Stimulation design at Oxy: Past, Present and Future

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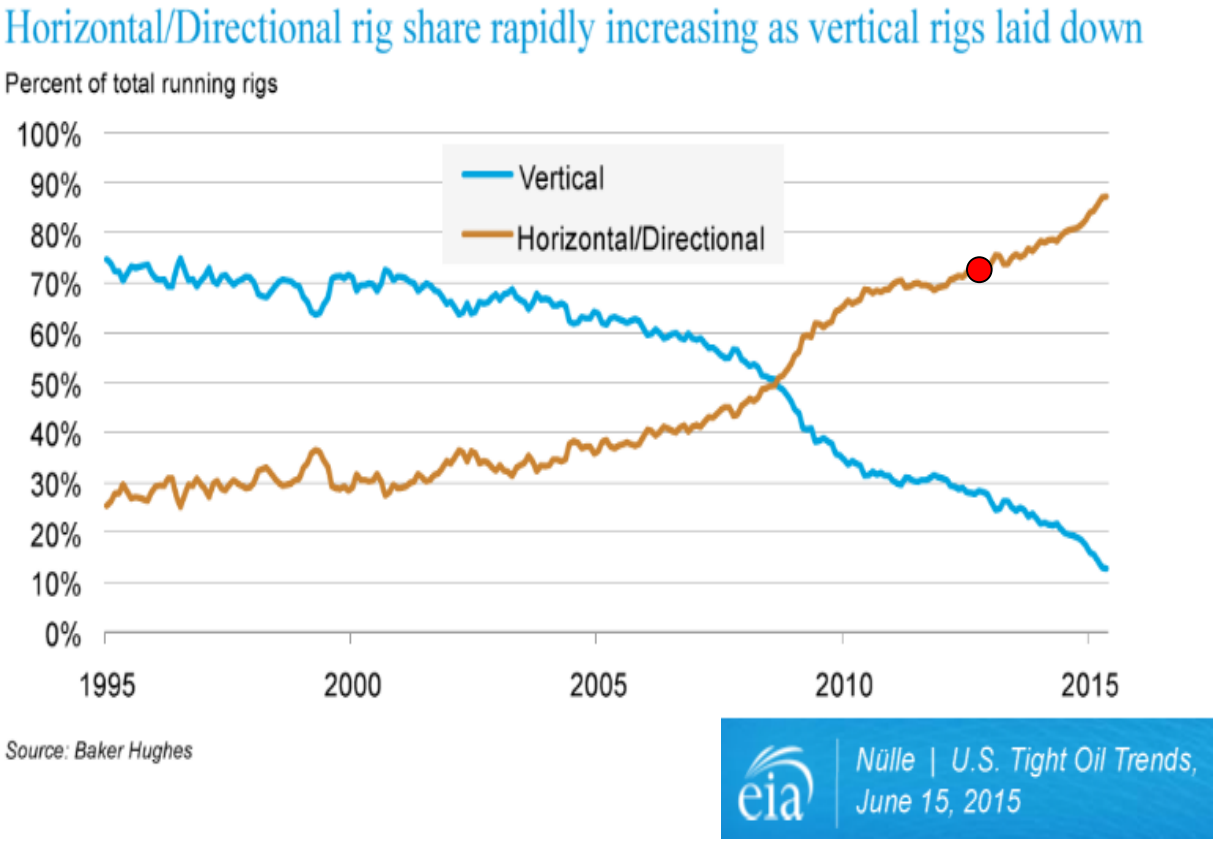
April 25, 2018

History of Oxy

Oxy long maintained a focus on conventional and EOR plays in the Permian

Oxy started slowly in the unconventional horizontal Permian plays

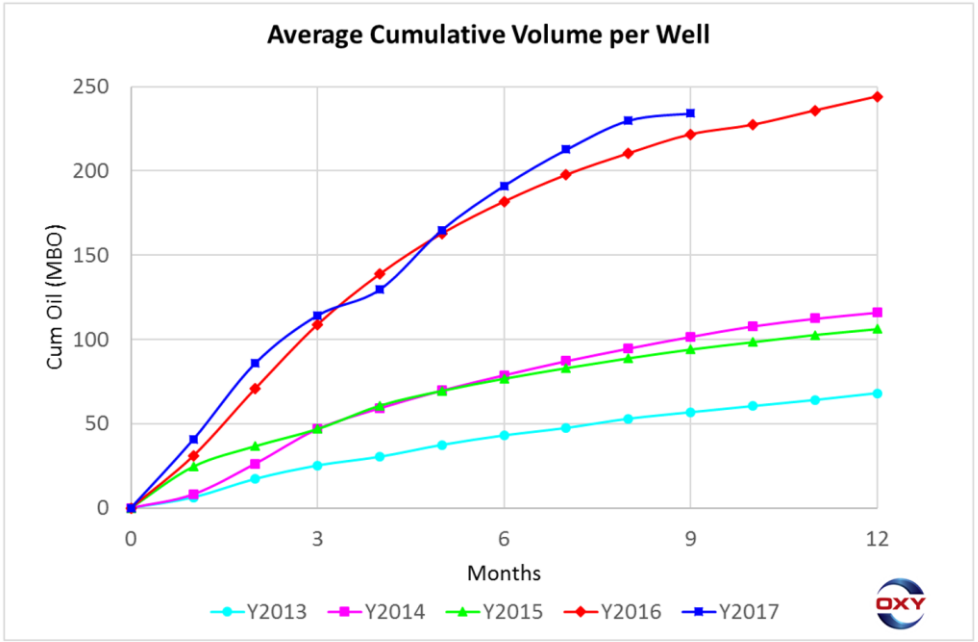
Unconventional drilling began around 2014/15



Building Success

Oxy became strongly focused on horizontal unconventional productivity in 2015

Occidental Results – Cedar Canyon 2nd Bone Springs



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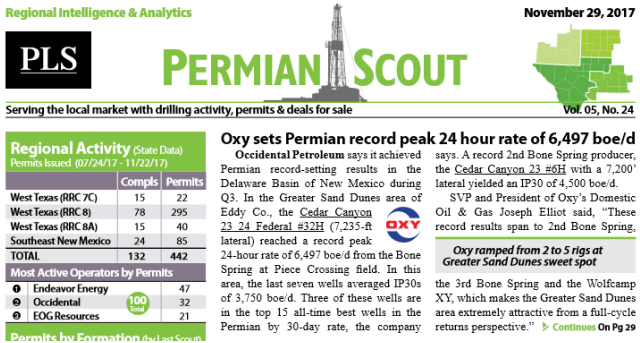
Innovation and Technology: How Our Industry's Past is Energizing Our Future • Vicki Hollub

Strive for Improvement

Most recent completions achieving

IP's over 6,000 boe/day



Regional Intelligence & Analytics

PLS

PERMIAN SCOUT

November 29, 2017

Serving the local market with drilling activity, permits & deals for sale

Vol. 05, No. 24

Regional Activity (State Data)
Permits Issued (07/24/17 - 11/22/17)

	Compls	Permits
West Texas (RRC 7C)	15	22
West Texas (RRC 8)	78	295
West Texas (RRC 8A)	15	40
Southeast New Mexico	24	85
TOTAL	132	442

Most Active Operators by Permits

1	Endeavor Energy	47
2	Occidental	32
3	EOG Resources	21

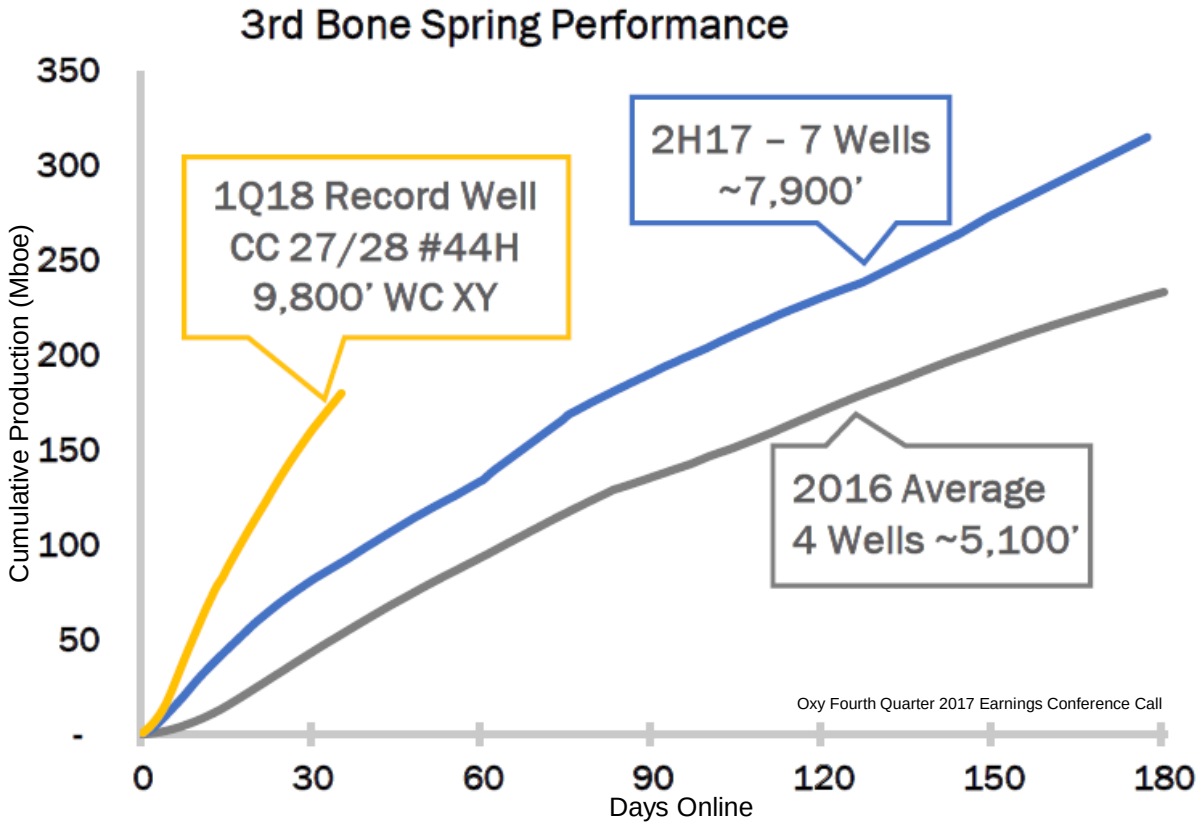
Permits by Formation (Bed Last Spud)

Oxy sets Permian record peak 24 hour rate of 6,497 boe/d

Occidental Petroleum says it achieved Permian record-setting results in the Delaware Basin of New Mexico during Q3. In the Greater Sand Dunes area of Eddy Co., the Cedar Canyon 23_24 Federal #32H (7,235-ft lateral) reached a record peak 24-hour rate of 6,497 boe/d from the Bone Spring at Piece Crossing field. In this area, the last seven wells averaged IP30s of 3,750 boe/d. Three of these wells are in the top 15 all-time best wells in the Permian by 30-day rate, the company says. A record 2nd Bone Spring producer, the Cedar Canyon 23 #6H with a 7,200' lateral yielded an IP30 of 4,500 boe/d.

SVP and President of Oxy's Domestic Oil & Gas Joseph Elliot said, "These record results span to 2nd Bone Spring, the 3rd Bone Spring and the Wolfcamp XY, which makes the Greater Sand Dunes area extremely attractive from a full-cycle returns perspective." Continues On Pg 29

Oxy ramped from 2 to 5 rigs at Greater Sand Dunes sweet spot



What have we done

Developed proprietary workflows

High graded properties

Improved landing zone

Longer laterals

Proppant and additive optimization

Move to slickwater and water recycling

Zero in on optimal lbs/ft and lbs/cluster

Optimum cluster spacing

Incorporate enhanced flowback techniques

Numerous carefully designed trials with data acquisition

Independent laboratory testing

Computer modeling

Improved execution

Highest HES standards

Proppants

Long road

Generally downsizing in proppant size

Tried many different “new” technologies

Conductivity not as critical as once thought

100 mesh is about 35,000 larger than typical unconventional formation pore throat

No apparent success in propping natural fractures with small particles

20/40

30/50

40/70

100 mesh

WC Pore Throat
0.005 microns

Resin Coated

Light weight &
Buoyant

Infused

Additive Optimization

Start with a blank slate and work forwards

- What additives are needed and why
- Justify the need
- Typically start with “kitchen sink” and work backwards

Perform 3rd party chemical analysis

- Is what I am using the best
- Does it meet supplier claims?
- Does it even work?
- Trust but verify

Understand the tests you are evaluating

- Many appear designed to sell chemicals

Trials

Why Trial?

Increase production and/or EUR

Lower cost

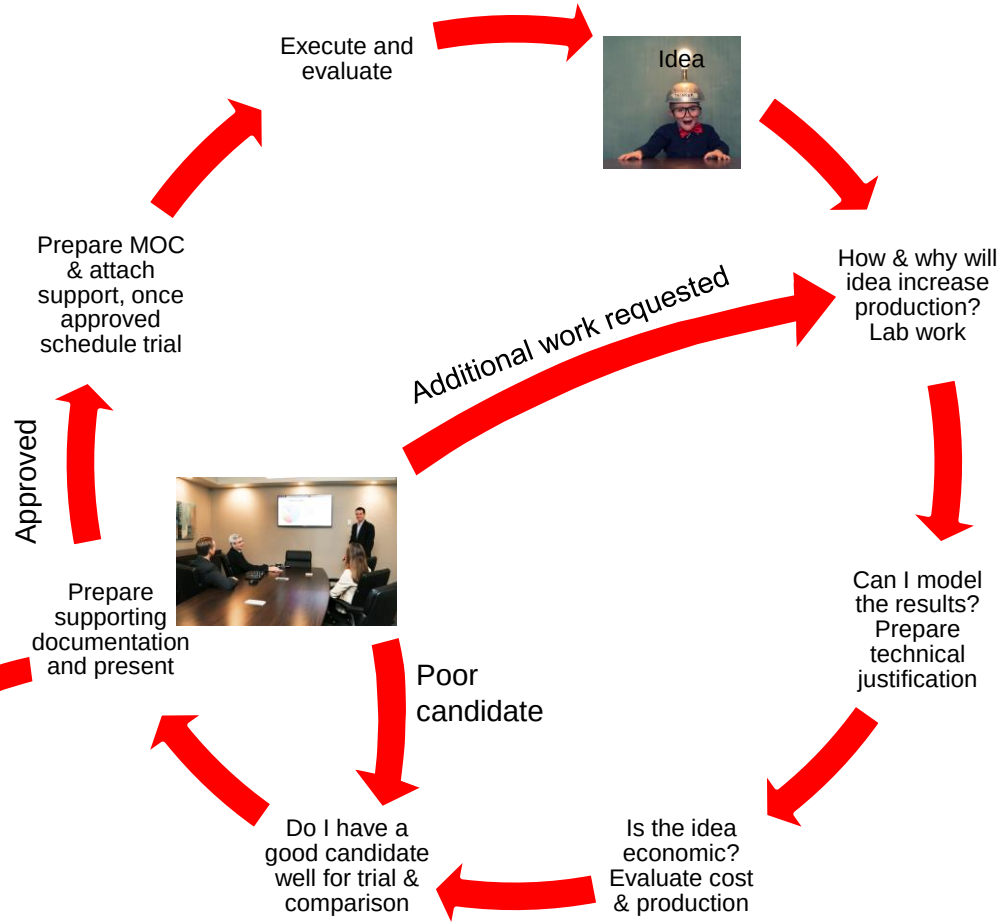
Learn something

- Aid in future job placement or design

Competitive advantage

Define success before starting

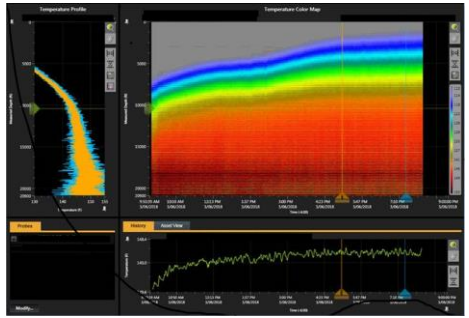
Know what will change if the trial is successful



Trial Evaluations

Includes but not limited to:

- Production logging
- RA tracers
- Single cluster stages
- Micro-seismic
- DTS/DAS
- DFITs
- Soluble tracers
- Fingerprinting
- DNA analysis
- Pressure monitoring
- Tilt-meter
- Specialized core analysis
- Specialized logs
- Modeling
- Normalized production
- RTA
- Productivity Index



Trial Evaluations

Use scientific method

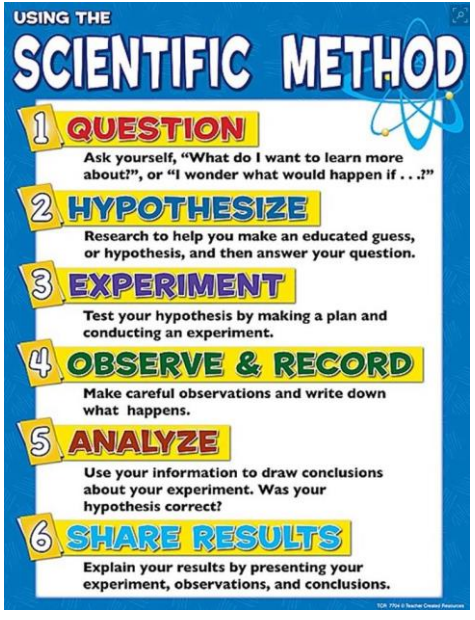
Production typically considered most definitive

- May be skewed by well operations, frac hits, execution, stand alone wells, reservoir heterogeneity

Highest confidence when multiple evaluation methods are employed simultaneously

- Can also provide conflicting results

Typically requires trials in multiple wells for thorough vetting



Looking Forward

Optimum design will be area and bench specific

Landing zone critical

Completion design will dependent on formation properties – “focus on the rock”

Determined by combination of laboratory analysis, field trials, economics and experience

Continually evolving, always looking for a better solution

Questions

Thank You