Hostile downhole conditions present complex challenges.
Conservative estimates show 168 trillion cubic feet of natural gas.
**Haynesville formation**

The Haynesville shale is akin to a modern day gold rush. The Haynesville is believed to be one of the largest domestic onshore natural gas fields, with conservative estimates showing 168 trillion cubic feet of natural gas. This would rank it as the fourth largest gas field in the world.

The Haynesville shale is a black, organic-rich shale of Upper Jurassic age that is approximately 10,500–13,500 ft deep. The Haynesville shale play spans several parishes/counties in Northwest Louisiana and East Texas, with some of the highest producing wells having been drilled in DeSoto, Red River and Bienville parishes of Louisiana and northern San Augustine county of East Texas.

Usually shales have low porosity but the Haynesville shale’s porosity has been surprisingly higher than other shales, indicating its ability to contain more gas.

The Haynesville formation is underlain by the Smackover formation and overlain by rocks of the Cotton Valley Group, both of which also contain gas and are current drilling targets. The Haynesville shale was deposited about 150 million years ago in a shallow offshore environment.


**Haynesville Shale Challenges**

The Haynesville shale’s geophysical properties have proved especially challenging. To economically develop the Haynesville shale’s heterogeneous formations, it is important to fully understand the unique characteristics of the reservoir.

In shale plays, reservoir knowledge is vital because the mineralogy, lithology, depth and thickness can change considerably over small distances. No two shale plays are the same. Indeed, the Haynesville play goes deeper and has higher reservoir pressure than other North American unconventional shale plays. Sustainable development in shale reservoirs requires a multi-disciplined company that can map a course from discovery through development on into the decline of the shale life cycle. Halliburton is this company.

From personal experience, we know that in the Haynesville, average well vertical depths are 11,800 ft with bottomhole temperatures averaging 330°F, and wellhead treating pressures during stimulation commonly exceeding 10,000 psi. As a result, wells here require almost twice the amount of hydraulic horsepower and more advanced fluid chemistry than other shale plays in the Southern US.

In these deep wells, with fracture gradients of 1 psi/ft and low Young's modulus, there is also concern about the ability to sustain production with adequate fracture conductivity. Because of variations in the formation, stimulation designs must be based on solid reservoir knowledge of every part of the entire well, identifying which parts of the horizontal have the greatest potential and what treatment best fits the formation.

Some environmental challenges for operators drilling in this play include requiring large volumes of water for fracturing, thus making water conservation and disposal a primary issue. In addition, the use of water-based mud systems is increasing as environmental issues come to the forefront. For optimizing the production and drainage area in a timely and economical fashion, horizontal completions are the most popular completions choice in the Haynesville shale.
Haynesville Shale

black, organic-rich
the geophysical properties are challenging
Experience Counts
Halliburton has pioneered the methodology, processes and technologies instrumental for developing and unlocking the gas reserves in the unconventional low-permeability reserves of the Haynesville shale formation. Our holistic approach consists of constant collaborations with the clients fit-for-purpose technologies to help operators enhance asset value throughout the reservoir life-cycle.

Some of the services include:
- **Drill bits**: built to withstand these harsh environments.
- **Durable high-horsepower pumping equipment**: provides the maximum horsepower necessary to effectively fracture stimulate the Haynesville, with formation depth and high-fracture gradients that can expose pumping equipment to extensive pump times at pressures above 12,000 psi.
- **Engineered solutions**: ensures a well-designed and executed cementing plan.
- **High strength proppants**: resists crushing when dealing with this high stress environment.
- **Microseismic tools**: can withstand high heat to improve well placement and stimulation designs.
- **MWD/LWD tools**: offers compatibility and reliability in the high temperature reservoirs.
- **Openhole logging tools**: key factor to ensure long-term well viability.
- **Shale evaluation service**: designed to help operators, geologists, and engineers answer key questions at critical junctures during the life of the shale asset.
- **Shale fracturing design service**: applies design technologies and modeling tailored to the unique properties of the Haynesville Shale, including handling high frac treatment pressures.
- **ShaleLog® service**: logs identifies sweet spots and characterizes the formation to provide needed data for completion and frac design.
What's your Shale challenge?
For solutions, contact your Halliburton representative.

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

www.halliburton.com/haynesville

H07509 04/2010
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