



FLASHPOINT

News from the World of Well Control • Spring, 2009

Critical Wellhead Restoration Services

In many parts of the U.S. and other places in the world there are numerous producing oil and gas wells. These producing wells, over a period of time, require workover procedures to insure production and surface barrier integrity. If regular routine maintenance is not scheduled and performed, the ability to maintain production and control the well is compromised. The lack of routine maintenance of the wellhead equipment renders the well a "ticking time bomb" in regards to well control.



Regular wellhead and production tree maintenance and management ensure that the primary surface barrier is intact and functional. If the wellhead equipment is not

properly sustained the wellhead will deteriorate to a point where routine maintenance will not allow the wellhead equipment to be operable and a maintenance operation becomes a "restoration." If normal restoration is not carried out, further deterioration of the wellhead leads to a critical situation. It becomes critical in the sense that normal and routine procedures cannot be used to restore the production surface barriers. The required procedures then become a "critical wellhead restoration."

Factors that affect the primary surface barrier integrity are production fluids and well location environment. In certain areas in the U.S., namely the Gulf Coast Region inland waters and the Gulf of Mexico, the environmental impact can be devastating.

This is especially true if maintenance and management are ignored. As time goes by, the wellhead components deteriorate.

Wellhead valves become inoperative and normal repairs can not be made because the fittings, nuts and studs have weathered away to an extent



that the proper tools do not fit or work. The wellhead components can become so eroded and corroded that the components body shell pressure integrity may be totally compromised. This leads to surface leakage of production and formation fluids. That results in uncontrolled discharge of oil, gas or water without the conventional means of stopping the flow. A situation that starts as a wellhead restoration project becomes a serious well control issue with environmental impact.

Cudd Well Control has been engaged in critical well head restoration operations for quite some time, and has seen a rise in customer service needs to manage and restore production surface barriers. There are three types on critical well head restorations that are normally encountered:

- Production surface equipment which is inoperable due to deterioration of some or all surface components which impedes production operations
- Production surface equipment which has deteriorated to a level such that some or all components do not function and the production tree's pressure integrity is compromised with slight leakage occurring
- Wells in which the deterioration level is so severe that the production surface barrier's integrity has

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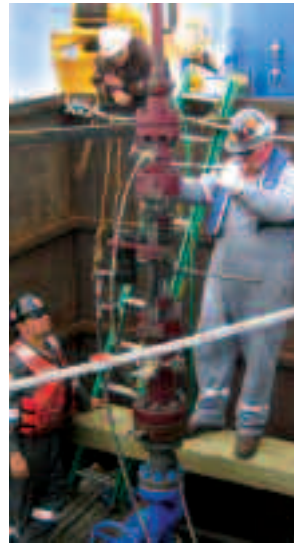
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been compromised allowing uncontrolled discharge of production fluids from the well requiring full scale well control operations.

Normally when contacted by a customer for one of these candidate wells, CWC conducts an on site well survey. This allows for proper equipment selection and generation of the proper forward operational procedures which are the safest and minimize environmental impact.



Wellhead and tree valve bodies can be checked for thickness using an ultrasonic thickness gauge to determine pressure integrity and determine pressure limits. Hot tap and gate valve drilling units with specialized bits can be used to provide conduits to check for trapped pressure and allow for pumping operations in order to kill the well when tree and casing valves are no longer operable. Special air tools are used to cut nuts, bolts and



studs for valve replacement when conventional wrenches and equipment no longer work. In some cases an abrasive jet cutter is used to cut the wellhead off for total wellhead replacement. Some wells that are located in inland waters and marsh areas may require the need for a coffer dam to access the wellhead and or tree.

Each restoration is unique and has its own special requirements. Cudd Well Control has extensive experience in this special service and is one of the forerunners in Critical Wellhead Restoration Services.

PERSONNEL ANNOUNCEMENT

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



WELL CONTROL CASE HISTORY EGYPT

CWC was contracted to perform blowout control operations in Egypt for a workover well control event. The well was a producer in a major development in the northern desert.

Situation upon arrival

The well was discharging through an elongated cut in the TIW valve. The CT equipment was hanging in the rig blocks and all rig equipment was shut down. All flow was up the tubing with the annulus isolated downhole by a production packer.

Intervention Strategy

There were several methods discussed for capping and diverting the flow. Based on the given conditions, one method gave the least exposure to personnel and would likely allow the shortest time frame for completion. The rig on the well had a two ram BOP stack. The bottom rams would be changed from blind rams to blind/shear rams. The upper rams would be changed from pipe rams to blind rams. The tubing would be sheared with the lower set of rams. A snatch block and a bulldozer would then be used to pull the fast line and raise the CT injector, CT BOPE, and pipe stub above the blind ram cavity. The blind rams would be closed and all flow would be diverted to a flare pit. The well would be



diverted due to several shallower zones, formerly isolated by the packer.

Operations

The diverter line was laid out to an existing flare pit already present near the wellsite. The diverting line was made from 7" casing. A coflex line was installed from the BOP choke line valves to a choke manifold, positioned a safe distance from the rig.

The annulus was opened and monitored to ensure that no flow was present before opening the BOP bonnet doors. These doors

were opened and the existing rams were removed and replaced with the desired configuration. Blind rams were placed in the top cavity and blind/shear combination rams were placed in the lower cavity. The doors were closed and new seals were installed.

The snatch-block was installed on the rig fast line and attached to a bulldozer. The line was pulled just enough to remove all the slack from the cable.

An additional accumulator was brought in and installed for the shearing rams. The rig accumulator would be used for closure of the blind rams after the shear attempt was made.

With all preparations complete, the pipe was sheared off. Flow was immediately visible from the bell nipple after closure of the blind/shear rams. The rig tongs were rigged up to a crane, by way of a sheave, and the pipe was rotated to ensure a complete shear was present. The CT equipment and pipe stub were raised above the blinds by the bulldozer and the blinds were closed. All flow was diverted to the flare pit.



Be Proactive... Be Prepared

Enhance your preparedness for well control events by calling Cudd Well Control (CWC) today to ensure you are ready if, and when, an issue arises. By utilizing CWC's complete line of engineering services your company will be better equipped to handle well control issues, shorten the learning curve and lessen the cost burden if an event does occur.

Rig Inspections

A rig inspection is a visual examination of the rig's well control equipment and installation. The rig inspection helps ensure that all well control equipment supplied by the rig contractor is "fit for purpose" and properly installed. This inspection has proven useful to operators and contractors in the past, and can be used to develop operational procedures and policies for drilling the critical section of a well.

Drilling Plan Enhancements

The purpose of a Drilling Plan Enhancement project is to review the well control portion of a drilling plan or prognosis. There are numerous well control issues that are often given less emphasis by drilling engineers than well control engineers. CWC engineering can review the drilling plan, make the following calculations and recommendations to enhance the drilling plan, and ensure that any critical well control issues are not overlooked.

- Kick tolerance
- Maximum expected surface pressure from an evacuated wellbore
- Maximum expected surface pressure and gas volume from a kick
- Gas buster throughput calculations
- Well control equipment recommendations
- Shut in procedures
- Well control circulation recommendations
- Dynamic kill study

Blowout Contingency Planning

The Blowout Contingency Plan is a document that is intended to guide and organize a response to a blowout or well control event. These documents are instrumental in getting a company properly prepared to respond to an event in the early stages of occurrence. Rapid response to a well control event is critical to successful event recovery and management. The Blowout Contingency Plan document is intended to accomplish the following tasks:

- Organize and dispatch the proper personnel to the appropriate location in response to a well control event
- Develop the team required to handle the onsite operations of a well control event
- Define personnel roles and responsibilities
- Develop a support team for offsite operations
- Identify and define well control levels, likely scenarios for each level, and provide proper reactions to these scenarios
 - Develop contact list of all viable personnel related to a well control event such as regulatory agencies, third party vendors, etc.

All of these aspects can greatly enhance the reaction time to a well control event, and significantly reduce the time required to return to normal operations. Preparedness is the key to successful management of any well control situation.

Specialized Training

Cudd Well Control offers a variety of training programs that are tailored to fit the specific needs of the customer on any well control related topic. The curriculum is designed to prepare office and field personnel for well control problems. An alert and knowledgeable crew is a key ingredient to the prevention of expensive

and lengthy well control events. The training programs can be as simple as covering the basics of well control, or can discuss more advanced topics, based on the customer's discretion. Most well control situations occur due to a series of mistakes made early in the preliminary stages of the event, rather than a single major error. Based on that principle, it is imperative that those personnel, who are assigned to handle well control issues, be trained and equipped with the knowledge required to do so correctly.

Relief Wells

Relief well planning requires the input of trained professionals for successful execution. CWC has personnel on staff with the experience necessary to properly design and implement relief well intervention projects. Relief well planning can be done for a variety of reasons. One such reason is for preplanning purposes on critical wells. CWC can provide the relief well contingency planning that is prudent for high risk wells. This planning includes the following:

- Relief well team designation
- Surface location determination
- Relief well trajectory philosophy
- Intercept strategy
- Relief well casing seat selection
- Dynamic kill design
- Kill surface equipment design
- Kill fluid selection
- Kill hydraulic modeling



Kick Modeling

Kick Modeling involves running simulations of various kick scenarios using SPT Group's DrillBench® software. The simulations calculate the wellbore pressure at depth, kick volume, ECD, casing shoe pressure, bottom hole pressure, mud-gas separator throughput, etc. The calculations are used to generate recommendations for well construction during the planning phase and kick handling during the drilling phase of a project.

Gas Dispersion Modeling

Certain oil and gas producing areas have an elevated level of risk exposure due to their relative proximity to the general public. In order to mitigate that risk, gas dispersion modeling has been used to determine the impact that a full scale blowout will have on the nearby surroundings.

CWC uses open flow potential data as input into the Breeze HazPro® gas dispersion modeling program. This program can be used to calculate the gas concentration for a variety of meteorological and surface terrain scenarios in the area surrounding the well. This data can be useful during the early stages of a major well control event to determine the impact area and the necessary response. The dispersion data can also be used to develop a Blowout Ignition Plan to determine when a blowout should be ignited.

Well Control Crossword

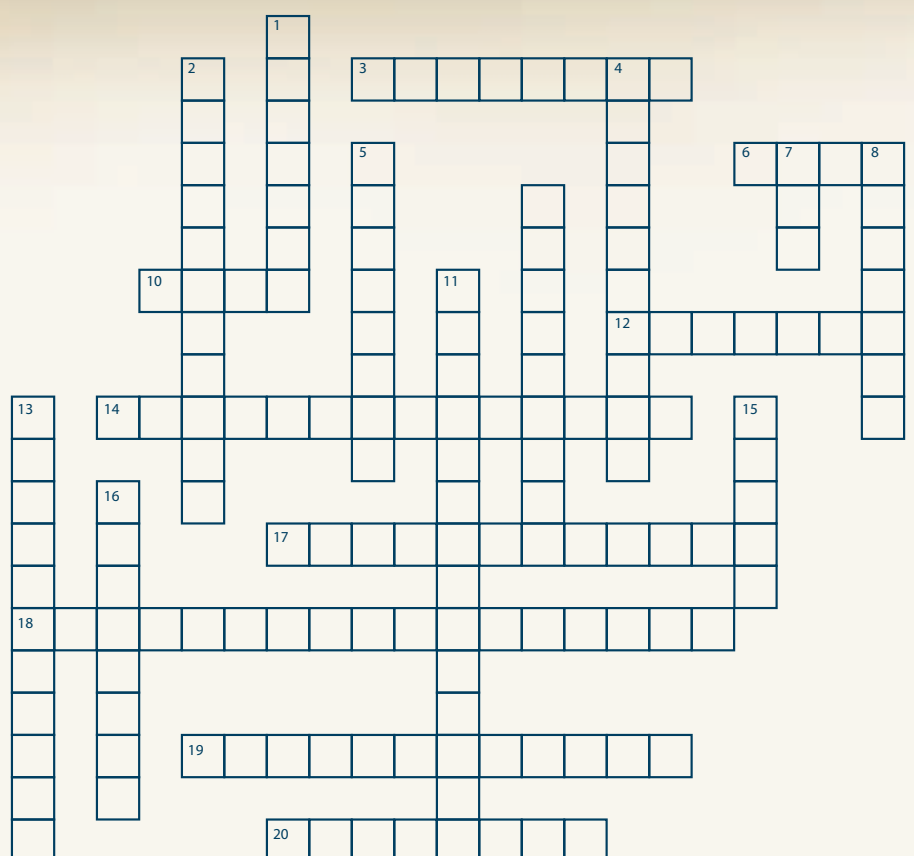
Complete the following crossword puzzle and submit to cmichalek@cudd.com. The first three entrants with the correct answers will win a CWC gift.

ACROSS

- Procedure where formation fluid is forced back into the wellbore by means of pumping fluid from the surface
- Four letter abbreviation for the tool or device inserted into the drill string, for the purpose of stripping into and out of a well
- An air or gas drilling fluid that consists of 97-99 percent air or gas and 1-3 percent liquid
- Bag type blowout preventer
- Method of circulation that does not involve an increase in mud weight (2 words)
- Series of BOP's used to cap or divert a well (2 words)
- A kill technique that uses the principal of exchanging mud in the well for gas, often used with no pipe in the hole (3 words)
- Top kill technique where in kill fluid collides with and overcomes the upward motion of the blowout (2 words)
- Part of a blowout preventer, which serves as the closing element on an open hole (2 words)

DOWN

- Uncontrolled flow of gas, oil or other well fluids into the atmosphere or into an underground formation
- Kill technique that utilizes both hydrostatic and frictional pressure to overcome the reservoir pressure in the producing zone (2 words)
- Specialized tracked vehicle used in well control intervention operations for debris removal, capping and equipment placement (2 words)
- The force that a fluid exerts uniformly in all directions
- Abbreviation for bottomhole pressure
- Ram with rubber element designed to form a seal around the pipe body (2 words)
- Process of directing the flow of a well in a controlled manner
- Fluid that exists in a subsurface formation (2 words)
- Process of pumping into a well causing the fluids in the column to be expelled at the surface
- Adjustable orifice used to control pressure and flow rate
- The practice of inserting pipe or tubulars into a well under pressure the fluids in the column to be expelled at the surface





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Albert Munsinger, Well Control Specialist, and Jace Larrison, Senior Well Control Engineer, prepare to rig up a casing cutter on an H2S blowout.



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WORKING TOGETHER: CWC AND WCS



Cudd Well Control and Well Control School (WCS) are working together to present a bundled services marketing campaign. The most recent project implemented to promote the synergies of these two companies, is through the introduction of regular "Lunch and Learn" presentations to students of the Well Control School. These sessions are led by a CWC Senior Well

Control Engineer, who presents interesting case histories and discusses technical subjects in a question and answer environment.

UPCOMING EVENTS

BE SURE TO VISIT THE CWC BOOTH AT THE FOLLOWING INDUSTRY CONFERENCES.

- SPE Rocky Mountain Petroleum Technology Conference in Denver, Colorado
- 2009 Alliance Expo & Annual Meeting in Wichita Falls, Texas
- IADC Drilling HSE Middle East Conference in Abu Dhabi, UAE
- 2009 Offshore Technology Conference in Houston, Texas
- Intergas V in Cairo, Egypt
- IADC Drilling Onshore Conference & Exhibition in Houston, Texas
- IADC World Drilling 2009 Conference & Exhibition in Dublin, Ireland
- SPE Asia Pacific Oil & Gas Conference in Jakarta, Indonesia
- IADC Well Control of the Americas & Expo in Denver, Colorado

RECENT ENGINEERING PROJECTS

- CWC Lunch & Learn Technical Session in Houston, Texas (Topic: Drilling Advances Complicate Well Control)
- Instructed BOP Systems and Well Control Classes at PETEX
- Dynamic Study for Deepwater Riserless Drilling in West Africa
- Presentation at IADC Middle East Well Control Conference in Oman
- London Well Control Seminars for Insurance Underwriters
- Mud Gas Separator Article for Nov/Dec 2008 Drilling Contractor Magazine