The C-Seal* and the finer grade C-Seal Fine* industrial carbon products are sized plugging agents used to bridge and seal permeable formations in water-, oil-, and synthetic-based drilling fluid systems.

When used while drilling depleted zones, C-Seal and C-Seal Fine reduce differential-pressure sticking tendencies by bridging and plugging formations with high differential pressures. They also can be used to control seepage-to-partial-to-severe lost circulation zones. C-Seal and C-Seal Fine are completely inert and will not affect the rheological properties of drilling fluid systems. They reduce torque and drag by decreasing the coefficient of friction (CoF) and can lower the spurt and total PPT filtrate loss values. Owing to their ability to remain in the entire circulating system using proper solids control, C-Seal and C-Seal Fine can be cost-effective solutions.

Typical Physical Properties
Physical appearance ................................................................. Gray-to-black powder
Specific gravity .................................................................................................................. 1.9
Solubility in water @ 20°C .............................................................. Insoluble

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Median Particle Size $d_{50}$ (μm)**</th>
<th>Recommended Test Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-Seal</td>
<td>100 - 150</td>
<td>Dry sieve analysis</td>
</tr>
<tr>
<td>C-Seal Fine</td>
<td>20 - 40</td>
<td>Laser light scattering</td>
</tr>
</tbody>
</table>

** Median Particle Size ($d_{50}$) is reported as a size range due to variations in the manufacturing and grinding process. If a precise size distribution of a product is critical to a drilling operation, it should be measured with the appropriate Recommended Test Procedure using samples that are representative of those expected to be used in that operation. Nominal $d_{10}$ and $d_{90}$ values are available from Houston Technical Services upon request.
Applications

C-Seal and C-Seal Fine are designed to bridge and seal permeable formations, reducing the risks of differential sticking and lost circulation, and decreasing the coefficient of friction (CoF).

The recommended treatment for seepage losses (< 10 bbl/hr or 1.6 m³/hr) is 15 to 20 lb/bbl (43 to 57 kg/m³) in spotted pills. Their relatively small size and chemical inertness, also allows C-Seal and C-Seal Fine to be incorporated into the entire system at a total concentration of 5 to 20 lb/bbl (15 to 58 kg/m³).

The recommended treatment for partial losses (10 to 100 bbl/hr or 1.6 to 16 m³/hr) is 20 to 50 lb/bbl (57 to 143 kg/m³) in spotted pills. Both materials can be used in combination with other lost circulation materials to control partial-to-severe losses. Fractured carbonates, conglomerates and other very high-permeability formations may require additional pills in tandem with lost circulation materials of appropriate particle size distribution. Alternatively, either or both products can be incorporated into the entire system at a total concentration of 10 to 30 lb/bbl (29 to 85 kg/m³).

Torque and drag may be reduced by incorporating C-Seal and/or C-Seal Fine sweeps into the active system up to a total concentration of 20 lb/bbl (57 kg/m³). Initial treatments for the active system may be added at 4 lb/bbl (11.4 kg/m³) increments while monitoring torque and drag.

C-Seal/C-Seal Fine may require additional wetting agent when used in an oil- or synthetic-based drilling fluid system.

Toxicity and Handling

Bioassay information is available upon request.

Handle as an industrial chemical, wearing protective equipment and observing the precautions as described in the Material Safety Data Sheet (MSDS).

Packaging and Storage

C-Seal and C-Seal Fine are packaged in 50-lb (22.7 kg), multi-wall, paper sacks.

Store in a dry location away from sources of heat or ignition, and minimize dust.