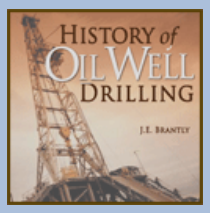

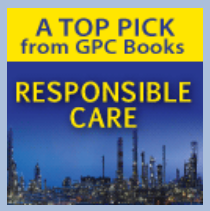

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Snubbing: Now an everyday service that is improving safety

With increased use comes a new standard, Industry Recommended Practices 15. Sanctioned over a year ago, it is now fully implemented in Canada. Oil companies can play a key role in implementing similar practices in their region.

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Although formerly used when more traditional well control methods were ineffective, snubbing is now an integrated mainstream operation that has proven to be both safe and cost-effective in maximizing productivity and reducing costs. Completion and workover programs now use snubbing as the preferred strategy to protect the formation from contamination and reduce the cost of well construction. In Canada, the snubbing industry has grown from three snubbing companies with 12 units in the late 1970s to more than 100 snubbing units operated by over 14 companies and is still growing steadily.

The Canadian snubbing industry worked hard to standardize equipment, practices and procedures, as well as to coordinate employee competency in the 2000s. We in the snubbing industry strive and succeed at being recognized as a safe and cost-effective way to perform completions and workovers on oil and gas wells.

Industry Recommended Practices 15 (IRP15) covers, but is not limited to, crew competency, equipment specs and certification, required safety systems, equipment inspections requirements, plug-setting procedures and requirements, safety meeting and Job Hazard Assessment (JHA) policies, and egress system requirements.

THE NEW IRP

The snubbing industry in Canada is regulated and/or monitored by industry and government agencies such as: Petroleum Services Association of Canada (PSAC), Energy and Utilities Board, British Columbia Oil and Gas Commission, Canadian Association of Oilwell Drilling Contractors, Drilling and Completion Committee, Canadian Association of Petroleum Producers, and the Occupational Health & Safety and Workers Compensation Boards of the various districts.

With the scrutiny of the oil and gas industry upon us, we have set in place IRP15 - safety standards for the snubbing industry. With the help of PSAC and some experienced, dedicated snubbing company personnel, IRP15 was taken from the original, very brief, generic document written in November 2003 to the robust standards that it embodies today. Sanctioned in June 2007, this document is now the standard to which all Canadian snubbing companies are measured. A few snubbing companies even go beyond it to safeguard snubbing operations.

With safety being paramount in today's oil patch, many new safety features have been added to today's snubbing units. One IRP15 requirement is that snubbing units must have a "smart" snubbing system, comprising visual indicators for stripping-ram positioning, which indicates whether the rams are opened or closed, and an audible alarm that sounds if the stripping rams are in the closed position.

Further, a throttle-control device must be connected to the rig engine, which limits the pulling power and speed of the drilling or service rig when the rams are closed. Pre-job calculations are essential and are performed to ensure proper working parameters for the tubing string and BHA. Using pre-job calculations, the throttle-control box can be set to limit the rig's pulling power and speed to within these specifications.

Also along these lines, the snubbing-jack snub-force capabilities are preset to limit the snub force to ensure pipe integrity and prevent buckling. Setting of the snub force is documented in the PSAC safety meeting booklets on each job. Online pipe-buckling calculators are now available on the web to perform these calculations (including one on the author's website).

Low-accumulator beacons and alarms should be used to indicate low system pressure on the snubbing unit. Slip-lever locks are used to prevent improper slip positioning, while

traveling slips are mounted on a rotating bearing to allow for pipe rotation even while pipe light.

IRP15 requires an egress system with “controlled descent” capability. The traditional method of egress - sliding down a pole - is still permitted for now, except in British Columbia. One method is a controlled descent via a “zip line” cable-trolley system. Another is a tube-like device that slows descent while allowing the worker to get a safe distance away from the rig while descending, Fig. 1. There are others.

Fig. 1 . The tube-like controlled-descent escape method (here by FoxxHole) meets IRP15 requirements. The “pole slide” will be disallowed in January 2009 in British Columbia.

Also, no derrick man is allowed on the rig monkey board during snubbing operations in the well.

Proper training and certification for snubbing crews has become essential. Snubbing is now a recognized and certified trade in Canada; it is not so worldwide. This is accomplished by qualified trained assessors and snubbing companies recognized by Enform, PSAC and others to train and certify snubbing crews. Assessors not only ensure that safety protocols and procedures are taught, but also the maintaining and repairing of snubbing equipment. Also, certification of the snubbing unit itself is vital to carry out safe snubbing operations. Crews receive government-recognized certificates indicating their levels of competencies.

Some service companies go beyond the basics. For example, the author’s company provides animated 3D virtual training for a hands-on experience and has test wells set up to supply hands-on snubbing training with the snubbing jack. Animated cross-sectional videos have been developed to use in training and informational seminars.

Pre-job meetings are an essential part of IRP15. The ability to pre-plan a snubbing job for tubing strings, BHA and BOP requirements and spacing, and expected working pressures greatly enhances the ability to provide a safe and economically feasible snubbing program. The snubbing program specifications allow the design and testing of snubbing equipment, BOP stacks and spacing before they arrive on location.

Another IRP 15 requirement is a dual-barrier plug setup for tubing. Wells with less than 3,000 psi surface pressure or H_2S content of less than 1% require single locking plug and slip stop, or single permanent plug, or tubing end plug. Wells with greater than 3,000 psi surface pressure or H2S content higher than 1% require dual locking plugs *and* slip stop, or dual permanent plugs, or dual floats, or tubing end plugs. These wells also require dual stripping ram BOP setups. Critical sour wells require the use of *either* shear rams or a hole volume of kill fluid to be on location. On wells with H2S content greater than 1%, a nitrogen blanket or other type of inert fluid or gas must be pumped into the casing. If the tubing is in the well it also must be filled with an inert gas or fluid. The author’s company requires these types of blankets on wells with H2S content higher than 500 ppm.

Ensuring pipe and BHA integrity is factored in, and snub forces are set accordingly and documented. Snubbing may actually enhance the safety of a well intervention with lost circulation, kicks or other circulation problems.

CASE HISTORY

Snubbing can greatly reduce potential formation damage and allows the ability to workover or complete the well in an underbalanced state. Snubbing unit design and configuration can be modified to accommodate almost any job-specific requirement

related to a workover or completion project, whether requiring a rig-assist or a self-contained snubbing unit.

In this case history, the client required a dual-string completion on a 2,000-psi gas well. They needed dual packers on the long string, with about 300 m of spacing between the packers. The upper packer was a dual-string packer (of 3.65 m length), which would allow the short string to be latched. A pre-job meeting was held and the job parameters were discussed. A snubbing program and JHA were completed. The snubbing stack was designed using offset-handling equipment, a lower stripping ram below the service rig's BOPs, 7 1/16-in. hang-off flange, 4 m of 7 1/16-in. spacer spool, and a standard snubbing BOP stack. An N_2 blanket was used for sand cleanout, with a trace of H_2S.

The lower packer was snubbed in along with assorted blast joints, sliding sleeves, tubing blanking plugs and the required amount of tubing. At this point, the tubing was still pipe light. This bottom assembly was held in place using the lower stripping rams and hang-off flange. The snubbing jack was rigged out, the upper packer was installed in the tubing string, the spacer spool was added to cover the packer, and the snubbing unit was rigged back up and pressure tested. The long string was then snubbed to bottom and landed, and hydraulic packers were set.

The snubbing unit was rigged down, offset spools (lubricator) were rigged in, and the snubbing unit was rigged back up and pressure tested. The short string was run and latched onto the upper dual-string packer. The short string was landed and the snubbing unit rigged out. The job was performed without incident.

CONCLUSION

The case history was included to drive home the point that the snubbing industry has made great strides in the last 30 years, many coming within the last 5 years. Snubbing is not just for high-risk well control. Complex workovers and dual completions are increasingly being performed that are cost-effective, minimize formation damage and maximize production. And, with the help of the new standards, they are being done safely. Lease operators would do well to emulate them and spread the success of safe and routine snubbing operations to locations worldwide. WO

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