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Cudd Well Control employees hosted a Houston Texans Tailgate party for the October 12 game, in which the Texans defeated the Miami Dolphins for their first win of the season. Fun was had by all.

www.cuddwellcontrol.com

UPCOMING EVENTS
BE SURE TO VISIT THE CWC BOOTH AT THE FOLLOWING INDUSTRY CONFERENCES:
• SPE Asia Pacific Oil and Gas Conference in Perth, Australia
• Permian Basin International Oil Show in Odessa, Texas
• Well CTRL Gulf of Mexico in Houston, TX
• IADC Well Control Middle East Conference in Muscat, Oman

RECENT PRESENTATIONS
• OIPA Unconventional Resources Forum in Tulsa, Oklahoma
• IADC Middle East Conference in Muscat, Oman
• AADE Student Chapter at Texas Tech University
• CWC Well Control Seminars in London
• CWC Lunch & Learn Technical Session in Houston, Texas

NEW LOCATION
Well Control School, a sister company of Cudd Well Control, has moved their Administrative Office Headquarters as of September 8th, 2008 to 16770 Imperial Valley Drive, Suite 290, Houston, TX 77060. This administrative facility will additionally offer instructor-led and computer-based well control training beginning October 20th, 2008. For registration or more information, please call us at 713-849-7400 or visit their website www.wellcontrol.com.

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FLASHPOINT
News from the World of Well Control

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Well Kill Methods

There are several well kill methods that well control specialists and operators use when well control events occur. Each method has its own application, as well as advantages and disadvantages.

There are basically two categories of well kills used in kill wells. Conventional well kills are generally used when the well has been shut in, and contained by the surface pressure control equipment. Unconventional methods are usually employed when flow from the well is not contained. This can be a surface or an underground blowout.

Conventional Methods

Conventional methods are those that are traditionally known by most operating personnel involved in drilling, workover and completion operations. These methods are:
- Driller’s Method
- Engineer’s Method
- Concurrent Method

The methods are considered constant bottom hole pressure methods, and all have the following characteristics:
- Each method requires the use of back pressure on the well to control the surface pressure during the well kill
- The calculations required are relatively simple
- Circulation is required to implement the kill
- A work string is required in the well close to the kick depth

The success of the kill operations with these methods depends on a number of factors, but as a general rule, if the well can be circulated near the kick depth with minimal or no loss of circulation, the likelihood of success is high.

Volumetric Well Control and Lubricate and Bleed operations are not generally considered as well kill methods. These are however, important well control methods that are routinely used for different operational settings, in conjunction with other well kill methods.

Volumetric Well Control is used to safely allow a gas bubble to migrate to the surface. The basic theory of the method is to expand the gas bubble in a controlled manner as it rises. The amount of the casing pressure rise associated with this is dependent on the hydrostatic pressure of the fluid bleed from the well. This method has the following characteristics:
- Used when pumping is not an option
- Basically a constant bottom hole method (within a chosen range)
- Requires bleeding fluid from the well in controlled volumes

Lubricate and bleed operations are basically the inverse of volumetric method. Fluid is pumped into the well, and the gas bubble is bleed from the well in controlled increments. Lubricate and bleed operations have the following characteristics:
- Gas bubble must be at the top of the well
- A constant bottom hole method (within a chosen range)
- The volume of fluid pumped into the well must be carefully measured
- A accurate casing pressure gauge is required for proper bleeding
- Can be used to kill the well in certain situations

As is the case with volumetric control, lubricate and bleed operations are usually applied in conjunction with other methods, to completely bring the well under full hydrostatic control.

Unconventional Methods

There are several well kill methods that are used to kill blowouts. These methods are momentum and dynamic kills. Momentum and dynamic kills are used on flowing wells, and involve more advanced calculations, in which most operations personnel have little or no experience. These situations are usually best handled by experienced and trained personnel.

Momentum Kills

A momentum kill is a collision of the blowout fluids and the kill fluid. The momentum force of the kill fluid overcomes the momentum force of the blowout fluid and forces the blowout fluid back down the well to the open formation or perforations.

Momentum kills have the following characteristics:
- Can be used in conjunction with controlled back pressure but is not necessary.
- Momentum force of the blowout fluids can be difficult to determine. This is because the density of the blowout fluid is required and is difficult to calculate.

(Continued on page 2)
WELL CONTROL CASE HISTORY
WEST TEXAS

The subject well was undergoing some diagnostic activities to attempt to locate a suspected hole in the production casing string. There was a workover rig on the hole, with a tapered tubing string and packer assembly. The rig crew was in the process of tripping out of the hole when the well began flowing. The pipe rams were closed and did not stop the flow. The rig was evacuated and Cudd Well Control was contacted to assist in regaining control of the well.

Situation upon arrival
The well was blowout through the annulus and exiting from the top of the rig BOP. The flow was heavily dispersed by the elevators, slips and traveling blocks and engulfed much of the location. The well was capable of producing up to 1100 ppm H2S. The well site was evacuated and a staging area was designated for the completion of all operations.

Intervention Strategy
The initial actions planned were to cut the tubing and allow it to fall into the well. The blocks would be raised to the top of the derrick, out of the flow of gas, and the slips and rig floor would be removed. This would be completed to alleviate the dispersion of the flow stream and allow for capping onto the rig BOP. The rig would be removed after the well was capped and diverted.

Operations
All pertinent equipment was ordered to complete the job and outside safety contractors were on location to provide adequate SCBA equipment for working in an H2S environment.

Prior to cutting the tubing, all wellsite debris was removed. This included a pump truck, several tanks and a hydraulic laydown machine. Several trailers were also moved off location to facilitate capping and diverting operations.

The tubing was cut using a dual abrasive jet cutting system and allowed to fall down the well. After successfully dropping the tubing, the blocks were raised to the crown by attaching a snatch-block to the fast line and pulling the line towards the front of the rig. The line was secured to hold the blocks in place. The slips were supported on the BOP stack by a small spool, attached to the stack. The slips and the spool were removed, along with the rig floor. The flow stream was now vertical with minimal dispersion.

The well was capped with a single blind ram and a spacer spool. The capping stack was placed on the rig BOP and nippled up. The diverting manifolds and lines were installed and run to a flare pit for diverting.

Well Kill Methods

• The higher the gas flow rates, the less likely the chance of a successful momentum kill.
• The deeper in the well the fluids collide, the higher the chance of success for a momentum kill. This requires that a kill string be as close as possible to the bottom of the well.

Momentum kills have traditionally been called “out running the well.” These kills have been tried on numerous underground blowouts where the controlling pressure is underground blowouts where the controlling pressure is dependent on the fracture pressure of the formation that is taking the flow. The requirement for a dynamic kill to be successful is, that the hydrostatic pressure of the mixture density of the kill and blowout fluids, combined with the friction pressure of the mixture of the gas and fluids and blowout fluids, combined with the friction pressure of the mixture density of the kill.

The calculations required to determine these pressures include:
• Blowout flow rate determination of the gas and fluids
• Blowout gas density
• Flowing bottom hole pressure of the blowout formation
• Mixture density of kill and blowout fluids at the dynamic kill rate
• Friction pressure of the kill fluid/blowout fluid mixture

These calculations can be tedious and complicated, and are usually done with computer programs of varying sophistication. These include steady state and transient models. Steady state models are usually sufficient for most kill scenarios, but transient models are usually recommended for high flow rate blowouts.
**GAS BUSTER (MUD/GAS SEPARATOR)**

A Mud Gas Separator (MGS) or gas buster is common on most drilling rigs throughout the world. The MGS is used to separate wellbore gas from the drilling fluid while circulating out a kick or circulating any gas present in drilling fluids during drilling or workover operations. The MGS is a very important component in underbalanced drilling. A typical MGS is constructed of a cylindrical vessel with a series of baffles in it. The drilling fluid from the wellbore enters the MGS and the action of the fluid hitting the baffles separates easily removed gas from the fluid. The gas exits through a vent line at the top of the MGS and is safely vented away from the rig floor. The mud exits the MGS through a line near the bottom of “up hill” to return to the pit system.

Typically, the maximum allowable pressure of the MGS when in use is determined by the fluid leg (fluid seal) height. The density fluid in the fluid leg is dependent on the fluid in use at the time and therefore operating pressure of the system is variable. This pressure is usually below 15 psig. However, there are MGS applications in which the vessel can operate at pressures up to 100 psi. The friction pressure of the gas flowing through the vent line must be less than the hydrostatic pressure of the fluid in the fluid leg. If this friction pressure is greater than the hydrostatic pressure in the fluid leg, gas will exit the fluid line and flow to the pit system.

Improperly sized MGS system can lead to the following safety hazards:

- If the fluid leg is compromised, gas will be returned to the shale shaker and/or mud pits.
- Oftentimes, in order to prevent excessive gas flow through the system, the choke is closed when the gas reaches the surface. This can lead to increasing back pressure on the well and will increase the chances of formation or shoe breakdown.
- The separator itself can rupture or split if the vent line becomes plugged.

The API has a brief explanation of the MGS in API RP 53. The document refers to a Society of Petroleum Engineers document Number 20430 for sizing calculations.

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**Cudd Well Control Names Two Senior Well Control Engineers**

Cudd Well Control, a division of Cudd Pressure Control, Inc. announces Mr. Alex Korzenewski as a Senior Well Control Engineer. Mr. Korzenewski has over thirty one years of oilfield experience in all aspects of drilling and completions.

Mr. Korzenewski began his career at Amoco Production Company as a drilling engineer working different regions of Texas. He went on to hold various production and completion engineering jobs for Sun Texas Company and Crown Exploration. Mr. Korzenewski has also served as President and consulting engineer for an independent engineering and geological consulting firm. He served time in the Army National Guard stationed overseas commanding a battalion of combat engineers in Bosnia. Upon his return to the states he resumed his career in the oilfield in the drilling, workover and completions consulting arena. Most recently, Mr. Korzenewski was working for Weatherford International where he held a myriad of jobs including Project Manager and Senior Underbalanced Drilling Engineer working on the design of both vertical and horizontal drilling programs, extensive cleanout and re-entry projects. Mr. Korzenewski is a registered professional engineer in the state of Texas and brings significant experience to the Cudd Well Control team.

Mr. Jace Larrison was recently promoted into the position of Senior Well Control Engineer at Cudd Well Control. Mr. Larrison, a Texas Tech University graduate in Petroleum Engineering, has experience in all aspects of well control engineering including Blowout Contingency Plans, Well Control Equipment Inspections, recommendations for special well control problems and all aspects of field operations.

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**Latest Engineering Projects**

- Rig Training Offshore Arabian Gulf
- Relief Well Planning Offshore Eastern Canada
- Emergency Preparedness and Response Training in Australia
- Gas Dispersion Modeling for product storage operation in Texas
- Deepwater Emergency Response Plan for the US GOM
- Editorial Article in Fall issue of Energy Magazine

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**WELL CONTROL TRIVIA**

Texas’ first producing oil was in 1866 at Melrose in Nacogdoches County. Other wells followed shortly after, and Nacogdoches County became the site of Texas’ first commercial oilfield, first pipeline and first effort to refine crude.