Summary
This new mud system was formulated to alleviate hole-cleaning problems an operator was experiencing while drilling extended reach lateral sections in a high temperature high pressure (HTHP) environment. The operator was looking for a fluid that provided high low shear rate viscosity (LSRV) with minimal equivalent circulating densities (ECD) and non-progressive gels.

Background Highlights
Previous drilling muds using Xanthan gum and partially hydrolyzed polyacrylamide (PHPA) polymers failed to provide these qualities under dynamic conditions even when treated with oxygen scavengers and biocides. The overarching goal was to develop a "high performance water-based fluid" that maximized penetration rates, minimized overall days on the well, provided a near-gauge wellbore, and minimized damage to the formation in the zones of interest in a bottom hole circulating temperature (BHCT) of 270 to 300°F. The Drilling Specialties lab formulated a system to help the operator achieve these goals.

Challenges
The potential problems identified through offset/recap data on wells in Cherokee County, Texas were:

- Excessive drag and torque while drilling
- Excessive ECD's leading to loss circulation
- Difficulty with cleaning the wellbore
- Difficulty maintaining the operator's desired 6 rpm reading
- HTHP environment degrading polymer performance
- Excessive days on hole
Solution
The solution to the problem was to utilize a 9.8 ppg (pounds per gallon) bentonite/polymer/lignite drilling mud system and switch from Xanthan gum and PHPA to the more thermally stable HE® 150 polymer and Driscal® D polymer.

Results
With the incorporation of just 6 pails of Liquid HE® 150 polymer into a 1478 bbl (barrels) system and a concentration of only 0.2 ppb (pounds per barrel), the hole cleaning problems ceased. Torque and drag were also reduced. This was validated by Drilling Specialties lab testing which illustrated improvement of the coefficient of friction of the field mud by 15 - 18 percent. Additional testing showed that adding 0.5 ppb of Driscal® D polymer increased the 6 & 3 rpm values substantially far beyond the 11 cps (centipoise per second) required. See Table 1 for 6 rpm readings.