Whatever your challenge, Halliburton is there with you.
Benefits of Advanced Technology

Based on two field case studies
Frac Fluid Additives

Depending on the fluid system being pumped various additives are used:

<table>
<thead>
<tr>
<th>Additives</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymers</td>
<td>Clay Control</td>
</tr>
<tr>
<td>Crosslinkers</td>
<td>Biocides</td>
</tr>
<tr>
<td>pH Control</td>
<td>Conductivity Enhancers</td>
</tr>
<tr>
<td>Gel Breakers</td>
<td>Fluid Loss Additives</td>
</tr>
<tr>
<td>Surfactants</td>
<td>Proppants</td>
</tr>
</tbody>
</table>

Additives are transported in concentrated form and diluted when pumped
- Typical blended concentrations are less than 3 gallons per 1,000 gal of base fluid

All additive injection rates are controlled

The purpose of any additive is to improve the overall effectiveness of the resulting hydraulic fracture
- i.e., productivity of the well
Biocides

- Specialized biocides
- Chlorine
- Ozone
- Ultraviolet light

DNA before exposure  DNA after exposure
Polymer Gels

- Sacked Gel
- Liquid Carrier Fluids
- Advanced Dry Polymer Blender
New Fluid System Performance

Applications
• Gelled fracs
• Water fracs
• Hybrid fracs

Performance
• Good results
• Wide range of parameters

All ingredients sourced from the food industry, but that comes with additional regulations and cost
Halliburton Chemistry Scoring Index

- Assesses three hazard criteria
  - Health
  - Safety
  - Environmental

- Hazards in each criterion assessed by reviewing specific categories

- Health and Safety categories based on the U.N. Globally Harmonized System for Classification and Labeling of Chemicals (GHS)

- Evaluated by third party

© 2011 Halliburton. All Rights Reserved.
Halliburton Chemistry Scoring Index

Provides a solid basis for choosing more environmentally-focused chemistry while balancing the selection with overall well-completion performance.