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Fishing For Dollars What's In Your Tackle Box Does Your Elevator Go All The Way To The Top

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The Voice of the Oil & Gas Service Industry™





Fishing for dollars

By STEVE ADAMS, DENNIS ASH &
JIM PATTERSON
Norris/A Dover Company

Millions of dollars are spent each year on fishing tools. And that enormous expenditure doesn't even account for rig hours, man hours and lost production. Therefore, if these costs are to be controlled, it is extremely important to use the right fishing tool for each application.

"Not all fishing tools are created equal." Good performance, design, engineering, and controlled tolerances in the manufacturing process, along with rigid inspection, assure that quality fishing tools reach the field. A fishing tool that provides quality and reliability is pivotal to properly perform the fishing job. Each tool is designed for a specific job or function. So, depending on the fishing application, choosing the right tool can be the difference between success and failure. When a well goes down, time is money. In this article we are going to discuss the proper use and application of fishing tools. Remember, when you have a fishing application, you are truly fishing for dollars.

History of sucker rod sockets (fishing tools)

The oil business was developing fast in the early 1920s. Many of the wells in the major fields, in states such as Arkansas, Kansas, Oklahoma and Texas, were operating on sucker rod lift. Wooden sucker rods were used extensively during this time although some "iron"

sucker rods were in limited use. While still considered experimental, iron sucker rods were coming to the forefront because of the deeper depths and harsher operating environments required from rod lift applications. When iron rods parted at the joint, a tubing job was necessary and, as iron rods became more prevalent, more and more operators were swamped by rod and tubing jobs. Wickered slip sockets to engage rod body failures were available, but these cheaply made fishing tools were considered a nuisance product by most manufacturers and their availability was limited by the small market demand.

The correct tools for fishing applications

Today, a variety of fishing tools exists. Understanding what application each tool is best suited for will help accomplish the job with minimum downtime and expense.

Operators can save time and money by carefully examining the lower end of the failed piece when it is pulled out of the hole. This examination along with answers to a few questions will help the operator determine what needs to be "fished" downhole. For a successful fishing job, begin by determining where in the rod string the failure occurred and what the fishing tool must catch. Then determine what type of fishing



Figure 1



Figure 2



Figure 3 and Figure 4

tool best suits the application at hand and size the tool by determining the inside diameter of the tubing. Following these few steps is important, because using the right fishing tool and properly sizing the wickered slips and/or slip unit is vital to success.

Combination socket

The combination socket (**Figure 1**) consists of an inner bowl that is attached to the top bushing and positioned inside the tapered outer bowl. The inner bowl employs an upper spring and a set of upper wickered slips that engage the sucker rod body. The outer bowl consists of a spring and lower wickered slips that engage the pin-shoulder and pin of the sucker rod. This socket also is capable of engaging non-hardened couplings, non-hardened polished rod bodies and pins, top valve rod bushings, pins and the fishing neck on the valve rod guides of the subsurface pump. However, there is the potential for damage to the lower wickered slips and/or enlargement of the lower outer bowl opening, if one of the components from the preceding list is worn or faulty, as all three wickers in the lower bowl may not engage.

Overshot socket

When producers began using spray metal couplings a new problem presented itself in the fishing operation. It was found to be impossible to fish spray metal couplings with wickered slips. To overcome the difficulty, an overshoot socket was designed that would utilize a slip unit to swallow the coupling rather than try to engage it with wickered slips. The overshoot socket is similar in construction to the combination socket, in that it is a two-stage fishing tool and comes in both a regular and oversize configuration (**Figure 2**). The oversize overshoot socket is constructed like the regular overshoot socket, however this tool was specifically made to “fish” larger diameter components in smaller diameter tubing, where the “fish” could not be caught by a regular overshoot socket. The bowl and slip units of the oversize overshoot socket are thinner and thus their strength is limited due to the smaller cross-sectional area of the lower bowl and slip unit. As a result, the lower bowl and slip unit of the oversize overshoot

socket is designed as a single run tool and does not carry a guarantee or warranty by most manufacturers. To preclude any argument or misunderstanding, this fact should be fully understood by the user.

The upper wickered slips in both the combination and overshoot socket will engage rod body breaks. However the overshoot socket replaces the lower wickered slips with a lower slip unit in the lower bowl which allows this tool to swallow API Class T and SM (spray metal) couplings, the pin-shoulder of the sucker rod, and the fishing neck of the valve rod guide on the subsurface pump. In operation, the “fished” component forces the slip unit in the lower bowl up until the “fish” enters the slip unit of the lower bowl. Once the “fish” enters the overshoot socket, the lower slip unit drops, under spring tension, between the shoulder of the “fish” and the shoulder in the lower end of the bowl. Thus, the “fish” is caught and can’t get out. Some operators prefer an overshoot socket that consists only of the lower bowl, spring and slip unit assembly. This modified overshoot socket can be achieved by removing the upper bowl assembly and engaging the top bushing with the lower bowl assembly.

Rod body socket

The rod body socket (**Figure 3**) was designed to fish rod body breaks. This socket has received wide acceptance because of its durability and proven performance. The smaller OD of this tool will not restrict production in most wells and permits this socket to bypass some areas where paraffin, scale and flattened areas in the tubing offer resistance to regular sockets. Operators will often fish parted rods with the rod body socket and immediately put the well back on production, leaving the fishing tool as a “splicer tool” in the rod string. Later, when the pump is pulled, the socket is removed from the rod string and the broken rod body replaced with a new sucker rod.

Polished rod socket

The polished rod socket (**Figure 4**) is for non-hardened couplings (API Class T), pin shoulders, pin threads and polished rods. However, this socket with a short body and a single set of wickered slips is

primarily used to economically “fish” polished rods. The polished rod socket uses a slip stop to prevent damage to the spring caused by shear lip discontinuities. The wickered slips and springs are interchangeable with the lower wickered slips and springs of the combination socket.

Small tubing socket

The continuing trend in dual and slim hole completions presents new fishing problems when 1¹/₄”, 1¹/₂”, 1³/₄”, or 2¹/_{16s}” integral joint tubing is used. Dimensional limitations make it impossible or impractical to make a wickered slip or overshot socket that will fit these applications. As a result, the small tubing socket (**Figure 5**) was designed with permanently cut wickers in the lower bowl. The socket is lowered onto the fish and rotated to the right. As it is rotated, the wickers cut into the fish, threading the socket onto the fish so that the fish may be pulled. Operators may use spray metal couplings on 5/8” rods in 1³/₄” tubing. If the small tubing socket is used to “fish” this coupling, damage to the socket may occur. Because it is possible that the socket may not screw on securely to the hard surface of the spray metal coupling in order to make the catch, operators should not use the small tubing socket on spray metal couplings. Small tubing sockets cannot be guaranteed against damage caused by spray metal couplings.

Precision fishing tools perform an important job and are entitled to proper care by users in order to guarantee maximum performance. These tools are engineered to be assembled by hand, with the use of a 12” crescent wrench on the flat of the top bushing and a strap wrench on the bowl. Careless handling or

improper makeup can result in damage to bowls, slips or slip units. Proper makeup procedures should include clean, lightly lubricated threads and clean, dry (non-lubricated) contact-faces. (The use of pipe wrenches on fishing tools is never recommended). Care must be taken when freeing the “fish” from the tool



Figure 5

to avoid damage to the socket. After being used in the field, maintenance of the fishing tools entails inspecting for excessive wear, fatigue, or other damage; this will help achieve long service life. Sockets should be promptly cleaned and thoroughly oiled prior to storage. Oiling the socket is important due to the heat treat condition of the alloy steel and the need to maintain the close manufacturing tolerances necessary for a long service life. This systematic procedure will maintain the user’s tools in top condition. So, the next time you go “fishing for dollars,” remember that proper selection and careful maintenance of your fishing tools can mean the difference between a successful fishing job and pulling the tubing string. 🏠

What's in your tackle box?

By STEVE ADAMS, SCOTT MALONE,
JIM PATTERSON & RUSSELL STEVENS
Norris/A Dover Company



Picture this: Your rig is 50 miles from the nearest supply store or service center and you've just called out to your tool pusher for a specific fishing tool — does he have all the necessary tools in his box to tackle the job at hand?

For example, your fishing job may be performed in tubing sizes ranging from 1 $\frac{1}{4}$ " through 4 $\frac{1}{2}$ " and include rod body breaks, pin shoulders, couplings, polished rods and/or pump fishing necks. This could mean as many as 15 different tools and over 100 different slip and/or slip unit combinations may be needed for the job. Because most experienced tool pushers know the field conditions and requirements in which they operate, it is not necessary for them to have every size and combination of fishing tool available, but most carry the essential tools needed for the parameters of the job.

Fishing jobs can be simple and relatively inexpensive, or extremely difficult and very expensive. Not only is

there the expense of lost production, rig time and the like, but there is the cost of fishing tool rental and possibly replacing or repairing various components of the tool that may be damaged during the job. Poorly maintained tools or inexperienced tool pushers may not be able to retrieve your fish. This implies that the success of your fishing job hinges on the availability and the integrity of the fishing tools, as well as the skill of the tool pusher who is "fishing." Therefore, it is extremely important that even the most experienced tool pushers follow the manufacturer's recommended procedures concerning the storage, transportation, makeup, fishing and breakout of these tools in order to insure a successful fishing job.

In the March/April issue of *Well Servicing*, "Fishing for Dollars" discussed the types of fishing tools used for various fishing applications. In this article, we address the proper care and use of these tools and how to evaluate their condition prior to use. Specifying the



Figure 1

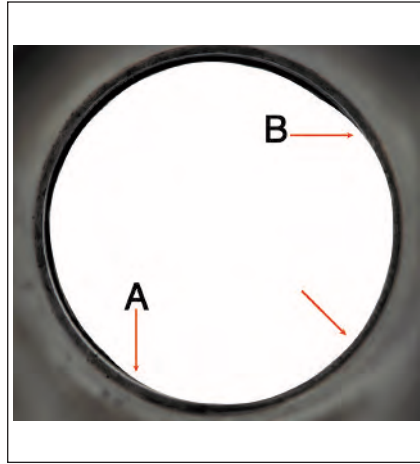


Figure 2



Figure 3

right fishing tools, insuring their good working condition and using proper makeup and breakout procedures is sure to save time and money during your next fishing job.

Storage & transportation

Fishing tools should be cleaned and protected with oil, grease or a diesel bath to prevent rust (both internally and externally). Thread protectors should be applied to all pin ends to maintain thread integrity. Fishing tools should be stored in a box that protects the tools from physical contact with one another, or with other metallic surfaces. (A box with individual compartments for each fishing tool or component is recommended.) Fishing tools and their components should never be allowed to “roll” around in a tool box or in the bed of a truck.

Makeup

Prior to use, inspect your fishing tools for damage. **Figure 1** shows an example of cracks in the wickered slips. Wickered slips should be free of cracks and the wickers should have sharp edges — not rounded. **Figure 2** shows the inside of an overshot bowl. Note that from point A to point B, the V-seat is bent inward allowing the slip unit (**Figure 3**) to pull out through the bottom of the bowl. The V-seat should be concentric around the entire circumference on the inside diameter of the bowl in order to properly secure the slip unit when engaging a fish.

The sucker rod threads and the shoulder of the top bushing should be clean and show no signs of damage. The pin shoulder and the bushing shoulder require friction to maintain proper makeup and should remain clean and dry (no lubrication). In contrast, a small amount of thread lubricant should be applied to the pin threads to help reduce the interference between threads. Thread lubricants need to be smooth, without fillers, have a grease-like consistency and contain corrosion inhibitors (like Topco SRL) to facilitate proper makeup and breakout.

Connections should be free running and made up by hand, without resistance, to shoulder contact. Fishing tool connections do not require extra makeup torque, from the hand-tight shouldered contact position, as



Figure 4

long as the threaded connection “snaps” together at the shouldered contact position during makeup. The shouldered area should be clean and dry.

Unlike the sucker rod thread connection that has 10 threads per inch (**Figure 4**), the threads connecting the top bushing and bowl of fishing tools have 16 threads per inch (**Figure 5**). This helps the fishing tools maintain proper makeup without becoming loose during the fishing operation. To facilitate breakout, an adjustable wrench like a Crescent® wrench can be placed on the wrench flat of the top bushing and a friction wrench can be placed over the internal thread area of the bowl. Pipe wrenches should *never* be used in makeup or breakout. If a pipe wrench is placed on a bowl, other than on the internal thread area, damage will occur and the fishing tool’s integrity is destroyed.

Fishing

The tool pusher is as important to the job as the fishing tool itself. Experienced tool pushers know how to fish various types of breaks by using techniques they have learned from other experienced tool pushers. Once the fish is engaged by the fishing tool, a slow, steady pull is required to retrieve the broken part. The fishing tool should never be “jarred” when trying to unseat the pump. If a slow, steady pull fails to unseat



Figure 5



Figure 6



Figure 7

the pump, an experienced tool pusher knows he must pull a predetermined amount of tension in the rod string and set the brake for approximately 10 to 15 minutes before trying again to unseat the pump. After repeating this process several times, if the pump fails to unseat, the experienced tool pusher now realizes he has a “stripping” job on his hands.

Breakout

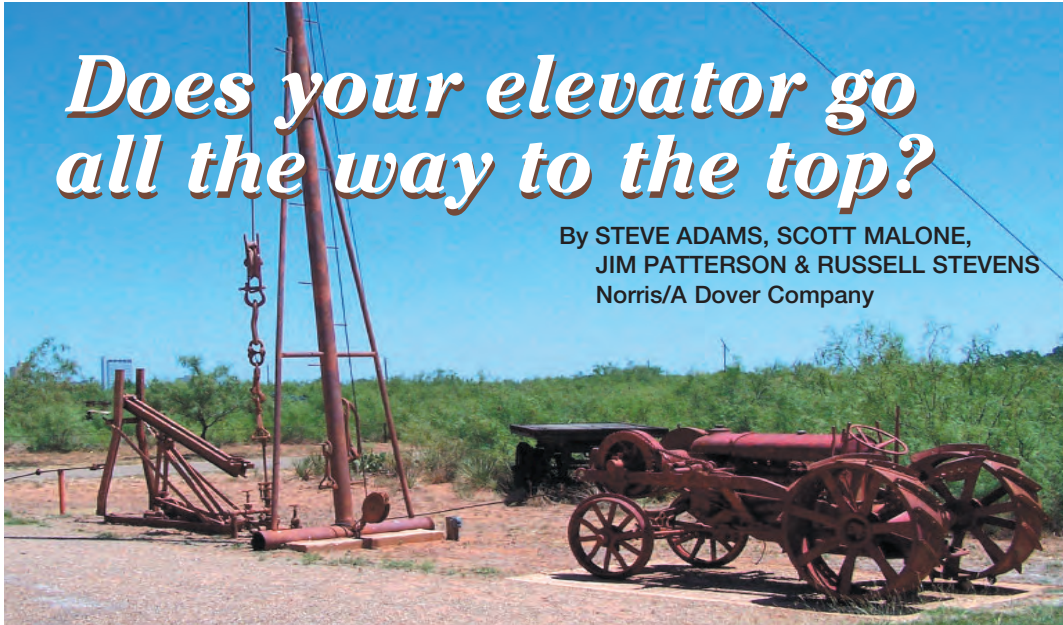
Once the “fish” is landed, the top bushing must be disengaged from the bowl in order to facilitate the removal of the fish back through the top of the fishing tool. In order to disengage the wickered slip or slip unit

from the fish, the fishing tool should be placed up off the ground on a block of wood (**Figure 6**). At this point, either strike the fish, or place another block of wood on top of the bowl and strike the wood in order to drive the fish out through the top of the fishing tool (**Figure 7**). Do not directly strike the fishing tool with the hammer or allow any contact with any hard material substance that might cause damage to the fishing tool.

By following these simple guidelines, you will have a greater chance of successfully “fishing” your well. So know what’s in your “tackle box” before you go out to the well and you will be sure to catch your “fish.” 🎣

Does your elevator go all the way to the top?

By STEVE ADAMS, SCOTT MALONE,
JIM PATTERSON & RUSSELL STEVENS
Norris/A Dover Company



Asking if your elevator goes all the way to the top sounds like a funny question, doesn't it? However, when you consider that rod hooks and rod elevators are used to hoist tremendous loads above the heads of well servicing personnel, it really isn't such a funny question after all. The safety of well servicing personnel should always be the prime consideration for manufacturers of rod hooks and rod elevators. There are several manufacturers of rod hooks and rod elevators and most, or at least the reputable ones, will adhere to or exceed the recommendations set forth in API Specification 8C. API Specification 8C is the "Specification for Drilling and Production Hoisting Equipment," which sets the standards for design, material and testing of drilling and production hoisting equipment. Production hoisting equipment should conform to these standards in every respect, so that it is fit for its intended purpose. This equipment should be capable of safely transferring the loads for which they were intended and should be designed for safe and simple use by your well servicing crews.

Production hoisting equipment that is rated for 150 short tons or less should be designed and manufactured to hoist at least 3 times the full-load capacity rating. So, for example, new rod elevators that are rated for a full-load capacity of 25 short tons should be designed and manufactured to hoist at least 75 short tons, according to API Specification 8C. In addition to the above design and manufacturing criteria, a proof load test using at least $1\frac{1}{2}$ times the full-load capacity rating should be pulled and sustained for at least 5 minutes on every new piece of production hoisting equipment. Therefore, a new 25 short ton rated rod elevator should be proof load tested to at least $37\frac{1}{2}$ short tons, with the load sustained for no less than 5 minutes. Once the proof load is released, a surface non destructive test (NDT) should follow to verify that this piece of production hoisting equipment and its components have not been impaired or damaged by the test. In addition,

materials that are prone to delayed cracking should be subjected to a surface NDT no earlier than 24 hours after the proof load test.

Safety should be the primary consideration when manufacturing reliable production hoisting equipment. Safety is, and should be, one of your primary considerations when specifying and purchasing equipment for your well servicing operations. Your well servicing crews should be equipped with modern production hoisting equipment that is designed, manufactured and tested for safety and reliability first. Well servicing crews should not use old, antiquated production hoisting equipment that presents potential safety hazards and has known reliability issues, as exemplified by the rod elevator hoisting the wooden sucker rod in **Figure 1** (rod elevator, circa 1884). In addition to using production hoisting equipment that has been properly designed, manufactured and tested, your equipment should be inspected and maintained at regular intervals as per the recommendations published in API Specification 8B. API Specification 8B is the "Recommended Practice for Procedures for Inspections, Maintenance, Repair and Remanufacture of Hoisting Equipment."

Inspection and maintenance

The regular inspection and maintenance of your production hoisting equipment is closely linked to both the safety of your well servicing crews and the performance reliability of the equipment. The inspection and maintenance of production hoisting equipment should be initiated based on, but not limited to, one or more of the following criteria:

- Regular and specific time intervals between inspection and maintenance.
- Measurable wear limits that do not exceed those recommended by API Specification 8B and/or the manufacturer.
- Load cycle accumulations during the life of the production hoisting equipment.
- Non-performance of equipment that regularly



Figure 1

dictates remedial corrective action.

- Operating environment (i.e. extreme cold, blowing sand, other).
- History (experience) of maintenance and expendable component life.
- Federal and state regulatory requirements.

The maintenance of this equipment consists of, but is not limited to, regular adjustments, cleaning, lubrication and the replacement of expendable components. The complexity of these activities and the safety risks involved should be the primary consideration in the assignment of appropriate resources such as the facilities needed, the equipment required and the qualification level needed for the personnel servicing the various components of the

production hoisting equipment. The inspection and maintenance recommendations outlined below address extremely important safety concerns for well servicing personnel and should be performed regularly at the specified intervals.

Rod elevators

Some of the criteria suggested and recommended in the regular maintenance and inspection of rod elevators includes, but is not limited to:

1) Check and lubricate the latch and lever mechanism daily to make sure it opens with resistance and snaps shut when released. If the latch and lever mechanism fails to close properly, the rod string may fall downhole resulting in a time consuming and expensive fishing job. The sucker rods shown in **Figure 2** are the result of an improperly operating latch and lever mechanism that allowed the rod string to drop downhole. The weight of the rod string drove the subsurface rod pump into the pump seating nipple and the resulting force of this jarring load parted the tubing.

2) The elevator bail should be checked daily to ensure free movement. If the bail hangs up at any point in its movement back and forth, the trunnion pins in the elevator body have been pulled out of proper alignment; which implies that the yield strength of the material in the elevator body has been exceeded. This rod elevator should be taken out of service immediately due to the potential for extreme safety hazards existing to human lives from a catastrophic failure of the trunnion pins under load.

- The snap rings on the trunnion pins should be checked daily. Damaged or missing snap rings should be replaced to help ensure proper alignment between the eye of the bail and the trunnion pins on the rod elevator body.
- 3) The eye and throat of the bail, and the base of the



Figure 2

trunnion pins need to be checked weekly for indications of wear and cracks. If there is an indication of possible malfunction in any one of these areas, the rod elevator should be taken out of service immediately due to the potential for extreme safety hazards present to human lives from a catastrophic failure of these components under load.

4) The rod seating area of the elevator body needs to be checked weekly for wear and cracks.

a) Plate-type rod elevators (**Figure 3**):

- Wear may result in plate-type elevators that have a tendency to nose down toward the latches. As a result of this condition, every sucker rod handled by this elevator will damage (cut) the rod body upset and may lead to premature rod body failures. This issue is more problematic with this style of elevator due to the “one size fits all” design concept. This elevator is unique in that its design allows the one rod elevator body to use three different sized plates (5/8" & 3/4", 3/4" & 7/8", and 1" sucker rod plates) to fit 5/8" through 1" sucker rods.
- Cracks in the plate may result in “pinched” rod bodies and the mechanical surface damage will result in a stress raiser that may ultimately lead to a premature rod body failure.

b) Solid-body rod elevators (**Figure 4**):

- Wear may result in a solid-body elevator that has a tendency to “nose” down toward the opening of the latch mechanism. As a direct result of this condition, every sucker rod, handled by this elevator, will bend the rod body near the upset taper, and may lead to premature rod body failures. This issue is more problematic with this style of rod elevator because a separate rod elevator body is required for 5/8" & 3/4", 3/4" & 7/8", and 1" sucker rods. This design concept dictates that the throat of the rod elevator is based upon the size of the sucker rod for which it is intended. This close tolerance fit will result in a higher tendency to bend sucker rods when the rod elevator doesn't set in a level position while hoisting its load.
- Cracks in the rod-seating area of the solid body rod elevator may result in mechanical surface damage to the sucker rod and facilitate premature sucker rod failures.

5) Clean, inspect and lubricate rod elevators weekly. Rod elevators should be thoroughly cleaned in a solvent so that all dirt and rust are removed. This will



Figure 3

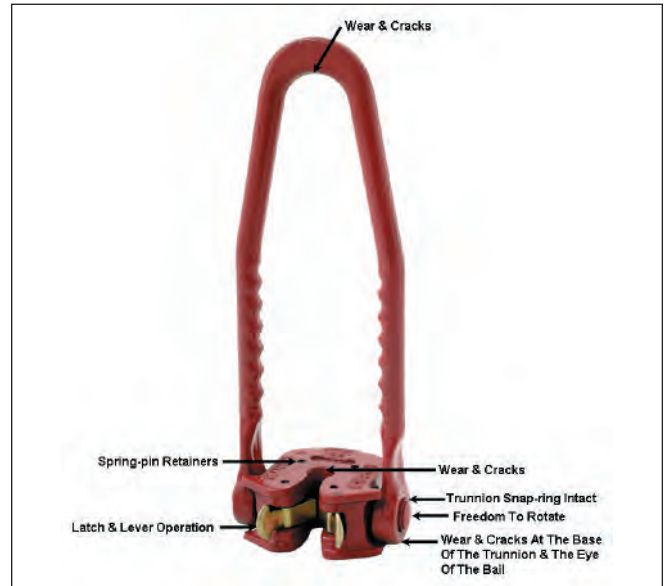


Figure 4



Figure 5



Figure 6

enhance the visual inspection process for wear and cracks. Proper lubrication of the trunnion pins should allow free movement of the rod elevator body, thus helping to ensure that the sucker rods set in the proper position in the elevator body seating area.

Rod hooks (Figure 5 & 6)

Some of the criteria suggested and recommended in the regular maintenance and inspection of rod hooks includes, but is not limited to:

- 6) Check and lubricate the latch and lever mechanism daily to make sure it opens with resistance and snaps shut when released. If the latch and lever mechanism fails to close properly, the rod elevator could fall out of the rod hook, resulting in injury to the well servicing personnel and damage to the well servicing equipment.
- 7) Inspect the bail, hook and hook swivel on a

weekly basis. The bail and hook should be free from cracks and excessive wear. The hook swivel should rotate freely and not require excessive force.

Following the recommendations of both API Specification 8C and 8B, as well as the recommendations of the manufacturer, should provide a safer working environment for your well servicing personnel and extend the reliability and performance of your production hoisting equipment. Where the safety of your well servicing crew is concerned, making sure your elevator goes to the top is one of the most important questions you can address! In conclusion, when you rig up on your next well site, properly designed, manufactured, inspected and maintained production hoisting equipment should be paramount in your safety program. 🎩