Fishing for dollars

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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

Figure 1

Figure 2

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 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 overshot socket was designed that would utilize a slip unit to swallow the coupling rather than try to engage it with wickered slips. The overshot 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 overshot socket is constructed like the regular overshot 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 overshot socket. The bowl and slip units of the oversize overshot 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 overshot 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.

Figure 3 and Figure 4

The upper wickered slips in both the combination and overshot socket will engage rod body breaks. However the overshot 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 overshot 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 overshot socket that consists only of the lower bowl, spring and slip unit assembly. This modified overshot 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 $1^{1}/_{4}$", $1^{1}/_{2}$", $1^{3}/_{4}$", or $2^{1}/_{16s}$" 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 $1^{3}/_{4}$" 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.

Figure 5

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 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.