Consistently measured digital data from drill cuttings:

Enhanced reservoir characterization
Regional sweet spot identification
Digitization of rock repositories

Benefits & Applications

Digital-Cuttings™ creates a permanent high-resolution digital record of the rock sample, generating a rich, analytics-ready dataset that can easily be upscaled into regional and reservoir scale subsurface models, accurately calibrate rock physics models, or assist in predicting near-wellbore completion performance, which is suitable for all cuttings or core samples, no matter the vintage.
If the DIGITALIZATION of subsurface data is important, then GEOLOG's DIGITAL-CUTTINGS™ service is for you.

At GEOLOG we are “Passionate about cuttings”. Cuttings are an invaluable source of quality data that can be consistently measured and converted into a digital record, stored in a cloud-based platform and easily accessed when required. GEOLOG’s patented Digital-Cuttings™ workflow offers a seamless and consistent approach to generating quality, measured rock and fluids data thus providing reliable quantitative subsurface data and valuable interpretations such as lithology, Litho-Brite™ (Lithofacies) and hydrocarbon fluids when combined with GEOLOG’s G9+ technology.

At the sample scale, the Digital-Cuttings™ workflow offers:

- High-resolution digital images in white light and UV light
- Particle segmentation for particle size & shape data
- Quantitative color extraction data
- Quantitative XRF major & minor elemental data
- Seamless addition of other analytical data e.g., XRD, TOC, GeoPyrolysis or G9+
- Lithology interpretation
- Litho-Brite™ (lithofacies) interpretation

### Screenshot of a typical XRF data sheet showing 10 major elements and 22 minor elements

**XRF Major Elemental Oxides (%)**

<table>
<thead>
<tr>
<th>Si</th>
<th>Al</th>
<th>Fe</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>S</th>
<th>P</th>
<th>Ti</th>
<th>Mn</th>
</tr>
</thead>
<tbody>
<tr>
<td>64.46</td>
<td>7.19</td>
<td>157</td>
<td>2.07</td>
<td>6.67</td>
<td>1.07</td>
<td>0.54</td>
<td>0.14</td>
<td>0.49</td>
<td>0.03</td>
</tr>
</tbody>
</table>

**XRF Trace Elements (ppm)**

<table>
<thead>
<tr>
<th>Cl</th>
<th>As</th>
<th>Cu</th>
<th>Ni</th>
<th>V</th>
<th>Mo</th>
<th>Sr</th>
<th>Pb</th>
<th>Zn</th>
<th>Zr</th>
<th>Rb</th>
<th>Th</th>
<th>U</th>
<th>Cr</th>
<th>Co</th>
<th>Nb</th>
<th>Nd</th>
<th>Cs</th>
<th>Ga</th>
<th>Gd</th>
<th>La</th>
<th>Ba</th>
</tr>
</thead>
<tbody>
<tr>
<td>7900.00</td>
<td>NO</td>
<td>34.90</td>
<td>36.80</td>
<td>52.70</td>
<td>4.60</td>
<td>210.80</td>
<td>1.10</td>
<td>36.80</td>
<td>216.10</td>
<td>62.90</td>
<td>6.10</td>
<td>2.50</td>
<td>51.80</td>
<td>NO</td>
<td>8.20</td>
<td>8.20</td>
<td>20.70</td>
<td>8.10</td>
<td>3.50</td>
<td>NO</td>
<td>7903.00</td>
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</table>

**Calculated Gamma Ray**

67.49

**XR D Lithology**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>15.60</td>
<td>72.30</td>
<td>NO</td>
<td>NO</td>
<td>12.10</td>
</tr>
</tbody>
</table>

**Example sample card display as part of a downhole digital sample catalogue**

- Digital white light image
- Particle segmentation image
- Screenshot of a typical XRF data sheet showing 10 major elements and 22 minor elements
Example 1:
Digitalization of a major Cuttings Repository: example North Slope, Alaska

- 100's of wells & 1000's of cuttings samples.
- Different vintages of cuttings from the 1940s to the recent.
- Analytical consistency.

Umiat-11 well. Full, Digital-Cuttings™ Data Summary Chart of a 1,500ft 1940's vintage vertical well, North Slope Alaska. The data display includes: Tops, SP curve, Cycle interpretation, Lithology, CGR, XRD, Resistivity, Color Extract, Brightness, Hydrocarbon Fluid & Source Rock facies data (G9+) and elemental anoxic, lithology, and marine indicators.

Umiat-11 well, Alaska North Slope. Good correlation (-ve) between Brightness and Total Clays (%) suggesting brighter phases (e.g. upper Torok & Torok/Nanushuk boundary) are ‘cleaner’.

Pristane/Phytane biomarker data from G9+ analyses of cuttings samples as part of a Digital-Cuttings™ workflow, Umiat-11 well Alaska North Slope. Note that a more reducing source rock depositional environment is indicated from the results.
Example 2:
Using a Digital-Cuttings™ based approach to predict reservoir performance, Delaware Basin, New Mexico, USA

• 6 Lateral wells & >1,200 cuttings samples.
• 2 main reservoir benches.
• Litho-Brite™ framework leading to ‘good rock vs bad rock’ interpretation & facies architecture predictions.
• Strong correlation with quantitative mud-gas data.
• Lateral wells with > proportion of ‘good rock’ out-performing wells with < proportion of ‘good rock’ facies.

2 Lateral wells from the Harkey Mills Sand bench of the Bone Spring Formation, Northern Delaware Basin, New Mexico, USA. The black line is the top Harkey Mills Sand pick for each Lateral well. Each plot includes MD (ft), tops, GR, Litho-Brite™ (green to brown colored zones), Brightness & anoxia elemental indicators. Green zones indicate channel-fill sands and relate to ‘good rock’, while brown colors indicate overbank deposits and relate to ‘bad rock’. When put on production Lateral 1 significantly outperformed Lateral 2, due to better completion stage performance in the higher proportion of ‘good rock’. Each Lateral is approx. 5,000ft in length from the top Harkey Mills Sand pick.
Example 3:
NOC requires better near-wellbore rock definition in key exploration well

- 400+ cuttings samples
- Litho-Brite™ interpretation provided a better reservoir definition
- Image analysis revealed a change in particle shape & size through the reservoir interval.
- Good correlation with flow units

Full, Digital-Cuttings™ Data Summary Chart of a 5000m vertical well, offshore GOM. The data display includes:
Tops, Lithology, Litho-Brite™ GR, CGR, XRD, Image Analysis, Color Extract, Brightness and elemental lithology, anoxic and marine indicators.
Lithofacies Description:
Average Brightness = 94.61. Confined stacked channel sands, clean, high energy with little evidence of anoxia.