Flash Point and the Future of Fuels testing

Robert Mackie
Technical Development Manager
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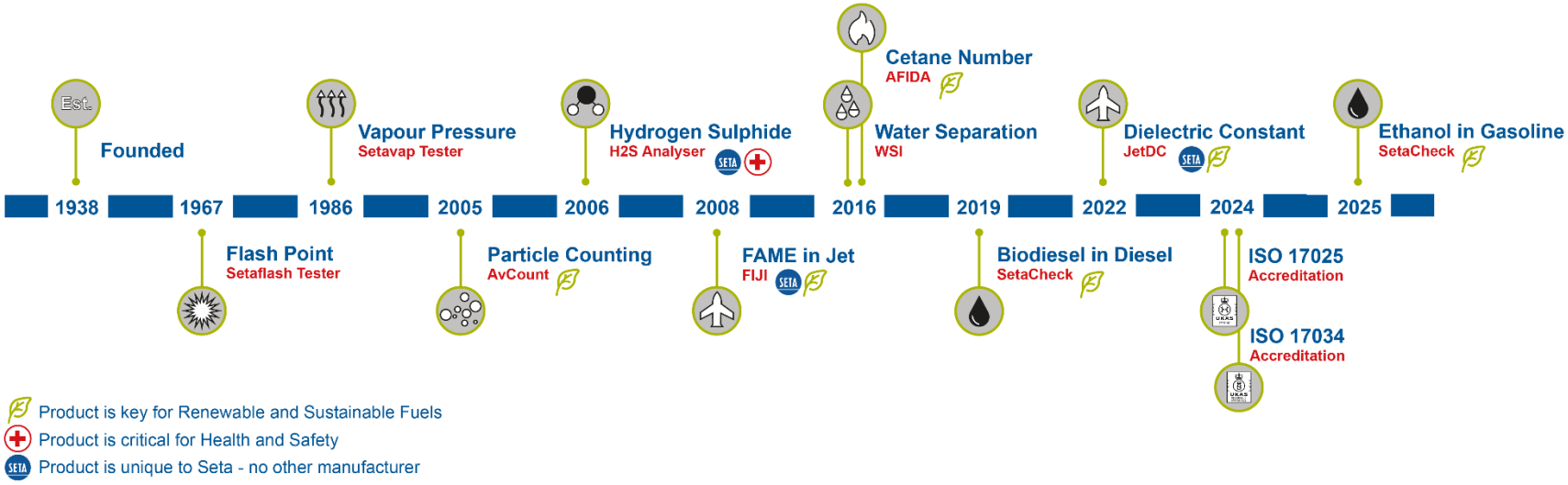
Stanhope-Seta – History

- UK-based instrument manufacturer
- Industry leaders in Flash Point, Particle Counting and contamination in fuels testing



Stanhope-Seta – Standardization

- Four key committees in Petroleum standardization:
  - ASTM D02 Petroleum Products, Liquid Fuels, and Lubricants
  - ISO TC 28 Petroleum and related products, fuels and lubricants from natural or synthetic sources
  - CEN TC 19 Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin.
  - EI TMS Analysis and testing of petroleum and related products

Stanhope-Seta – Standardization

Highly active in specifications and test method and instrumentation development:

Ian Mylrea – Director of Research and Development

ASTM D02.J Officer, ASTM D02.08 Section b Chair (Flammability), ASTM D02.14 (Stability & Cleanliness) – Working Group & Task Group Co-Chair (Various methods),

ASTM Non-Executive Director

Energy Institute G-5 Chair (Sulfur & H_2S), B-5 Chair (Stability, Fuel Oils), SC B-11 Dielectric Task Group Chair

Mike Sherratt – Former Director of Research and Development

Energy Institute Test Method Standardisation Committee, EI B-4 Chair (Flammability), ISO/CEN Joint Working Group on Flash Point

Robert Mackie – Technical Development Manager

ASTM D02.14 (Stability & Cleanliness) – Working Group & Task Group Co-Chair (Various methods), Energy Institute G-4 Secretary (Molecular Spectroscopy, Technical contact for ASTM D8274

Giles Verity – Commercial Director

ASTM D02.14 Working Group on Particulate Contamination and Particle Counting in Liquid Fuels – Co-Chair, Technical contact for ASTM D8183 (AFIDA)

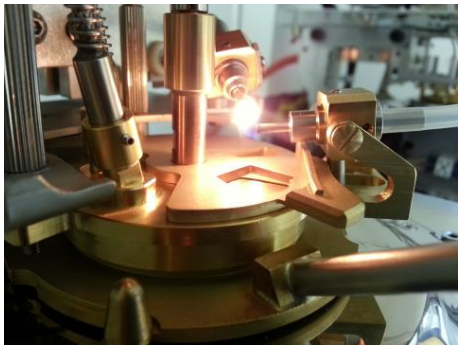
Stanhope-Seta – Certified Reference Materials

- New ISO 17034 and ISO 17025 laboratory
- Full traceability through UKAS accreditation (ILAC)
- Providing 70 reference materials
- Covering over 40 test methods
- New ISO 17034 CRMs available for:
  - FAME (D7797, D7963, D8274, …)
  - Flash Point (D93, D7094, D3828, …)
  - Particle Counting (IP 565, D7619, …)
- https://www.seta-crm.co.uk/

UKAS REFERENCE MATERIALS 28074

UKAS TESTING 28074

Flash Point – Pensky-Martens (ASTM D93)



- Developed in 1880
- Closed Cup FP method with 70 mL sample volume

- Most widely used FP method globally
- Wide temperature range with precision
- Procedure A, fastest ramp rate

- Referee method in MIL-DTL-5624X, MIL-DTL-83133L and MIL-DTL-16884R

Flash Point – Seta PM-93 35000-2

- New to market ASTM D93 FP tester
- Fully Automatic with fire extinguisher
- Easiest operation & local calibration
- Motorized raising & lowering of lid
- Quick removal lid and shutter for cleaning
- Ultra Robust – life tested to over 1,000,000 dips
- Large touch screen with modern software

On display with Lazar Scientific, Inc. today

Flash Point – Setaflash CCC – ASTM D7094

- Small sample volume: 2 mL or 1 mL
- Convenient sample handling
- Electric arc ignition
- Wide temperature range, single unit: -15 °C to 420 °C
- Fuels & Lubricants
- Fully automatic
- Sensitive to contaminants
- Now in D1655 as alternative FP method
- No correlations

On display with Lazar Scientific, Inc. today

Flash Point – Seta CCCFP – ASTM D6450

- 1 mL sample volume
- Temperature flash range of -8 °C to 86 °C
- Ruggedized enclosure and hardened software specifically for Military applications - designed for portable kits
- Battery use
- Environmentally tested between -30 °C and 50 °C

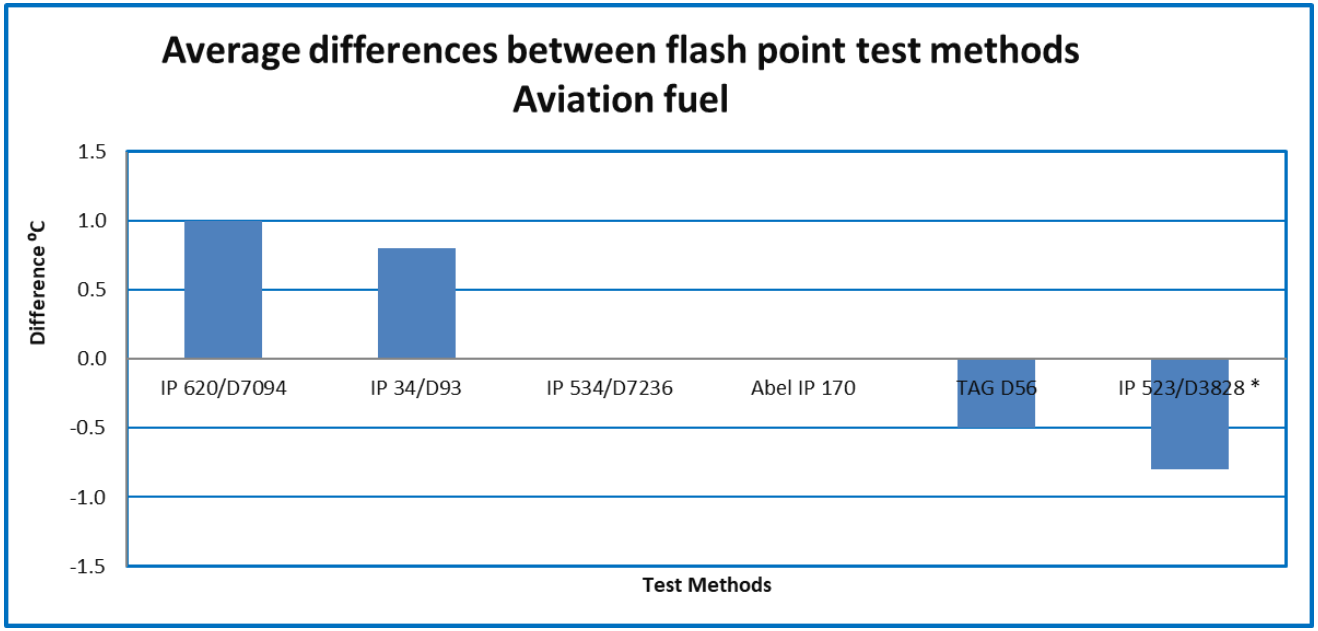
EI 2019 Multi Method Flash Point Study

Two Study Aims:

- Re-evaluate precision for TAG D56
- To examine relationship of other test methods for testing aviation turbine fuels.
  - IP 170 Abel – Requests to quantify relationship with D56.
  - D93 (IP 34) P-M – Added to D1655 specification.
  - IP 620 D7094 CCCFP – Data required for specification use.
  - IP 534 D7236 SS Ramp – Data required for specification use.

Funded by the Energy institute and ASTM D02
35 participants in Europe and North America used 5 test methods
11 participants for D56 TAG tested 8 samples in duplicate randomly/blind
6 participants for the other test methods tested 8 samples randomly/blind
Samples comprised Jet A and A-1 from Europe and USA, synthetic FT SJF from South Africa and 2 chemicals

EI 2019 Multi Method Flash Point Study



* IP 523/D3828 relationship with IP 534/D7236 determined in an earlier program

- Clear differences in reported results found across samples

Correlation and Flash Point test methods

Is flash point an empirical or theoretical property?

It is empirical …

… meaning it is based on observation rather than fundamental theory

… and a result is specific and entirely related to its method of measurement

Even small differences in method volumes, ignition type and physical set up will change the resulting outcome!

Correlation and Flash Point test methods

- Flash point is an empirical test
- Correlations between methods cannot be applied
- Some instrument manufacturers promoted reporting of correlated results e.g. a D93 correlated result from a D7094 test

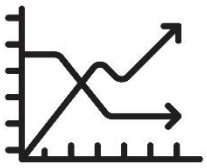
- ASTM D1655 has passed ballot on new wording:

"Use only the apparatus specified by each test method. Some apparatus have automated correlation of test results to other flash point methods. These correlated results are not valid and are not permitted for use in this specification."

Market Trend and the Future of Fuel testing

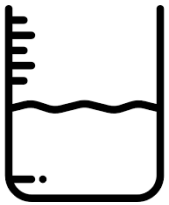
Market Trend

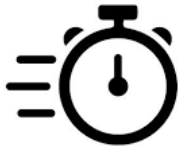
- Global push for renewables
- Material and testing costs increasing
- Impact on Quality Control systems from refinery to the field



Effect on fuels testing

- Reduced sample volumes
- Quicker testing time
- Larger instrument scopes
- Smaller apparatus
- Lab quality result capability in field test equipment





New and Upcoming instrumentation from Stanhope-Seta

- Setaflash CCC – 35600-0
  - ASTM D7094 and ASTM D6450 instrument for small volume FP testing

- Seta PM-93 – 35000-2
  - Newest to market ASTM D93 instrument with all new modern features upgrades

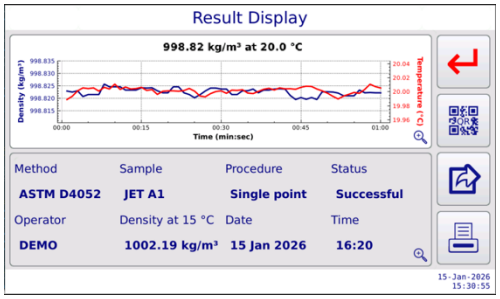
- SetaCheck Biodiesel Plus – SA5550-0
  - ASTM D8274
  - Handheld % FAME measurement from 0.1 % to 80 %

New and Upcoming instrumentation from Stanhope-Seta

- SetaCheck Ethanol – SA7500-0
  - Handheld Ethanol % in Gasoline measurement
  - 0 % to 100 % measurement range
  - Less than 5 mL of sample, no flush cycles
  - Rapid test and simple to use
  - Automatic temperature measurement and correction
  - Test method being developed at ASTM D02 under ballot as WK96670

New and Upcoming instrumentation from Stanhope-Seta

- Seta Digital Density – SA2500-0
  - Compliant to D4052 and D5002
  - Glass oscillating U-tube
  - Automatic bubble detection using image analysis algorithm, DensAI
  - Integrated 1080p camera
  - Temperature & humidity controlled
  - Suitable for light, middle distillates, and crude oils



Q&A

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