

# Extended Refinery Gas and Trace Sulfur Analysis

Configuration of an Agilent Technologies 7890 Series Gas Chromatograph with flame ionization, sulfur chemiluminescence and dual thermal conductivity detectors (FID/SCD/TCD/TCD) for the extended refinery gases and trace sulfurs.

Two separate methods will be developed. Please note that these methods cannot be run simultaneously.

## Method 1 performs the trace impurities analysis in polymer-grade ethylene.

### Components analyzed on TCD 1 include:

<ul style="list-style-type: none"> <li>• Carbon dioxide</li> <li>• Ethane</li> <li>• Ethylene</li> <li>• Acetylene</li> <li>• Hydrogen sulfide</li> </ul>	<ul style="list-style-type: none"> <li>• Argon/oxygen composite</li> <li>• Nitrogen</li> <li>• Methane</li> <li>• Carbon monoxide</li> </ul>
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Lower quantifiable limit of 400 ppm except for carbon monoxide (800 ppm) and hydrogen sulfide (1000 ppm). TCD 2 detects hydrogen to a lower quantifiable limit of 200 ppm.

Components analyzed on the FID include: C1 through C7 paraffins and olefins.

### Determined Components during method development include:

<ul style="list-style-type: none"> <li>• Methane</li> <li>• Ethane</li> <li>• Ethylene</li> <li>• Propane</li> <li>• Propylene</li> <li>• Acetylene</li> <li>• Isobutane</li> <li>• Propadiene</li> <li>• n-Butane</li> <li>• t-2-Butene</li> </ul>	<ul style="list-style-type: none"> <li>• 1-Butene</li> <li>• Isobutene</li> <li>• c-2-Butene</li> <li>• Neopentane</li> <li>• Isopentane</li> <li>• Methyl acetylene</li> <li>• n-Pentane</li> <li>• 1,3-Butadiene</li> <li>• 3-Methyl-1-butene</li> <li>• t-2-Pentene</li> </ul>	<ul style="list-style-type: none"> <li>• 2-Methyl-2-butene</li> <li>• 1-Pentene</li> <li>• 2-Methyl-1-butene</li> <li>• c-2-Pentene</li> <li>• Neohexane</li> <li>• n-Hexane</li> <li>• n-Heptane</li> <li>• Benzene</li> <li>• Initial toluene/C8+ backflush</li> </ul>
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An analysis time of less than 15 minutes is expected for Method 1. Requires split/splitless capillary inlet with Electronic Pressure Control.

## Method 2 – Sulfurs in Gaseous Fuels

### The SCD Determined Components in gas phase samples to a lower quantifiable limit of 0.02 ppm:

<ul style="list-style-type: none"> <li>• Hydrogen sulfide</li> <li>• Carbonyl sulfide</li> <li>• Sulfur dioxide</li> <li>• Methanethiol</li> <li>• Ethanethiol</li> <li>• Dimethyl sulfide</li> </ul>	<ul style="list-style-type: none"> <li>• Carbon disulfide</li> <li>• 2-Propanethiol</li> <li>• 2-methyl-2-propanethiol</li> <li>• 1-Propanethiol</li> <li>• Ethyl methyl sulfide</li> <li>• 2-Butanethiol</li> </ul>	<ul style="list-style-type: none"> <li>• Thiophene</li> <li>• Diethyl sulfide</li> <li>• 1-Butanethiol</li> <li>• Dimethyl disulfide</li> <li>• Diethyldisulfide</li> </ul>
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Analysis will be developed per ASTM D5504: "Standard Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Chemiluminescence." Heavier Sulfur compounds will be detected, but may have some compounds co-eluting.