



# JOHN WRIGHT COMPANY

BLOWOUT CONTROL ENGINEERING AND RELIEF WELL SPECIALISTS  
SINCE 1989

## Highlights

- First bridge plug placed in a blowout from a relief well
- Relief well used to safeguard the environment on well knocked over by shrimp boat
- HPHT Blowout logged and production tested after a 7" liner set in a re-entered 8-1/2" open hole from a relief well below 3800m
- Connect wells between two platforms to eliminate a subsea pipeline
- Unique relief well technology used to safeguard a platform from blowout risk

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## Innovation and Experience

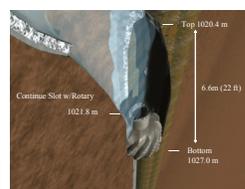
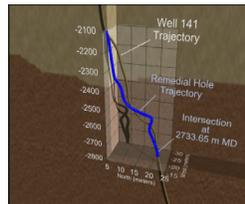
### World Leaders in Relief Well Design & Implementation

Need a relief well construction partner with the capabilities to get you there? A well oiled, high performance relief well drilling machine. This is the kind of integrated engineering team we have built since 1989. We have successfully designed and implemented over 30 diverse relief well and intersection projects worldwide. A number that cannot be approached by any other company.

We have the total project management experience, processes, technology, mobility, and local understanding of client's needs worldwide. And key team members that have been with us since the beginning.

When it comes to capabilities we have the whole performance package. We develop the strategy, design the kill and intersection using proprietary process steps and software tools, integrate the design into the clients management team, coordinate service companies, subcontract special services and supervise the implementation.

We provide you more options to accelerate your project completion and free your key employees to manage other aspects of your business. You get the confidence that you have the best team and technology in the world. Call John Wright Company and be assured of getting there, on time and within budget.



### How Critical are Hydraulic Simulations?

Some companies claim they are of minimal importance, "we've gotten by for donkey years without it and besides there are too many unknowns". Analysis: they do not understand the problem, do not have the software & expertise, or it is not in their interest.

*Hydraulic modeling drives every aspect of blowout control.*

From kick tolerance and kick circulation for prevention to blowout modeling for flowpath diagnostics, multiple flow zones, pollution, gas dispersion, temperature effects, hole collapse, erosion

potential, gas lifted water, cross-flow, depletion, capping design, diverter design, snubbing design and more. Kill simulations control fluid requirements (density & volume), temperature and pressure effects, pumping plant requirements, tubular requirements for relief wells and snubbing kills, rig requirements, personnel, support equipment, barges, etc.

*If you have a complicated blowout "hip-shooting" diagnostics and kill attempts can lead to disaster.*

Complicated control operations require experience, state of the

art software tools, systematic diagnostics and an integrated engineering solution.

Since 1991, Well Flow Dynamics is the only company dedicated fulltime to simulating kicks, blowouts and hydraulic kills. We have the most advanced software using OLGA 2000 in conjunction with proprietary blowout well and kill modules. Our flow engineers will work independent of your choice of contractors to assure you have the best unbiased engineering knowledge available to base your multimillion dollar decisions.



"Learn from the mistakes of others. You can never live long enough to make them all yourself."

*It Can't Happen Here*

**"Organizations don't have memories. Only people have memories and they move on."** *Trevor Kletz*

*Accidents re-occur every 10 to 15 years*



"Victory awaits those who have everything in order — people call that luck. Defeat awaits those who don't — this they call bad luck". *Amundsen*

## A Blowout Hazard Management System

Many blowouts occur because those concerned did not know how to prevent them although the knowledge may be well known to other people.

*The knowledge was in the wrong place!*

Because personnel are constantly on the move knowledge is lost to the organization. A systematic process can help to minimize this loss. In 1994 John Wright Company (JWC) implemented the first blowout contingency plans utilizing a hazard management process.

These processes were developed in the petrochemical industry and were adapted for blowouts.

There are 4 essential parts to managing hazards:

1. Identify the Hazards
2. Define the impact and probability of hazard release and escalation
3. Implement controls to reduce the risk and mitigate escalation of an event

4. Develop a plan to respond if an event occurs for three levels of severity.

- Level I - An SOP exists for recovery (e.g. kick)
- Level II - No SOP exists for recovery, but a complicated situation exists which could escalate to a blowout if mishandled
- Level III - A blowout. ICS system or similar recommended for recovery

## An Ounce of Prevention is Worth a Pound of Cure

Hazard identification is best performed using a team of engineers and operation personnel familiar with the design, equipment and procedures for the well construction or work-over and blowout control engineers from JWC.

We evaluate the well construction program and list any obvious hazards. Next static and circulation kick tolerances are calculated based on the design. We look for probability of underground crossflow either from kick or swabbed influx. If cross flow is possible we evaluate blowout rates, flowing borehole pressures, probability of collapse, and possibility of escalation to a surface or seabed blowout.

We next evaluate surface and/or subsea blowout rates for plausible scenarios. We calculate flowrates, oil/gas/water ratios, temperature profile, velocity profile, and pressure profile. Sensitivities are then run to determine critical variables (e.g., IPR, reservoir pressures, fluid composition, exit pressure, hole diameter, kh,

etc.). This information is used to evaluate impact on environment and people.

Oil rates may provide input to pollution models and gas rates to gas dispersion models for ignition and H<sub>2</sub>S poison gas risk.

We next evaluate kill rates. If sustained crossflow is possible we calculate whether it is possible to control the crossflow using the existing rig. If not, what is required? —Perforate the HWDP, more HHP, snub larger tubulars, reactive gunks or a relief well or combination.

For surface blowouts we evaluate kill rates required at defined points in the well. The normal presentation is a chart showing kill rate verses a variable (e.g., kh) with a number of curves using different mud densities. These curves can be generated for any number of sensitivities and are useful to bound realistic scenarios for exploration wells where many parameters are speculation.

The next phase is to connect the kill point with a conduit to

the surface. This may be a snubbed in drillstring or it may be a relief well. We then compute injection pressure, HHP, and volumes for various tubular configurations until a reasonable compromise is achieved between kill depth, HHP, kill fluid density and volume.

For critical wells (e.g., HPHT, deepwater, remote) we produce a complete plan to include relief well and surface planning to uncover any scenario that may prove difficult to implement a control plan.

Management can then decide, based on the risk, if changes are justified to the plan or if extra training or mitigation steps are necessary or if additional insurance may be justified.

Response plans cover actions at the wellsite and at the office for kicks, complicated non-SOP recovery and for a blowout which includes a 48 hour plan and procedures to accelerate the management of regaining control of the well.

## Why Well Flow Dynamics?

*State of the art software, dedicated specialists and 15 years continuous experience.* Dr. Rygg worked as a flow scientist on the OLGA project for IFE in the late 1980s. He developed kill and well modules for this software at the request of Saga Petroleum after a North Sea blowout. In 1991 we obtained licenses for OLGA and formed Well Flow Dynamics (WFD) to offer blowout and kill simulation services to the industry, Dr. Rygg is the director. Since that time three additional engineers have

joined the firm all with masters degrees in flow dynamics and petroleum engineering.

WFD maintains the latest version of OLGA 2000 as new releases are made by Scandpower. Our blowout and kill modules, that interface with OLGA2000, are proprietary in-house software packages that have been under continuous development since 1989.

Performing complicated blowout diagnostics, simulating blowouts under various sensitivities and developing a kill

program is not a job for an engineer who only occasionally uses a simple model and has no formal training in the science of multiphase flow in wells and reservoirs.

WFD is the only company that is dedicated to this highly specialized field.

*Independent and unbiased diagnostics of your blowout and kill hydraulic requirements just makes good business sense.*

*Call the Professionals.*



Well Flow Dynamics forms exclusive agreement with Scandpower for OLGA2000 use to simulate blowout kills

## What can we simulate?

- Fully transient three phase model, gas, oil and water/mud simulations
- State of the art PVT model for oil/gas/water
- Support for non-Newtonian fluid flow with drilling fluids including PVT effects on muds
- Different rheology models, Herchel-Buckley, Power Law and Bingham
- Detailed reservoir inflow description, e.g. permeability, net pay
- Different IPR relations, eg. Forchheimer, Vogels, Back-pressure
- Complex well bore geometry, e.g. flow through bit nozzles, annular flow, tool joints, wellheads
- Capable of simulating fracturing resulting in losses and injection
- Kick tolerance and kick circulation simulations
- Simulation of fluid flow in drilling operations
- Start-up and shutdown of production & well testing
- Production from different zones & gas lifted water
- Reservoir injection, WAG
- Cross flow analysis
- Multilateral well simulations
- Underbalanced drilling
- Blowout simulations
- Any number of ingoing and outgoing branches
- Process equipment: chokes & separators
- Advanced controllers
- Positive displacement pump model
- Rapid evaluation of sensitivities on simulations

## WellFlow™ Software

Wellflow is an easy-to-use simulator that calculates pressures, temperatures, flowrates, liquid holdup and velocities in a wellbore. The software is specially designed to help as a diagnostic tool for uncontrolled well situations or to be used in contingency planning for new wells. Different inflow correlations can be used and are calculated by using reservoir properties.

The blowout simulations will give the rate of gas and oil together with the pressure profile in the well. Both internal and annulus flow are supported. A pseudo transient kill module will give an estimate of the required kill rate. The module includes the effect of slip between the reservoir fluid and the kill fluid. The built in black oil utility will generate thermodynamic properties for

the reservoir fluid based on well known correlations from the literature. In addition the user can import fluid property tables from 3rd party characterization software packages if a more detailed description is required.

*This software is for sale to selected Well Flow Dynamics clients. Contact us for details.*

**OLGA 2000 is the world leading software suite for transient multiphase flow simulations**



SINTEF Large Scale Flow Loop in Norway

Over 10,000 Experiments OLGA flow correlations

\$70 Million in development

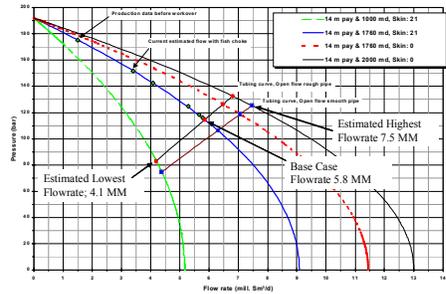


Prolific Gas Blowout Initiated during a Work-over Operation

## Capping on Fire - What we do as Engineers

This prolific gas well blew out in early 2000. The well was cased with no chance of bridging in a giant gas field. A relief well was expected to take more than a year. It was critical that the well be capped successfully. The primary identified risk was casing burst after capping due to sand erosion near the surface. Blowout engineers were requested by the operator. John Wright and Ole Rygg were mobilized. Our primary job was to work with the operator's engineering team in developing a control strategy after the well was ready to be capped. Our secondary role was to support the capping team as requested.

The major steps in that process are as follows: Access the blowout boundary conditions; Define kill methods to evaluate (cap well and bull-head, cap well - divert - snub in tubing and circulation kill or drill a relief well); Perform kill analysis for chosen method; Define pros and cons for each method; Re-evaluate kill methods at capping milestones. Accessing the boundary conditions required: Compiling data on the blowout; Tune simulator to match production data by varying IPR and pipe roughness; Develop 'base case' IPR curve; Develop sensitivities for high & low case IPR from reservoir kH and skin values; Develop tubing performance curves for various blowout configuration and pipe roughness.



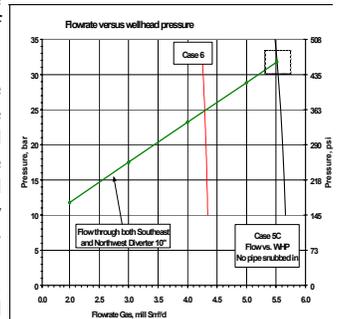
**It was critical that minimum pressure be exerted on the wellhead after capping and during snubbing to avoid an underground blowout**

## Design Diverter and Snubbing Loads

After determining the base case IPR curve for the gas blowout, the next task was to consider diverter arrangements that would minimize wellhead pressure after capping. Pressure drop simulations were performed for different configurations. Two opposing diverter lines were chosen for the design, a 10" and 8" line of 250m length each. Snubbing pipe sizes of 4-1/2" and 5" were evaluated. 5" would have the largest initial pressure drop but would reduce as the pipe was snubbed into the well due to higher friction pressure. The 5" would also reduce the required kill rate for the same reason.

When the wellhead was severed, 560 m of BHA was dropped back into the well. It was not certain if this string fell to bottom or was caught at the top of the 7" liner. If the pipe was caught the kill would be more difficult as the snubbed pipe could only reach the top of the fish some 1000m off bottom.

The kill plant would have to be designed assuming this to be the case. After the well was capped and the diverter lines installed, pressure readings in the lines and wellhead were used to refine the original flow calculations to 5.6 Mm<sup>3</sup>/d. Simulations additionally indicated the fish was indeed caught at the liner top. The 5" was chosen as the snubbed pipe diameter after this assessment.

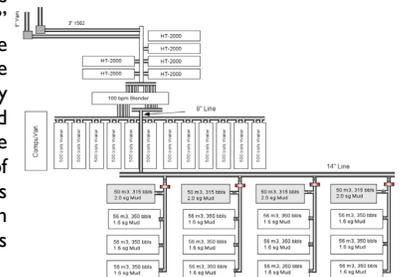


Tubing was snubbed in the well for a controlled circulation kill

## Kill Plant Design and Implementation

The kill plant was designed based on the worst case scenario. This required 40 bpm of 1.6 sg mud with a total volume requirement w/50% excess of 4000 bbls. Pumping units assessed for flowrate and HHP with one unit backup. A total of five HT2000 pumps were assembled. A mud plant was constructed consisting of 16 - 500 bbl tanks in four banks with a mixing tank in each bank. A 100 bpm blender was used to feed the high pressure pumps from the mud plant. 2 x 5" liner of 320 m in length connected the discharge side of the pumps to the tubing on the snubbing unit. A

choke manifold was installed to BOP and after the kill fluid was seen at the flairs, the diverters would be closed on the kill continue through the manifold. After the kill plant was installed and tested the 5" tubing was snubbed into the well following exactly the pressure profile predicted by OLGA. The fish was tagged as predicted at the top of the liner and fell to the bottom of the well. The pipe was snubbed to the top of the fish and the kill completed as planned.



*The client was sufficiently impressed with the operation and the accuracy of the software that we were asked to develop a steady state blowout modeling package their engineers could use. This is the Wellflow model seen on page 3.*

## Gas Storage Field Blowout Requires a Relief Well

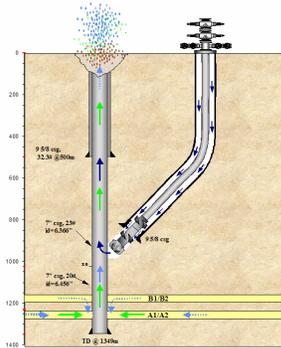
Control of a gas storage well was lost during a workover operation in August 2000. The gas quickly ignited destroying the rig and associated equipment. The well was efficiently capped by the national control team but the casing burst below ground when the well was shut-in and bullheaded. An adjacent well disappeared below the ground (see picture top right) as the flow broached to the surface. The capping BOPs were opened stopping the broach but the well subsequently cratered and began making large volumes of produced water. A relief well was the only practical solution to regain control.

An immediate requirement was the necessity to store the produced water and prevent run-off into local drainage ditches. The well was located in a prolific agricultural area. A sump pit was dug followed by four 40,000m<sup>3</sup> surface pits lined with plastic. Large submersible pumps moved the water from the sump pit to the storage pits.

*Disposal of produced water can be one of the most expensive aspects of a land blowout control operation but is rarely considered in risk assessments.*

The relief well design method used on this project was developed by John Wright Company and refined

on over 30 relief well projects. The relief well strategic planning process is based on an iterative procedure. *For additional details see our website: <http://jwco.com>.*



## Project Planning Considerations

The flowing reservoir was an unconsolidated sand package. Sand production observed at the surface provided evidence of potential erosion of the casing around the perforations and possible creation of a cavern. Other normal pressure sands were located just above the flow zone. In evaluating the intersection point options, an obvious choice would be to drill straight to the perforations. Hydraulic simulations, however, indicated it could be much more difficult to kill the well if the normally pressured sands connected to the

blowout flow path during the drilling of the relief well. The sands were separated by only a thin shale and would be very risky to attempt to set the kill casing in this shale.

Based on this analysis a kill point was evaluated 300m above the gas sands. This option would require a more complicated intersection and hydraulic communication but reduced the risk of complications associated with a perforation intersection.

Following the design method the relief well surface location was

chosen at 250 m upwind from the crater. The only rig immediately available was a dated mechanical unit with a kelly and duplex pumps. The intersection depth was chosen in a shale at +/- 950 m. The relief well casing would be 9-5/8" with a short 7" liner. It would be positioned with a low incident angle pointed at the intersection target. Hydraulic communication would be achieved using a mill. After the well was killed, a slot would be milled and an attempt made to re-enter the casing and if possible a bridge plug would set.

**A WORLD FIRST**  
**A cast iron bridge plug is set inside the blowout casing 200 m below a slot milled from the relief well**

## Project Implementation

JWC supervised all special services for this project, which include everything not normally associated with drilling a gas well. Vector Magnetics were contracted to provide homing-in services. The blowout well was vertical but there were no surveys taken in the top 500 m. The intersection angle was less than 3°.

This required precision direction drilling at very low inclinations all within a few feet from the blowout casing. SDI, high speed Keeper gyro was utilized to take drillpipe surveys during drilling. To avoid accidental intersection with the

blowout casing prior to setting a kill string in the relief well, 9-5/8" was set 2 m laterally away. Then rock bits were used to steer to the intersection depth. Once this was achieved a short 7" liner was set.

The kill plant was assembled using local pump trucks and connected to the well with imported high pressure lines. A HES supervisor with an electronic flow monitoring kit assisted in plant design and kill monitoring.

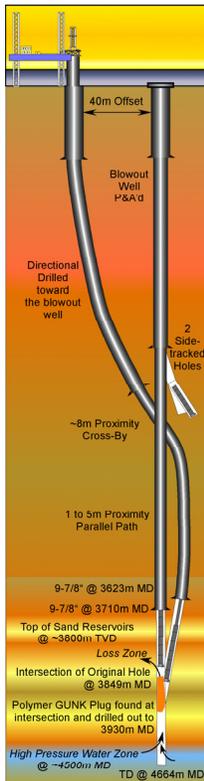
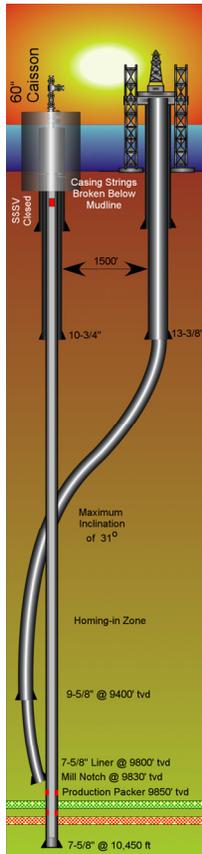
Hydraulic communication was gained using a custom designed mill on the end of a mud motor. A hole was cut in only a few seconds.

After the flow was stopped, the well went on a vacuum due to depletion during the blowout. With produced water pumped down the annulus a 7 m slot was extended down the casing.

The casing was re-entered and the window dressed with string mills. After a test run was made, a bridge plug was hydraulically set just above the perforations. This was followed by a balanced cement plug back to the window, and finally a retainer cement job to the blowout surface.

*Good plan, good team and success beyond expectations.*





## Relief Well Used to Safeguard Environment in GOM

An errant shrimp boat struck a single caisson oil well in the Gulf of Mexico and bent the well to the seabed in 24' of water in late 2000. When the well was pulled back vertical, all casing strings were observed cracked just below the mudline. The tubing was apparently intact and the SCSSSV was holding.

The remedial strategy was to drive a 60" caisson around the well and jet the mud out below the cracks. Then tie-back the damaged casing strings and tubing with new ones and bullhead the well dead.

If anything went wrong with the operation, however, oil could potentially flow uncontrolled into the

Gulf for over a month while a relief well was being drilled. This risk was unacceptable.

JWC was called to evaluate mitigation solutions using relief well technology. Several options were considered. One was to drill to the perforations and stand by while the surface operations were performed. The perforations were gravel packed and milling operations might dislodge the production packer. The chosen plan was to intersect the problem well just above this packer, cut a notch in the 7-5/8" casing without cutting the tubing and circulate mud from the relief well back to the surface through the problem well. With

that accomplished, a retainer could be set and a short cement plug placed in the annulus above the production packer. This would prevent the packer from becoming dislodged if the tubing needed to be cut. The relief well would then standby until the surface remediation was complete.

The relief well was implemented as planned. A notch was cut at 9600 ft using a custom mill on a motor. The relief well U-tubed into the problem well annulus, a short cement plug was placed and the relief well stood by to cut the tubing if a problem occurred during the surface remediation. *New application, objectives achieved.*

## PHPA Gunk Used to Control HPHT Underground Blowout

In early 2001, an offshore HPHT exploration well reached TD at 4600m (135° C, 13,500 psi). While tripping out to log, the BHA became stuck with the bit at 3800m. After unsuccessful jarring a blind back-off was made to PU a fishing assembly. While tripping out a kick was taken. The pipe was stripped back and screwed into the fish. After several days of attempting to control the kick, JWC was called to assist. Once on location a temperature - pressure log was run. The results clearly showed an underground cross flow only 40 m

above the bit. It was impossible to strip back to bottom. Circulations and pressure showed the influx to be water from a zone at 4500m. A dynamic kill would not be possible so far off bottom and with only 40m of flow area to work with. The solution was to use a weighted high concentration PHPA polymer gunk mixed in diesel and pumped through the BHA. The polymer when mixed with the flowing water would gel and hopefully seal the wellbore around the BHA. After extensive pilot testing, 50 bbls were prepared in a batch

mixer and displaced out the bit with the cementing units. Several hours after placement, the annulus was bled to zero and reran the temperature log. The crossflow was stopped. Since the fish was 800 m off bottom and the zone to be evaluated was below the fish, it was not known if the water was flowing into the potential reservoir. JWC was then asked to plan a relief well to re-enter the open wellbore below the fish and plug the well to TD and if possible log the zone of interest.

## Relief Well Re-enters Blowout, Liner Set, Well Continued

The well discussed above was P&A back to surface and a relief well started with the goal of re-entering the 8-1/2" openhole below the fish. The objectives were to set a 7" liner in the blowout, clean out the hole to TD, determine if there was crossflow below the fish, stop the flow if observed and permanently plug the well.

If the over pressured water was encountered before setting the 7" liner, then the relief well would be in the same predicament as the target problem well.

The drilling went as planned. The

target borehole was re-entered exactly at the bit and no abnormal pressure was observed. We began to circulate up large blobs of the gunk pumped the year before. It was still extremely tough and rubbery. The liner was run and cemented 50m deeper. We continued to wash through the gunk and hit the water pressure 15m below the shoe. Following the plan we continued to wash to bottom with the well shut-in using the rotating BOP. Once on bottom, we circulated the well dead. The well was later logged and a long term pro-

duction test carried out over the zone of interest from the relief well.

*All plus bonus objectives achieved.*

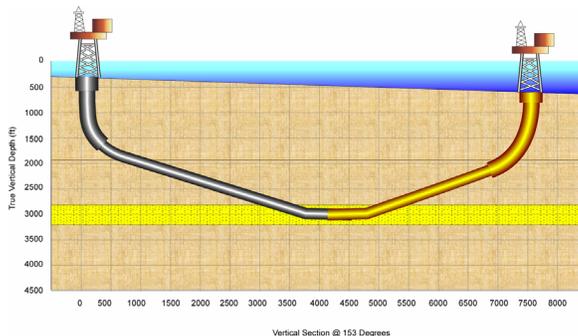


Gunk Circulated Out 1 Year Later

## Study Concludes Wells Can be Connected End to End

In the summer of 2001, JWC was commissioned to evaluate the feasibility of connecting two horizontal wells end to end. The study lasted two months and involved a number of service companies. The petition was to consider how the connection would be made, what equipment would be necessary, multiphase flow and thermodynamic analysis, what size pipe were possible and the procedures and communication required for working two rigs in concert simultaneously. Considering such an operation had never before been attempted, the results of the study indicated that not only was it possible, but the probability of success was high.

Application for such a technique include, eliminating short runs of subsea pipeline (the technique could work within the bounds of long reach drilling), connecting subsea satellite wells back to a platform, extending long reach wells from shore or platform by tying into existing long reach wells using a jackup, possibilities for connection multilaterals and other possible mining and tunneling applications.



## Relief Well Used to Safeguard a Production Platform

The trouble began when a sidetracked well broached under a gas platform while attempting to circulate a kick. The well flowed gas and water uncontrolled around the conductors to the seabed. The flow lasted for approximately 10 hours before the open hole collapsed around the drillpipe. The gas did not ignite and there was no apparent major surface or structural damage to the rig or 12 slot platform.

JWC responded with a 3 man engineering team to assist with control operations. Wireline logs showed the well to be cross-flowing below the bridge. Flow diagnostics using Olga-Well-Kill helped the operator make quick decisions on the path forward. The well was subsequently plugged above the crossflow and a replacement pressure relief well was completed in early 2002. There was less risk to the platform to deplete the gas than to risk escalation during a control attempt.

While attempting to bring a well, adjacent to the blowout, back on stream it was discovered that all tubulars were flow cut just below the mudline. The SCSSSV was the only barrier between the platform and another blowout. The risk was too high to attempt remedial operations from the surface, as in the GOM case (opposite page), the

platform could be destroyed before a relief well could be drilled. Another less risky method was needed. JWC was again commissioned to propose relief well intervention methods to safeguard the platform with minimal escalation risk.

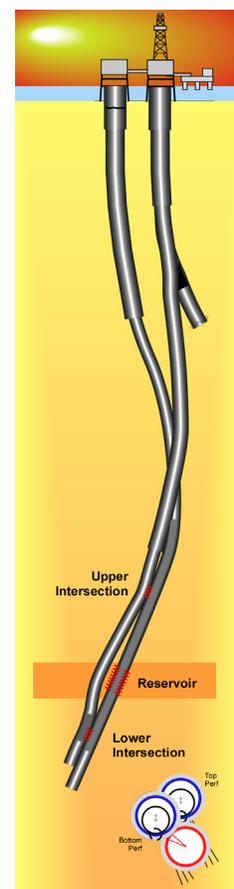
Three options were proposed. The one chosen is illustrated at right. The basic design strategy was to drill an intervention well from an adjacent bridge connected platform and intersect the problem well at its production casing string both above and below the producing reservoir perforations. After intersection was confirmed using homing-in technology, a liner would be set in the relief well. With this accomplished, the lower intersection zone would be perforated through both strings using oriented tubing conveyed perforating guns.

Once adequate hydraulic communication was confirmed the upper intersection zone would be perforated using the same technique. A re-settable test packer would then be run to confirm circulation between the lower and upper perforations through the problem wells production casing. When this was confirmed a cement retainer would be set just above the lower intersection. Cement would then be circulated down the relief well work string, through the retainer,

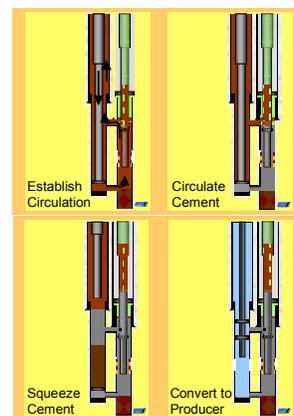
up the problem well's production casing and back into the relief well's annulus. With this accomplished the relief well would circulate out excess cement from its annulus (confirming cement circulation through the problem well). This would plug the tubing, perforations and production casing annulus with cement between the lower and upper intersection depths. As a final assurance, a balanced cement plug would be set across the upper perforations and squeezed into the problem well's tubing designed to lift above the production packer. With the intervention completed, the well would be turned into a producer replacing the problem well.

JWC managed the implementation of the special operations for this well with a four man engineering team consisting of John Wright, Ole Rygg, Jim Woodruff and Bill McElduff. The operations were completed within the budgeted time frame. Diagnostics indicated the well was plugged as designed and the project objectives met.

*The success of the project demonstrates that new technology and novel approaches to solving problems can be implemented with a high probability of success. The key is assembling the right team of professionals to design, manage and implement the strategy.*



*How do you cement off a perforated reservoir using a relief well when there is no flow?  
Perforate above and below and circulate between the two*



Cementing Sequence after Gaining Communication between the Two Sets of Perforations



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## Blowout Control Engineering and Relief Well Specialists

### John Wright Company Profile

John Wright Company is a highly specialized consulting engineering firm devoted to the management of well blowout hazards and well intersections with global project experience. Our services are divided into categories of prevention, response and special projects.

Well Flow Dynamics AS (WFD), an affiliate company, provides state of the art software and related engineering services for well control, blowout, kill and associated hydraulic modeling. John Wright is a founder and co-owner of WFD.

Together we comprise an integrated team of specialists working to assist operators to manage complex well control and blowout related hazards.

#### Response Services

**Project Management** for relief well and hydraulic kill special services

**General Contracting** of special services, e.g. hydraulic specialists and software, electromagnetic homing in services, gyro surveying and other related engineering specialists

**Design and Supervision of Hydraulic Well Kills** for: Underground blowouts, bullheads, relief wells and diverted flows

#### Prevention/Mitigation Services

**Critical Well Risk Assessment**

- Evaluate drilling/workover plans and production fields for blowout hazards
- Hydraulic modeling of kicks, plausible blowouts (surface, subsea, and underground) and kills (drillpipe, snubbing, relief wells) under various scenarios

- Expose potential Impact of blow-out on: personnel, 3rd parties, environment, property, reservoir, business disruption, public image

- Recommend risk reduction, mitigation and control steps.

#### Response and Contingency Plans

- Immediate onsite and offsite response plans with blowout control management using ICS system
- Surface and Underground blowout contingencies
- Relief well plans for critical wells for example deepwater & SBOP

#### Special Projects

##### Design and Supervision of Well Intersections

- Plug and abandonment
- Well Connections

### John Wright Company Key Engineering Personnel



John Wright



Jim Woodruff



Bill McElduff

Resumes can be  
downloaded from  
our website

### Well Flow Dynamics Key Engineering Personnel



Ole Rygg



Morten Emilsen



Grete Høeg



Thomas Selbekk