pads have compounded the issue as space becomes limited and equipment is often stored off to one side requiring it to be moved multiple times.

To address this issue, forklifts are being assigned to rigs to help move tubing around on location by the crews who have been trained in proper care and handling. To further facilitate this, a best practice that can be implemented is to install a nonmetallic covering over the tubing racks such as PVC, polyethylene, or wood strips as demonstrated in Figure 1 to minimize metal to metal contact. Also ensure that wood strips are placed between layers rather than joints of pipe which is a common practice.

PUMPS

Multiple well pads often requires that pumps be stored off to one side of the location requiring them to be properly stored and moved. Ensuring that the crew understands and follows the correct techniques to properly handle a pump is important to prevent damage. If a forklift is used to move the pump, a spreader bar with nylon straps along with a crew member on each end is recommended.

For many years, we have picked up pumps using a lift sub, but the danger is inadvertently scoping out the pull rod and damaging it. There are at least two pump clamps available (see Figure 2) that limit the risks of pump damage while lifting it into the derrick. However, operators will have to furnish or pay for them and require that they be used.
Testing the pump in a bucket of diesel or water before lowering it into the well has become prevalent in many areas. However, there is a risk that the pump can be damaged particularly as the wind increases and begins to blow the blocks around. It is advisable to train the crews on the proper testing techniques such as making sure that the fluid is clean and stroking the pump only once to minimize risk.

Pulling units are not normally equipped with tools to handle "slick" surfaces encountered on the job such as couplings, polished rods, strainer nipples, on/off tools, and shear tools. The normal tool used in those cases is a pipe wrench which is guaranteed to damage the equipment. A friction wrench/tong is the best alternative, and in the case of spray metal couplings grips better than a pipe wrench to remove them. But, operators normally have to furnish or pay for them, and instruct the crews to utilize them. Another option is to have the pump shop install those components to the pump during fabrication.

RODS

As previously mentioned, the multi well pads often times necessitates setting the rods off to one side and moving them at a later time. An assigned forklift better facilitates this, but it also requires a spreader bar with T bars to properly lift the rod bundles. Be sure to cover the T bars with tape or similar substance to minimize metal to metal contact. However, if moving a few rods at a time it is recommended to bundle the rods together with cord and use the spreader bar with nylon straps. This will save a lot of rig time if preparing to send the rods to be inspected.

Train the crews to inspect all equipment as it arrives on location to ensure that it is not damaged. It is becoming too common to find metal straps on rod bundles that slipped during transportation rubbing against the rods, loose rods/sinker bars bundled in such a way as they may be damaged, pony rods loaded with equipment stacked on them, and pins rusted or damaged. You cannot train everyone, but you can ensure that you don't run damaged equipment.

Many of the wells today are deeper and more "deviated" whether by design or not. This often times has resulted in using multiple sections of guided rods. A best practice that is starting to be implemented is using the aforementioned tubing racks. The racks allow the rods to be laid out in the correct order that they are to be run to help ensure the guided rods are installed in the correct position. They greatly assist with the cleaning, inspection, and lubrication of the pins versus doing so while in a bundle. They also make it easier to properly pick the rods up and lay them down since the racks are next to the rig. Some crews have built hooks that attach to one end of the racks so that they can attach a "slide" to further assist this process (Figure 3).

A common practice that has existed for years is to install a rope across the edge of the rig floor to prop the end of a rod on to facilitate attaching the rod elevator. This works well until something happens and the rod drops to the rig floor damaging the rod. A good practice is to install a board across the edge of the rig floor to reduce any damage, and it can be used in lieu of a rope.

Properly cleaning and lubricating the pins/collars has always been an issue, but in many cases it seems to have gotten worse resulting in pins as shown in Figure 4. API RP 11BR does not currently spell out what to use to clean the pins/collars, and crews normally do not carry any cleaning solutions. Diesel is not recommended as it leaves a film, but if nothing else is available, that is what the crews will use. Brake cleaner does an excellent job of removing grease or other contaminants while not leaving a residue, and the spray can makes it easy to use on the rig floor. For the bigger jobs, varsol or paint thinner works well, but it normally requires brake cleaner and a clean rag to properly finish the job.

Proper lubrication is another important step in ensuring a good connection. Crews tend to over lubricate the pins getting it on the shoulder. A technique that has worked well is to coach the crews to start mid-thread and apply the lubricant back towards the end of the pin stressing that it only takes a little. This works much better when the rods are laid out rather than bundled.

Carding to ensure proper makeup torque is the final stage of a good connection. Carding is sometimes just a matter of getting the crew to use a card when they either don't have one available or they don't have the correct one or they just don't think that they need one. Step one is to convince them with training that they do need to card the rods to set and periodically check the tongs by explaining the importance of the procedure. Step two is to make sure that they not only have cards but the correct cards by having them provided with each delivery. Step three may be that the operator has to enforce their use. However, a couple of related items may need to be addressed.
Many companies are running sinker bars with some placing stabilizer bars between every bar or every other bar. These have to be made up by hand since they only have two wrench flats, but crews get confused as to which card to use. The sinker bars are grade C or K but they typically don't have those cards since they are typically running high strength or grade D rods. Add in stabilizer bars (often grade KD) and it gets more confusing because they now have two different grades on each side of the coupling. The recommendation is to use a sinker bar card or grade C card on the sinker bar side and a grade D card on the stabilizer bar side. That sounds great until you have to do it on location and all you have is a pipe wrench for the coupling. It has been recommended to use the lower grade card on both sides of the coupling allowing one to use rod wrenches without holding a backup on the coupling.

The polished rod requires a polished rod coupling, but what torque do you use to make up the coupling? Everything from a grade C to high strength cards to no cards have been used. The recommendation is to always use the appropriate card for the sucker rod side and the upcoming revision to API RP 11BR recommends using a grade D card for the polished rod side. However, a major issue is how you hold a backup on the coupling and/or polished rod? There are some polished rods and couplings with wrench flats, but they are not API approved. The most common answer is to use a pipe wrench on the polished rod and a rod wrench on the sucker rod, but if you are using high strength rods the polished rod side will be over tightened. A friction wrench used on the coupling can assist in making this connection properly.

Lastly, when installing the polished rod clamp, the manufacturers state the proper torque that should be used on the bolts to prevent the chance of damaging the polished rod, but seldom is it followed. It is typical to see a crew grab a wrench and cheater pipe then get the biggest one or two crew members to tighten the bolts. A torque wrench is preferred, but again the operator has to furnish the tool and instruct the crews to use them.

IN CONCLUSION

1. Care and handling practices are well documented, but multiple groups need to be trained on these practices and on site coaching to reinforce them. Personnel turnover rates demand continuous training.

2. Multi well locations often require that equipment be continually moved. Continuous onsite forklifts, spreader bars, and T bars greatly facilitate proper handling.

3. Covering pipe racks and the edge of the rig floor greatly reduce metal to metal contact. They also enhance handling practices such as cleaning and lubricating rod pins. Plus, it helps lay out a string when running multiple sections of guided rods to ensure they are run in the correct order.

4. Tools such as friction and torque wrenches greatly help reduce damage to rods and related equipment. Ensuring crews have the proper cards, lubricant, and cleaning materials enhance the chances of proper makeup.

REFERENCES

API RP 5C1, "Recommended Practice for Care and Use of Casing and Tubing", Reaffirmed August 2010

API RP 11AR, "Recommended Practice for Care and Use of Subsurface Pumps", Reaffirmed April 2008

API RP 11BR, "Recommended Practice for Care and Handling of Sucker Rods", August 2008

Russell Stevens and Norman W. Hein, Jr., "Circumferential Displacement – Partial History of the Industry Practice", Southwestern Petroleum Short Course, 2010, Lubbock, Texas.

Erik Tietz and Arun Sriraman, “Comprehensive Studies on the Factors Affecting Sucker Rod-Coupling Make-Up”, Southwestern Petroleum Short Course, 2009, Lubbock, Texas

James M. McGee, “Evidence of the Cause of Sucker Rod Failures”, Southwestern Petroleum Short Course, 1975, Lubbock, Texas

Russell Stevens, Norman W. Hein, Fred Newman, Steve Conquergood, “API 11BR Revisions on Sucker Rod Makeup”, Southwestern Petroleum Short Course, 2013, Lubbock, Texas

Figure 1

Figure 2

Figure 3

Figure 4