Gulf Coast Conference 2013

Fast & Micro Gas Chromatography and its use in Advanced Automated Technologies in the Upstream World

Graham Mullings

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COMPANY OVERVIEW

- Founded in 1878 in Rouen, France
- World's leading inspection, verification, testing and certification company
- Over 1250 offices and laboratories
- 80,000 employees including:
  - Scientists, engineers, doctors, chemists, auditors and inspectors
- 80,000 customers in 137 countries
- 11 business lines

SGS Business Lines

Agricultural Services

Automotive Services

Consumer Testing Services

Environmental Services

Industrial Services

Life Science Services

Minerals Services

Oil, Gas & Chemicals Services

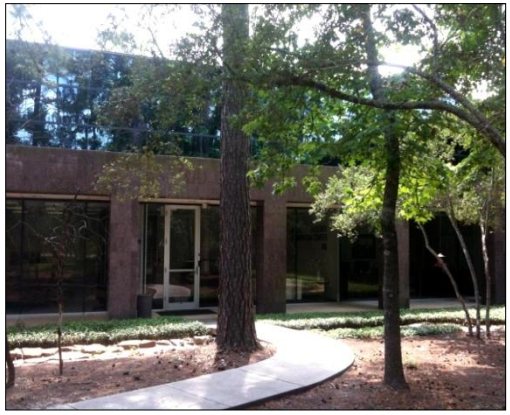
Systems and Certification Services

Technical Staffing Services

Trade Assurance Services

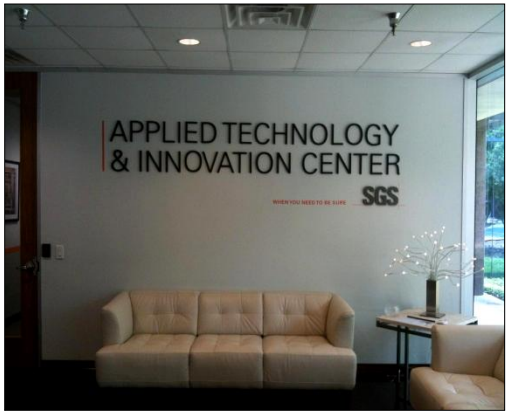
APPLIED TECHNOLOGY AND INNOVATIONS CENTER

DEVELOPING NEW TECHNOLOGIES AND SERVICES



Started in 2008:

- Spring, Texas
- Staff: 5 scientists and engineers
- 2,000 ft^2
- Developed: FluidPro PAL™
  Mini-PVT™
  GC-GOR™



November 2011:

- The Woodlands, Texas
- Staff: 28 scientists and engineers (Oct 2013)
- 15,000 ft^2
  - 3,000 ft^2 pilot plant and machine shop
  - 4 x 1,000 ft^2 laboratories
  - 30 offices

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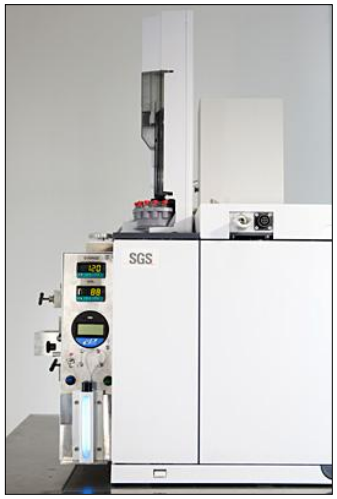


Goals:

1. Lab quality data in the field
2. Reduce costs and turn around time for our client
3. Support geographically remote locations
4. Reduce demand on field technicians

Strategies:

- Improve portability & reduce footprint
- Automate analyses and calculations
- Reduce human intervention

Challenges Resolved with Fast & Micro GC

1. *Rapid Deployment in Remote Locations*

FluidPro PAL™

2. *Automated Analyzers in Hazardous Locations*

CSA Symbol. http://www.waterfurnace.ca/Products/Accessories/polyethylene.php *(2013)*
IECEx Symbol. http://www.zenitpumps.com.au/IECExDeatils.aspx *(2013)*
ATEX Symbol. http://www.seko-group.com/page/standard/site.php?p=cm&o=vh&id=189 *(2013)*

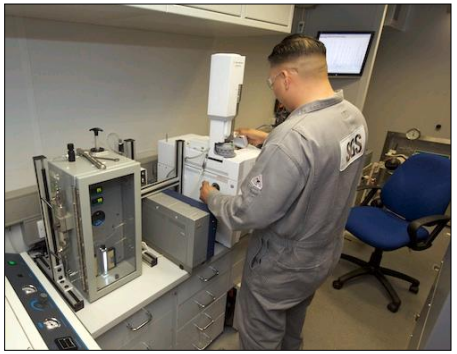
Rapid Deployment in Remote Locations

Scenario:

- FluidPro PAL™ in Israel
- Analyzing gas and condensate
- GC complication causes delays
- Two weeks backlog natural gas samples

Challenge:

- Need fast, reliable solution
- Portable and small
- Easy to install and train onsite technicians



Rapid Deployment in Remote Locations

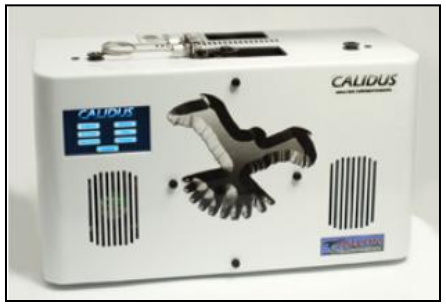
Solution:

- Hand carry Calidus micro GC on airplane
- Natural Gas Analyzer with FID and TCD
- 6 minute analysis (C_1-C_{14}, CO_2, air)
- Minimal cross training, utilizes *ChromPerfect*

Results:

- Arrived onsite from Houston within 48 hours
- Calidus calibrated and analyzing samples within 6 hours
- Cleared backlog of 30+ natural gas samples within 48 hours

Total Time: 102 hours (~4 days)



Falcon Analytical Calidus GC. http://www.falconfast.net/ (2013)

Challenges Resolved with Fast & Micro GC

1. *Rapid Deployment in Remote Locations*

FluidPro PAL™

2. *Automated Analyzers in Hazardous Locations*

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Automated Analyzers in Hazardous Locations

AutoGOR™

Automated pressurized well stream fluid analyzer

Sample

Max pressure: 1,800 psig
Max temperature: 160˚F

Physical

Gas/Oil Ratio (GOR), Shrinkage Factor, API Density

Chemical

Gas Composition (C_1 to C_{14+})
Oil Composition (C_1 to C_{15+})

Process Flow AutoGOR™

Load cylinder into sample chamber

Restore sample for desired Press, Temp, and Time

Perform "Quick Flash" to purge system with fluid

Perform Flash 1: Determine GOR, Shrinkage, API Density

Perform Flash 2: Determine GOR, Shrinkage, API Density

Repeatability withinrequired specifications?

No

After 4 repeat runs

No

Message Operator and Engineering Team to Troubleshoot System

Yes

Collect Gas & Liq Composition from GC's

Converts Data to Standard Conditions

Fluid Composition Check Pass Criteria?

No

Generate Report

Load report to internal database. Email results to designated project managers.

GAS
6 minutes

LIQUID
48 minutes

Falcon Analytical Calidus GC. http://www.falconfast.net/ (2013)
Agilent 6850. http://www.speciation.net/Database/Instruments/Agilent-Technologies-Inc/6850-Series-II-Network-GC-i223 *(2013)*

Future Developments for ATIC

1. Investigate market for Rapid Deployment Kits (RDK™)
2. Work with Falcon Analytical towards a online crude oil liquid analyzer
3. Portable Micro GCMS (1st Detect)
4. Research new applications for portable GC's

Falcon Analytical Calidus GC. http://www.falconfast.net/ (2013)

Questions?

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