

# Fuel additive technology suite

## Increase fuel values and address safety concerns

Maximizing profitability while making fuels has always been tough, and increased regulations make it harder than ever. In addition, markets have become complex and competitive, and customers need every advantage.

As a long-time technology leader in the industry, Baker Hughes has a dynamic suite of technologies to help combat fuel problems, including **SULFIX™ hydrogen sulfide (H<sub>2</sub>S)** and **mercaptan scavengers** and **TOLAD™ fuel additives**. Baker Hughes technology experts have extensive application knowledge and field training, and can accurately diagnose hydrocarbon needs and apply the appropriate program in a safe and economical manner.

In addition, the **PREPARED TO RESPOND™ (P2R™) services** helps maximize profits by meeting fuel and crude oil specifications, increasing their value and marketability.

Whether importing or exporting, in a refinery or a distribution system, there are defined fuel quality specifications to be met. Baker Hughes has fuel additives that reduce fuel injector deposits, enhance lubricity, improve stability, mitigate corrosion, and eliminate water entrainment. The Baker Hughes fuel additive technology suite can increase the profitability of cargos that have high pour points or high H<sub>2</sub>S levels, and effectively maintain refinery throughput during a shutdown.

Contact Baker Hughes for more information on how the fuel additive suite can increase fuel values.

### Applications

- Refineries and terminals
- Biofuels and finished fuels
- Pipelines
- Aftermarket fuel packages

### Benefits

- **SULFIX H<sub>2</sub>S** and mercaptan scavengers
  - Address health, safety and environment (HSE) concerns and government regulations
  - Reduce product rejections and shipping delays
- **TOLAD corrosion inhibitors**
  - Meet corrosion specifications for both ferrous and non-ferrous metals
- **TOLAD cold flow additives**
  - Improve low-temperature operability
  - Decrease filter plugging caused by wax buildup
- **TOLAD dehazers and demulsifiers**
  - Eliminate water haze from fuels
  - Reduce corrosion in distribution systems
- **TOLAD lubricity improvers**
  - Restore lubricating properties of hydrotreated diesel fuels
  - Reduce failure of fuel pumps and injectors

Challenges					Baker Hughes solutions	Benefits gained
	Crude oil	Marine fuel	Intermediates	Refined products		
<ul style="list-style-type: none"> <li>Fouling in fuel distribution system</li> <li>Fouling in burners</li> <li>Fouling of combustion chamber and exhaust chamber</li> </ul>					<ul style="list-style-type: none"> <li>Ash reduction additives and dispersants</li> </ul>	<ul style="list-style-type: none"> <li>More efficient combustion</li> <li>Less maintenance of fuel system</li> <li>Increase reliability of equipment</li> </ul>
<ul style="list-style-type: none"> <li>Slime and solids in fuel storage</li> <li>Plugged filters and fouled instrumentation</li> <li>Emulsion problems</li> <li>Corrosion</li> <li>Elastomer breakdown</li> </ul>					<ul style="list-style-type: none"> <li><b>X-CIDE™ biocides</b> (water- or fuel-soluble)</li> </ul>	<ul style="list-style-type: none"> <li>Decrease plugging of filters and injection equipment</li> <li>Improve water shedding characteristics</li> <li>Reduce storage tank corrosion</li> </ul>
<ul style="list-style-type: none"> <li>Poor ignition quality in diesel</li> <li>White smoke</li> <li>Difficult starting</li> <li>Rough idle</li> </ul>					<ul style="list-style-type: none"> <li>Cetane improvers</li> </ul>	<ul style="list-style-type: none"> <li>Improve combustion efficiency</li> <li>Better starting characteristics in cold weather</li> <li>Reduce emissions</li> <li>Permits increased blending of lower cetane stocks</li> </ul>
<ul style="list-style-type: none"> <li>Gelled fuel</li> <li>Reduced flow</li> <li>Filter plugging</li> <li>Blocked lines</li> </ul>					<ul style="list-style-type: none"> <li><b>TOLAD™ operability additives</b> (CFPP, LTFT)</li> <li>TOLAD pour point depressants</li> <li>TOLAD cloud point depressants</li> </ul>	<ul style="list-style-type: none"> <li>Improve flow characteristics in cold weather</li> <li>Permits blending of higher pour materials</li> <li>Improve low temperature vehicle operability</li> <li>Lower cloud point and pour point</li> </ul>
<ul style="list-style-type: none"> <li>Poor fuel economy</li> <li>Highly visible emissions</li> <li>Fouling of combustion chamber and exhaust chamber</li> <li>Vanadium-based corrosion at the 'hot-side' of a boiler, engine, or gas turbine</li> <li>Cold-end corrosion due to hydrolyzed SO<sub>2</sub></li> </ul>					<ul style="list-style-type: none"> <li><b>MariQuest™ marine fuel additives</b></li> </ul>	<ul style="list-style-type: none"> <li>Overall improvement in performance, efficiency, and emissions standards</li> <li>Reduce corrosion</li> <li>Extend maintenance cycles</li> <li>Reduce slag</li> </ul>
<ul style="list-style-type: none"> <li>Electrical charge build-up in fuel due to movement and pumping with the potential for static discharge and explosion</li> </ul>					<ul style="list-style-type: none"> <li>TOLAD conductivity improvers</li> </ul>	<ul style="list-style-type: none"> <li>Increase electrical conductivity of hydrocarbon liquid</li> <li>Enhance safety during handling, loading, and transport of fuels</li> <li>Meet industry conductivity specification for diesel fuel</li> </ul>
<ul style="list-style-type: none"> <li>Hazy fuel caused by finely dispersed water droplets or an emulsion</li> <li>Diminished water shedding properties of a fuel resulting from surfactants present in an additive package</li> </ul>					<ul style="list-style-type: none"> <li>TOLAD dehazers</li> <li>TOLAD demulsifiers</li> </ul>	<ul style="list-style-type: none"> <li>Clear, marketable fuel</li> <li>Reduced microbiological growth</li> <li>Reduced potential for corrosion</li> </ul>
<ul style="list-style-type: none"> <li>Presence of toxic H<sub>2</sub>S</li> <li>Corrosion</li> <li>Emissions control</li> </ul>					<ul style="list-style-type: none"> <li>SULFIX H<sub>2</sub>S scavengers</li> </ul>	<ul style="list-style-type: none"> <li>Improve safety, minimizing employee exposure to H<sub>2</sub>S</li> <li>Reduce toxic emissions</li> <li>Minimize the number of product rejections</li> <li>Decrease demurrage</li> <li>Reduce storage corrosion</li> </ul>
<ul style="list-style-type: none"> <li>Poor fuel lubricity</li> </ul>					<ul style="list-style-type: none"> <li>TOLAD lubricity additives</li> </ul>	<ul style="list-style-type: none"> <li>Reduce wear within engine and fuel injection system</li> <li>Meet industry specification</li> </ul>
<ul style="list-style-type: none"> <li>Presence of mercaptans</li> <li>Corrosion</li> <li>Failed doctor test</li> <li>Odor problems</li> </ul>					<ul style="list-style-type: none"> <li>SULFIX mercaptan scavengers</li> </ul>	<ul style="list-style-type: none"> <li>Improve product quality</li> <li>Reduce odor complaints</li> <li>Improve corrosion characteristics</li> </ul>
<ul style="list-style-type: none"> <li>Increased instability due to the presence of metals such as copper, vanadium, and iron</li> </ul>					<ul style="list-style-type: none"> <li>Metal deactivators</li> </ul>	<ul style="list-style-type: none"> <li>Catalytic metals are chemically deactivated</li> <li>Improve stability</li> </ul>
<ul style="list-style-type: none"> <li>Premium or exported diesel fuel</li> </ul>					<ul style="list-style-type: none"> <li>TOLAD multi-purpose additive packages</li> </ul>	<ul style="list-style-type: none"> <li>Exceed standard fuel specifications</li> <li>Premium fuel marketability claims</li> </ul>
<ul style="list-style-type: none"> <li>Failing copper and/or silver strip corrosion tests</li> </ul>					<ul style="list-style-type: none"> <li>TOLAD non-ferrous corrosion inhibitors</li> </ul>	<ul style="list-style-type: none"> <li>Meet fuel specifications</li> <li>Inhibit corrosion to non-ferrous metal</li> </ul>
<ul style="list-style-type: none"> <li>Hydrocarbon has an objectionable odor</li> </ul>					<ul style="list-style-type: none"> <li>SULFIX hydrogen sulfide and mercaptan scavengers</li> <li>Odor abatement chemicals</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation of H<sub>2</sub>S and mercaptans</li> <li>Acceptable fuel odor</li> </ul>
<ul style="list-style-type: none"> <li>Rusting of pipelines or fuel systems resulting in corrosion-based failures</li> <li>Increased particulates</li> <li>Plugged filters</li> <li>Rough pipe walls</li> </ul>					<ul style="list-style-type: none"> <li>Corrosion inhibitors</li> </ul>	<ul style="list-style-type: none"> <li>Improve pipeline integrity</li> <li>Decrease corrosion of carbon steel equipment</li> <li>Reduce filter plugging</li> <li>Decrease pumping costs</li> </ul>
<ul style="list-style-type: none"> <li>Hydrocarbons which cannot be moved due to: <ul style="list-style-type: none"> <li>high pour point</li> <li>solidification</li> <li>wax deposition</li> <li>reduced pumping rate</li> </ul> </li> </ul>					<ul style="list-style-type: none"> <li>TOLAD heavy oil pour point depressants</li> <li>Paraffin control additives</li> </ul>	<ul style="list-style-type: none"> <li>Enable transportation of waxy crudes and fuels</li> <li>Reduce the need for system heating</li> <li>Reduce the need for higher value cutter stock</li> <li>Enhance the value of heavy fuels</li> <li>Better handling of opportunity crudes</li> </ul>

■ Crude oil   
■ Fuel oil and bunkers (marine fuel)   
■ Intermediate products   
■ Refined products

