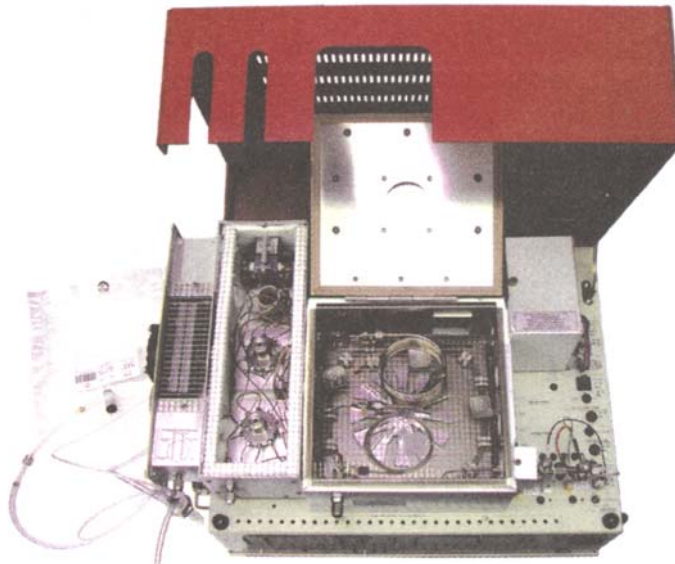


Transformer Oil Gas Analyzer (TOGA) GC System

- **HID, FID and/or TCD Detectors**
- **Built-in PeakSimple Data System**
- **Built-in Standards Preparation Module—
Make Your Own Standards**
- **Dual 10-port Gas Sampling Valves**
- **Gas Extraction Loop**
- **...on the compact 8610C chassis**

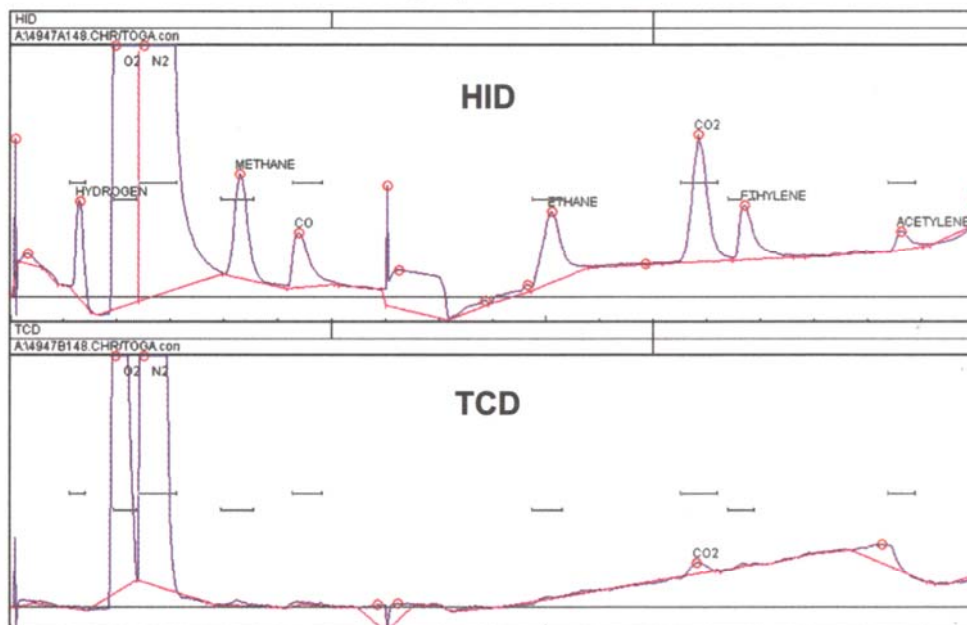
By analyzing the gases dissolved in transformer oil, potential transformer faults can be avoided. ASTM D3612 provides for identification and quantification of dissolved gases in transformer oil by GC. The SRI TOGA GC uses the version referred to as D3612B, the direct injection technique where the dissolved gas extraction takes place inside the GC. Other than collecting the transformer oil in an airtight glass syringe, no sample preparation is necessary prior to injection into the TOGA GC. This helps to avoid contamination made possible by transferring the sample between various containers.



The presence and quantities of certain gases in the oil indicate four broad types of possible general fault conditions:

- ① **Transformer Oil Overheating:** methane, ethane, ethylene, and small quantities of acetylene
- ② **Partial Discharge:** hydrogen, methane, and small quantities of acetylene and ethane
- ③ **Sustained Arcing:** hydrogen, acetylene and ethylene
- ④ **Insulating Paper Overheating:** carbon monoxide and carbon dioxide

To achieve these chromatograms, a transformer oil standard was pumped through the gas extraction loop of a TOGA GC equipped with HID and TCD detectors. The TCD was used to quantify the oxygen and nitrogen because the HID is too sensitive for the large quantities found dissolved in transformer oil.



Concentration by Weight:
Hydrogen 10.7ppb
Oxygen 25.74ppm
Nitrogen 76.65ppm
Methane 70.6ppb
Carbon monoxide 207.4ppb
Carbon dioxide 518ppb
Ethylene 120.9ppb
Ethane 120.7ppb
Acetylene 86.7ppb