

Using Technology to Improve Shale Gas Production – NAPE 2009

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Global Expertise | Innovative Technology | **Measurable Impact**

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A Few Salient Points

Gas prices will remain “low” for the foreseeable future...costs will not!

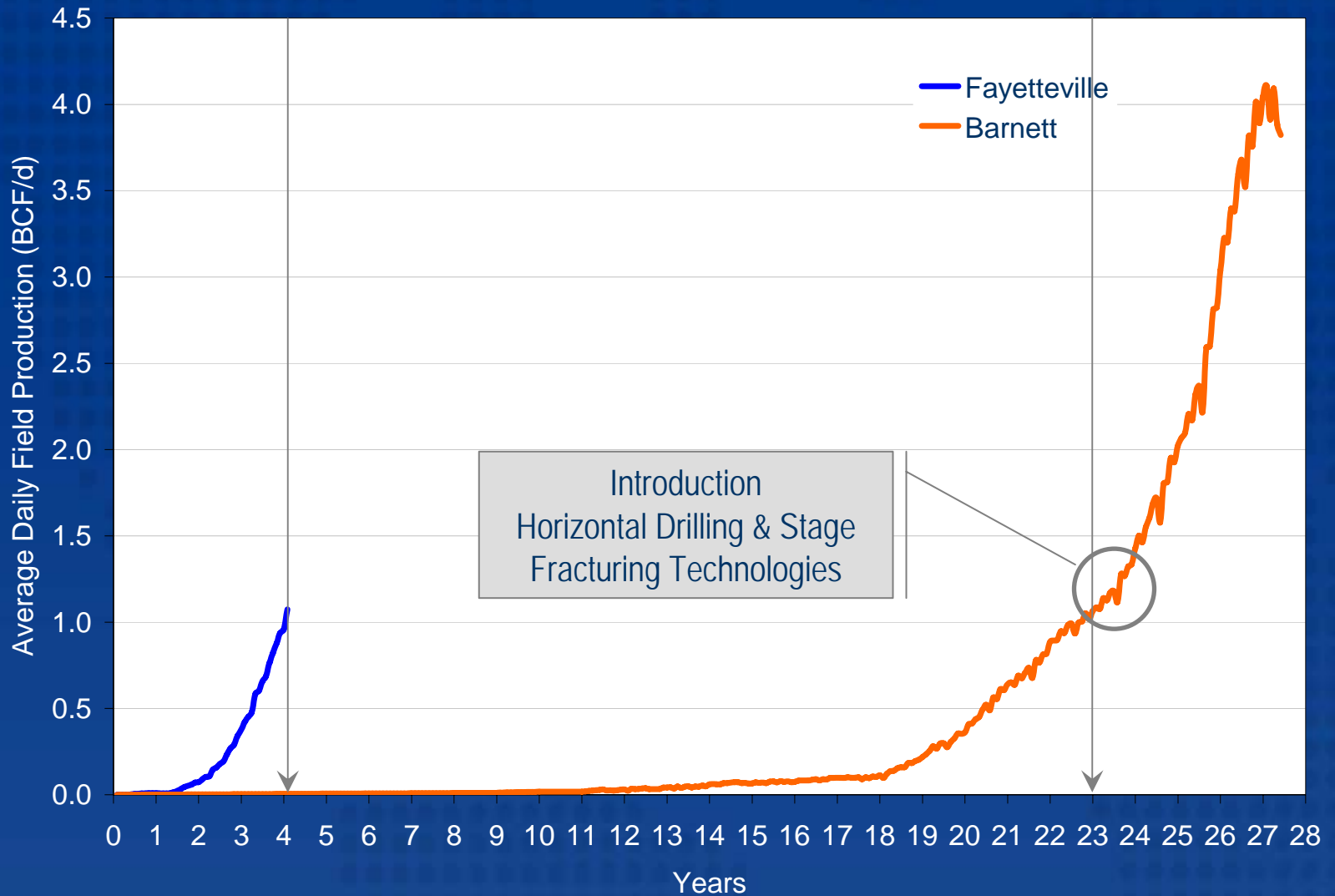
The rate of technology innovation is slowing....using a bigger hammer doesn't count .

Greater regulation of the industry is coming and we should get prepared....education and tone are critical.

Measurements will play a role in lowering the cost and footprint of future natural gas activity.



Shale Gas Wells in the US... Climbing the Learning Curve



Faster, Faster...Cheaper

Goal:

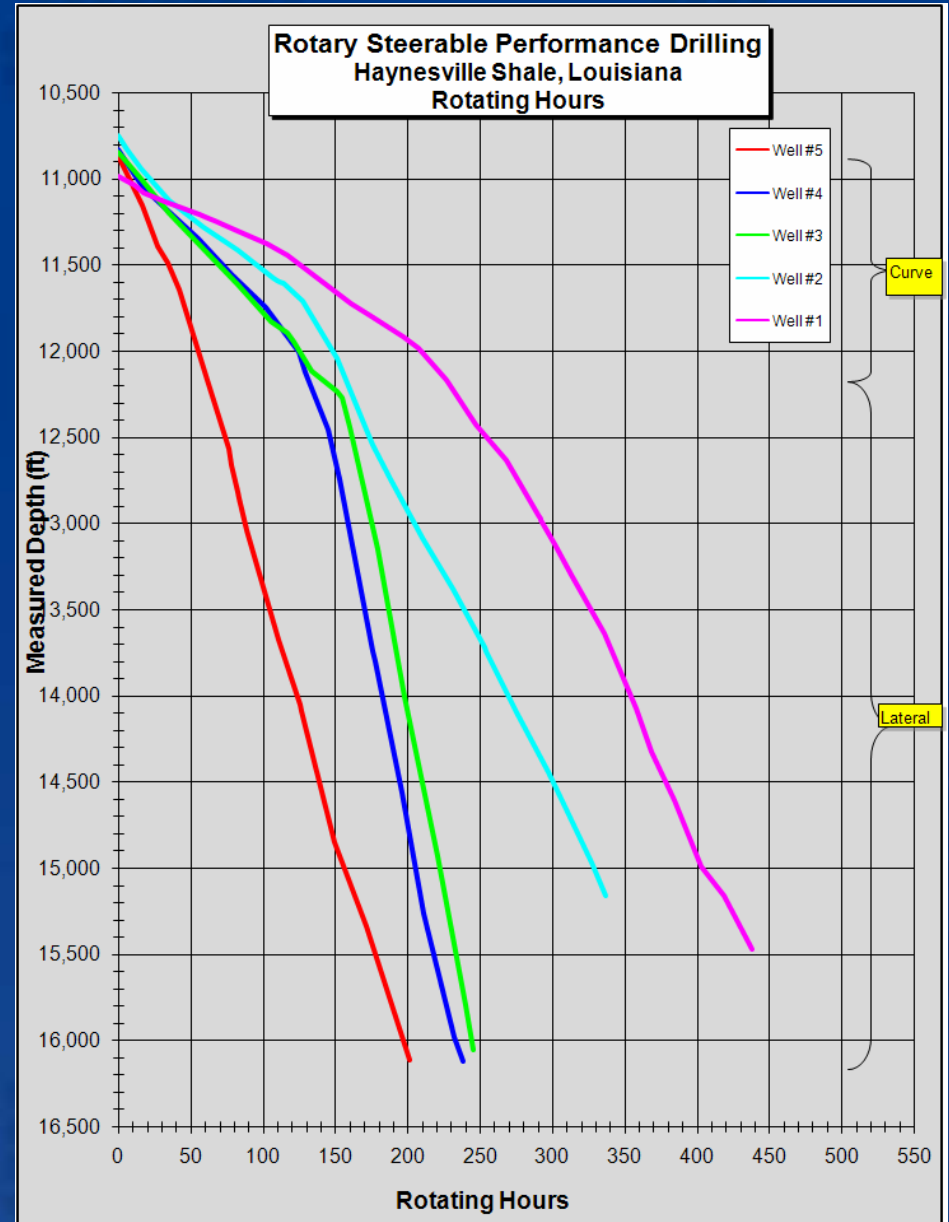
To reduce the number of days taken to drill the curve and the lateral

Solution:

Utilize PowerDrive* rotary steerable drilling system and K&M drilling optimization to Increase Penetration Rate and maintain Wellbore Quality

Results:

Reduced Drilling Days well-on-well



Land the lateral in the sweet spot...

Goal:

Improve Fracture Conductivity

Solution:

In-Situ Stress Testing technique combined with a calibrated stress profile to select the optimal lateral landing

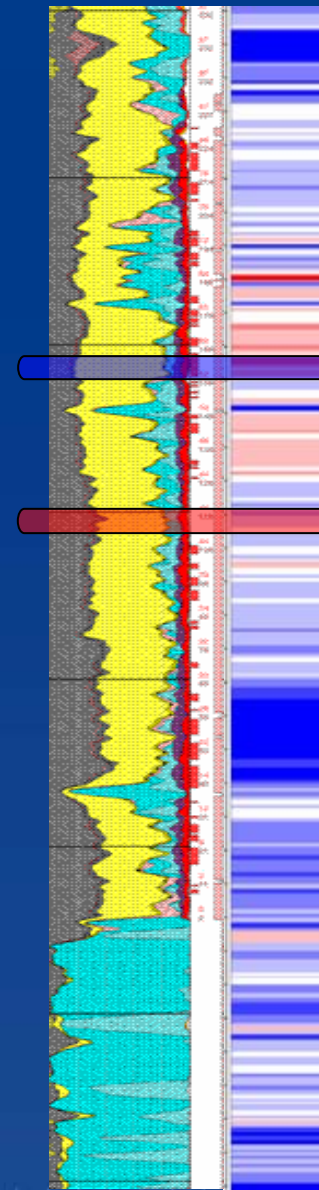
Results:

Maximum fracture coverage in the zone of interest.

IP and after tax rate of return doubled;

EUR increased by 20%

Well Evaluation



MDT/Sonic Scanner

- Better Reservoir Quality
- Better Stimulation Coverage

< 1BCF Well



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Solve the water problem....

Goal:

Reduce fresh water requirements and produced water disposal

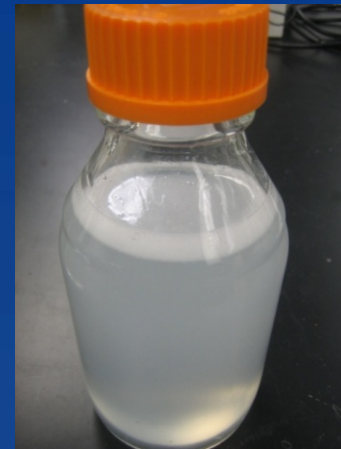
Solution:

XE174 Environmentally friendly friction reducer for high salinity produced water. Solvent and surfactant free.

XE175 Biodegradable Non Hazardous Biocide effective on all types of bacteria

Results:

Reduces water required by > 50%



Typical solvent in tap water



XE174



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Distributed Temperature and Distributed Vibration Understanding Production

Goal:

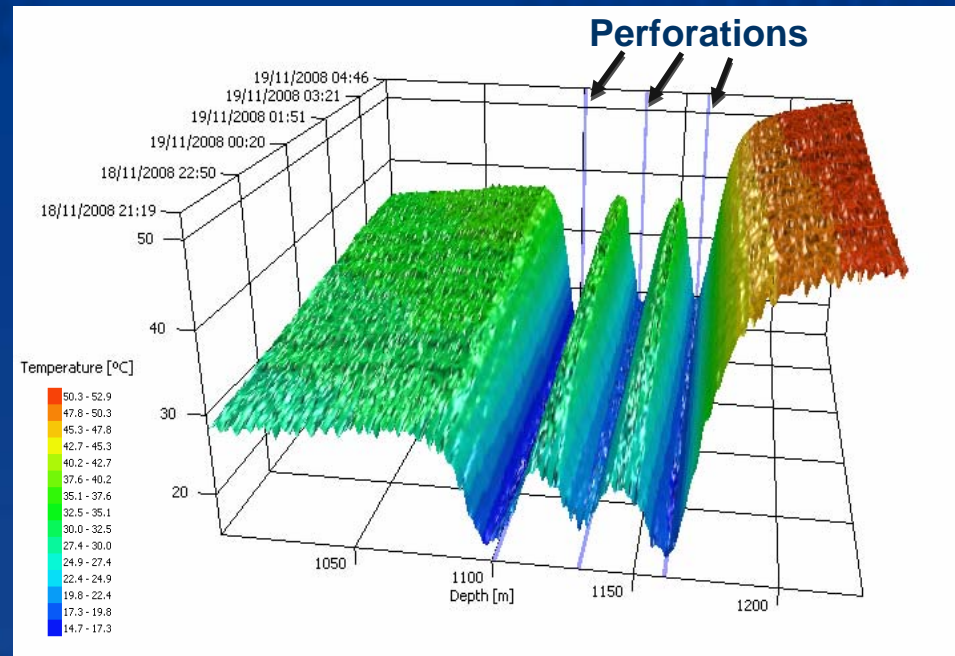
Monitor frac treatment and long-term production

Solution:

Install Fiber Optic line behind casing for frac and production monitoring using the same fiber

Results:

Distributed Temperature and Vibration behind casing provides a cost effective solution for job monitoring with the added value of production monitoring



Frac Less....Produce the Same

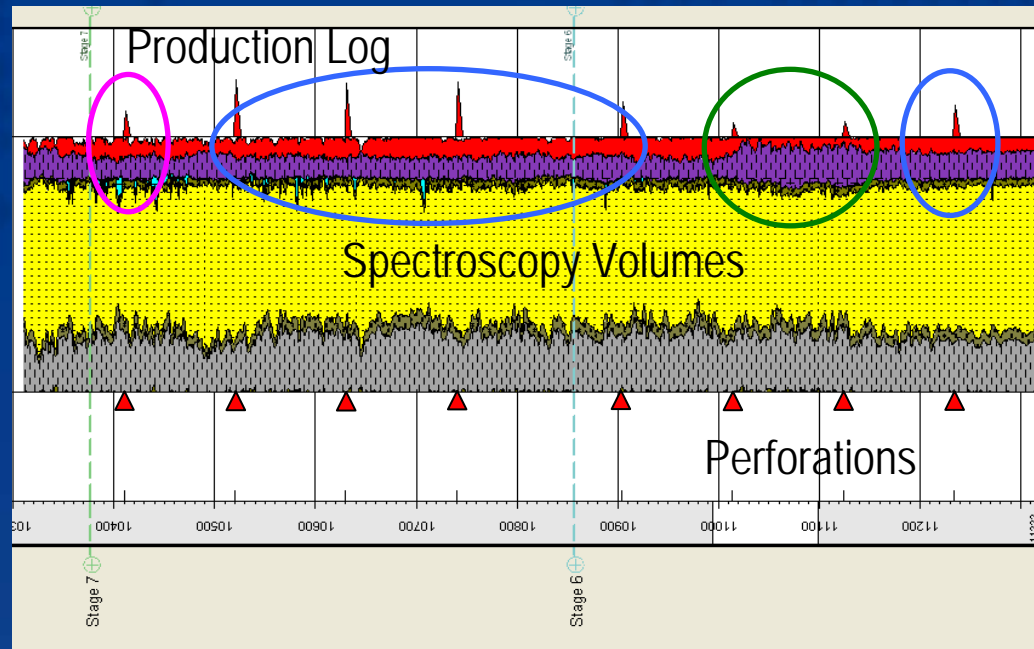
Goal:

Increase horizontal well production

Solution:

Use LWD measurements to pick perforations and frac staging.

Use PL measurements to indicate highly productive zones.



Results:

Increase in production up to 30% compared to offset wells.

Reduce cost of frac treatment



Smaller Treatments...Same Production

Goal:

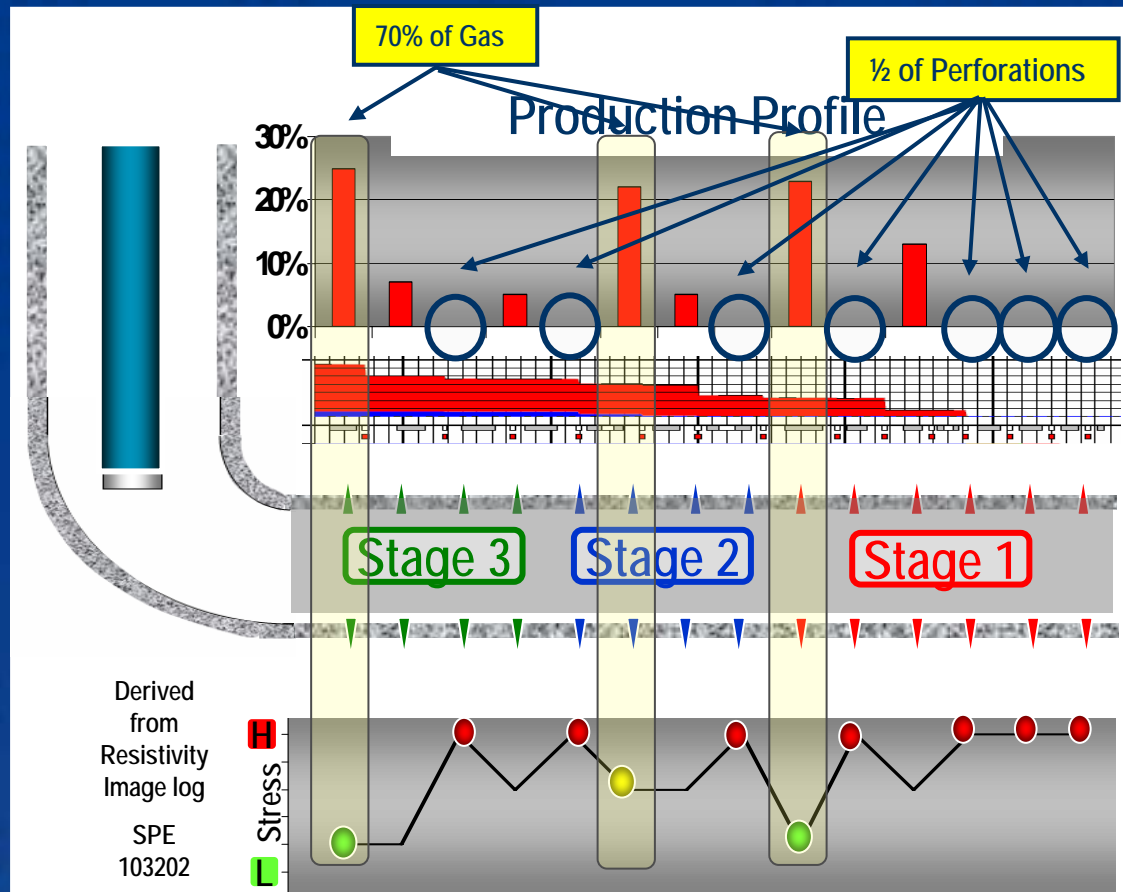
Increase production per dollar spent

Solution:

Use FloScan Imager* measurements to understand what drives production

Results:

Reduced cost of frac treatments on subsequent wells



Thank You!



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