

Oil Field Innovation  
in an Environment of Falling Oil Prices

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# Schlumberger

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Dimmit County, Texas

Greene County, Pennsylvania



“US shale resilience a product of innovation, CEOs say”

– Oil & Gas Journal, March 2016

What do they mean by “innovation”?

## Process & Efficiency Improvements

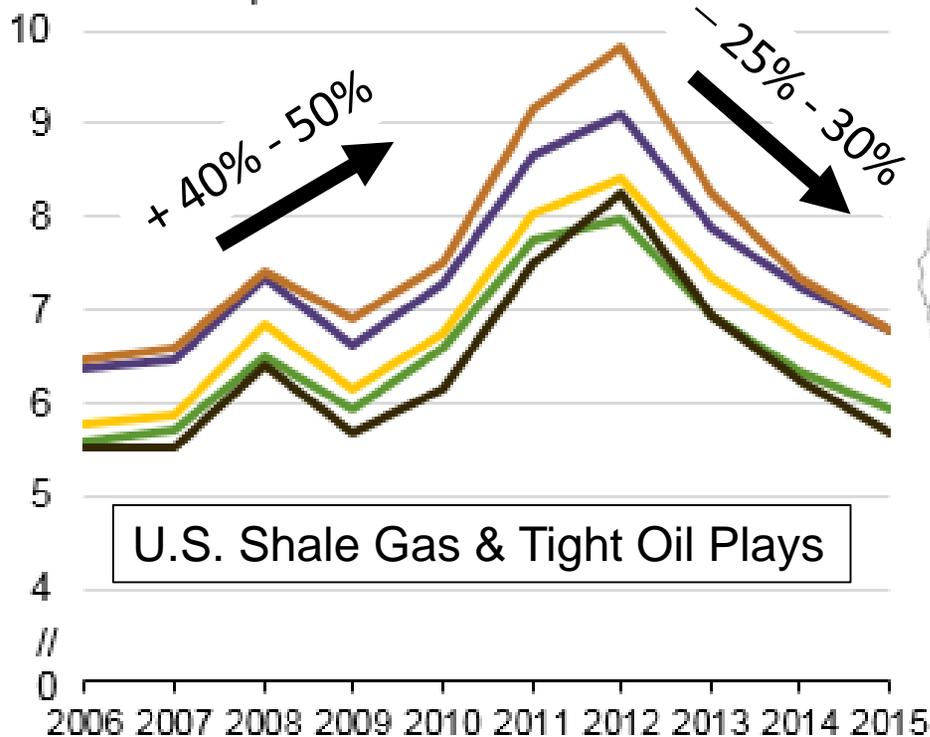
Increasing Costs	Decreasing Costs
Play margin delineation	Derisked geology
Drilling/completion/ stimulation surprises	More efficient drilling/ completion/stimulation
Competition for leases	Consolidation of leases
Supply chain bottlenecks	Supply chain optimization
Infrastructure bottlenecks	Infrastructure buildout
Service cost increases <ul style="list-style-type: none"> <li>○ Equipment shortages</li> <li>○ Personnel shortages</li> </ul>	Service cost discounts <ul style="list-style-type: none"> <li>○ Amortization of CAPEX</li> <li>○ Service efficiencies</li> <li>○ Increased competition</li> </ul>

Early in development cycle

Late in development cycle

# Process and Efficiency Improvements are “Every Day Innovations” that Continue Through Business Cycles

Average well drilling and completion costs indexed to 2014 well designs (2006-15)  
million dollars per well



[https://www.eia.gov/petroleum/weekly/archive/2016/160602/includes/analysis\\_print.cfm](https://www.eia.gov/petroleum/weekly/archive/2016/160602/includes/analysis_print.cfm)

<b>Downturn-Driven Efficiencies</b>		
Asset High Grading	<ul style="list-style-type: none"> <li>▪ No more exploratory drilling</li> <li>▪ Ultra sweet spotting</li> <li>▪ Completing DUCs</li> <li>▪ Only the best rigs and crews</li> </ul>	Intelligent Downsizing
<b>Technical Innovations</b>		
Pad Drilling	<ul style="list-style-type: none"> <li>▪ Site construction efficiencies</li> <li>▪ Well construction efficiencies</li> <li>▪ Creeping rigs</li> <li>▪ Supply chain simplification</li> </ul>	Factory Mode
Super Fracks	<ul style="list-style-type: none"> <li>▪ Longer laterals</li> <li>▪ Tighter fracture initiation points</li> <li>▪ More water</li> <li>▪ More proppant</li> </ul>	Even More Brute Force

# How Do Industry-Changing Innovations Develop Through Business Cycles?

## **Case Studies**

- 3-D Seismic
- Logging-While-Drilling & Geosteering
- Rotary Steerable Drilling
- Horizontal Drilling + Massive Hydraulic Fracturing

# Innovation & the Business Cycle

## **When Oil & Gas Prices are Rising or High**

- Industry R&D grows
- Research prioritizes novel techniques
- New people enter the field, generating fresh ideas.
- Academic & government research driven by societal goals
  - 1970s Petroleum & Synthetic Fuels
  - 1980s Unconventional Gas
  - 2010s Renewables

# Innovation & the Business Cycle

## When Oil & Gas Prices are Falling or Low

- Academic & government O&G research winds down
- Industry R&D shrinks
  - Hiring is cut
  - Less emphasis on novel techniques
  - Efficiency improvements prioritized
  - Some innovations are lost
- Technology development outsourced
  - Downsizing of risk
  - IOCs → Service Cos → Start Ups
- Technology leaders of the next up-cycle shrink the least
  - Industry-changing innovations develop over 10 - 20 years
  - Technology true believers carry on through thick and thin

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