Testing Challenges in the Williston Basin

Crude Oil Quality Association
Minneapolis, MN
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SGS North America

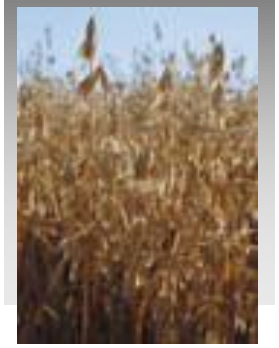
ABOUT US

SGS is the largest inspection, testing and certification organization in the world. The core services offered by SGS (split between 10 divisions) can be divided into three categories:

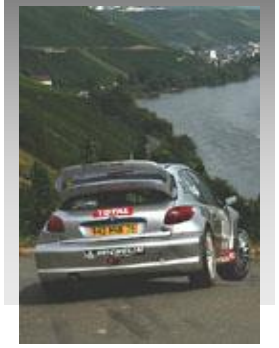
- Inspection services – help reduce risk, control quality and quantity, meet all relevant regulatory requirements
- Testing services - SGS tests product quality and performance against various health, safety and regulatory standards.
- Certification services - SGS certifies that systems or services meet the requirements of standards set by governments

Global Business Lines

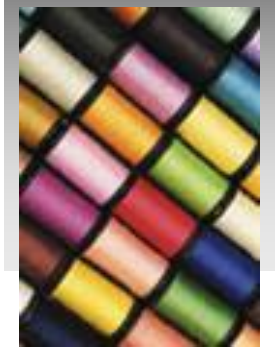
Agricultural Services



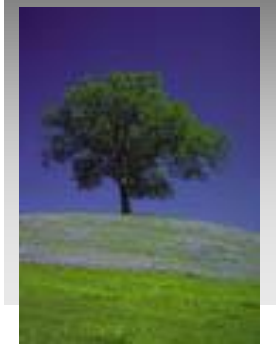
Automotive Services



Consumer Testing Services



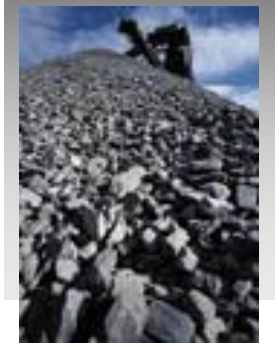
Environ-mental Services



Industrial Services

Life Science Services

Minerals Services



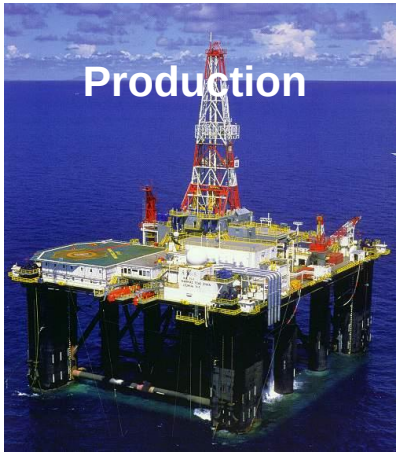
Oil, Gas & Chemicals Services

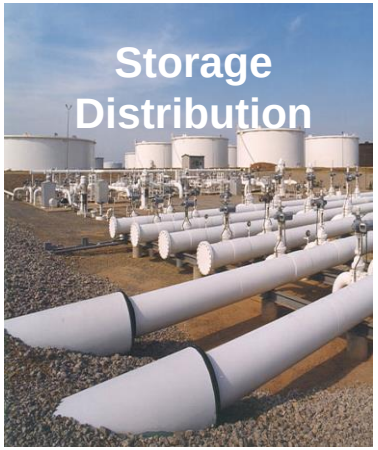
Systems and Services Certification

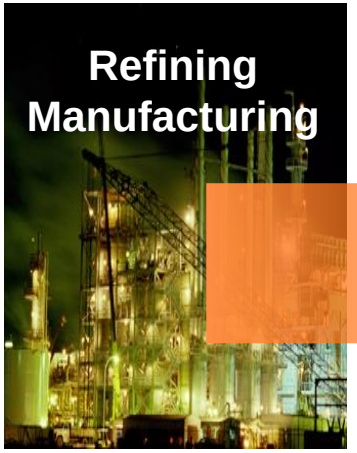
Technical Staffing Services

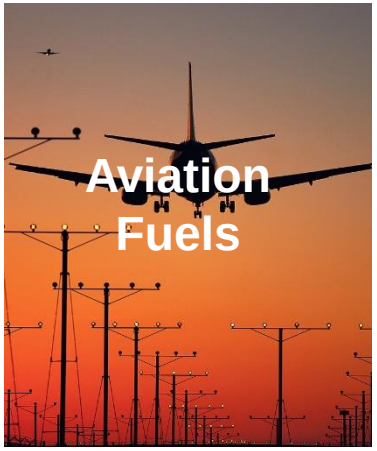
Trade Assurance Services

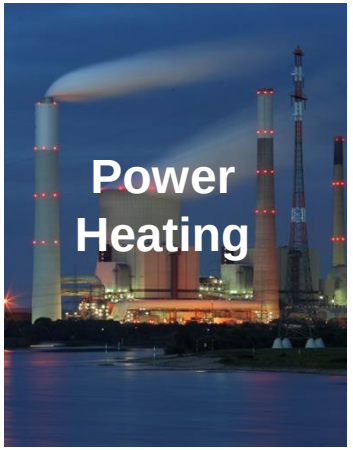
Oil, Gas & Chemicals Services











SGS Oil Gas & Chemicals in USA

- 725 Employees
- 40+ Locations
  - 29 Laboratories
  - 3 Major Regional Offices
  - 15+ Field Only
  - 12 Onsite Offices
- 1,300+ Customers
- 55,000+ Inspection Files per Year
- Centralized Invoicing and other Admin
- Support and Involvement with Canada and Mexico

SGS OGC Services Overview

Main Commodities

- Crude Oil, Petroleum Products, Lube Oils, Chemicals, Gases, Liquefied Gases

Commodity Trading Services

- Field Inspection & Laboratory Testing

Contract Services

- Plant & Terminal Operations (PTO)
- Laboratory Up*Sourcing
- Upstream - Services to Exploration & Production Industry
- Cargo Treatment Services – Blending & Additives

Other Services

- Fuel Integrity Programs
- Calibration of tanks and flow meters
- Collateral Management

CFR Service Center

- **Full line of CFR engine support**
  - Gasoline
  - Diesel
  - Aviation
- **Training, Gasoline and Diesel Engines**
- **Full Maintenance**
- **Consulting**
  - Engine facility layouts, Engine installs, etc.

Thomas Grant
Regional Manager
832-435-9708

Galson Laboratories

- Joined SGS May 2014
- Provides Air Quality Monitoring in industrial environments
- Offers equipment for both passive and active monitoring
- Example: Hydraulic Fracturing Operation (OSHA/NIOSH published a Hazard Alert in 2012)
  - Respirable Dust
  - Silica Quartz
  - VOCs (benzene, toluene, ethyl benzene, xylene)
  - H2S
  - Noise
  - Diesel Particulate
  - Acid Gases (HCL)
  - Aldehydes such as glutaraldehyde
  - Metals such as lead

Williston Laboratory, ND
OGC Services

- Crude Oil Analytical Testing (21+ Test Methods)
  - Sulfur, API, Water, RVP, Flash Point, D86 Distillation, SimDist (D7900/D7169), H2S, Pour Point, Gas Analysis (GPA 2261, 2286), Viscosity, TAN, Salt
  - Additional support at St. Rose, LA
- Additional Capabilities
  - Tank Calibrations
  - Meter Calibrations (gas, some oil)
  - SGS Upstream Services (broadly supported by other facilities)
  - Industrial hygiene testing services (air) through Galson Laboratories
  - Environmental Services (broadly supported by other facilities)
    - Services for all matrices including: Air, Soil, Water, Solid Waste, Product, Tissue and Sediments.
    - Dioxins/Furans
    - PCB Congeners
    - PAHs
    - ultra SVOA
    - Pesticides
    - Other unique organic chemical

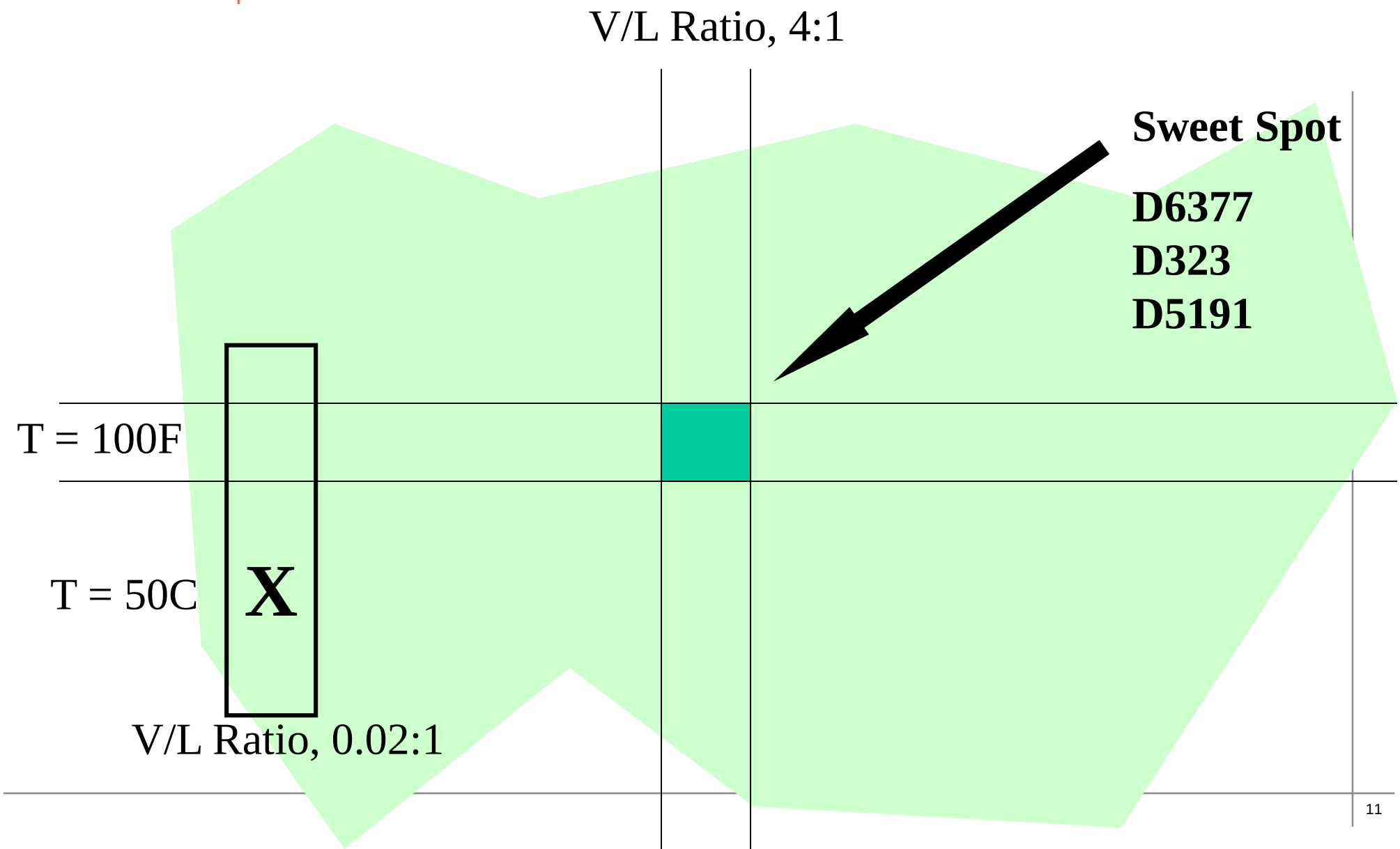
Challenges at Williston
Vapor Pressure Measurements

- 10 ± 1
- 10.01 ± 10
- 10.001 ± 0.001

What do these numbers mean?

- Nothing (or not much) unless:
  - Means of generating number is known (laboratory procedure)
  - Precision is stated, clearly defined
  - Scope is defined (sample, conditions)
  - Implied: purpose of number is understood

Vapor Pressure, parameter space



ASTM, Precision Statements, & Method Scope

- Conservatively (ASTM), if test parameters are outside of precision statement scope, user must decide relevance.
- Precision Statement Defines the Method
- D6377: If not specific to Precision Statements, Laboratory SOP should be required.

1. Scope*

1.1 This test method covers the use of automated vapor pressure instruments to determine the vapor pressure exerted in vacuum of crude oils. This test method is suitable for testing samples that exert a vapor pressure between 25 kPa and 180 kPa at 37.8 °C at vapor-liquid ratios from 4:1 to 0.02:1 (X = 4 to 0.02).

NOTE 1—This test method is suitable for the determination of the vapor pressure of crude oils at temperatures from 0 °C to 100 °C and pressures up to 500 kPa, but the precision and bias statements (see Section 14) may not be applicable.

D6377, Floating Piston Cylinders, V/L = 0.02:1 Back-Pressure?

- Minimum: sample VP + 100 kPa (14.5 psi)
- Maximum: Limit of pressure transducer

- Unfortunately, value of back-pressure matters

8.3.2 If the sample is contained in a pressurized floating piston cylinder, apply a back-pressure which is higher than the vapor pressure of the sample at the introduction temperature plus a minimum of 100 kPa for the piston movement. The applied back-pressure shall not exceed the maximum limit of the pressure transducer used in the vapor pressure apparatus.

Sample Introduction Temperature?

8.3 *Sample Transfer:*

8.3.1 Transfer the sample from the cylinder container into the measuring cell at room temperature but at least 5 °C above the pour point (as determined by Test Method D5853) of the sample.

12. Procedure

12.1 Set the sample introduction temperature of the measuring chamber between 20 °C and 37.8 °C. For crude oil samples with a pour point higher than 15 °C, set the injection temperature at least 5 °C above the pour point temperature of the sample.

1.0 Scope:

NOTE 1—This test method is suitable for the determination of the vapor pressure of crude oils at temperatures from 0 °C to 100 °C and pressures up to 500 kPa, but the precision and bias statements (see Section 14) may not be applicable.

Challenge to Williston Laboratory

- How to measure vapor pressure from floating piston cylinder of Williston Basin Sample, defined parameters of:
  - 50° C
  - V/L Ratio = 0.02:1
- Consider the potential damage to the instrument
- Note CCQTA Statement (5/22/2014):
  - Recommended measurements at V/L = 4:1, 0.25:1
  - V/L of 0.02:1 may exceed capability of some instruments due to thermal expansion of light high VP crudes.

Comparison of D6377 Vapor Pressures ($VPCR_X$)

- Typical Bakken Samples (NDPC Report)
  - $VPCR_4$ (37.8C) = 11.5 average
- Welker Cylinder
  - $VPCR_{0.02}$ (50C) = X psi ($T_{ICell} = T_{TCell}$)
    X psi (T_{ICell} = 20°C/68°F)
- Ametek Floating Piston Cylinder
  - $VPCR_{0.02}$ (50C) = X psi ($T_{ICell} = T_{TCell}$)
    X psi (T_{ICell} = 20°C/68°F)
- Glass Bottles
  - $VPCR_{0.02}$ (50C) = X psi ($T_{ICell} = T_{TCell}$)
    X psi (T_{ICell} = 20°C/68°F)

T_{ICell} = Measuring Chamber, Introduction Temperature

T_{TCell} = Measuring Chamber, Test Temperature

Note: instrument calibrations, quality control checks, were all good

Summary

- ASTM D6377 belongs to ASTM International
  - COQA has no position with respect to the details of the method
- Within the scope of the precision statement, variances are within the method boundaries—no problems there.
- Outside the scope of the precision statement, SOP must be defined, including any potential deviations from the published procedure.
- I welcome input on what that SOP should look like.

Discussion/Questions?