FLAIR
Fluid Logging and Analysis in Real Time Service
FLAIR

The FLAIR* fluid logging and analysis in real time service, delivered by Geoservices analysts, is a unique wellsite service for continuous extraction and analysis of hydrocarbon from mud while drilling.
The FLAIR fluid logging and analysis service provides fluid characterization and early insight into C₁–C₅ reservoir fluid composition ahead of downhole sampling and well testing.

Hydrocarbons extracted from the drilling mud at surface are continuously analyzed to provide quantitative analysis of C₁–C₅ analogous to the composition of downhole reservoir fluid. Drilling conditions common to deepwater wells, cold mud returns, and complex modern drilling fluids do not affect the FLAIR service results. In addition, the FLAIR service allows monitoring of C₆–C₈ components and light aromatics to enhance fluid characterization even in the zones where the acquisition of other conventional data is inconclusive.

The proprietary process provides a continuous fluid log that allows the operator to plan smarter downhole sampling points. Integration of the FLAIR service data with data from various other formation evaluation techniques provides a robust and more accurate picture of hydrocarbons in the formation. This early quantitative assessment of the composition of potential pay zones while drilling is helping our customers make faster decisions.

### Benefits
- Continuous fluid log
- Smarter wireline sampling decisions
- Improved investigation zones
- Reduction in rig time and costs

### Applications
- Exploration and field development
- Deepwater and ultradeep hot wells
- Unconventionals and tight reservoir environments
- Difficult logging conditions
- Thin beds
- Well placement

### Features
- Controlled extraction and measurement conditions
- Calibration of extractor efficiency
- Correction from recycling and contamination
- Quantitative hydrocarbon characterization
The FLAIR service is supported by the Schlumberger domain experts organization, where experts are located in proximity to the operations, ensuring the right support and information is delivered to the client at the right time, impacting operational decisions.
<table>
<thead>
<tr>
<th>CnF</th>
<th>FLAIR pilot hole</th>
<th>PVT pilot hole</th>
<th>FLAIR sidetrack hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_{1f}</td>
<td>89.2</td>
<td>89.2</td>
<td>89.5</td>
</tr>
<tr>
<td>C_{2f}</td>
<td>6.1</td>
<td>5.9</td>
<td>6.0</td>
</tr>
<tr>
<td>C_{3f}</td>
<td>2.4</td>
<td>2.1</td>
<td>2.5</td>
</tr>
<tr>
<td>iC_{4f}</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>nC_{4f}</td>
<td>0.9</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>iC_{5f}</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>nC_{5f}</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>

*C_{nF} = Quantitative fluid composition provided by the FLAIR fluid logging and analysis in real time service. This composition is comparable to reservoir fluid.*
The Quantitative Service

**Sampling, transport, and analysis**
The FLEX fluid extractor continuously samples mud from the flowline returning from the well. The extracted hydrocarbon is transported to the detector, which is able to analyze the gas from C₁ to C₈ and several Cₙ isomers. The FLEX unit heats the drilling mud to a constant temperature and maintains a steady air-to-mud ratio inside the extraction chamber. These features contribute to a very efficient and repeatable extraction. The constant thermodynamic conditions enable calibration of the extraction efficiency for every component from C₁ to C₅.

To detect and analyze gases at a parts-per-million (or micrograms-per-gram) level, a specially designed mass spectrometer is used as a detector, coupled to a high-speed chromatograph.

By using the principle of mass spectrometry, the FLAIR system’s analyzer can detect co-eluting peaks created by the various ion currents that characterize the different components extracted from the mud. This leads to a very short analysis time—85 s for a full chromatographic analysis up to C₈, including differentiation of several Cₙ isomers.

**Recycling correction**
By placing a second FLEX unit in the pump suction line, the fraction of hydrocarbons recycled with the mud and pumped back into the well is also measured. Correction for recycled gas is only possible because the extraction conditions are the same for both units. The calibration and recycling correction enable the formation fluid composition with respect to the C₁–C₅ components to be quantitatively determined throughout the drilling of the well.

**Data processing**
The Facies gas-on-surface interpretation software is a powerful gas data processing package that handles data versus time, processes data for synchronization and correction, and generates a fluid facies log and compositional analysis of various facies.
Hydrocarbons extracted from the drilling mud are continuously analyzed to provide quantitative analysis of $C_1$–$C_5$ analogous to the composition of reservoir fluid.