QUANTUM DOWNHOLE SYSTEMS INC.

- Under-balanced well bore cleanout and production test/evaluation operations.

Presentation Overview

- Why This Technology is Required
- How It Works
- Applications
- Benefits
- Case Histories & Successes

Why is This Technology Required

- Under-pressured reservoirs
- Horizontal and extended reach well designs
- Liquid loading of shallow to medium depth well bores
- Comingling of zones CBM and sandstone reservoirs
- More produced water and water of condensation than originally thought
- No tubulars in well designs
- Cleanout damage is becoming more of a problem each and every day
- Scale the problem

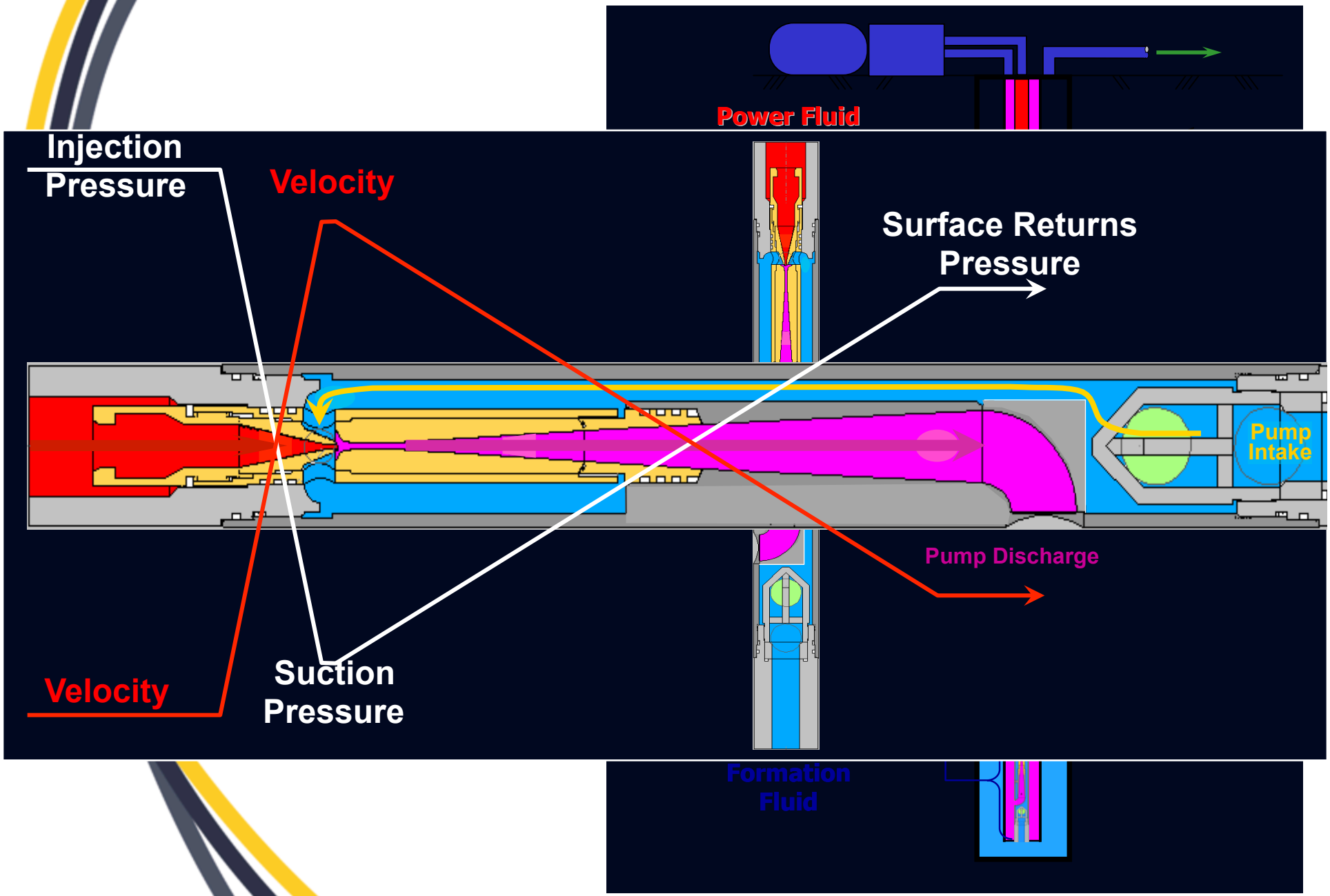
Why This Technology is Required

- Alternative processes such as fluid circulation, swabbing, gas cleanouts and bailing or pump to surface technology have limitations and can no longer be generally applied.
  - Adds pressure to formation (over-balanced)
  - Does not work in Hz
  - Costly to deploy
  - Slow process ---> expensive

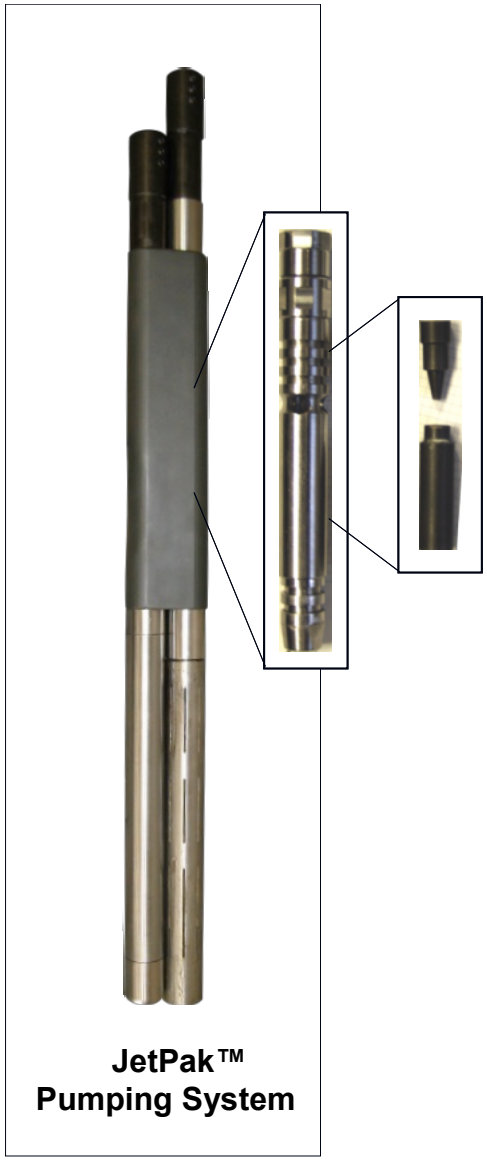
How it Works

- Quantum Downhole Systems utilizes two unique technologies to revolutionize the well bore cleanout operations. Our JetPak™ system utilizes CJS Coil Tubing's FlatPak™ coil technology as well as Source Rock's specifically engineered jet pump to remove solids and liquids from well bores. The primary function of this technology is to create a low pressure environment in the well bore to pump the fluid and/or solids to surface.

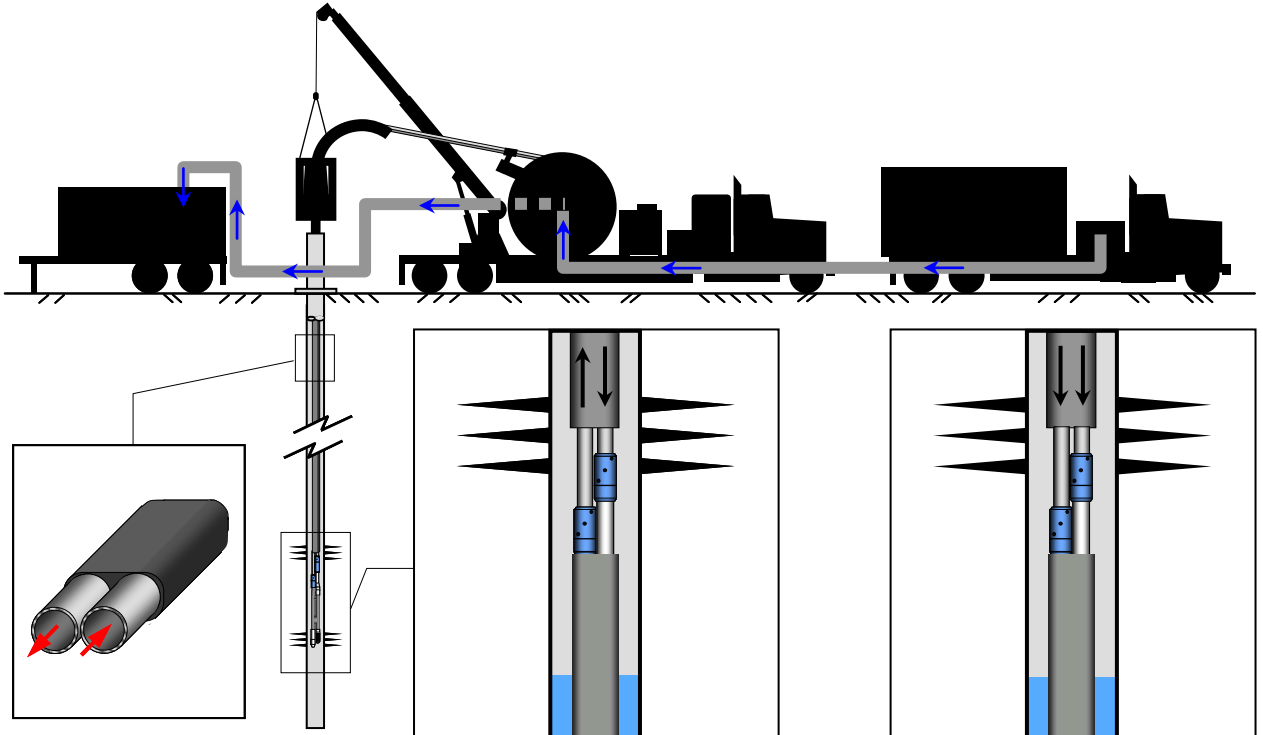
Venturi principle, applies to JetPak & JetVak



JetPak™ Well Cleanout System



JetPak™
Pumping System

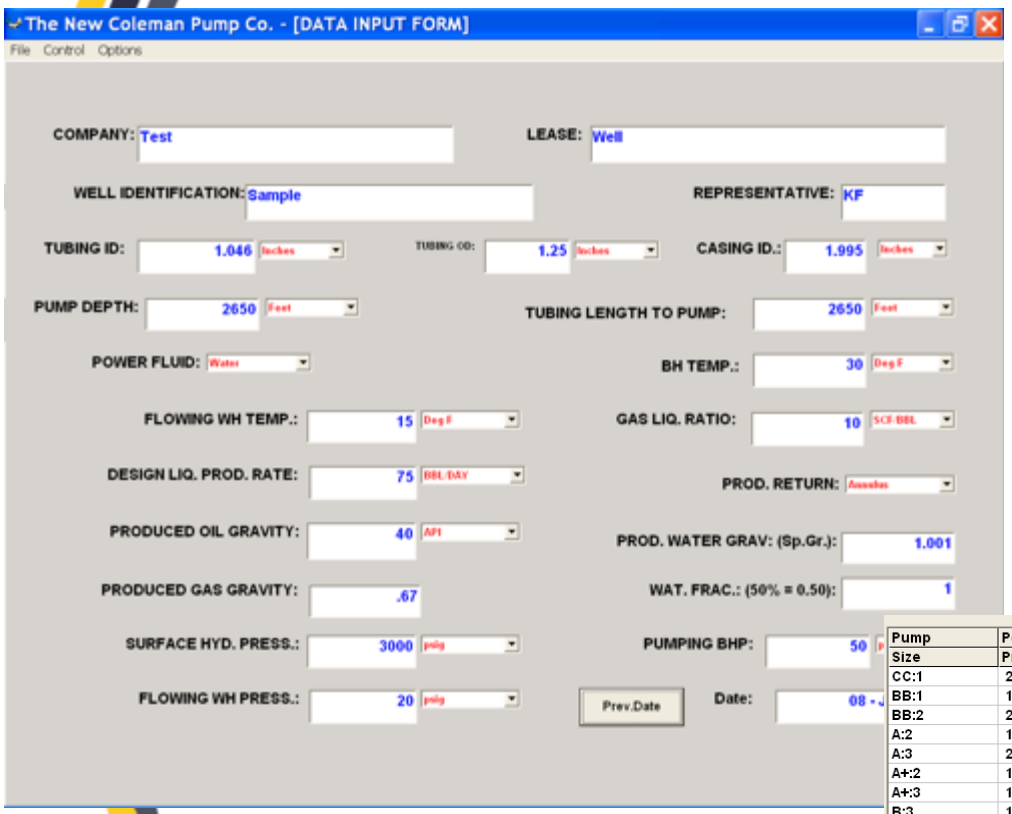


FlatPak™
Tubing System

Fluid Cleanout Mode

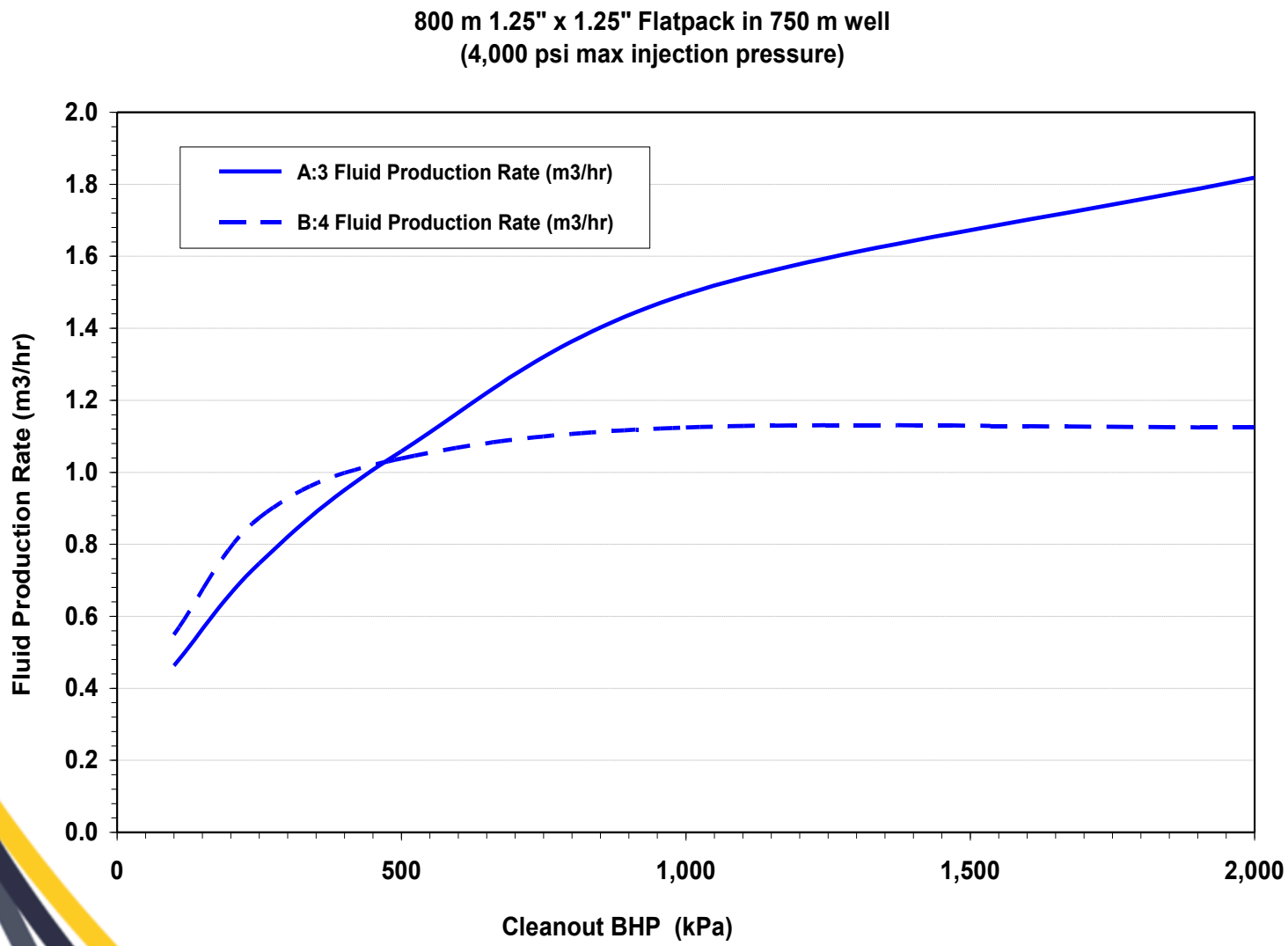
Sand Jetting Mode

Advancements in Jet Pump modeling



Pump Size	Power Press	Power fluid Rate	Horse Power	Max Non-cav. rate	Prod.Rate (bbl/d)	Pumping BHP	Nozzle Area	Throat Area
CC:1	2538	212	10	85	75	50	.0028	.0143
BB:1	1775	255	8	77	75	50	.0038	.0143
BB:2	2424	283	12	112	75	50	.0038	.0189
A:2	1573	354	10	99	75	50	.0055	.0189
A:3	2102	388	15	138	75	50	.0055	.0241
A+:2	1108	434	9	84	75	50	.0075	.0189
A+:3	1481	470	13	123	75	50	.0075	.0241
B:3	1159	550	12	108	75	50	.0095	.0241
B:4	1614	603	18	162	75	50	.0095	.0314
B:5	2058	651	25	211	75	50	.0095	.038
B:6	2563	701	33	264	75	50	.0095	.0452
B+:3	1027	606	11	97	75	50	.0109	.0241
B+:4	1419	660	17	152	75	50	.0109	.0314
B+:5	1812	710	24	201	75	50	.0109	.038
B+:6	2263	764	32	254	75	50	.0109	.0452
C:3	946	663	11	87	75	50	.0123	.0241
C:4	1285	717	17	141	75	50	.0123	.0314
C:5	1637	769	23	190	75	50	.0123	.038
C:6	2048	825	31	244	75	50	.0123	.0452
C:7	2519	885	42	302	75	50	.0123	.0531
C+:4	1140	828	17	121	75	50	.015	.0314
C+:5	1433	881	23	170	75	50	.015	.038
C+:6	1785	942	31	224	75	50	.015	.0452
C+:7	2198	1008	41	282	75	50	.015	.0531
C+:8	2921	1114	61	379	75	50	.015	.0661
D:4	1101	944	19	101	75	50	.0177	.0314
D:5	1344	996	25	150	75	50	.0177	.038
D:6	1656	1059	33	204	75	50	.0177	.0452
D+:4	1162	1094	24	77	75	50	.0209	.0314

JetPak™ Pump Efficiency Curve



Applications

- Class I and II vertical, deviated or horizontal well bore cleanouts
- Produced or frac sand cleanouts
- Acid frac/stimulation cleanup
- Drilling fluid recovery
- Production testing/evaluation

Under Development

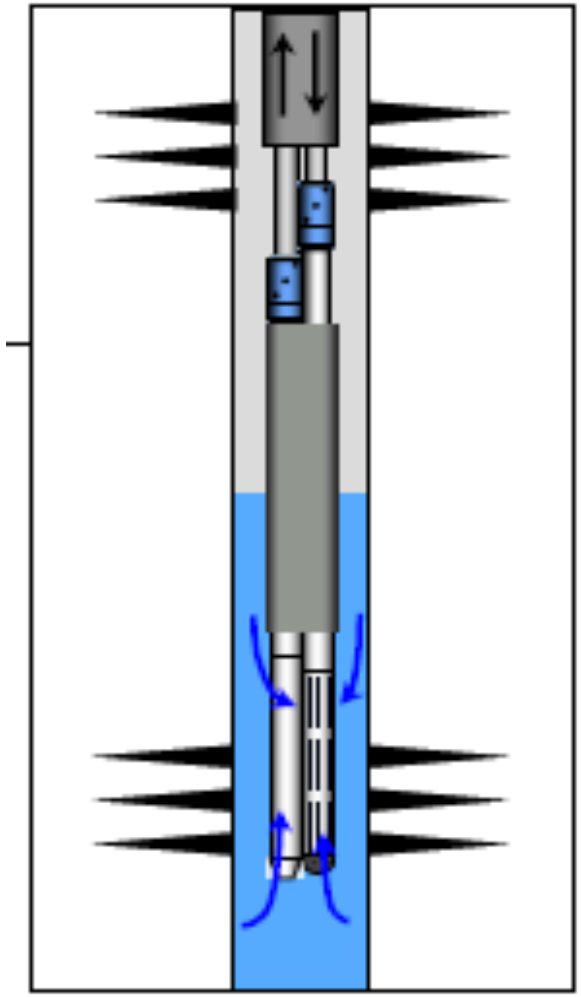
-Hz thermo SAGD & CS cleanouts

QUANTUM
DOWNHOLE SYSTEMS INC.

Field Operations

What is JetPak?

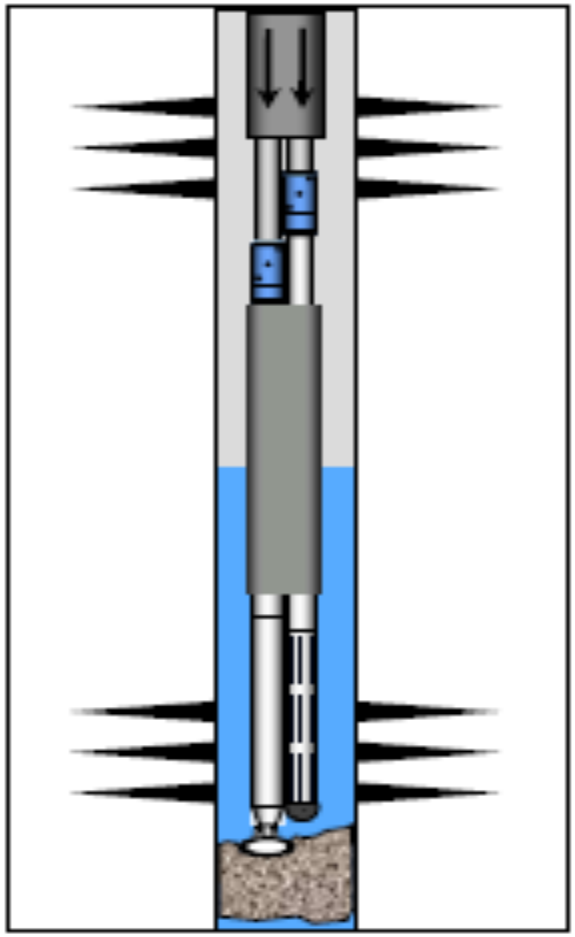
- Quantum started with, and is still using, a system called the JetPak.
- By pumping fluid through one of the coil conduits, the pump creates a suction.
- The power fluid and the net fluid out of the well bore are returned up the second conduit in the coil.



Fluid Cleanout Mode

What is JetPak?

- To switch to sand jetting mode, valves are manipulated at surface on the coil tubing reel.
- Fluid is pumped down both conduits in the coil.
- The check valve closes.
- The back pressure valve is then exceeded, allowing for jetting or washing to take place.



Sand Jetting Mode

Jetting Options

Feb 2010 testing\Spin Cat quantum bpv 21mpa 100lpm.MOV

Feb 2010 testing\Spincat 100 lpm no casing.MOV

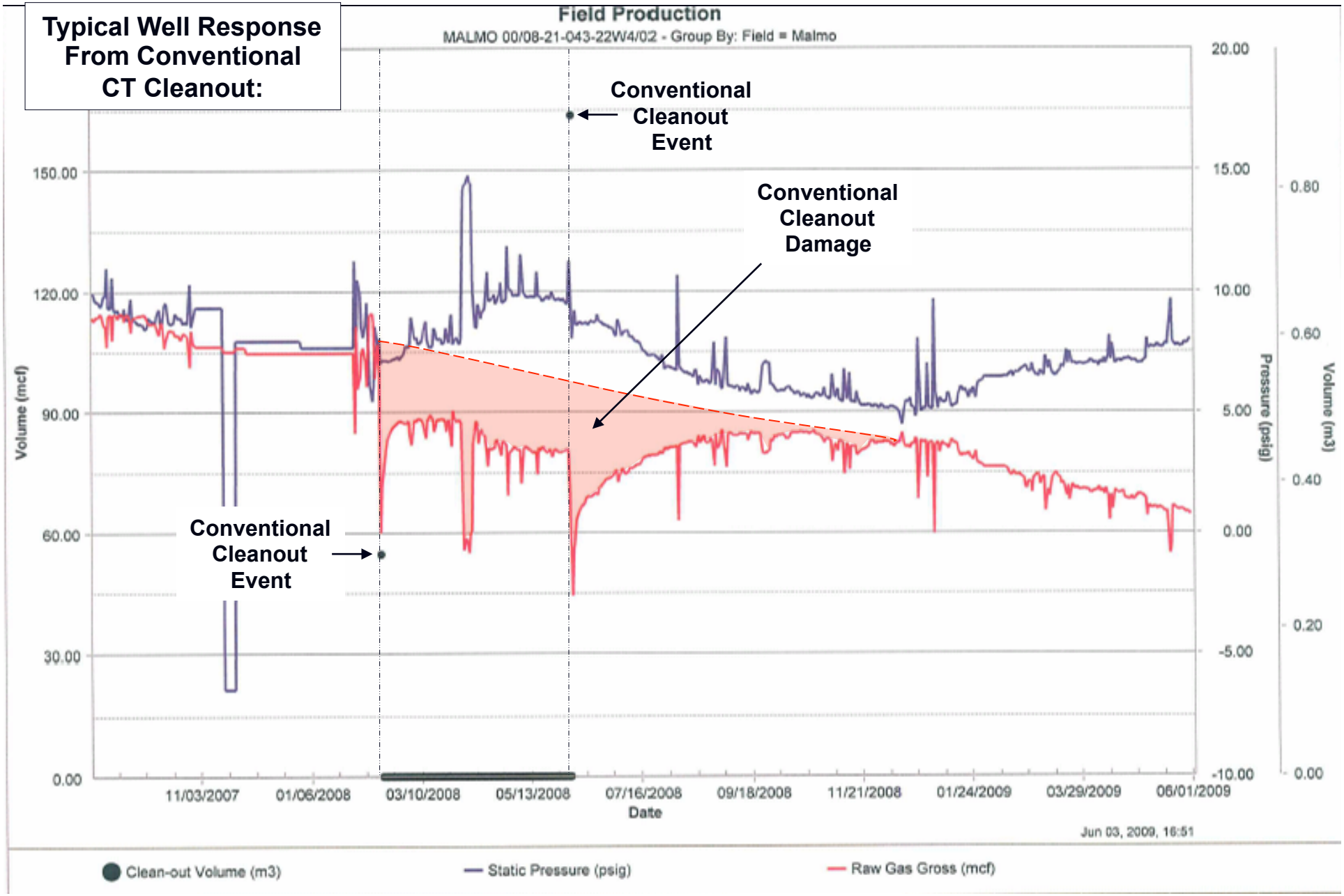
Feb 2010 testing\sonic hammer #2 with casing.MOV

Feb 2010 testing\sonic hammer #2 no casing.MOV

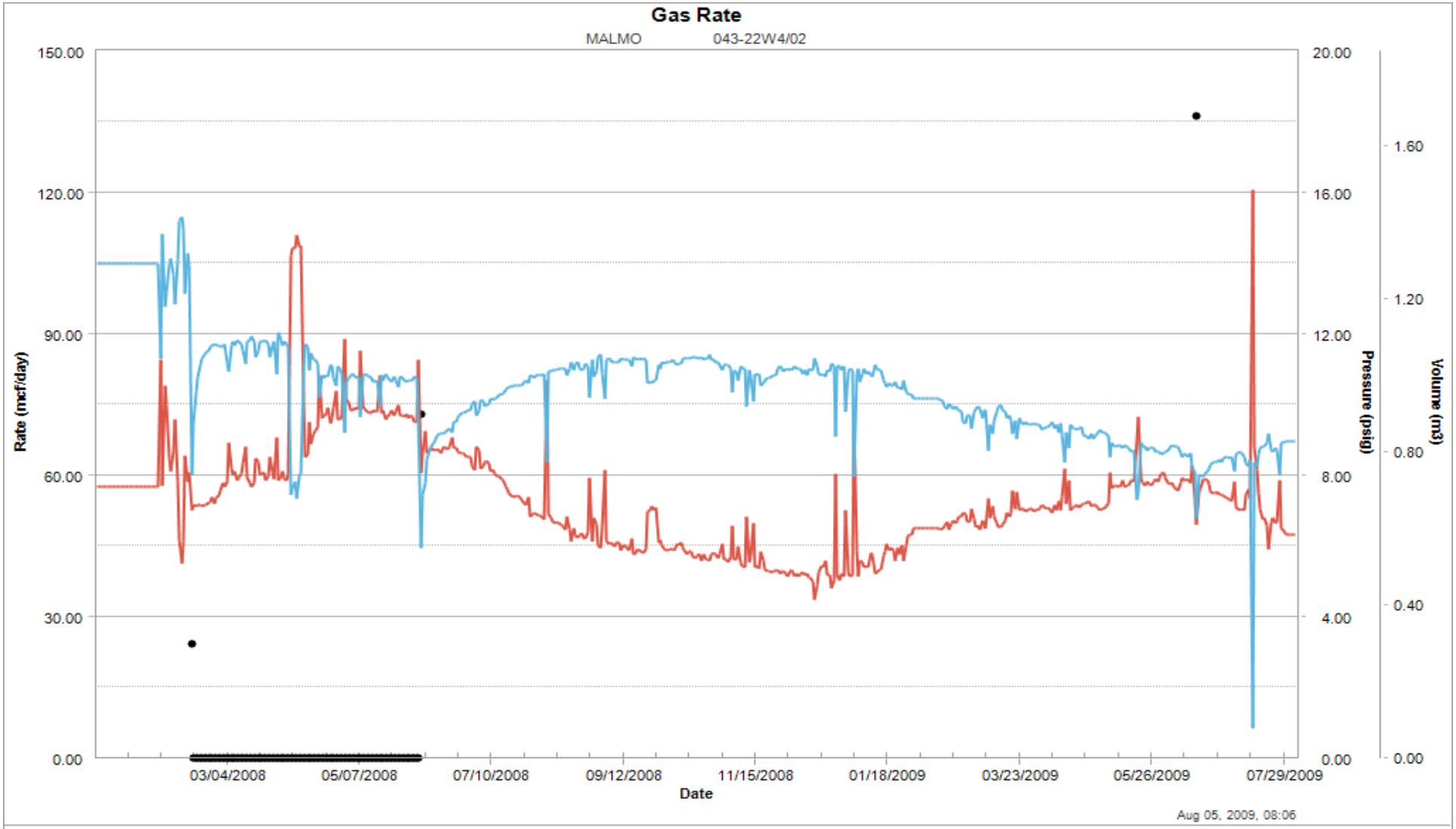
Benefits

- **Cleanout Damage** is a relatively recent but common problem in our mature basin. Many shallow gas wells have upper zones that can experience short or long term damage using current cleanout techniques. The JetPak™ technology allows E&P companies to economically and effectively clean these well bores out while not risking temporary or permanent damage to these sensitive zones. Well productivity increases immediately after the JetPak™ has been run.

Text Book “Cleanout Damage”



JetPak™ Cleanout Comparison



	01/01/2008	01/02/2008	01/03/2008	01/04/2008	01/05/2008	01/06/2008	01/07/2008	01/08/2008	01/09/2008	01/10/2008	01/11/2008	01/12/2008	01/13/2008
Clean-out Volume (m3) Wellview													
Clean-out Volume (m3)													
Static Pressure (psig)	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69

Benefits

- **Directive 033 compliant** - UEL and LEL are not a concern when using the JetPak™. The JetPak™ system utilizes produced or fresh water to run the pump, and virtually no gas is vented to the atmosphere.

- **No Moving Parts** - One of the unique features of our Jet Pump is there are no moving parts, making it less prone to wear and failure.

- **Safety** - The JetPak™ system offers full well control options for class I or II.

Benefits

- **Production Testing** - This is an excellent system to evaluate wells that are in a two phase flow regime. The subject well may be a candidate for a permanent installation or an abandonment candidate. None the less, the JetPak™ will remove the fluid so accurate well data can be collected.

Benefits

- **Frac Sand Cleanouts** - Due to the low pressure of our reservoirs, frac sand cleanouts are a common technique used during the completion process in the WCSB. One of the unique features the JetPak™ offers is the ability to jet through a high pressure nozzle on the bottom of the pump to break through or liquefy sand. The pumping process can then be restarted and the solids removed from the well.

Benefits

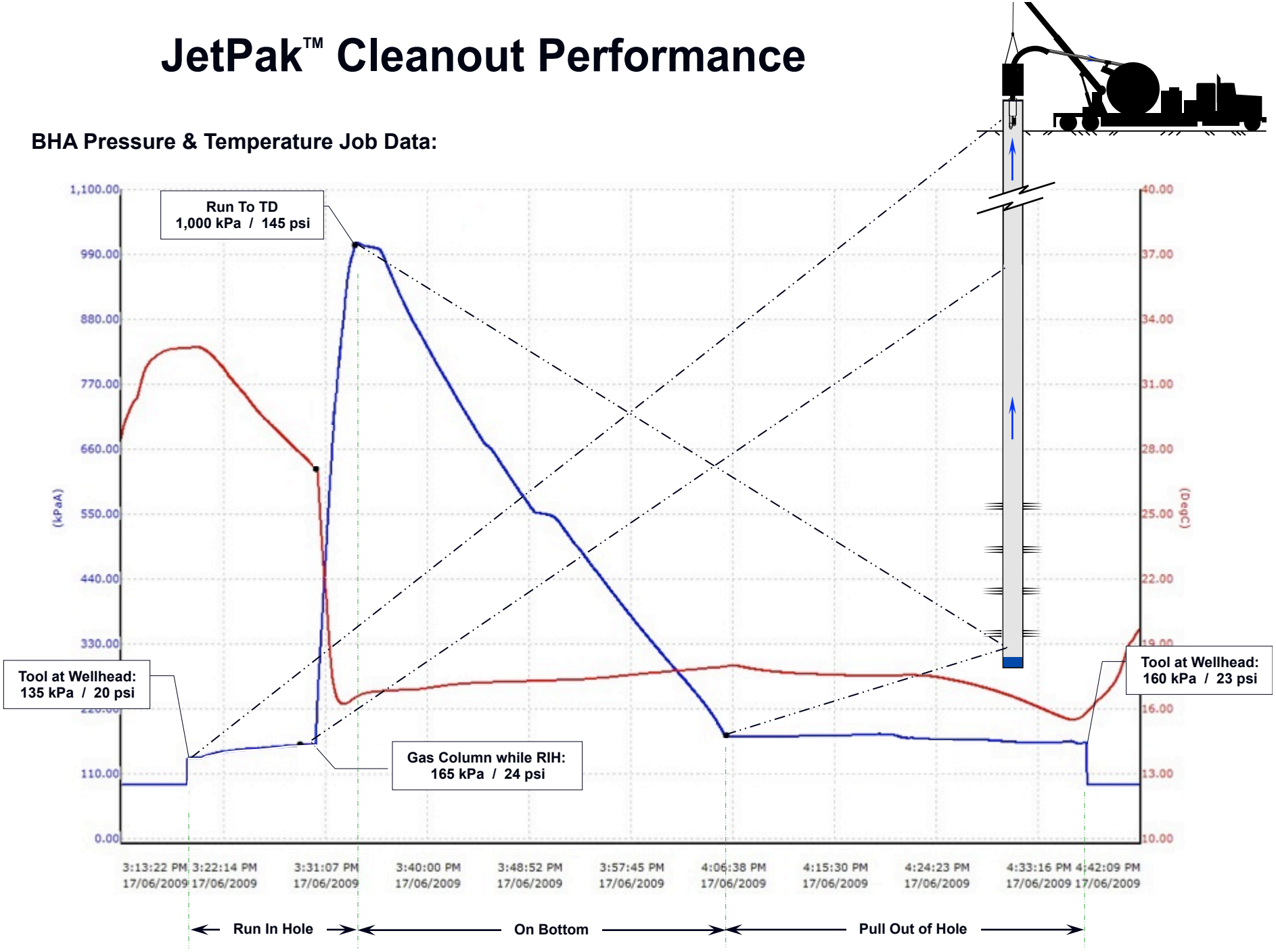
- **Efficiency** - The JetPak™ technology drastically improves well cleanout efficiency; with a compact pump assembly, multiple wells can be cleaned out in one day without disassembly of the pump from the coil tubing between wells.

Benefits

- **Reduce the number of interventions**
  When using the JetPak™, the number of cleanouts done on the well will be reduced. Since the well is in an underbalanced state during the cleanout, not only is the well bore fluid removed, but the fluid that has been built up in the near well bore area is removed. With the JetPak™ process, a higher volume of fluid is recovered out of the well versus conventional cleanout techniques.

JetPak™ Cleanout Performance

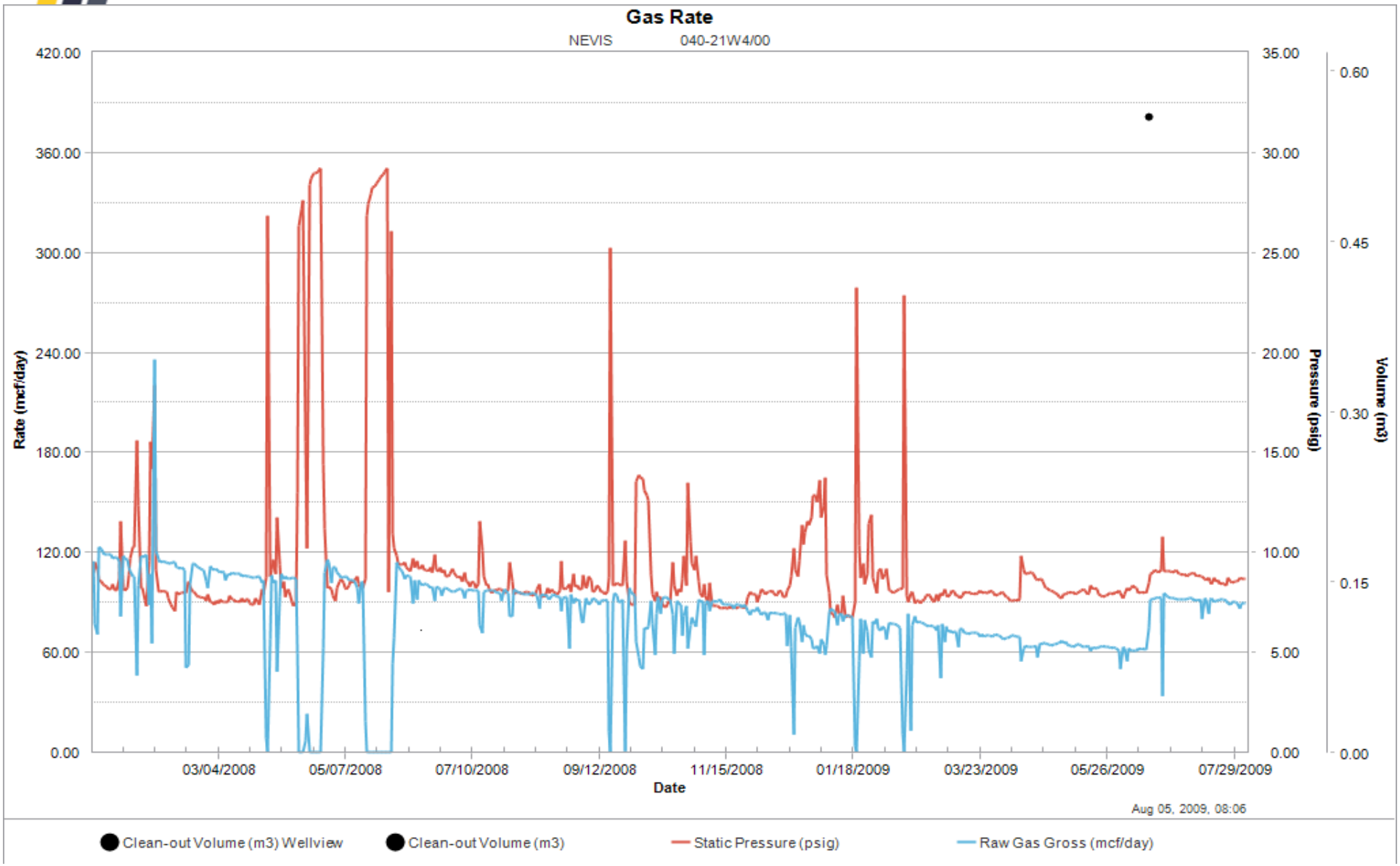
BHA Pressure & Temperature Job Data:

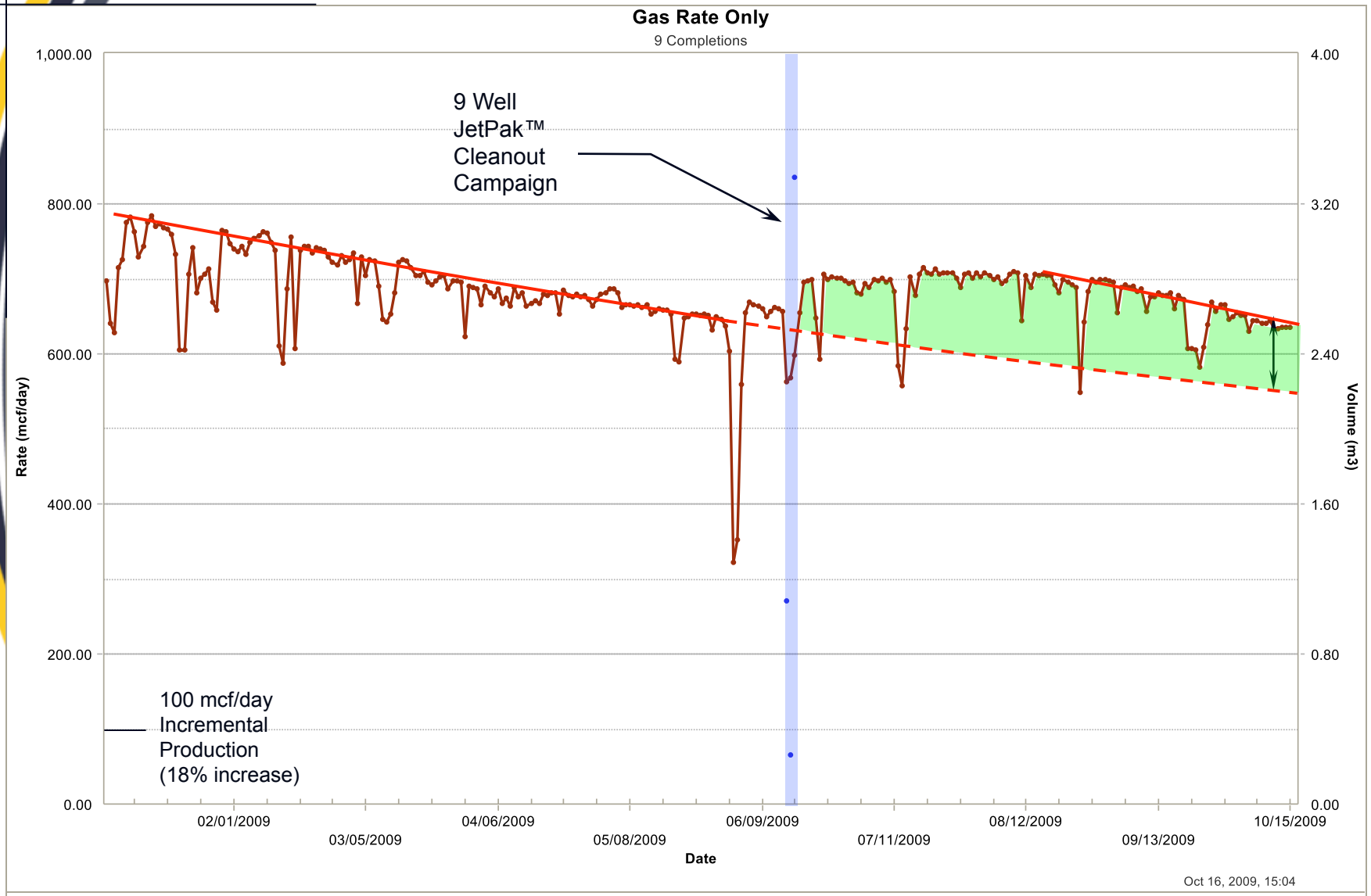


JetPak™ Cleanout Performance

BHA Pressure & Temperature Job Data:

Case Histories & Successes





	01/01/2009	01/02/2009	01/03/2009	01/04/2009	01/05/2009	01/06/2009	01/07/2009	01/08/2009	01/09/2009	01/10/2009	01/11/2009	01/12/2009	01/13/2009	01/14/2009
Clean-out Volume (m3)														
Raw Gas Gross (mcf/day)	697.82	640.25	628.95	714.42	725.36	775.16	781.51	762.80	729.95	743.02	774.80	783.63	769.15	774.10

What is JetVak?

- We have recently developed a pump that facilitates simultaneous jetting and pumping (Vak) operations.
- The FlatPak coiled tubing string is bonded and contains dual 1½" carbon steel coils.
- The length of the string is 2150 meters, and is deployed by Technicoil's rig 2006 based out of Red Deer, supported by Quantum.

Areas of Application

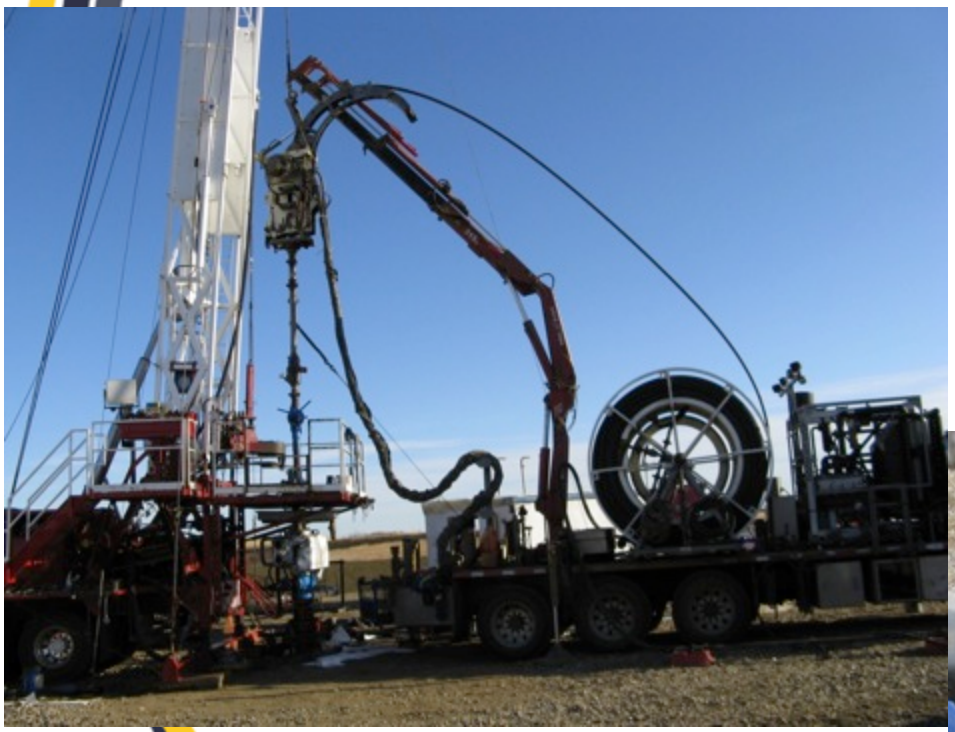
- Three fork/Sanish SW Manitoba
- Viking
- Manville group
- CHOPS Vertical & Hz Lloyd. Slave Lk. And Wabasca
- Shallower Shaunovan, Bakken and Cardium
- Banff
- Dina

Quantum JetVak high res.swf

JetVak Testing

Case Histories & Successes

Husky CHOPS Hz under pressure well cleanout with JetPak

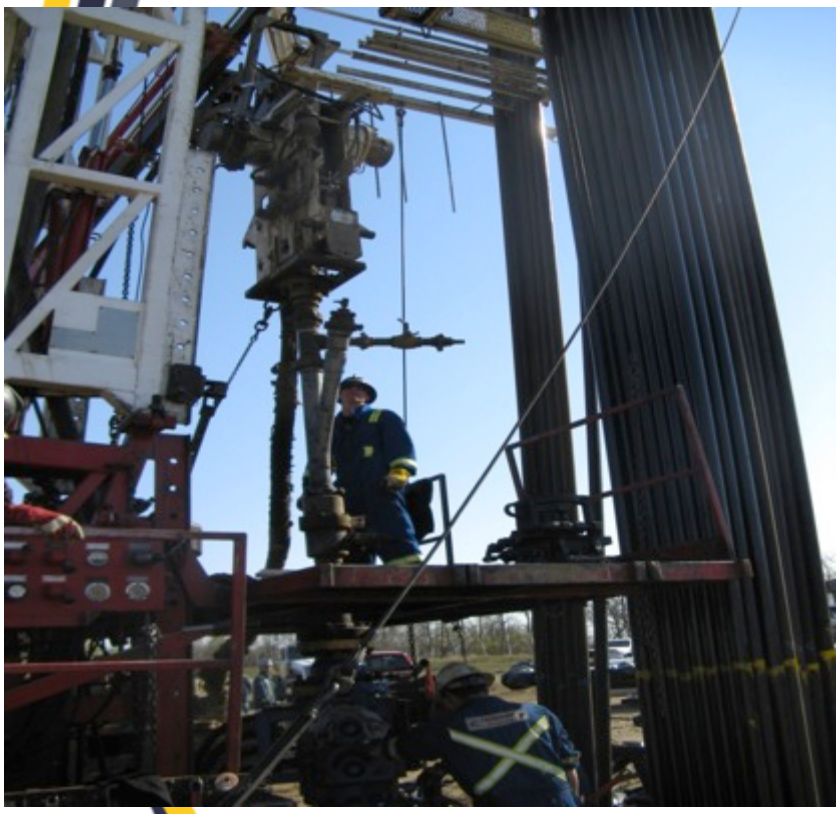


- 0.8m3 sand
- Up to 30% sand - avg. 6% through job
- 3.5m3 of fluid
- 740TVD
- 1550MD
- 114mm guide string in 137mm liner

This well was 1yr old and did not produce, unknown problem.
The well is now producing at 10m3/day yielding Husky a daily cash flow of over $3000.00

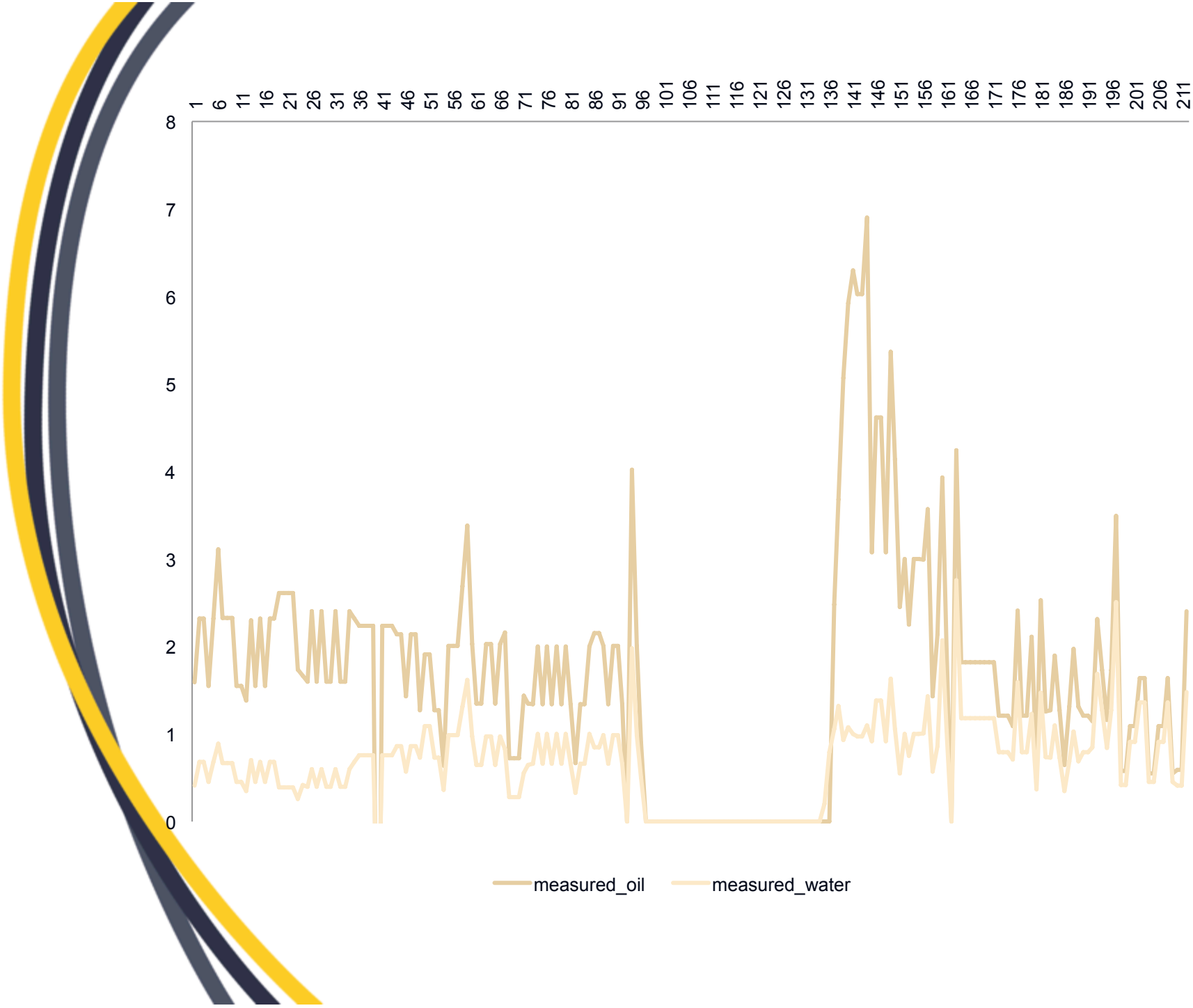
Case Histories & Successes

Harvest CHOPS Hz under-pressured well cleanout with JetVak



•0.9m3 sand
•Up to 25% sand - avg. 2-3% through job
•600TVD
•1110 TD pump landed @1060MD
•219mm int. casing 139mm liner no guide str.
•6000lbs. positive weight at 1060m

•This well declined to 2m3 of oil per day.
•Post cleanaout the well produced 6 to 7m3 of oil per day.
•The well has tailed off, indicating sand is once again restricting inflow


1
6
11
16
21
26
31
36
41
46
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56
61
66
71
76
81
86
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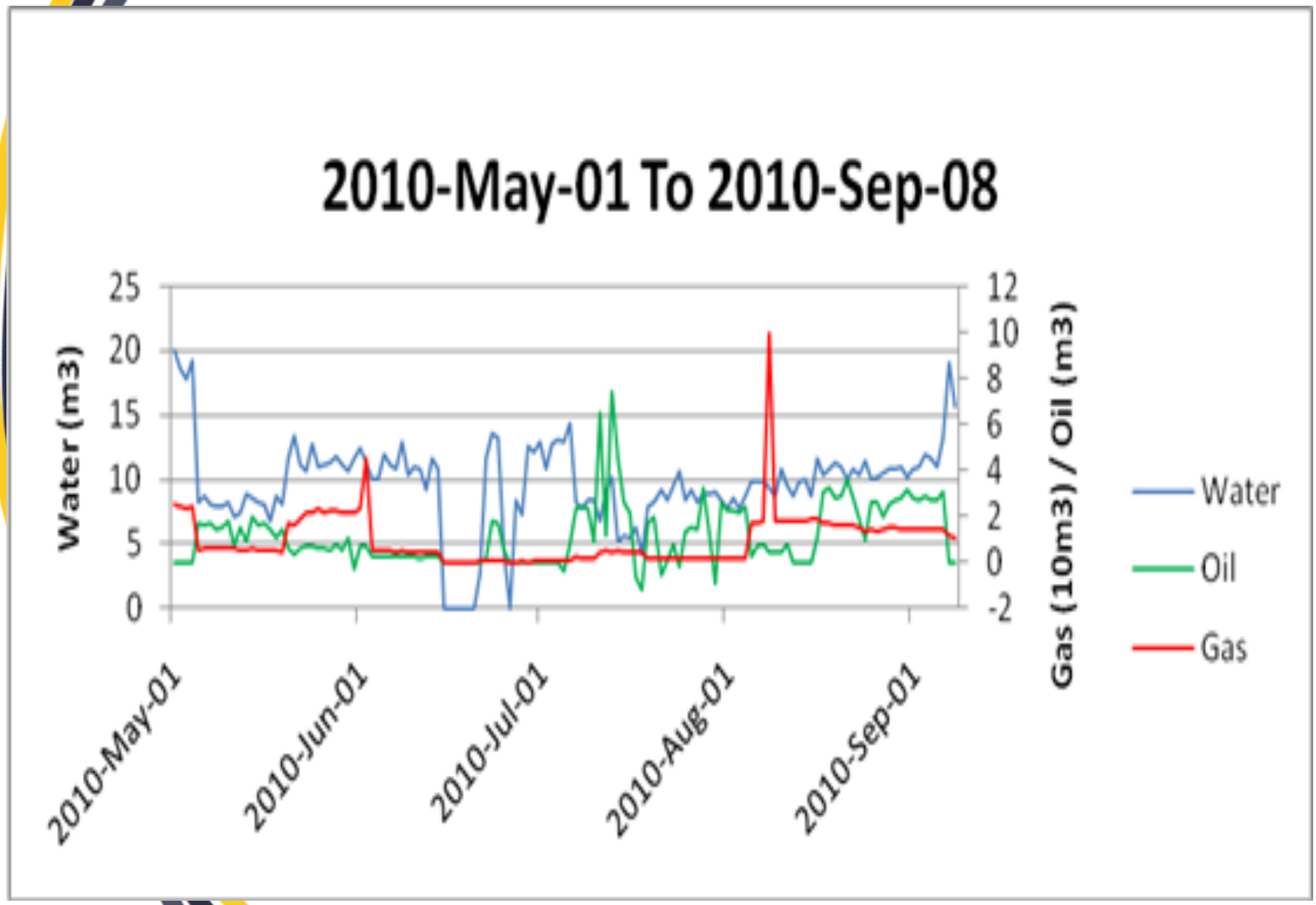
96
101
106
111
116
121
126
131
136
141
146
151
156
161
166
171
176
181
186
191
196
201
206
211
8
7
6
5
4
3
2
1
0
measured_oil
measured_water

Case Histories & Successes

Bronco CHOPS Hz under pressure well cleanout with JetVak

- 1.1m3 sand
- Up to 11% sand - avg. 2-3% through job
- 400TVD,2300m TD we landed @ 960MD
- 114 mm guide string ran into 139mm liner at 575m
- -3000daN weight at 960m


2010-May-01 To 2010-Sep-08
Water (m3)
Gas (10m3) / Oil (m3)
25
20
15
10
5
0
12
10
8
6
4
2
0
-2
2010-May-01
2010-Jun-01
2010-Jul-01
2010-Aug-01
2010-Sep-01
Water
Oil
Gas

Case Histories & Successes

Husky Hz Viking under-pressure well cleanout with JetVak

- 1.1m3 sand
- Up to 45% sand - avg. 2-3% through job
- 685TVD, 2216m TD
- 114 mm guide string ran to 1 jt. Above 114mm multi-frac liner
- Pump TD @2008M -6000daN

At mid point of the Hz section, many bridges were encountered. Frac gel with gas was evident in the returns. No post production nos. available for this project. On the way out of the well, high oil cuts were observed.

E&P Company		Husky Energy				Date	Sept. 03, 2010
Well Location surface						CT company	Technicoil
Well Location Bottom Hole						name of individual filling out report	
Pressure Truck press.			18.6Mpa				Steve Winkler
Pressure Truck fluid rate			88lpm				open frac port
RIH #1	corrected or uncorrected						
time	depth	Sand%	Oil %	Water %	tank level		comments or notes
	884	0	20	80			minimal gas
	982	0				2% frac jell	
	1125	0.5	3	96.5			wax in returns
	1200	0	8	92			foamy with gas
	1260	0.25	10	89.25			big gas kick in returns
10:33	1315	0.5	25	74.5	16		
10:45	1355	1.5	10	88.5			small amounts of gas
10:50		2	20	78			
10:54	1400	3	20	77	32		88lpm returns
11:20	1446	0.2	20	79.8			quite gassy returns
11:40	1504	0.75	3		62		gas rate dropping 86lpm returns
12:07	1535	1	3	96		2% frac jell	oil is jelling when sun in the centrifuge
12:50	1561	5	1	94		"	sand bridge
12:55	1584	15	1	84		1% frac jell	sand bridge
1:12	1590	1	0	99		1% frac jell	
1:15	1595	18	0	81		1% frac Jell	
1:30	1617	1	0	98		1% frac Jell	
1:55	1655	1	10	89		1% frac Jell	sand bridge
2:25	1708	1	9	90		sand bridge	increase in gas in returns gren frac fluid
2:50	1702	45	10	45			
2:55		30	10	60			
3:00	1692	1.5	0	98.5		trace of frac jell	
3:15	1716	2	18	80			sand bridge
3:38	1713	10	20	70		trace of frac jell	
3:48	1756	2.5	12	85.5			from bridge at 1706
4:30	1850	2.5	12	85.5			
4:50		0.5	0	99.5			clear returns in cellar
5:30	1700	0.5	18	81.5			POOH
6:05	1280	0.25	20	79.75			POOH
6:30	1005	0.5	18	81.5			POOH
7:45	0						on surface blow coil dry rig out

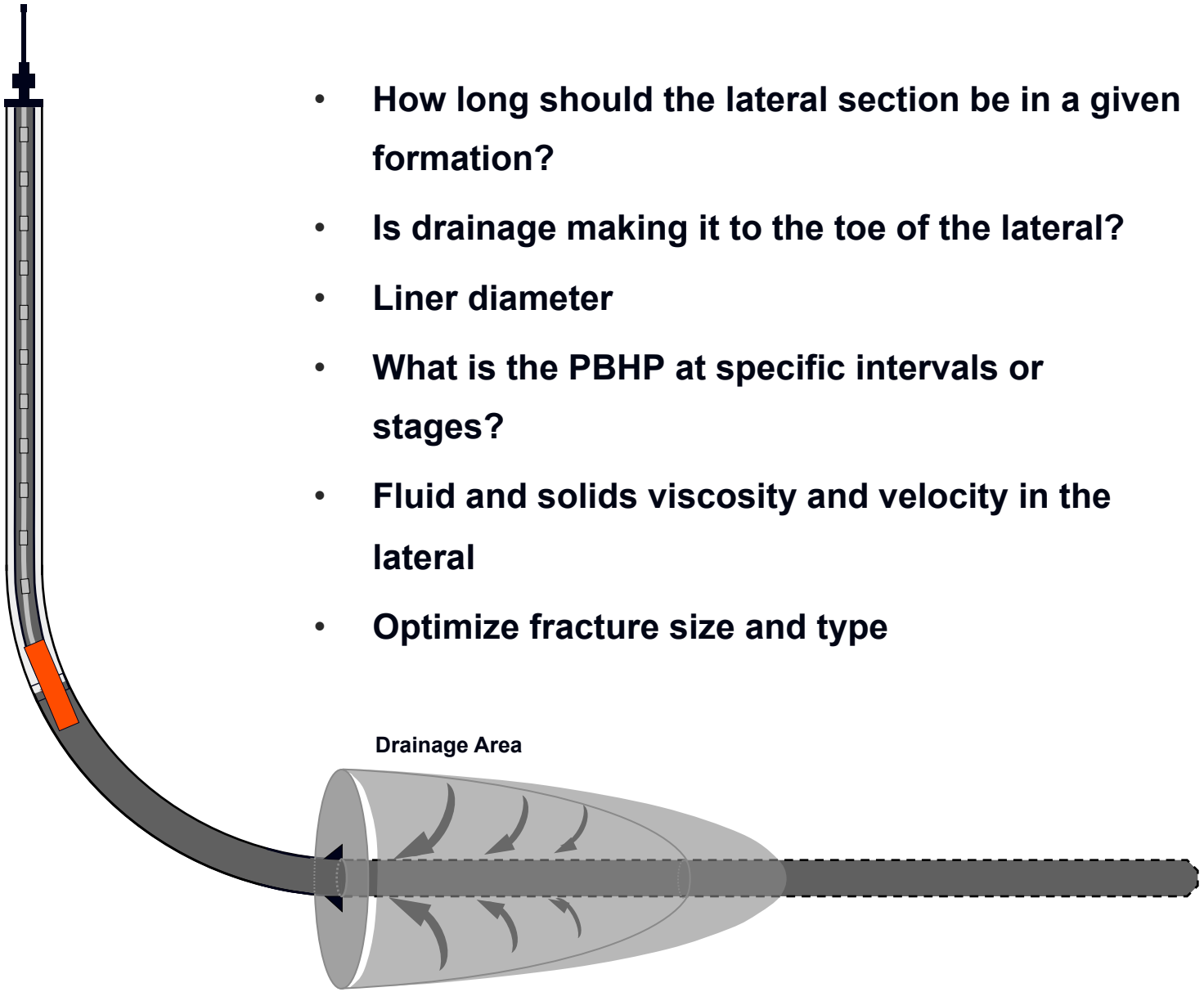
Husky Lloydminster

- 4.5m3 sand
- Up to 35% sand - avg. 7-8% through job
- 660TVD, 1785m TD
- 114 mm guide string ran 1jt into 139mm liner
- Pump TD @1530M -6000daN.

- 10 year old well with production issues
- 635 TVD 1635 TD
- 114mm guide string landed into 139mm liner
- 600 meters of drilling fluid encountered
- Well is on prod. with 40% increase in volume

With high viscosity oil we are mixing a chemical into the power fluid. The high pressure jets blast the heavy oil the result is a nonviscous

Questions Surrounding Horizontal Well Types



- How long should the lateral section be in a given formation?
- Is drainage making it to the toe of the lateral?
- Liner diameter
- What is the PBHP at specific intervals or stages?
- Fluid and solids viscosity and velocity in the lateral
- Optimize fracture size and type

Conclusions

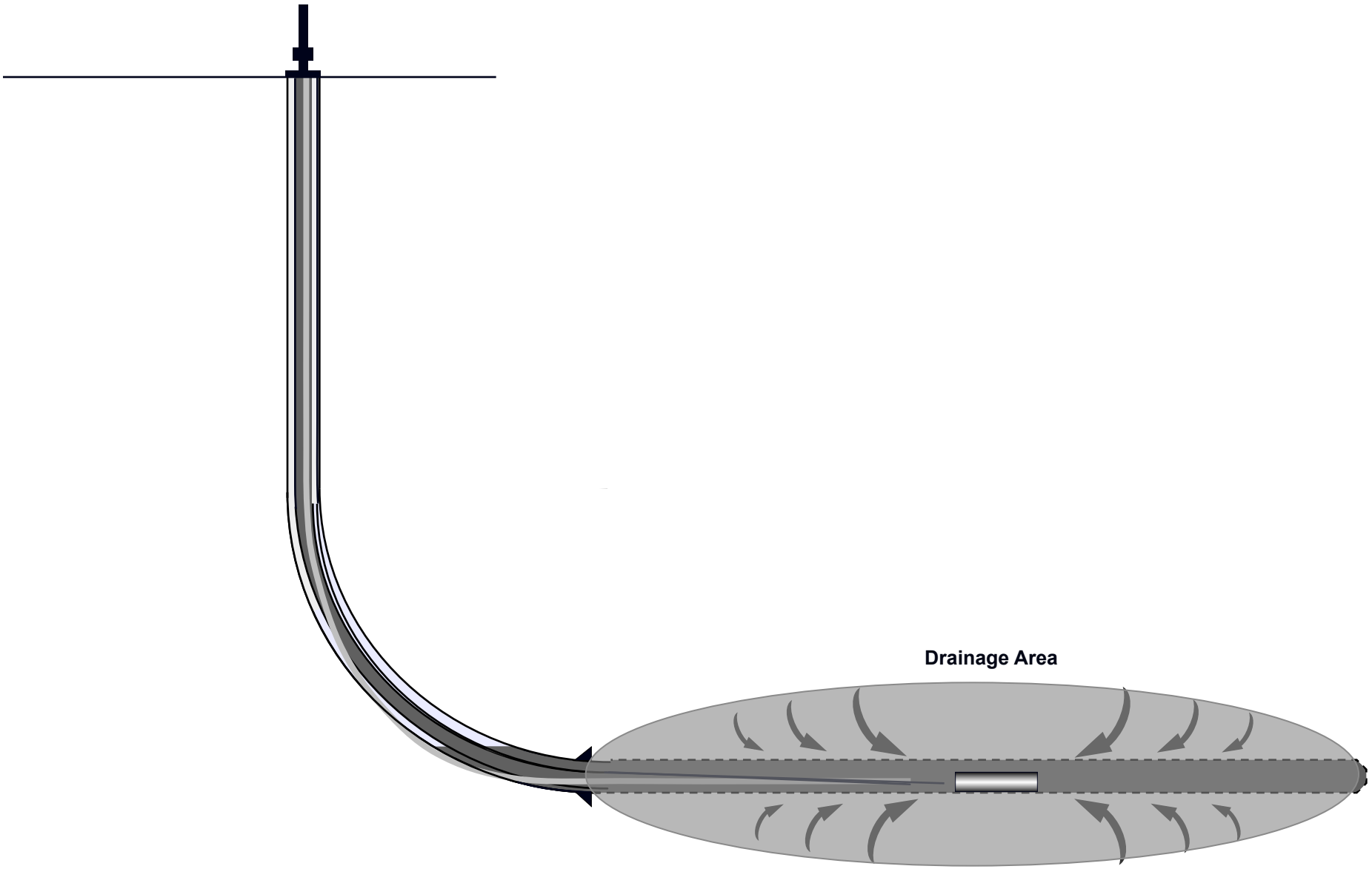
•In the mid 1990s, the SPE did a world wide study on the production from Hz wells of all types. They found that, on average, 30% of the lateral sections did not produce.

•Our findings reaffirms the out come of this study. The majority of the Hz wells we have entered have given the best production from the mid point to the toe of the lateral section. Alternately the liner has proof of non production since new, drilling fluid, drilling enzymes or the liner entirely full of sand. Soon we will be running BH recorders on each and every cleanout. This will be another diagnosis tool we can use to identify issues or potential upside.

•To make a horizontal well economically successful, it has to yield at minimum 4 times what an offset vertical produces. Thus, we are still in our infancy when it comes to completion and production of Hz wells.

•This information may help E&P companies design wells that will optimize recovery of the given formation. Geology- Longer may not always be better.

Hz well information? How do we gather it?



Commonly Asked Questions

- 350 successful operations with, safety incidents or stuck pipe or plugged coil.
- Velocity on the return conduit of the FlatPak is 2m/sec. well above hz sand settling velocity.
- We are incorporating oil/water dispersants and sand suspension chemicals into our heavy oil operations.
- Maximum amount of sand out of one well, 5.2m3 or 3200kgs.
- Clients, Husky, Encana, Ember Res., Nexen, Quicksilver, Paramount, ARC Res., Provident, CNRL, Westfire, Harvest, Enerplus/Enermark, Progress Energy, Fairborne, Anderson, Suncor/Petro-Canada, Baytex Energy, Bronco, Pengrowth.

Thank you for your time. I invite any questions.

Have a great day!

Presented by: Steven Winkler

Adding Value through Technology

SPE International

Lloydminster Section