8TO. CONGRESO IAPG
Producción y Desarrollo de Reservas
HACIA UN DESARROLLO DE RECURSOS SUSTENTABLE

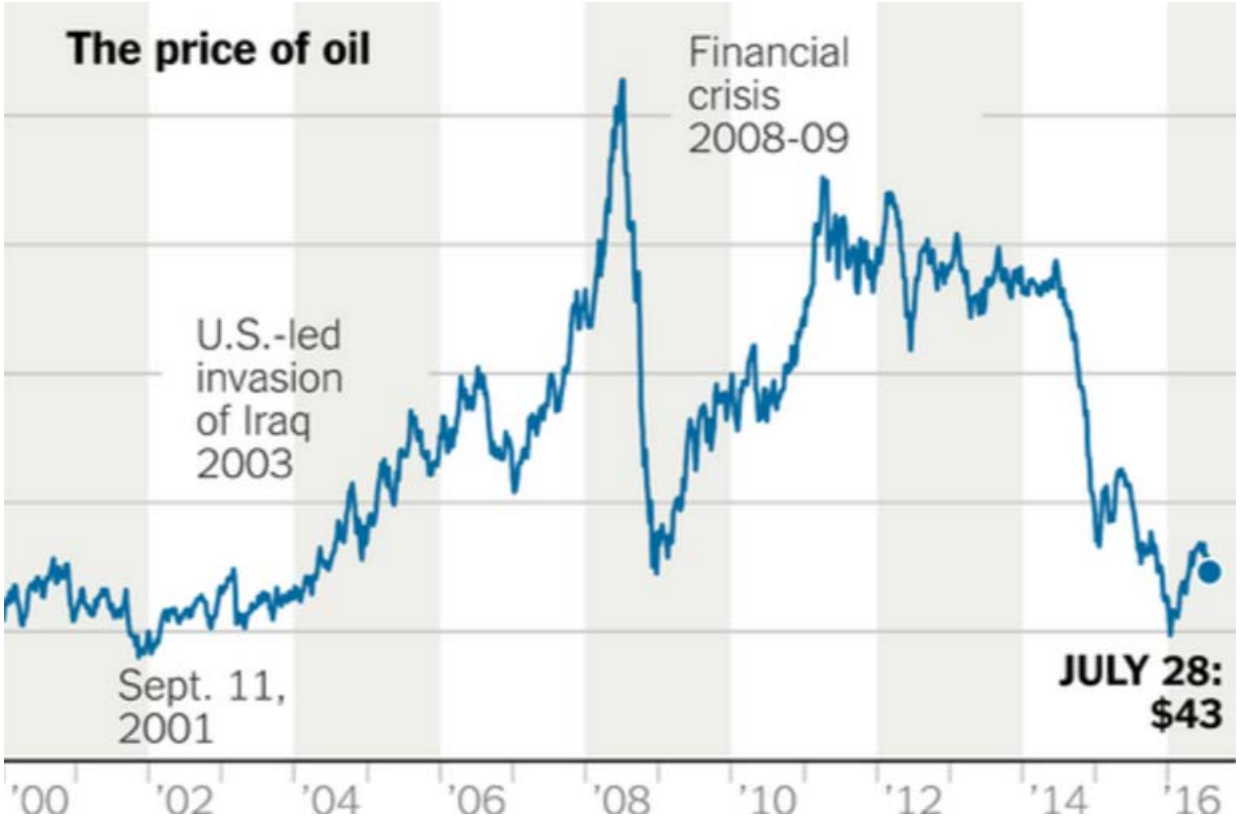
INSTITUTO ARGENTINO DEL PETROLEO Y DEL GAS
24 • 27 Octubre 2016
Llao Llao Hotel&Resort
Bariloche, Argentina

Calvisc

Youssouf Zotskine
Calfrac Well Services S.A.




Nuestra Industria



NY Times

Cual es el role de la tecnología en estos tiempos?

CalVisc – Una Oportunidad

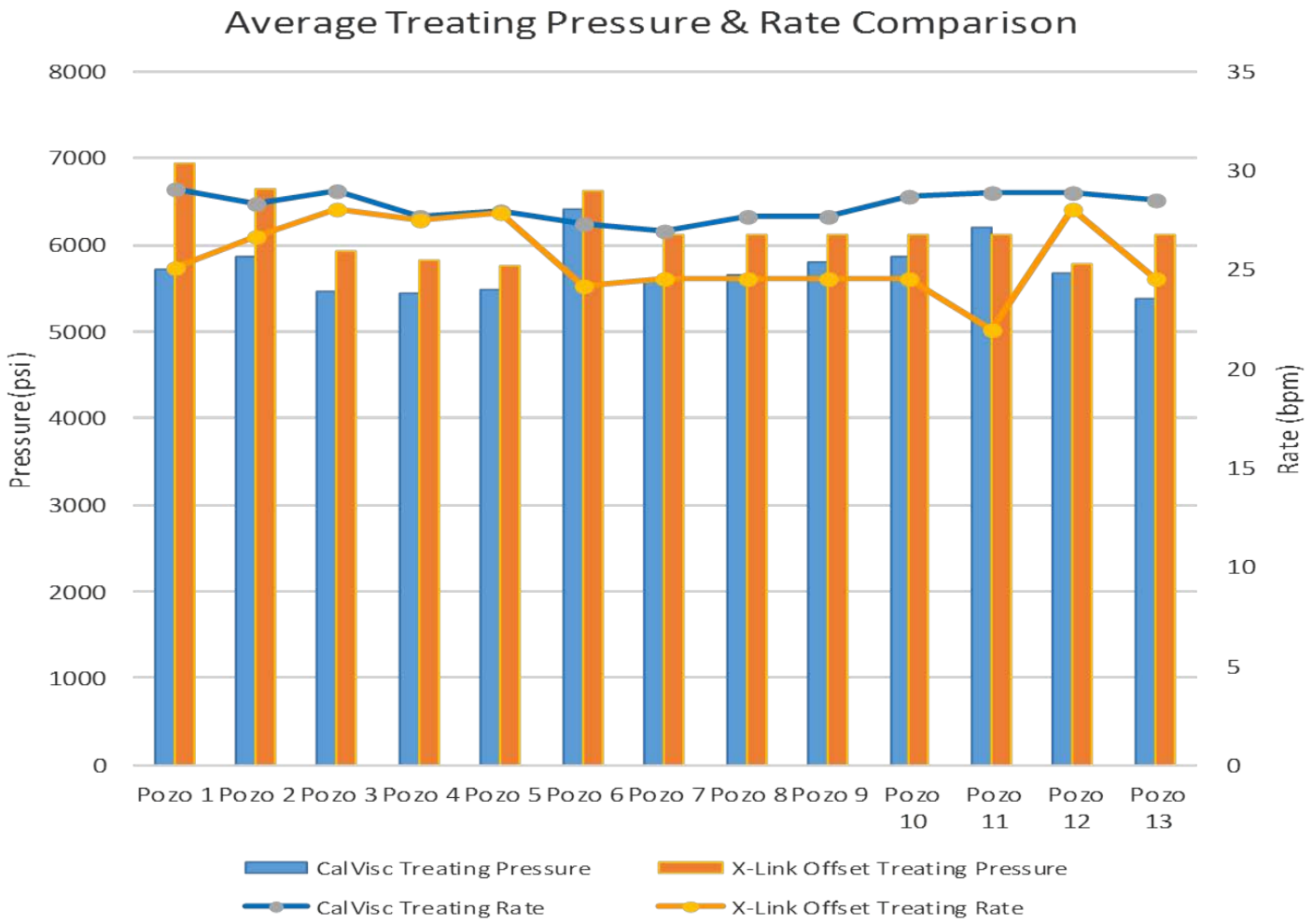
Es un polímero base poliacrilamida, que se bombea a "cargas" (dosificaciones) elevadas para crear geometrías fractura complejas, mientras se transporta la misma concentración de agente de sostén como si fuese un fluido reticulado.

Mejor Limpieza

Mayor Conductividad

Mejor Geometría de Fractura

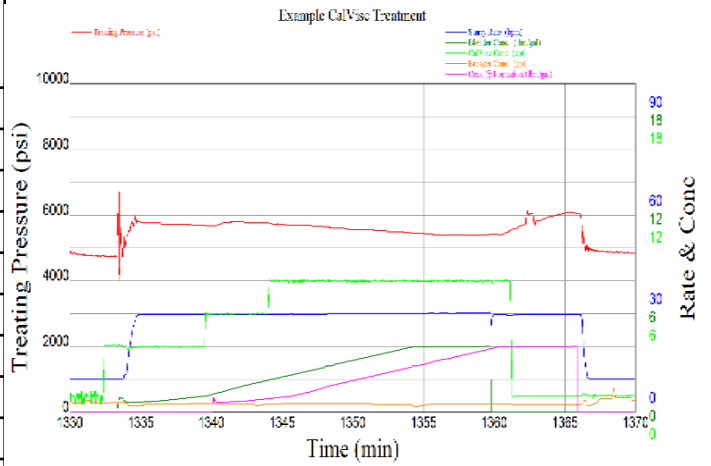
Tratamiento con CalVisc - Pruebas de campo

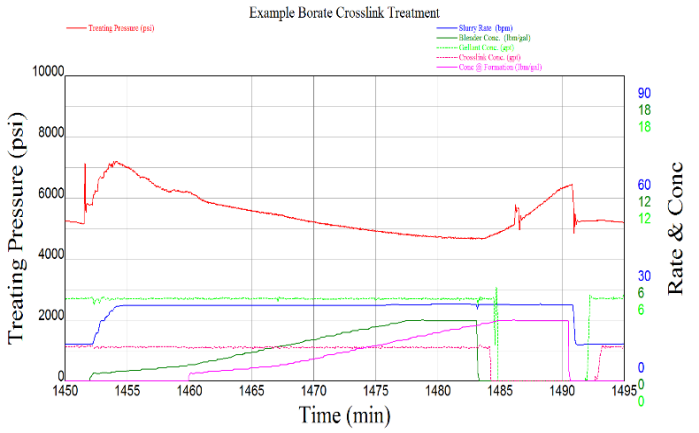


Pozos Completados con CalVisc

Pozo	Etapas	Agua TDS (mg/L)	Máx. Conc. FR (gpt)	Peak Job Visc (cP)	Máx. Conc. Arena (psa)	Máx. Conc. Arena Program. (psa)
Test Well #1	29	570	10	39	4	4
Test Well #2	28	2842	10	26	4	4
Test Well #3	27	1190	9	30	4	4
Test Well #4	30	107	9	48	4	4
Test Well #5	30	729	8	24	4	4
Test Well #6	30	764	8	25	4	4
Test Well #7	30	704	8	32	4	4
Test Well #8	30	625	8	32	4	4
Test Well #9	30	515	7	31	2.5	2.5
Test Well #10	30	250	9	42	4	4
Test Well #11	31	259	9	45	4	4
Test Well #12	31	155	9	45	4	4
Test Well #13	33	157	9	50	4	4

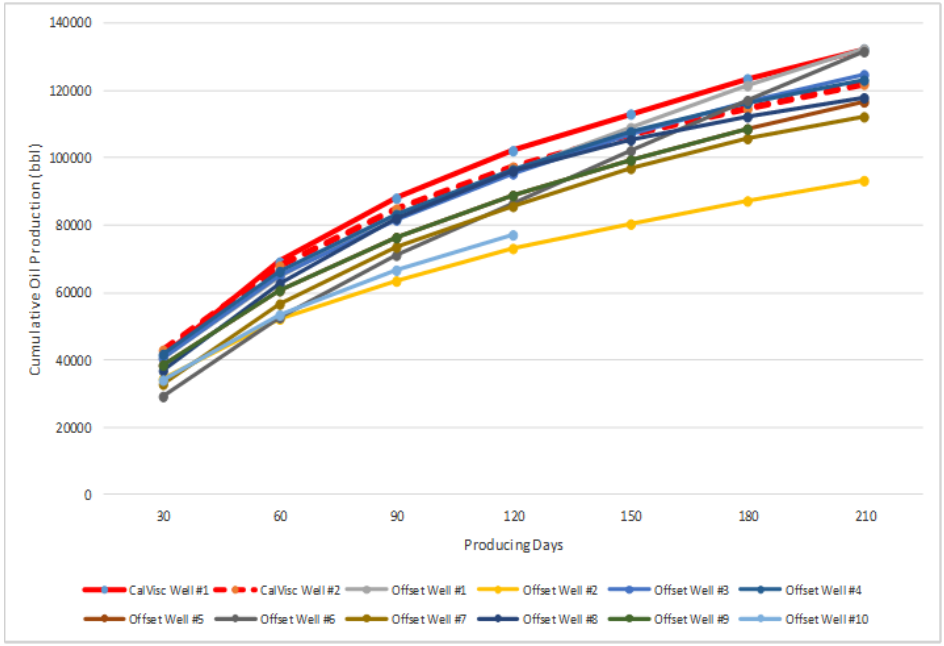
Formación	Período	Etapas	Screenouts	%
Bakken/ Diseño Conv	Ago 2014- Ago 2015	1672	7	0.42%
Three Forks/ Diseño Conv	Ago 2014- Ago 2015	1605	27	1.68%
Bakken/ Diseño con CalVisc	May 2014- Aug 2015	423	1	0.24%
Three Forks/ Diseño con CalVisc	2 pozos	30	0	0.00%





Pozos Vecinos con 210 Días de Producción de Petróleo - Todas las Cías. de Servicio – Radio de 10 millas

- 210 Day Oil Offset Wells - All Service Providers
- 10 Mile Radius



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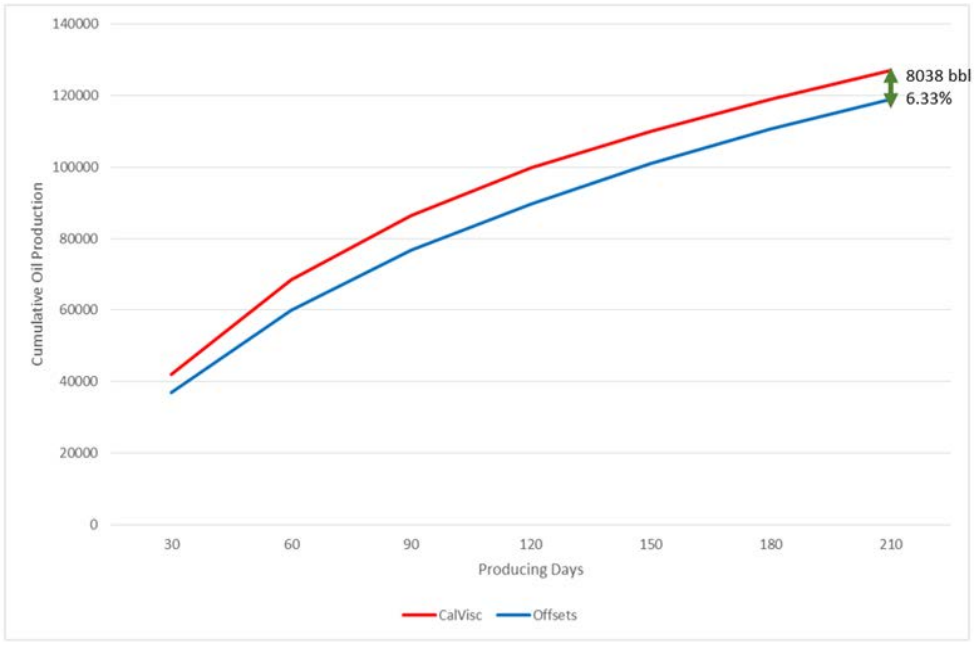
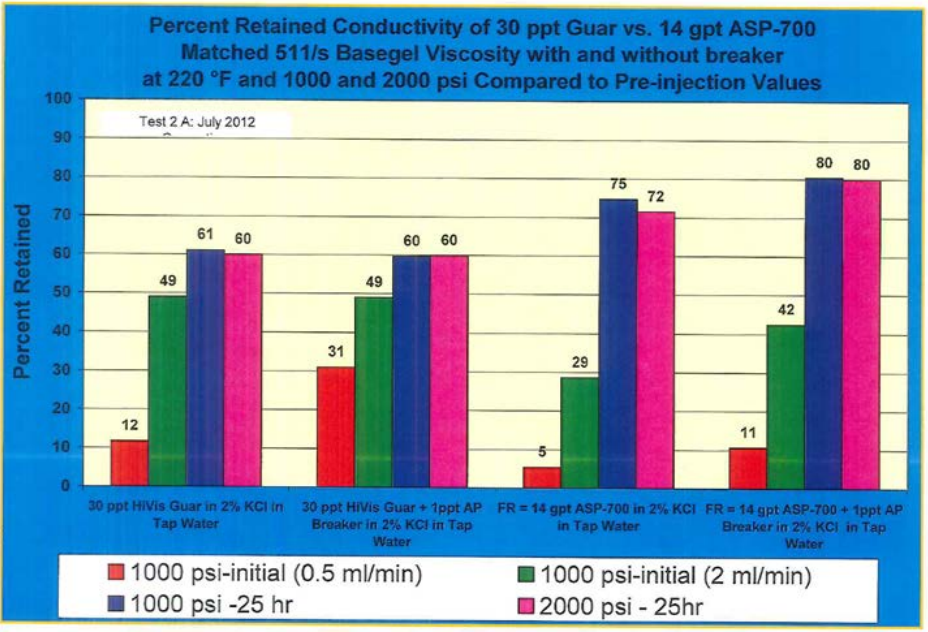
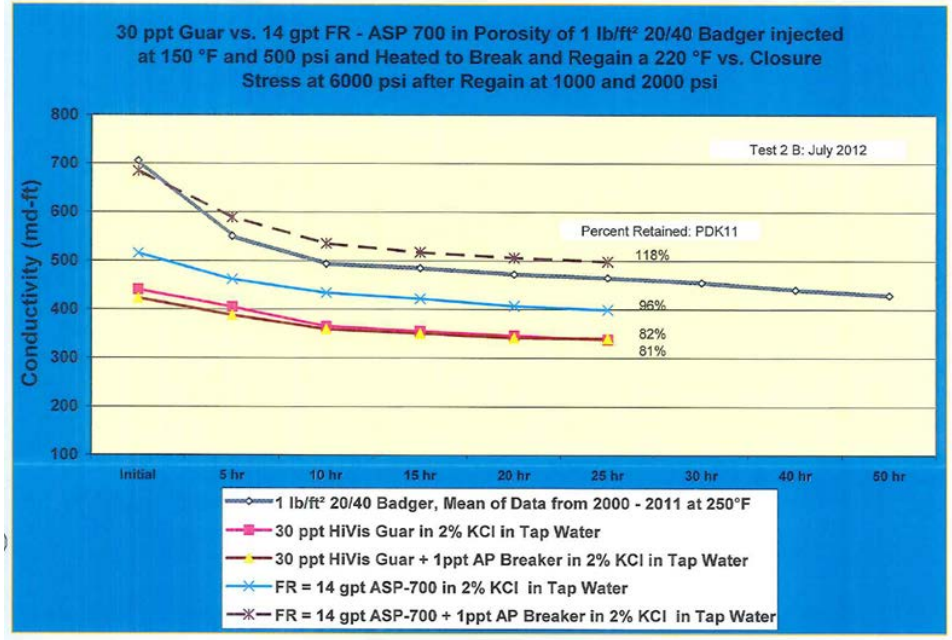


Datos STIM-LAB 2012

STIM-LAB presentación del 2012: probó Guar Lineal 30#, con/ sin ruptor vs. fluido con Reductor de Fricción a 14 gpt, con/ sin ruptor

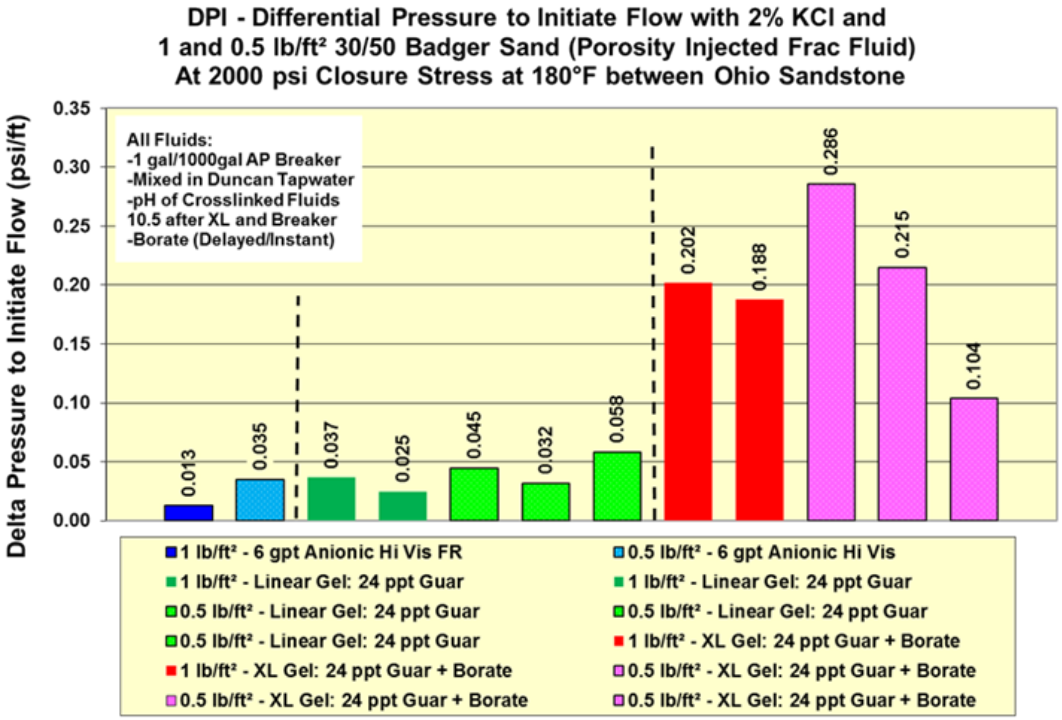
Las ***conductividades retenidas*** de los distintos RF fueron ***mejores*** que el guar, en todos los casos.





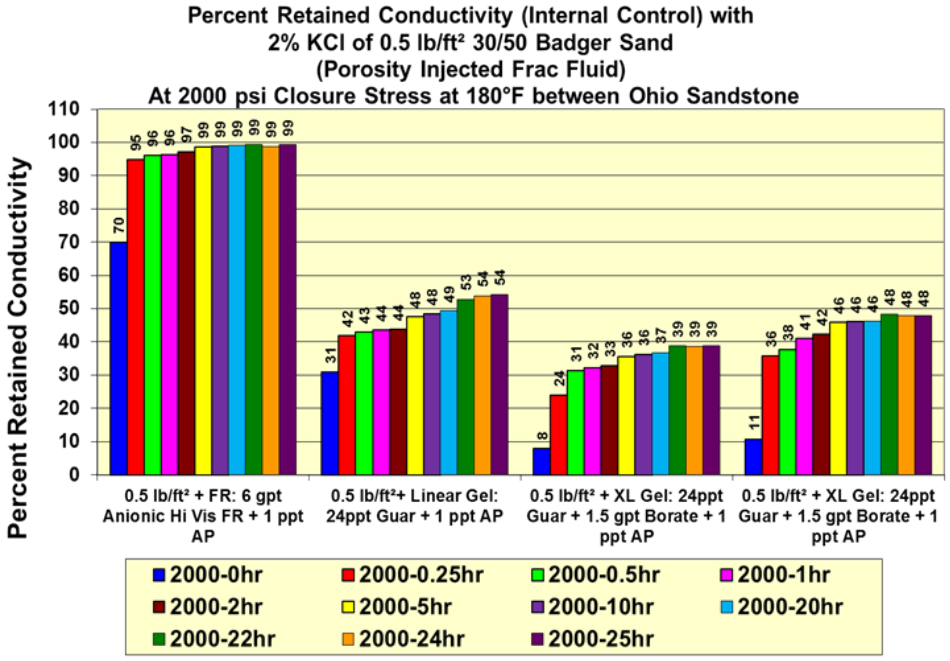
Análisis STIM-LAB 2015

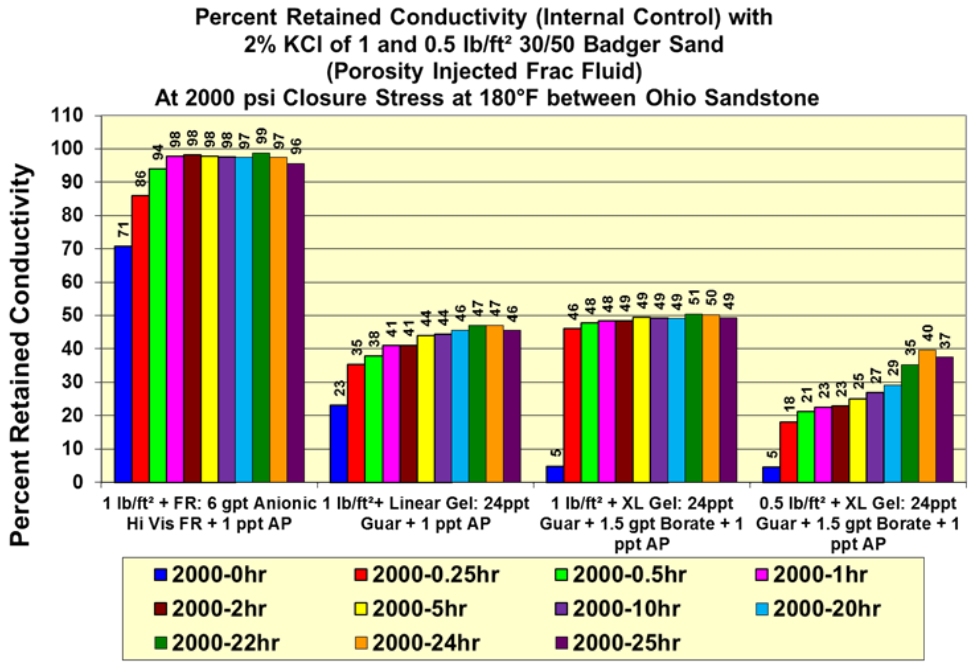
- StimLab presentación del 2015: probó RF aniónico, de alta viscosidad a 6 gpt con agua corriente –con/ sin ruptor vs. Lechada de guar 24# con agua corriente –con/ sin ruptor, y un sistema reticulado base borato 24# , pH 10.5 “entrecruzado” –con/ sin ruptor.
- La ***Presión Diferencial Promedio*** para iniciar el Flujo (DPI) fue ***menor*** con todos los RF, respecto del gel lineal y del “reticulado” .
- La ***Conductividad Retenida*** por los distintos RF fue ***mejor*** que los fluidos “reticulados” y geles lineales, en todos los casos.
- No se observó capa visible del RF, sobre el agente de sostén.



(*) X-linked: reticulado, entrecruzado

Conductividad Retenida Porcentual – Serie 1 de Ensayos - STIM-LAB Proppant Consortium

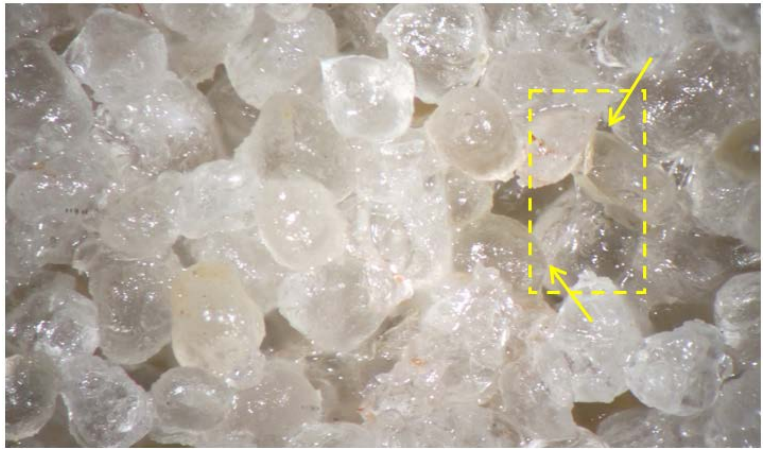




Fotos post ensayo **1.0** lb/ft² Arena 30/50, 6000psi, 180F - STIM-LAB Proppant Consortium

Sistema FR: Hi Vis FR Aniónico 6 gpt + 1 ppt AP

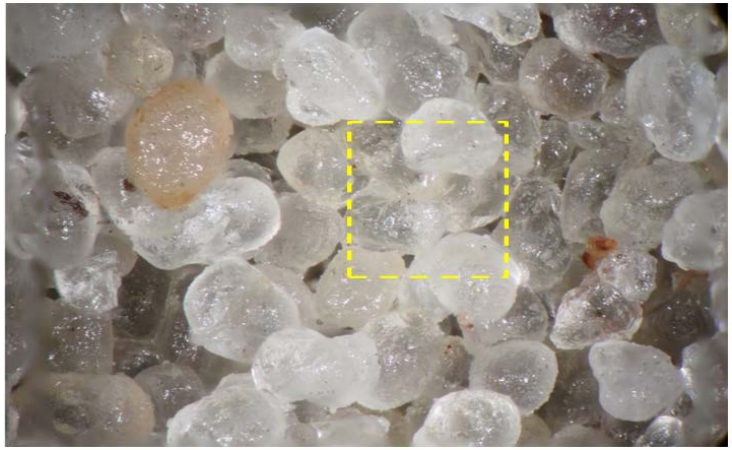
Gel Reticulado: Guar/Borato 24 ppt + 1 ppt AP



Fotos post ensayo **0.5** lb/ft² 30/50 Sand, 6000psi, 180° F - STIM-LAB Proppant Consortium

Sistema FR: Hi Vis FR Aniónico 6 gpt + 1 ppt AP

Gel Reticulado: Guar/Borato 24 ppt + 1 ppt AP



Características de Decantamiento del Agente de Sostén, de varios Fluidos

- Fueron ensayados tres distintos agentes de sostén usando tamiz No. 30, 35, 40
  - Para los ensayos de sedimentación sólo el agente de sostén malla 35
  - Se utilizó 2-3 partículas que se dejaron caer sobre la parte superior de la columna de fluido
- Las partículas que caen fueron cronometrados sobre una distancia determinada por triplicado
- En pruebas en las que las partículas de apuntalante se movían muy lentamente:
  - el tiempo fue medido por un período determinado, a continuación se midió la distancia recorrida

Seive #35 (>500, <600 µm)

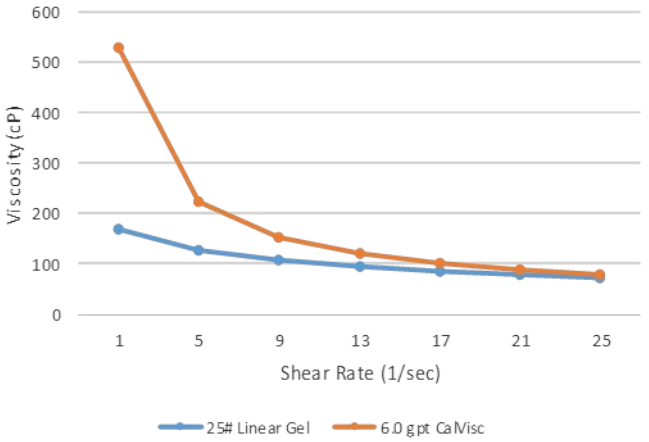
Proppant Type	Velocity in Water (mm/s)	Velocity in 6.25 gpt Linear Gel (mm/s)	Velocity in 1.0 gpt Slick Water (mm/s)	Velocity in 3.0 gpt CalVisc fluid (mm/s)	Velocity in 6.0 gpt CalVisc fluid (mm/s)
20/40 Ceramic	125.4	2.39	50.0	3.48	0.067
20/40 Sand	93.1	1.97	40.7	2.30	0.083
20/40 Frac Black HT	6.96	0.053	1.29	0.021	*

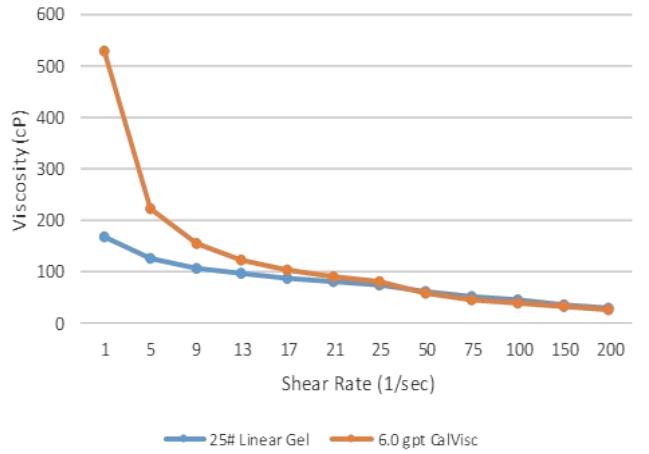
* Particles still suspended after 24 hours

Seive #40 (>425, <500 µm)

Proppant Type	Velocity in Water (mm/s)	Velocity in 6.25 gpt Linear Gel (mm/s)	Velocity in 1.0 gpt Slick Water (mm/s)	Velocity in 3.0 gpt CalVisc fluid (mm/s)	Velocity in 6.0 gpt CalVisc fluid (mm/s)
30/50 Ceramic	92	1.34	31.3	2.39	0.124
30/50 Sand	75	1.03	30.12	2.26	0.047
30/50 Frac Black HT	4.74	0.099	0.829	0.096	*

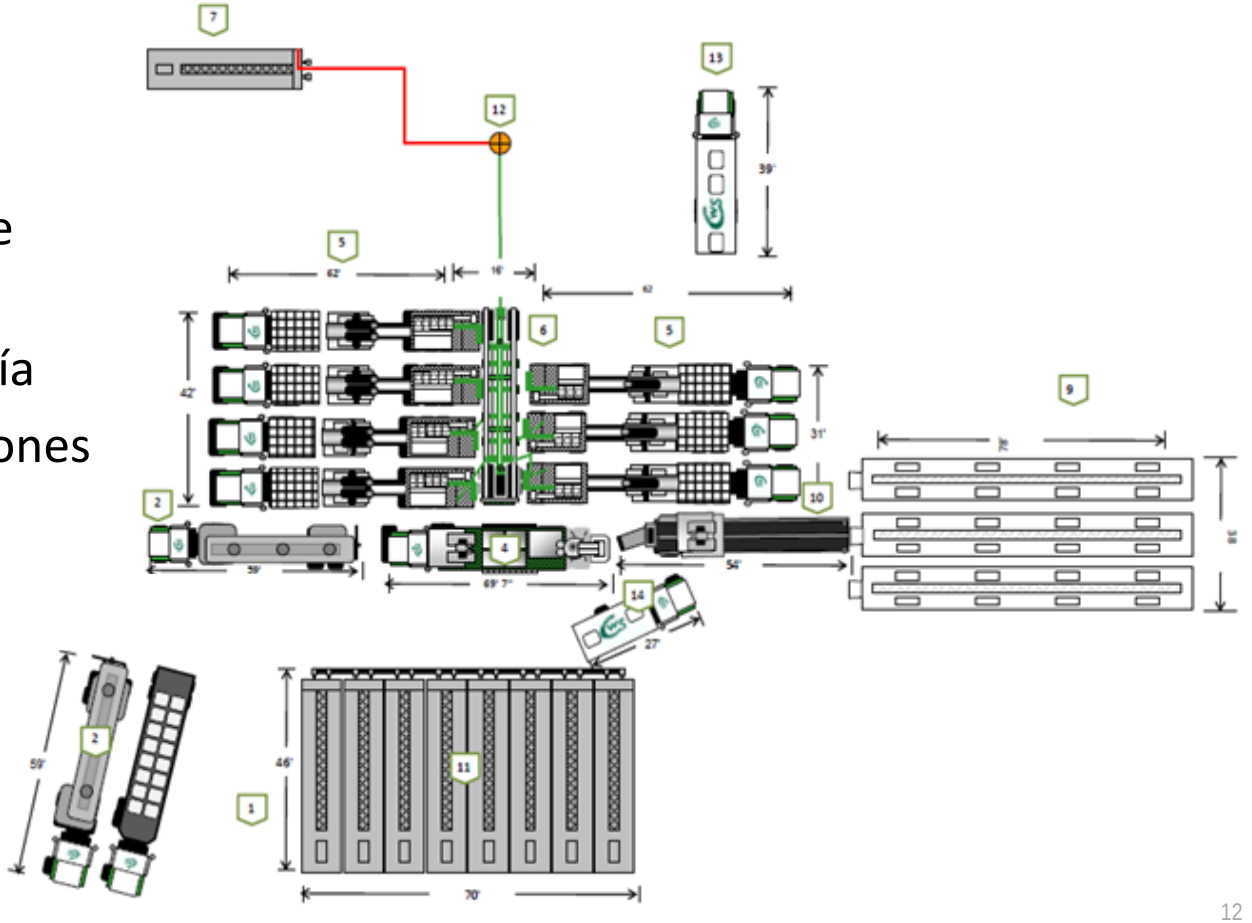
* Particles still suspended after 24 hours





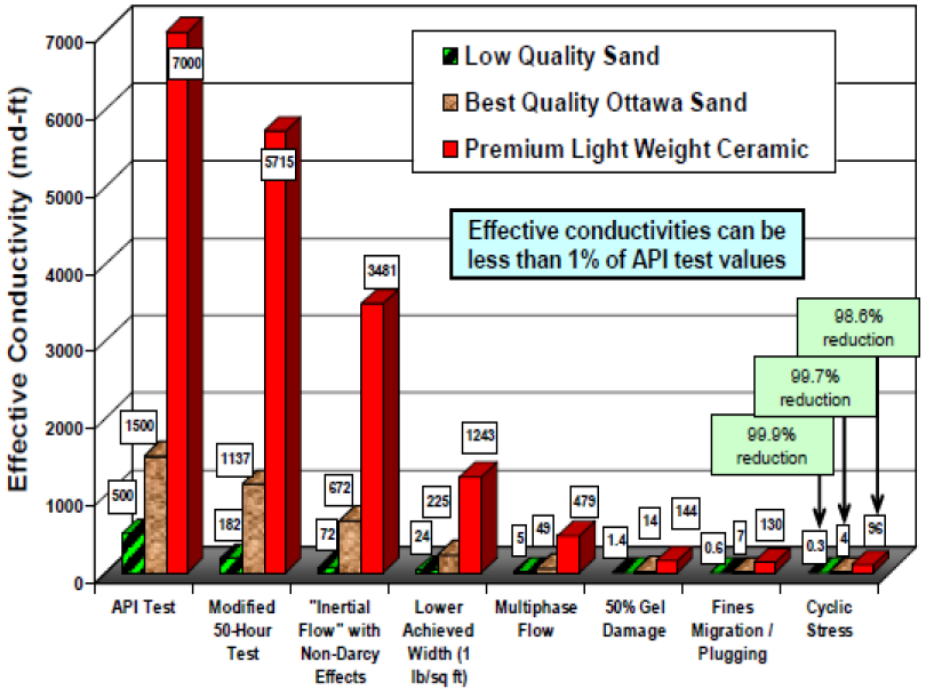
Oportunidades

- Precio
- Operativa
- Reducción de complejidad
  - Ingeniería
  - Operaciones
- Seguridad



¿Que pasa en la formación con este fluido?

- Calvisc brinda una ***mejor ubicación*** del agente de sostén, comparada con la de un fluido reticulado
- Calvisc es ***menos perjudicial*** que la goma guar
  - Causa menos daño?
  - Cambio en la humectación del agente de sostén?
  - Mejor limpieza?
- Potencialmente, ***longitud de fractura más eficaz*** con una mejor limpieza y una mayor permeabilidad recuperada
- Todo apunta a un ***mejor potencial de producción***



Source: SPE 119143 Insight Consulting

Material de lectura

SPE-179154-MS

Society of Petroleum Engineers

High Concentration Polyacrylamide-Based Friction Reducer Used as a Direct Substitute for Guar-Based Borate Crosslinked Fluid in Fracturing Operations

Monet Motiee, SPE, Maxwell Johnson, SPE, Brian Ward, SPE, Christian Gradl, SPE, Michael McKimmy, SPE, Hess Corporation; Jeremy Meeheib, SPE, Calfrac Well Services.

This paper was prepared for presentation at the SPE Hydraulic Fracturing Technology Conference held in The Woodlands, Texas, USA, 9–11 February 2016.

Abstract

Traditionally, friction reducer systems have been used to promote laminar flow in pipe to reduce friction pressure in pumping of low viscosity, slickwater-type fracture treatments. In these types of treatments, velocity is the key factor in proppant transport into the reservoir. Typical testing of these conventional friction reducer fluid systems focuses primarily on the chemical's ability to reduce treatment pressures and permit higher fluid velocities.

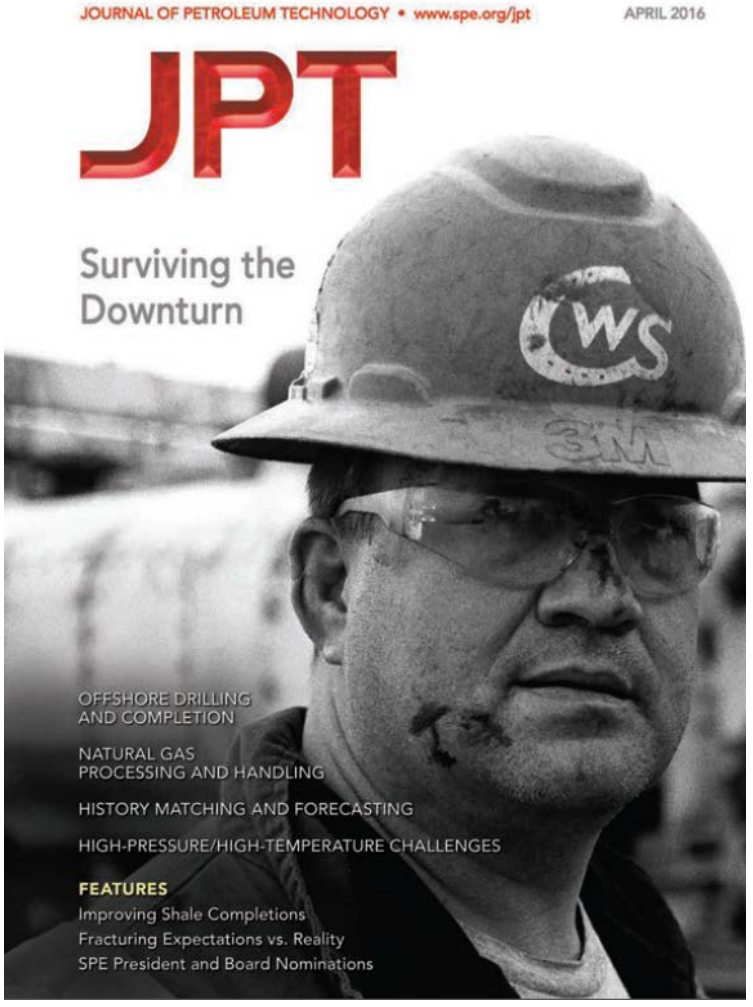
In an effort to reduce completions costs and improve operational efficiency while maintaining baseline well productivity, our Completions Team applied these conventional friction reducers in an unconventional way. The project used high concentrations of friction reducer (HCFR) as a direct replacement for a guar-based borate crosslinked system without modification to the standard treatment and proppant schedule. The team took steps to qualify the fluid for field implementation, including low shear rate viscosity testing, proppant settling testing, and regained conductivity testing.

Following qualification and operational planning, the team performed field trials. The data showed a reduction in footprint and overall horsepower requirements. The reduced volume and number of chemicals on location led to decreased exposure to hazardous chemicals and also simplified logistics, resulting in fewer truck movements on location. The reduction in chemicals impacted the economics of the well completion positively. The stimulation costs of the wells treated with HCFR when compared to the wells treated with the baseline fluid design showed a chemical cost reduction of approximately 22% per well.

In addition to the cost and operational efficiency benefits observed in the project, initial production data indicates that the wells are meeting or exceeding baseline productivity curves.

Background

In 2013 the cost of guar increased by more than 300%, severely affecting completion and stimulation costs in a number of the operator's assets. Several alternative systems were tried, but with limited success based on production results.



GRACIAS POR SU TIEMPO!

PREGUNTAS?