Water in petrochemical feedstocks can cause problems for processors. Freezing of pipe lines and valves and poisoning of expensive catalysts are just a few examples. Monitoring water in petroleum from an upstream source to the downstream processing plant is critical to insure uninterrupted operation. Unlike the Karl Fischer analysis, the GC water analyzer does not suffer from the adverse effects of the petroleum matrix which can skew the KF results. Head-space GC is a cleaner approach to automated sample introduction that bypasses the undesirable chemical interference that would otherwise be present. Shimadzu’s proprietary BID or TCD and Supelco’s water analysis column “Watercol” are combined to separate and measure the water in a formulation of feedstock and provide a sensitive and accurate result. Measurements can be made in a wide concentration range from ppm to 100%.

Water concentration of commercial oil products and NIST reference materials by HS-GC-BID method.

↑Water concentration of commercial oil products and NIST reference materials by HS-GC-BID method.

←Crude Oil from NIST SRM. As shown in the table, sulfur components led to inaccurate results using KFT methods due to unwanted by-reactions, while HS-GC-BID method had no interference.
GC System Configuration

<table>
<thead>
<tr>
<th>Analytes</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruments</td>
<td>GC: Shimadzu GC-2010 Plus BID, Data Integration: Shimadzu LabSolutions LC/GC</td>
</tr>
<tr>
<td>Carrier Gas</td>
<td>Helium (Purity &gt; 99.9999%) with Supelco High Capacity Gas Purifier</td>
</tr>
<tr>
<td>Column</td>
<td>Supelco Watercol 1460/1900/1910</td>
</tr>
</tbody>
</table>

- **Liquid/Gas Sampling Valve + GCBID**

  - Sample: Liquefied Petroleum Gas (LPG)
  - Sample Introduction: Valco Liquid Sampling Valve
  - Target Concentration: 1-100 ppm water

- **Headspace Sampler HS-20 + GCBID**

  - Sample: Liquid Petroleum Products NIST Reference Materials (Motor, Crude, Transformer Oil, etc.)
  - Sample Introduction: Shimadzu Headspace Autosampler HS-20 (Up to 90 vials)
  - Target Concentration: 10–10,000 ppm water

Typical Chromatograms

- **25ppm Water in LPG Standard by Liquid Sampling Valve+GCBID (2uL Liquid, Split 1:5).**
  - Water (25ppm, S/N > 400)

- **10ppm Water in Mine Oil (KFT Water Standard) by HS-20+GCBID (1mL Gas, Split 1:100).**
  - Water (10ppm, S/N > 90)