

# **Innovation and Entrepreneurship for the Independent: What Is Different Now Than Before?\***

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## **Abstract**

In a time of low oil and gas prices coming on the heels of "breakthrough" and paradigm-shifting technologies, significant opportunities exist for optimizing or revitalizing reservoirs. The optimized reservoirs can be in mature fields or in unconventional where completions may have resulted in understimulated zones.

In order to develop a strategy, we must consider current conditions in the oil industry and to analyze them both from a causal and a historical perspective, and to determine effective methods for acquiring and developing fields with the goal of positive return on investment. In late 2015, some companies such as SandRidge, Halcon, Goodrich Petroleum, Swift Energy, and Energy XXI had lost more than 90% of their market value since 2014. As of late August 2015, at least 19 companies were projected to be facing imminent bankruptcies, and more were extremely vulnerable.

Is there anything to be learned from previous corrections? The dramatic industry collapse in the 1980s, which extended for many years, was caused by a number of factors. First was an extended price collapse, not only in oil but also in natural gas. In the case of deep gas, the price collapse was particularly dramatic because it had been artificially propped up by government incentives. While technological innovations were meaningful for drilling in overpressured, high-temperature conditions, there were no significant breakthroughs until the horizontal drilling / directional drilling of the Austin Chalk and also offshore. The price collapse, coupled with an era of hostile takeovers, high interest rates, banking instability, and declining production resulted in a

downturn from which it was very difficult to recover. In 1998, another price collapse occurred, this time from macro-economic factors. It coincided with the collapse of the ruble.

Current conditions were created due to a perfect storm of innovative technology and massive financial firepower in the form of what can be considered to be “Wall Street Plays” or IPO plays, along with massive investment banking portfolios. The prospect of being able to develop and produce a homogeneous reservoir the size of the state of Rhode Island, and to utilize horizontal drilling and multi-stage hydraulic fracturing was deeply exciting to large investment houses. Further, the USGS and other entities fed the flames by revising upward the reserves estimates in the Bakken. What was not truly factored in were the steep decline rates and the extreme heterogeneity in the reservoirs (a failure to listen to the geologists!), and when the reserves estimates had to be written down to conform with SEC regulations, difficulties resulted. Unfortunately, many companies felt compelled to take on significant debt, and as a result they have been unable to continue the same rates of drilling and to produce what they have.

What resulted was a classic bubble. And, as in the case of all bubbles, there are significant opportunities for acquisitions. Companies, properties, and royalties may be available at fire-sale prices.

How can one identify good candidates for acquisition and also for optimization (refracturing, increased density, EOR, improved equipment, etc.)? It is important to adopt new technologies and also financial strategies / entrepreneurship. One approach is to take a systematic approach and posit a number of questions which will allow one to identify opportunities and to deploy a plan which brings together teams of geologists, engineers, and other specialists. The presentation discusses the factors to keep in mind--and how to go about identifying and developing a plan for reservoir optimization and for creating successful entrepreneurial start-ups that can operate, provide services, and develop new technologies.

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**Link to audio of presentation**

<http://www.zenzebra.net/podcasts/nash-santafe-august2015.mp3>



# **Innovation and Entrepreneurship for the Independent: What Is Different Now than Before?**

***Susan Smith Nash, Ph.D.***  
***AAPG***

# *Current Conditions*

**Some of the companies that have lost more than 90% of market value since 2014**

- SandRidge
- Halcon
- Goodrich Petroleum
- Swift Energy
- Energy XXI

# *Current Conditions*

## **Imminent Bankruptcies**

- Samson
- PostRock
- Midstates Petroleum (NYSE:[MPO](#))
- Resolute Energy (NYSE:[REN](#))
- W&T Offshore (NYSE:[WTI](#))
- Breitburn Energy (NASDAQ:[BBEP](#))
- Comstock Resources (NYSE:[CRK](#))

# *Contributing Factors*

## **Convergence**

- Low oil prices
- Debt
- Reduced line of credit
- No refining capacity / storage
- Rising midstream costs
- Litigation resulting in paralysis

# *Now vs. Previous Corrections*

1985 and late 1980s

- High interest rates

- Artificial pricing for deep gas

- Extreme overproduction

- Few technology paradigm shifts

1998

- Collapse of ruble

- Collapse of demand, with overproduction

2008

- Global economic collapse / demand collapse

- Overproduction to fund underground military activities

# *Now ...*

- Demand slowdown
- Overproduction to destabilize producers
- Overproduction to fund military activities
- Technological breakthroughs
- Consequences of “Wall Street plays” (massive unconventional)
- Massive debt
- Low interest rates
- Refining / storage bottlenecks

## *Initial Result? No Drilling*

Time of “wait and see”

- Getting through the “pinch points”
- Looking for opportunities
- Developing a strategic approach

What is  
a geologist  
to do?

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SMITH 1

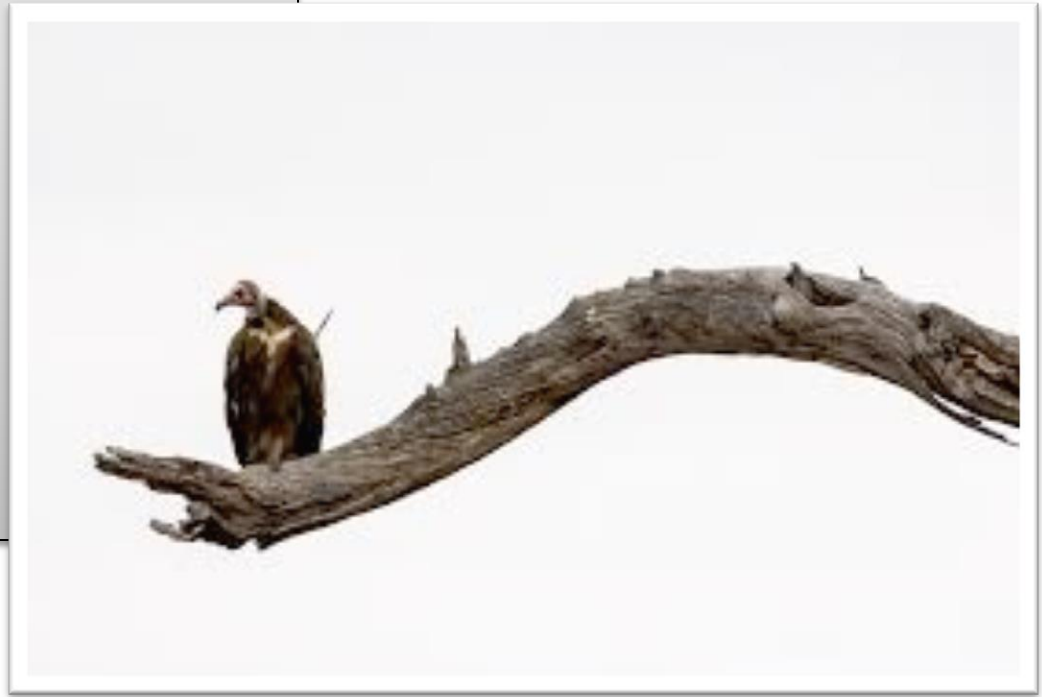
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CLEVELAND COUNTY, OK.

# *Acquisitions and Fire Sales*

## ***Year of the Vulture***

- Companies
- Properties
- Royalties



# *Identifying Good Candidates*

- Mature Fields
- Shale plays with steep decline rates in the laterals
- Refracturing
- Understimulated potential between laterals
- Horizontals: drilled but not completed

# Question 1

- *What do we do about reservoirs that have lost their drive?*
- *How can geologists and geophysicists contribute?*
- *Engineers?*

# *Floods to Restore Reservoir Drive*

- CO2 floods
  - Where economically viable?
  - What are the pros and cons?
- Waterfloods:
  - how / why geology matters

# *Seismic Applications*

- Seismic for pore pressure
  - Where economically viable?
  - What are the pros and cons?
- 3D seismic to model the reservoir
  - Structure
  - Faults

# *Shale Plays*

- Do they decline because they have lost their drive?
- What we do we know about
  - fractures,
  - proppants,
  - interference?
- If they have lost pressure / drive, what are the implications?

## Question 2

- *What are the best ways to recover oil within an old field?*

# *Infill Drilling*

Where and why do we drill?

- Depositional environment / understanding the geology
- Geochemistry: what can it tell us?
- Geomechanics: Drive / migration pathways
- Structure: Faults / fracture networks

# *Optimizing Operations*

- Oil field chemicals
- Corrosion control
- Midstream
- Storage
- New pumps / downhole
- Smart oil field / remote operations

# *Synchronous Information*

- What do I need?
- When does it help?

# *Examples*

- Smart Drilling / Geosteering
- Mudlogging?
- XRF?
- XRT?
- Logging While Drilling:
  - what is the state of the art right now?

# *Examples*

- Smart Drilling / Geosteering
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**Won't get  
fooled  
again**

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THIS UNIT STARTS  
AUTOMATICALLY

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CLEVELAND COUNTY, OK.

I have a big problem, Graham.  
Check out the new pumping unit.

Looks good!



A photograph showing two people from behind, standing on a gravel path at a closed metal gate. The person on the left is a woman with dark hair in a bun, wearing a grey t-shirt and dark jeans. The person on the right is a man wearing a white hard hat, a blue long-sleeved shirt, and a high-visibility orange safety vest. They are looking towards an oil pumpjack in the distance. To the left of the pumpjack is a large pile of hay covered with a grey tarp. To the right is a large metal storage tank. The background shows a flat landscape with bare trees under a cloudy sky. A speech bubble on the left contains the text "Yes. It looks good.".

Yes. It looks good.

But, it is horrible.  
It is not working!

What happened?



I got fooled again! I thought I got a great deal on a refurbished pumping unit, and it was a great deal. But it was too small, and it is not able to pump off all the water.

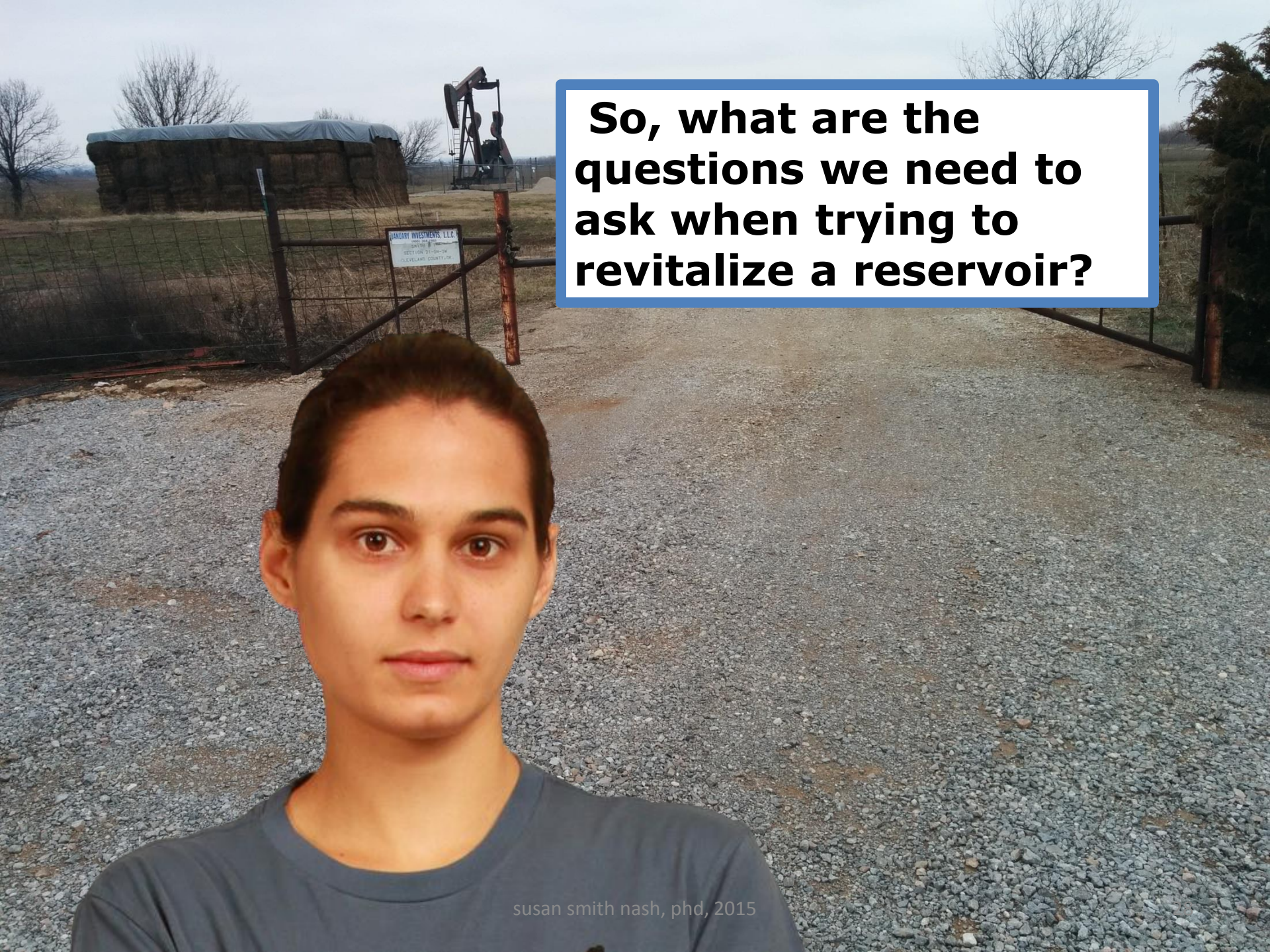
How did you decide on that pumping unit and not another?



It was being auctioned and I got it for a great price. And, supposedly it could handle the volume of water -- but it can not. Plus, it is on a timer, and it freezes up and does not start pumping when it is supposed to. Can you help me understand more about pumping units in mature fields?

I would love to! There is really a lot to selecting the right size pumping unit. It is all about producing, and I am always eager to share my experience.





**So, what are the questions we need to ask when trying to revitalize a reservoir?**



**We are eager to learn!**

# *Completing horizontals*

- Geological vs. Geometrical fracs
- Selecting proppants
- Developing a reservoir model using logs, geochemistry, geology

## Question 3

- *I've drilled but not completed a horizontal well. I wanted to get a better price on my completion.*
- *Is that all I need to think about?*

## Question 4

- *What is the information I need to revitalize a reservoir?*
- *How do I develop workflows and put together teams?*

# *Team Realities*

- Solutions on a shoestring budget
- Larger fields / moderate budgets
- "If we could have it all" budgets / workflows

# *Implementation*

- Artificial lift
- Infrastructure (gas processing, reinjection)
- Water issues
  - Injection
  - New concerns about injection
  - Disposal and other dilemmas

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