OGC Applied Technology and Innovation Center (ATIC)

COQA November 8th, 2012
SGS Applied Technology and Innovation Center

- Assure competitive advantage through *market driven* technological innovation:
  - Enhance the depth, width and competitiveness of our service offering
  - Focus on “Applied Technology” rather than pure “Blue Sky” research responsive to client and industry specific needs
  - With aim to generate solutions:
    - with important revenue potential
    - delivering cost reduction and efficiency enhancements
TECHNOLOGICAL INNOVATION – INNOVATION CYCLE FROM OPPORTUNITY TO SOLUTION

- Customer
- Operations
- Technology Center
- Sales Team

Arrows indicate:
- Results
- Needs
- Ideas, Desires
- Feedback, Information
- Products
- Projects
Drivers and Objectives

- Decision was made in 2006 that SGS should “take the laboratory to the field”

- To accomplish such SGS had to develop or adopt technologies that produce laboratory quality data in remote and harsh environments.

- Systems had to be user friendly, truly portable or transportable, conform to published methods, and highly accurate

- The fundamentals of Upstream analyses rely on the following tests
  1. Gas analysis – Extended Natural Gas (C1 to C15 + inert gases) – GPA 2186
  2. Liquids analysis – Extended Compositional Analysis (C1 to C35 plus C36+) GPA 2286*
  3. Ability to analyze High Pressure (20,000 psi), High Temperature Fluids (~350F)
  4. Determine live fluid densities, Gas to Oil Ratios (GOR) Fluid shrinkage, and bubble point
  5. Cover a range of fluids i.e. Rich & Lean Gases, Condensates, Black Oils and Heavy Oils

- So the quest began!!
TECHNOLOGICAL INNOVATION – TRACK RECORD

- SGS in-house developed technologies
  - Allowed us to enter a mature market long dominated by major Oil Services houses
  - Set us apart from competition with services that others currently can not match
  - Increased our visibility and reputation with major oil companies

- Portable Analytical Laboratories (PAL)
  - Revenue USD 1.0 – 1.5 Mio/yr/unit – 15 units built

- MiniPVT® backbone of PVT both for PAL and Land based Laboratories
  - Cost reduction of USD 600k compared to available commercial units (e.g. VINCI)
    – Units used in Malaysia, Dubai, Columbia, Brazil, Mexico and USA

- AutoGOR, game changer for well testing and allocations through “real time”, on-site analysis

- GC/GOR System mainstay of analytical capabilities for PAL, Rapid Deployment Kit (RDK) and Land based Laboratories.
THE SGS Methanol-in-Crude Systems

- Detection limit of 2 ppm methanol
- Water content in crude sample does not interfere with analysis-key advantage over GC procedure
- Portable analysis package requires no electricity, gas, or other utilities. Can be used on a platform, in the field (pipelines, terminals) or laboratory environment
- Precision of consecutive results within 5%
- Online version of analysis for continuous, automatic monitoring available

![Graph showing absorbance vs initial methanol concentration with a linear regression line and equation: y = 0.0097x + 0.1129, R² = 0.9989].
Mini-GOR System Components

Mini-GOR Flash Separator:

Benefits…

- Small footprint: requires < 18 inches of bench space
- Light weight: 20 lbs
- Fast: small sample volume allows quick duplicate, triplicate, or more analyses
- Separate temperature-controlled chambers for flash & gas collection
- Simple to disassemble and thoroughly clean
Mini-GOR System Components
Sample Cylinder:

Benefits…

- Small volume: 10 – 20 cc capacity
- Light weight: 3 lbs
- Duplicate, triplicate, or more samples & analysis
- Simple to disassemble and thoroughly clean
SGS GC/GOR – Perdido Modifications

Benefits…

- Self contained Flash Station
- Analysis of flashed gas without transfer vessel
- Gas Analysis in strict accordance with GPA 2186
- Instrument is dual mode both gases and liquids
- Liquids analysis to C35 with C36+ by mass balance
- Totally self contained fluids laboratory – easily transported
SGS Innovations – Fluid Analysis

GC-GOR™

Combined temperature controlled sample flash cabinet and gas chromatograph for optimization of GOR & compositional measurements

Mini-PVT™

HP/HT PVT cell with capillary viscometer & solids detection system providing multiple PVT properties in a single unit

SGS develops innovative technology for lab and field operations through a dedicated competency team based at the SGS Advanced Technology and Innovation Centre (ATIC) located in Houston, Texas
Advanced technology in place

**cEOR Core Flood Unit**
for up to 12” whole core
(for brine, oil, ASP, polymers)

**HP rheometer**
for live “waxy” fluids
(top side and sub sea flow line predictions)

**Hydrate cell**
with 3 cameras and stirrer for torque measurements
(for hydrate prediction and inhibitor studies)
On the Platform
THE SGS GASPRO™ SYSTEM

- Configured for LNG, Natural Gas, Stack Gas, or LPG analysis
- Transportable for use in the lab or the field
- Certified for use in Class 1 Division 2 hazardous areas
- Self-contained utilities (power and carrier gas)
- Customized reports downloaded from integrated operating system via WiFi or USB
Falcon GC Configured for Crude Oils and Condensates

Benefits…

- Light weight: 15 lbs
- Truly portable
- Conforms to ASTM D5307
- Black Oil analysis in <20 min
- Conforms to ASTM 2887
- Condensate analysis in <10 min
- Very rugged design
- Data in SIMDIS format or by Carbon number
AutoGOR System

Most ambitious R&D effort for SGS ATIC
2+ years in development

Benefits…

- 4 ft x 4 ft footprint
- Remotely controlled and monitored
- Sample up to 5,000 psi and 200°F
- Purged Class I Div II Enclosure
- Automatically Measures:
  - Gas/Oil Ratio (GOR)
  - Shrinkage
  - API Density
  - Gas Composition ($C_1$ to $C_{14}$)
  - STO Composition ($C_1$ to $C_{36+}$)
MiniPVT System

Benefits…

- Mercury Free
- Small sample size: ~100 mL
- Pressures up to 20,000 psia
- Temperature Range: 20°F to 350°F
- Black oil & volatile oil PVT studies
- Wellstream Recombination
- Separator Optimizations
- Fluid Rheology / Viscosities
- Live Sample WAT / Asphaltene Onsets
Falcon Natural Gas Analyzer

Benefits…

- Small footprint: requires < 20 inches of bench space
- Light weight: 29 lbs
- Fast: 6.0 minute analysis
- FID and TCD
- True splitless injection
- Gas Composition:
  - Hydrocarbons (C_1 - C_{14})
  - Permanent Gases (N_2, CO_2)
  - Atm Contamination (O_2, N_2)
UPSTREAM SOLUTIONS THAT LOCATE, ANALYSE AND EXTRACT

WHEN YOU NEED TO BE SURE