

Safety foremost in tong redesigns: Industry-driven revamps of drilling tongs have had one goal—improving safety. The reengineering process was initiated by the IADC Safety by Design Subcommittee, which works under the auspices of the IADC HSE Committee. Several manufacturers enthusiastically shifted into high gear to develop more worker-friendly tongs. These photos show the changes. At top left is Foley Corp's new tong (inset shows old device); The 2 photos at top right (photo and inset) show Varco BJ's redesigned tong. The drawing at lower right shows National-Oilwell Harrisburg Woolley's changes (inset shows the old tong).

## IADC Safety by Design group scores victory with tongs, takes on mismatched hammer unions

**THE IADC SAFETY** by Design Subcommittee, with enthusiastic participation from contractors and manufacturers alike, has successfully effected fundamental changes in drilling tongs that should greatly improve rig safety. Now the group, led by **Helmerich & Payne International Drilling Co.'s Warren Hubler** and HSE Committee Chairman **John Auth** of **Diamond Offshore**, is moving to address another rig-floor danger: mismatched hammer unions.

### REDESIGNING TONGS

Tong injuries are responsible for more than 10% of rig injuries industrywide, according to IADC safety statistics. In some companies, tongs are responsible for as many as 25% of injuries. The subcommittee found that the sources of tong injuries are: latches, 45.5%; between tongs, 17.5%; tongs slipping off pipe, 14.4%;

strains, 10.3%; hanger, 8.2%; and the back and side of tongs, 4.1%. Mr Hubler said that a 1996 H&P study indicated that 76% of rig injuries were to the hands, and that tongs were the major culprit for these accidents.

Worse, tongs can break apart, the latch flying loose and endangering bystanders.

As Mr Hubler observed, tongs have undergone little change during the last 6 decades.

The subcommittee decided it was time for a change. And the tong manufacturers lost little time swinging into action.

H&P began working with **Varco BJ** in 1997 on this issue. By the time the subcommittee began its work, the Tulsa-based contractor had put 4 sets of redesigned tongs in the field. The result

was a substantial decline in hand injuries, which Mr Hubler attributed to a combination of the new design and increased safety awareness within H&P.

Varco's changes focused on the tong hanger, lever and the tong itself. On the tong hanger, Varco removed the rippled edges. These, the manufacturer reasoned, could look like a place for one to place one's hands—which they weren't. Also, the distance from the pipe to the tong hanger was increased, allowing more clearance between a piece of equipment and the tong. 2 vertical handles were added to the tong, as well, both as a convenience to the floorman and to increase leverage.

Providing 2 handles offers another advantage, observed Varco's **Rod Garner**. "Having 2 handles lets one of the handles act as a guard for the other one," he said.

Varco also changed the angle of the handle to the lever. "Putting the handle at an angle toward the floorman makes it easier and possibly less tiring to handle the tong," Mr Garner said. "We have also added guards on the handles of the latch, the long and short jaw and the latch lug jaw—anywhere there is a handle on the head of the tong."

New guards are intended to discourage floormen from placing their thumb atop the jaw.

Other manufacturers lost little time implementing their own design changes. For example, **National-Oilwell Harrisburg Woolley** has modified its tong hanger and block and introduced several new tong handles. The company plans to showcase a display of the new tong features at the Offshore Technology Conference. Woolley's improved tong handles, the company says, will prevent damage to operators' hands. Some offer a soft plastic cushion for any body part caught between the make out and break out tongs.

The new tong block design features bushings to help improve the service life of the tong's snub line.

**Foley Corp** also incorporated several design improvements. These include yellow urethane handles, a longer vertical section on the hanger, safety latch, angled handle, tong-line block, and wear grooves for gauging the need for part replacement and when hinge-pin holes are worn. In addition, Foley provides customers with a safety tong die driver and a training video.

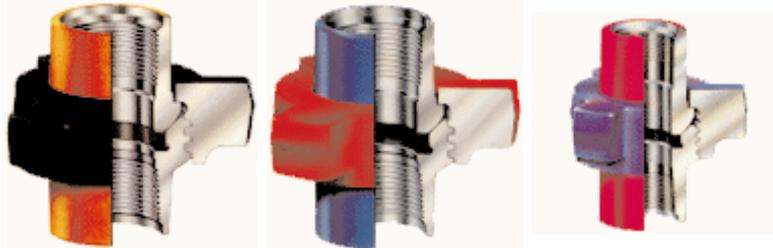
## HAMMER UNIONS

No body of statistics exists on injuries caused by mismatched hammer unions. However, ample anecdotal evidence exists to determine that the problem is serious and has led to fatalities. At least 2 oil companies, **Shell** and **Alaska Shared Services**, have taken steps to eliminate the problem on their rigs. Still, no industry-wide effort has been undertaken to eliminate this hazard—until now.

The problem occurs because male, or thread, halves of 2-in. 602 and 1002 hammer unions will make up onto the female,

or wingnut, half of 2-in. 1502 unions. This is because the threads on the 2 halves have the same pitch and ACME design.

The worker understandably believes that 2 compatible components have been joined that will withstand pressures to the rated 6,000 psi. Unfortunately, though, a 5/16-in. gap exists between the diameters of the thread and wingnut halves.



A persistent hazard: The Safety by Design Subcommittee is targeting mismatched hammer unions, which poses a persistent threat on the rig floor. The problem occurs because male halves of 2-in. 602 and 1002 hammer unions (left and center, respectively) will make up onto the female, or wingnut, half of 2-in. 1502 unions (right). Despite the compatible threading, though, the mismatched components will not hold pressure, because a 5/16-in. gap exists between the diameters of the male and female halves. When pressurized, therefore, the components can blow apart, with deadly and environmentally harmful effects.

"The 2 mismatched components will *not* actually hold high pressures very long," Mr Hubler explained. "The hammer-union halves will eventually separate."

When they do, he added, 3 immediate hazards are created. First, the wingnut becomes an 8-lb projectile on the rig floor. The potential for danger there is obvious. Second, high-pressure fluids are released that pose another clear hazard. Finally, the release of drilling and other fluids could harm the environment.

Such an event occurred in 1995 on an H&P rig.

## A PERSISTENT HAZARD

"Since then," Mr Hubler said, "safety and operations managers with other drilling contractors, service companies and major oil companies have described similar incidents in their operations. Despite efforts to share the lessons learned across the drilling industry and to correct the problem through procedural controls in the field, the hazard continues to persist throughout our industry."

"The bottom line is that unsuspecting roughnecks remain exposed to a very real and potentially fatal hazard," he said.

H&P IDC decided to eliminate all 602s and 1002s and to standardize on 1502 hammer unions.

However, even this might not suffice. For instance, service companies arriving at the rig site could bring their own 602 or 1002 half and connect it to the 1502—thereby creating the hazard.

The subcommittee's objective is to develop a consensus among manufacturers, suppliers, contractors and operators to rethink the use and design of these unions. A broad cross-section of the industry attended an inaugural meeting in March sponsored by H&P and **Shell Western E&P** in Houston.

The event proved compelling for many of those who attended. **Clent Rawlinson**, DSC Manager for National-Oilwell, likely spoke for many: "I left this conference believing if I did my small part, that I myself may be responsible for

actually saving a life."

The group brainstormed several short- and long-term solutions. Possible long-term answers include reducing the number of hammer unions used on the stand pipe, reversing threads, changing thread pitch, and designing a completely new line of hammer unions.

Unfortunately, manufacturers' representatives indicated the likelihood of winnowing down the number of hammer unions available was small. This is because the drilling business uses only a small portion of the 2-in. 602 and 1002 unions produced.

Shorter-term answers include discriminating by color, either maintaining that of the manufacturer or by standardizing on another. Another idea was to attach safety cable or chains across the union halves. Pre-job coordination among all parties was also suggested, along with inspections of stand pipes and choke manifolds for potentials to mismatch.

To get involved, contact IADC's **Barbara Burrage**, /281-578-7171, ext 217 (barbara.burrage@iadc.org; fax, 1/281-578-0589). ■