ASTM CRUDE OIL TESTING & TRAINING PROGRAMS

Harry N. Giles, PetroStorTech LLC
Crude Oil Quality Association meeting
San Francisco, CA, October 30 – 31, 2014
OUTLINE

- Proficiency Testing Programs (PTP); formerly Interlaboratory Crosscheck Programs (ILCP)
- Technical & Professional Training (TPT)
  - Open enrollment and on-site courses
- E-Learning
  - Online
October 1998: Gerald Lekberg of Williams initiated a crude oil program for COQG members

This continued for 11 rounds until May 2002, with ~30 COQG members participating

Success of program prompted Clifford Mills & Harry Giles to develop the ASTM program initiated in mid-2000.
ASTM INTERNATIONAL’S Proficiency Testing Programs

Why Participate?
• Confirm and improve compliant performance
• Identify testing or measurement problems
• Compare methods and procedures
• Improve the capability of your management and staff
• Determine method precision and accuracy
• Satisfy regulatory and accreditation bodies

How the Programs Work
As a program participant, you receive different, sample-size, representative test pieces for each test cycle. Electronic data submission forms and help instructions guide your laboratory in performing the tests that you normally conduct within your own facility. Your laboratory submits tests electronically. Summary reports are prepared by a statistician. Each participating laboratory’s test results are stored on an identifying number. Summary reports include:
• Statistical analysis of test data
• Charts and graphs plotting test results versus laboratory code
• Other pertinent information

Summary Reports Aid Improvement
Upon completing the tests, each laboratory electronically submits helpful test results. Summary reports provide feedback on the accuracy of your laboratory, helping you improve. Each participating laboratory’s test results noted for improvement are highlighted.

ASTM PTP Portal
Provides fast and easy access from the ASTM website to information specific to PTP:
• Enter Data - Enter your test results for the current testing cycle
• Reports - View reports based on statistical analysis of submitted data
• Important Dates - View dates for shipment of samples and when data is due for timely release of reports
• View Submitted Data - Access your data submitted from previous test cycles
• Documents - View list of instructions and toll worksheets

AVAILABLE PROGRAMS
• Aromatic Hydrocarbons pg. 4-5
• Cement and Concrete pg. 6-9
• Electrical Insulating Liquids pg. 10-11
• Engine Coolants and Related Fluids pg. 12-13
• Metals pg. 14-17
• **Petroleum** pg. 18-31
• Plastics pg. 34-35
• Textiles pg. 36-37

Distribution of Samples
Materials and test samples are prepared and distributed for ASTM by businesses hired for their expertise in these areas. Program registration fees will include the cost of shipping the test samples to the continent.
PTP OVERVIEW

- Currently includes 26 products, among them:
  - #2 diesel oil, #6 fuel oil, aviation turbine fuel (Jet A), crude oil, engine lubricants, motor gasoline
  - Crude oil 4th largest program in terms of participation
WHY PARTICIPATE?

- Provides a statistical quality assurance (SQA) tool to monitor laboratory performance
  - Is my chemist or technician doing what is expected and what he or she is being paid to do?
- Identify testing or measurement problems
- Compare test results with those of other labs
- Determine and improve precision and accuracy
- Satisfy regulators, accreditation bodies, & clients
CRUDE OIL PTP

- Major sample prerequisites
  + <10 ppm (m) H₂S, and pour point ≤50°F (10°C)
- 3-55 gal drums composited and homogenized;
  + Each not necessarily identical in quality
  + Material used has ranged from 16 to 43 °API, and 0.1 to 3.4% S
  + Syncrudes and “tight” crudes have been included
- 600-1L subsamples withdrawn into Al containers,
  + Random samples tested for uniformity in quality
- This year, 276 labs worldwide participated
HOW IT WORKS

- Three times yearly, labs receive 2-1L samples
- They perform the tests they normally conduct, and electronically submit results to ASTM within approx. 8 weeks of sample receipt
- ASTM prepares coded report with results and a statistical summary for each test method, then distributes to participants within approx. 1 month
Crude Oil

Annual Fee: $768
Schedule: March, July, November

TEST MATERIALS
Two liters of crude oil will be used in the program for each test cycle.

TEST PARAMETERS (subject to change)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>D664</td>
<td>Acid Number, Total</td>
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<tr>
<td>D6560</td>
<td>Asphaltenes</td>
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<tr>
<td>D1298, D5002, D287</td>
<td>Density, Relative Density or API Gravity</td>
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<td>D7169</td>
<td>High Temperature Simulated Distillation</td>
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<td>D5708, D5863</td>
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<td>Micro Carbon Residue</td>
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<td>D4629, D5762</td>
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<td>D97, D5853</td>
<td>Pour Point</td>
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<td>Reid Vapor Pressure</td>
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<tr>
<td>D2622, D4294</td>
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<td>D445</td>
<td>Viscosity, Kinematic</td>
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<tr>
<td>D4006, D4928,</td>
<td>Water</td>
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<td>D4377, D4007</td>
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</table>
17 courses in

- Environment, coal chemistry, corrosion, fire safety, light sports aircraft, petroleum, plastics, and rubber

5 petroleum courses cover

- Aviation Fuels, Crude Oil, Diesel Fuels, Gasoline, and Marine Fuels

These can be open enrollment or tailored on-site

All focus on use of ASTM standards
CRUDE OIL TPT COURSE TOPICS

- Quality variations and what causes them
- Crude oil composition & classification
- Sampling – manual and automatic methods
- Inspection and comprehensive assays, and test methods
- Other important crude oil properties, fractions, and correlations
- Tight oil and oil sands bitumen
- Quality case studies
- Basic crude oil evaluation
- Crude Oil Proficiency Testing Program (PTP)
- Challenges and future needs in characterization
CRUDE OIL TPT 2015 OPEN COURSES

- Houston, TX: March 4th – 6th
- New Orleans, LA: October 26th - 28th
E-LEARNING

NEW Petroleum Lab Technician Series

ASTM's new Petroleum Lab Technician Series enables lab techs to improve their skills through industry leading, self-guided, online training. The training modules are a key tool to supplement existing internal lab QA/QC programs.

Each series Includes:

- Self-guided training complete with video demonstrations, checklists, concept presentations, data sheets and glossaries
- Review quiz with automatic grading
- Certificate upon successful completion of training module
AN ONLINE, SELF-GUIDED SERIES

- Available by annual subscription to Online Learning Center
- Currently 40 standards covered, with an additional 40 slated for inclusion in 1Q2015
- For each standard, modules cover
  + Overview of test method, procedural details, video demonstrations, glossary, and a quiz
- Certificate provided lab technician upon successful completion of each standard
Sulfur occurs naturally in petroleum in concentrations typically ranging from 0.5 - 5.0 wt %.

Fuel oils contain varying amounts of sulfur depending on crude source, refining process, and fuel grade.
You have reached the end of this module.
Please take this short quiz to check your knowledge!

Start Quiz
CURRENT CRUDE OIL RELATED STANDARDS

- Asphaltenes, D6560
- Carbon Residue, D4530
- Density, Relative Density, API gravity, D1298
- Salts, D3230
- Sulfur, D2622, D4294
- Total Acid Number, D664
- Vapor Pressure, D5191
- Viscosity, Kinematic, D445
- Water, D4006, D4928
FURTHER INFORMATION

- Proficiency Testing Programs
  + Steve Hepburn, shepburn@astm.org

- Training and E-learning
  + David von Glahn, dvonglahn@astm.org

- Crude Oil TPT course
  + Harry Giles, petrostortech@verizon.net
Thank you!

QUESTIONS?