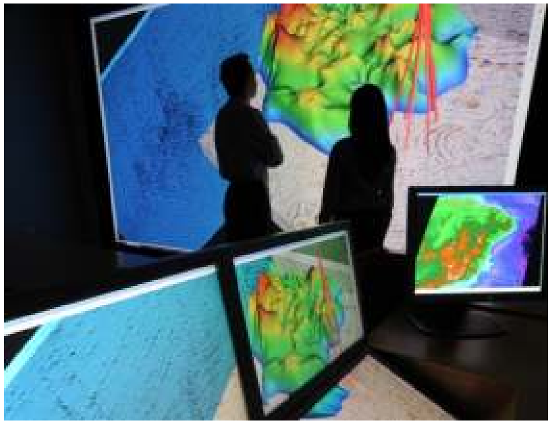
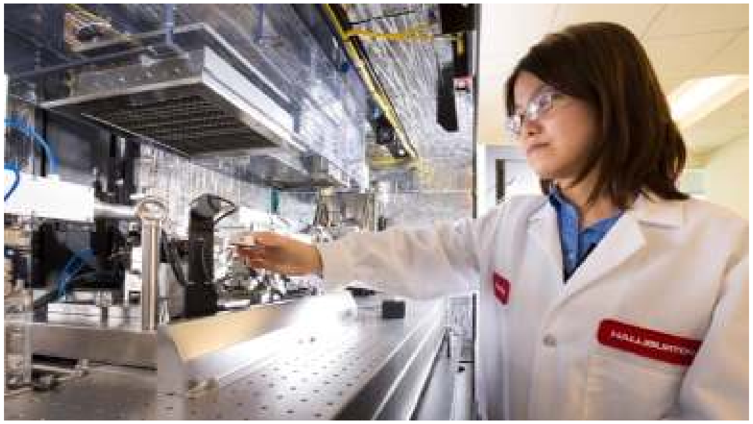
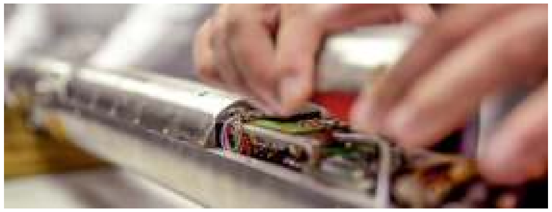





SLAP 2016
SIMPOSIO LATINOAMERICANO DE PERFORATING

Perforations Cleanup with Surge Chambers to Increase Well Productivity

SLAP 16-25

Jorge Patino, Halliburton

Oct 18th, 19th & 20th , 2016

HALLIBURTON

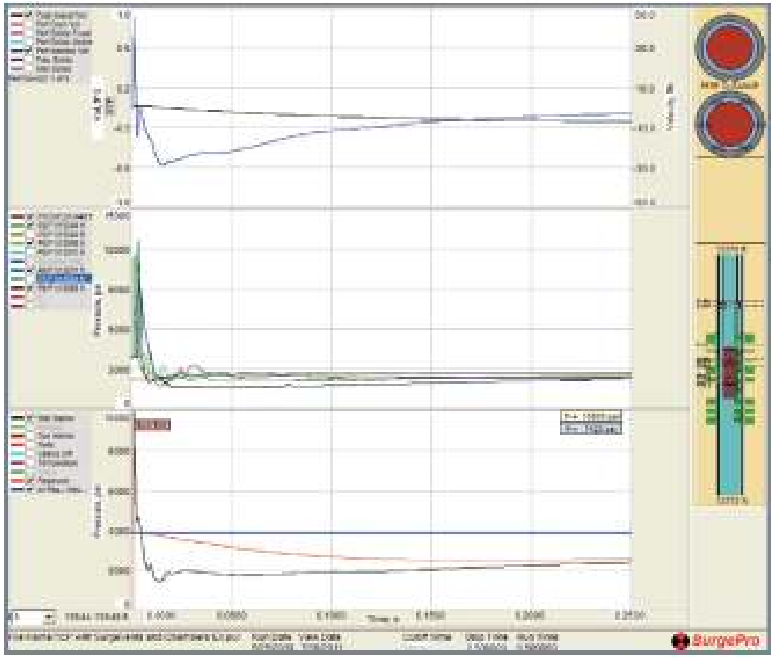
REVIVING MATURE FIELDS

- New technology has enabled oil recovery from mature fields and wells that have been forgotten because of the natural depletion.
- This technology has been successfully used on rigless wireline operations, as well as in tubing-conveyed operations.
- Results have shown that it is possible to regain initial production rates at a relatively low cost as compared to other near-wellbore (NWB) stimulation techniques.

DYNAMIC UNDERBALANCE

- The simulation model and applied techniques of dynamic underbalance (DUB) have been used successfully for optimizing several producing wells globally.

- This technique consists of two primary components:
  - **Software** that is physics-driven and relies on measurable or estimated actual input parameters.



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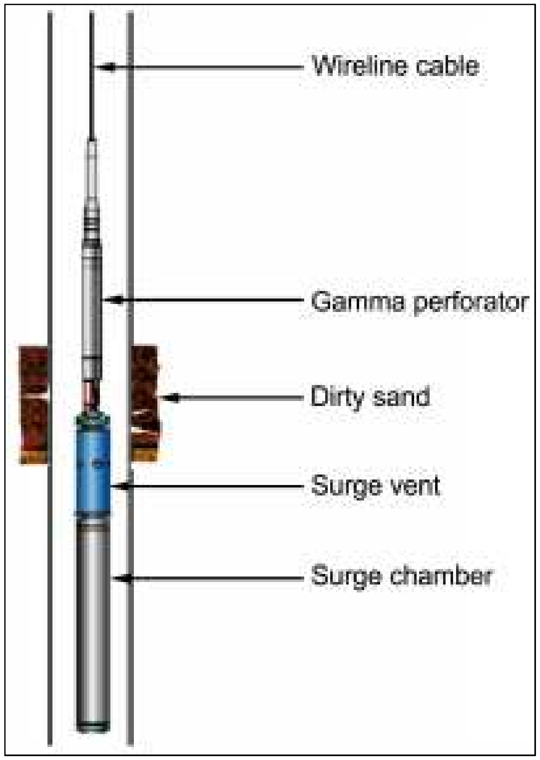
DYNAMIC UNDERBALANCE

- **Hardware** consisting of vents and chambers that enable the dynamic fluid surges in milliseconds.

SurgePro Vent

SurgePro Chamber



Wireline-deployed DUB design service chambers and vent

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CASE HISTORY 1 — LIMONCOCHA K-031 WELL

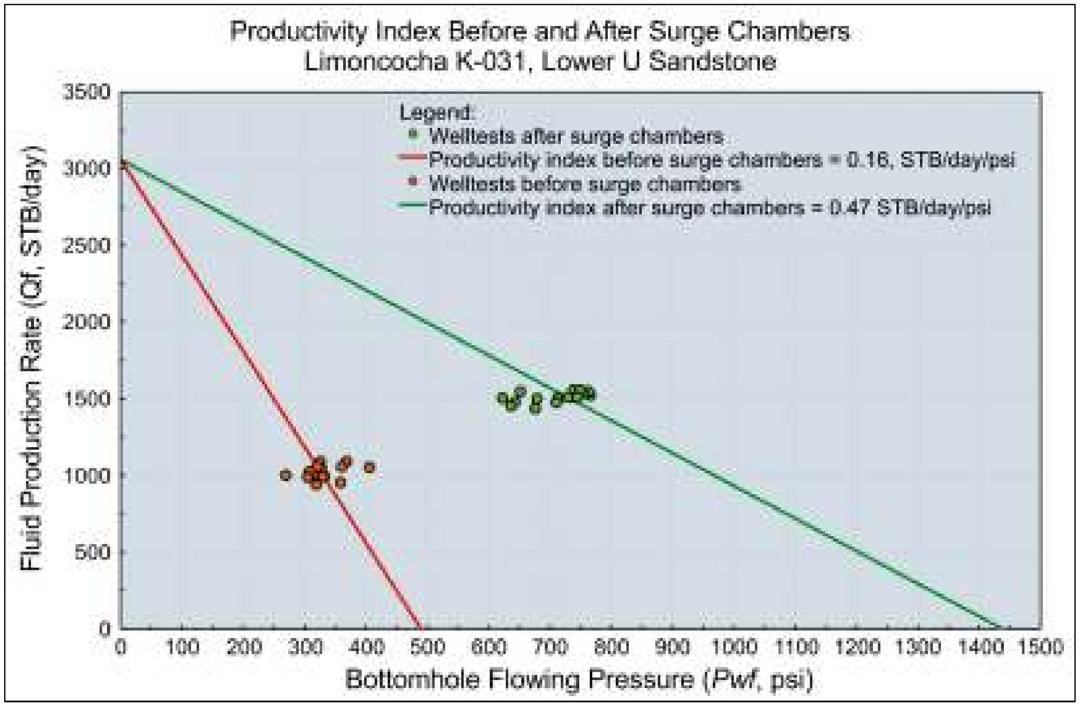
Objective

The primary objective for this well was to execute a perforation cleanup in the "Lower UI" interval at a depth of 10,282 to 10,304 ft. This cleanup would be performed using an engineered DUB design service by designing the predetermined volumetric surge chambers and flow area configuration. The optimized surge volume is determined using the highly sophisticated DUB software modeling tool.

Challenge

Previous to the intervention, it was noted that there was some communication between the UI interval and TP interval below.

CASE HISTORY 1 — LIMONCOCHA K-031 WELL



Productivity index before and after surge chambers

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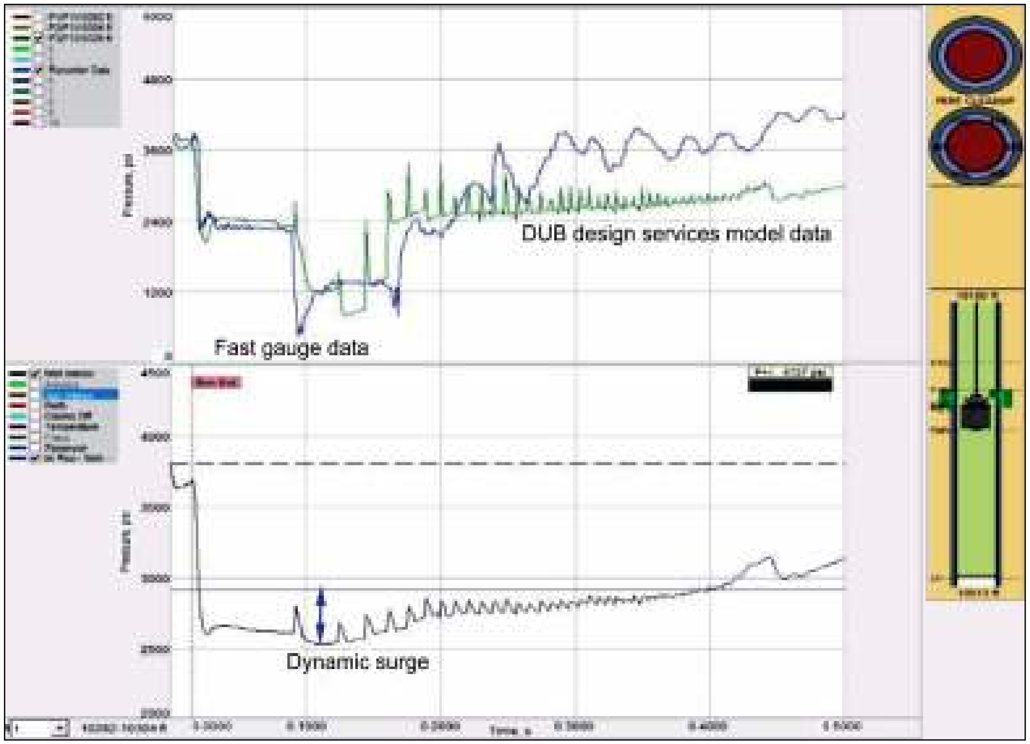
CASE HISTORY 1 — LIMONCOCHA K-031 WELL



Post-job simulation matched with downhole gauge data

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CASE HISTORY 2 — COCA 39A

Objective

The primary objective for this well was to re-establish oil production in the Hollin Superior formation. The recommended treatment was to clean up the perforation tunnels with surge technology at depths ranging from 10,638 to 10,646 ft (8 ft) and 10,616 to 10,629 ft (13 ft).

Challenge

The mechanical limitations with surface well-control equipment prevented the stimulation treatment from being run in a single run. Through modeling, it was discovered that a second run with additional free volume would be necessary to achieve the optimum dynamic drawdown and duration at the specific location to achieve the desired perforation cleanup.

CASE HISTORY 2 — COCA 39A

Job Design

The surge chambers and vents were deployed on wireline and positioned on depth with gamma ray and collar locator tools. The vents are opened, causing an instantaneous surge on the perforations immediately located in front of the bottomhole surge assembly. The wireline-deployed tools are removed from the well, and the ESP completion is deployed with production tubing.

Results

From May 2014 to shut-in in March 2015, the data shows that the oil-water ratio was at 9%.

CASE HISTORY 2 — COCA 39A

The oil production stabilized at a rate two times higher than pre-shut-in at 539 B/D of oil, which can be seen in the graph below. The value in using this technology has been proven on several wells in terms of productivity.

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CASE HISTORY 3 — INDILLANA 13

Objective

The primary objective for this well was to reperforate the upper section of the UI formation at a depth of 9,589 to 9,610 ft after setting a bridge plug to isolate a deeper water zone in the UI formation.

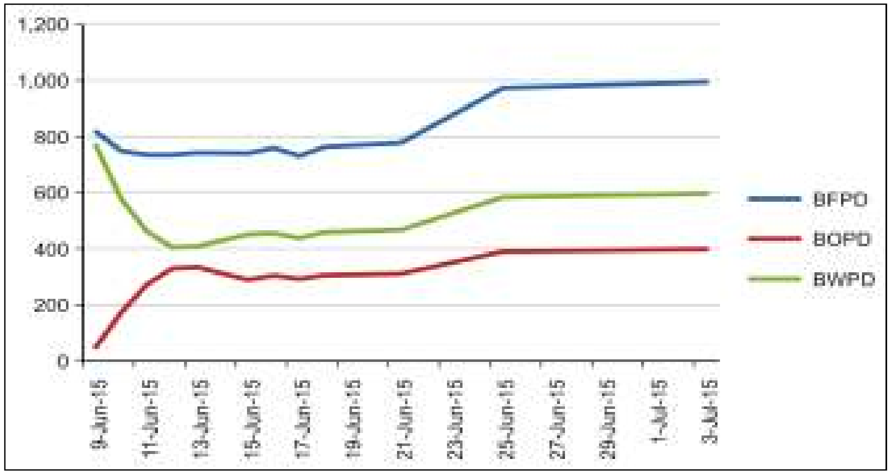
Challenge

The rat-hole limitations prevented the perforation/stimulation treatment from being run in a single run. Through modeling, the optimum dynamic underbalance necessary to clean the perforation tunnels was identified.

CASE HISTORY 3 — INDILLANA 13

Job Design

Surge chambers and vents were deployed on wireline and positioned on depth with gamma ray and collar locator tools after setting the plug and perforating the producing interval.



13-day production data until stabilization

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CONCLUSION

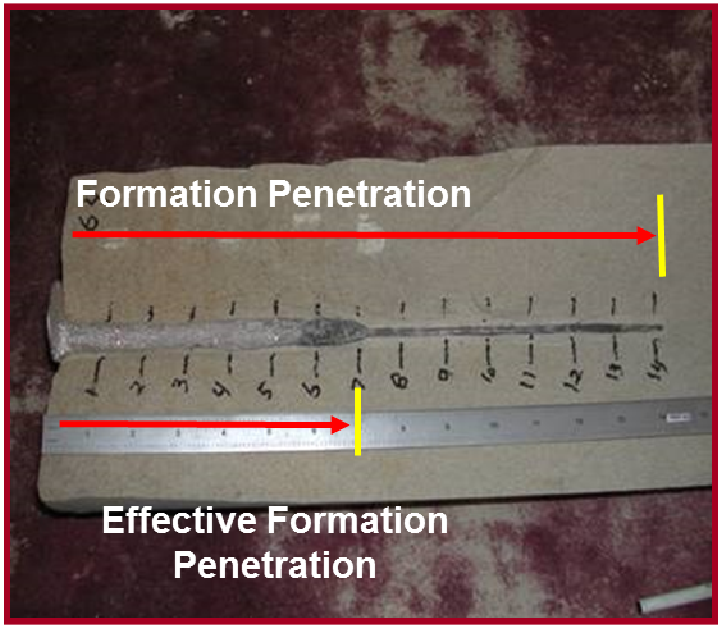
- The treatment method used and discussed in this paper has a continued history of success.
- The results of this paper are summarized in this table for easy reference.
- Highly trained engineers are necessary to perform the modeling simulations and treatment designs.

Well	Production Presurge		Production Postsurge	
	Oil (B/D)	Water (B/D)	Oil (B/D)	Water (B/D)
Limoncocha 31	58	267	249	345
Coca 39	241	24	539	60
Indillana 13	83	1982	398	597

Table 1—Results of the paper.

CONCLUSION

Which Perforation Do You Want?



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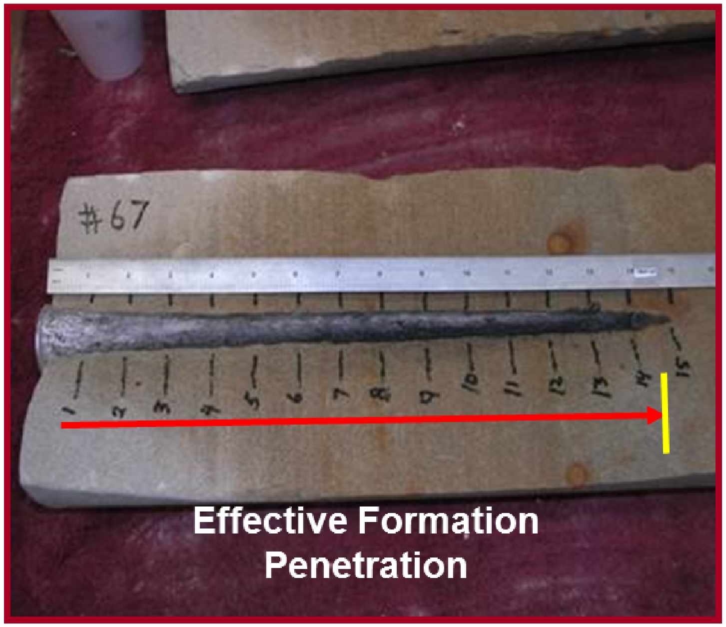

Could be 82% Difference in Productivity

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