



# **Standards and Regulatory Development for Biofuels**

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**ASTM International**

# Presentation

- Provide an overview of ASTM International
- Introduce Committee D02 and Overview the ASTM Standards Development Process
- Provide Background and Current Status of ASTM Specifications for Ethanol and Biodiesel
- Provide Key Considerations for APEC Activities

# About ASTM International

- Organized in 1898
- Independent, private sector, not-for-profit
- Provides a global forum for the development of voluntary, consensus standards and promotion of related knowledge
- Does not provide certification or accreditation

# ASTM Standards are International

- ASTM complies with the principles identified in the World Trade Organization's, Technical Barriers to Trade Agreement, document G/TBT/1/REV 8 Section IX.
  - Transparency
  - Openness
  - Impartiality and consensus
  - Consideration of the concerns of developing countries
  - Relevance
  - Coherency

# ASTM's Open and Direct Membership

- Open to any individual or body from anywhere in the world
  - No prerequisites
- Producers, users, government, academia, laboratories are equal partners in the process
- Operate under Consensus, and all negative ballots must be addressed
- 21,300 technical experts participating
  - Representing 124 nations

# ASTM Role in the U.S.

- ASTM standards meet the needs of Government
  - Over 3300 ASTM standards are cited in the U.S. Code of Federal Regulations (number one cited SDO)
- ASTM standards are specified in a variety of state and federal laws, tax regulations, product listings (tanks, pumps, dispensers, etc.), safety and OSHA regulations, EPA regulations, insurance listings, and approvals of one nature or another



# Who Uses ASTM International Petroleum Standards?

Australia	Egypt	Mexico	Mongolia
Belarus	El Salvador	Netherlands	South Africa
Bolivia	Finland	New Zealand	Switzerland
Bosnia	Germany	Nicaragua	Tanzania
Bulgaria	Guatemala	Nigeria	Taiwan
Canada	Honduras	Panama	Thailand
China	Hong Kong	Paraguay	Trinidad
Chile	Iceland	Philippines	Turkey
Colombia	Indonesia	Peru	United States
Costa Rica	Israel	Romania	Uruguay
Denmark	Jamaica	Russia	Venezuela
Ecuador	Japan	Saudi Arabia	Vietnam
Latvia	Malaysia	Slovenia	Zambia



# D-2 Interlaboratory Crosscheck / Proficiency Testing Programs

- Globally recognized programs
- Statistical quality assurance tool enabling laboratories to compare their performance in the use of ASTM methods with other laboratories



# Global Participation in Proficiency Testing Programs

- ARGENTINA
- AUSTRALIA
- BAHAMAS
- BANGLADESH
- BAHRAIN
- BELGIUM
- BOLIVIA
- BRAZIL
- BULGARIA
- CANADA
- CHILE
- CHINA
- CAMEROON
- COLOMBIA
- CROATIA
- DENMARK
- ECUADOR
- EGYPT
- EL SALVADOR
- England
- FINLAND
- FRANCE
- GERMANY
- GREECE
- GUINEA
- GUATEMALA
- HONG KONG
- HONDURAS
- HUNGARY
- ICELAND
- INDIA
- IRELAND
- ISRAEL
- ITALY
- JAPAN
- KENYA
- SOUTH KOREA
- KUWAIT
- Latvia
- Malta
- MALAYSIA
- MEXICO
- MOROCCO
- MAURITIUS
- NETHERLAND  
ANTILLES &  
ARUBA
- NETHERLANDS
- NICARAGUA
- NORWAY
- NEW ZEALAND
- PAKISTAN
- PANAMA
- PERU
- PHILIPPINES
- POLAND
- PORTUGAL
- Russia
- SAUDI ARABIA
- SCOTLAND
- SINGAPORE
- SOUTH AFRICA
- SPAIN
- SURINAME
- SWEDEN
- TAIWAN
- THAILAND
- TRINIDAD & TOBAGO
- TUNISIA
- TURKEY
- UNITED ARAB EMIRATES
- UNITED KINGDOM
- UNITED STATES
- URUGUAY
- VIET NAM
- ZAMBIA



# Technical and Professional Training Programs

- Started in mid 80s in response to market needs
- Teaches the performance, use, and application of ASTM Standards, other standards, and standards-related issues.
- Over 18,000 students in over 30 countries.

# ASTM INTERNATIONAL TRAINING

ASTM International provides training courses in over 30 countries.

- Australia
- Bahrain
- Belgium
- Canada
- China
- El Salvador
- Ecuador
- France
- Germany
- India
- Indonesia
- Israel
- Italy
- Jamaica
- Japan
- Korea
- Mexico
- Panama
- Peru
- Philippines
- Qatar
- Saudi Arabia
- Singapore
- South Africa
- Spain
- Sweden
- Switzerland
- Trinidad and Tobago
- United Arab Emirates
- United Kingdom
- United States
- Venezuela

**ASTM Committee D02**

**on**

**Petroleum Products and Lubricants**

## Committee D02

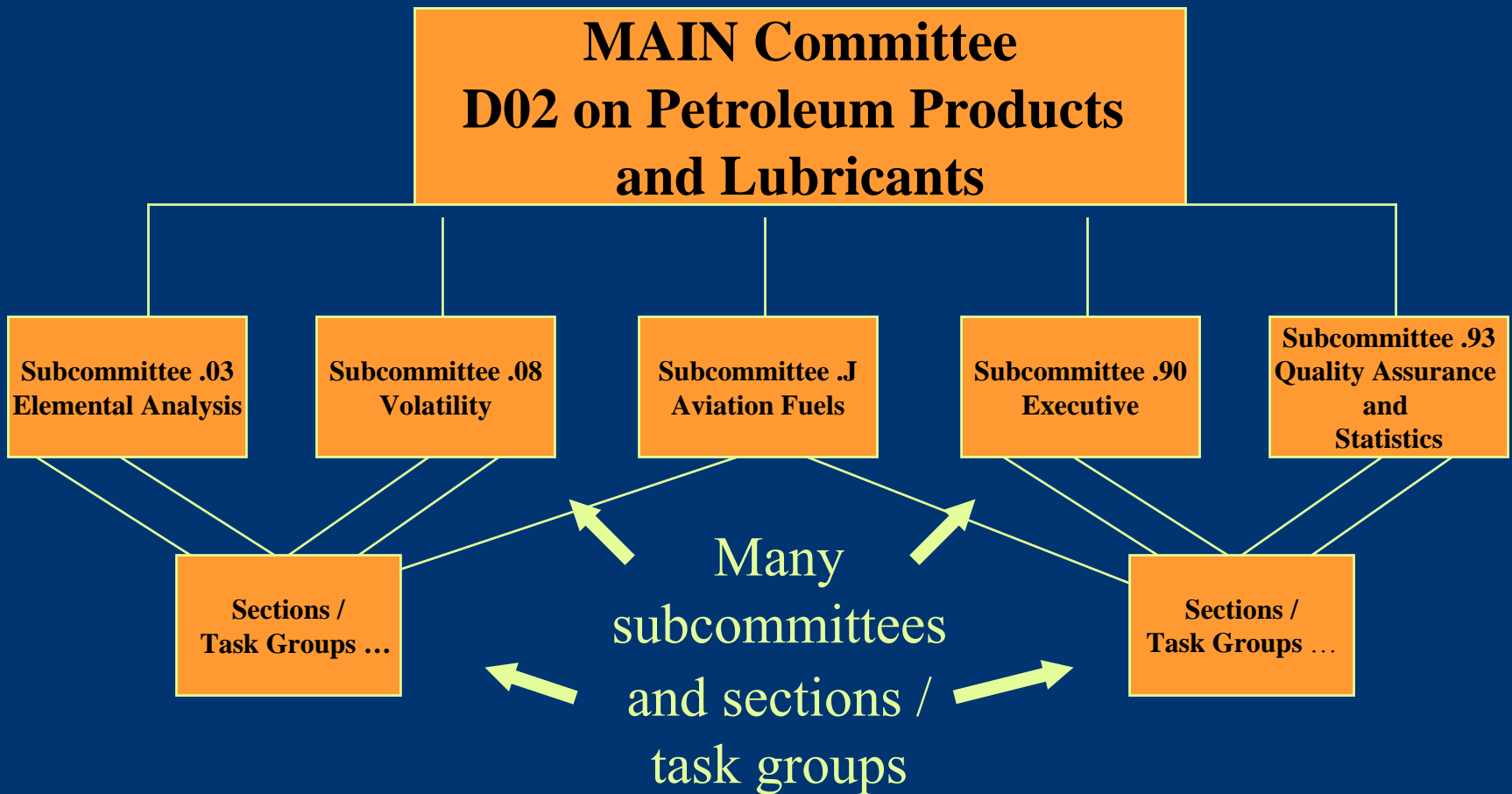
- Includes over 1,600 members from 52 countries
- Developer of over 650 petroleum standards that have helped to provide heat for homes, fuel for automobiles and airplanes, and lubricants for machinery
- Sponsor of numerous technical publications, laboratory quality assurance programs and technical and professional training courses, workshops, and symposia.

# Committee Meetings



- Committee D02 (and its related subcommittees) usually meets twice annually
- Many subcommittees/task groups use virtual meetings

# Technical Committee Structure



# Product Subcommittees

## 12 Product subcommittees

- Specifications

- Performance Testing

- **A. Gasoline and Oxygenated Fuels**
- **B. Automotive Lubricants**
- **C. Turbine Fuels**
- **D. Hydrocarbon for Chemical and Special Uses**
- **E. Burner, Diesel, Non-Aviation Gas Turbine and Marine Fuels**
- **F. Manufactured Carbon and Graphite Products**
- **G. Lubricating Greases**
- **H. Liquefied Petroleum Gases**
- **J. Aviation Fuels**
- **L. Industrial Lubricants**
- **N. Hydraulic Fluids**
- **P. Recycled Petroleum Products**



# Properties Subcommittees

## 14 Properties Subcommittees

- Test Methods for Properties
- Measurements

- 1. Combustion Characteristics
- 2. Static Petroleum Measurement
- 3. Elemental Analysis
- 4. Hydrocarbon Analysis
- 5. Properties of Fuels, Petroleum Coke and Carbon Materials
- 6. Analysis of Lubricants
- 7. Flow Properties
- 8. Volatility
- 9. Oxidation
- 10. Properties of Petroleum Wax
- 11. Engineering Science of High Performance Fluids & Solids
- 12. Environmental Standards for Lubricants
- 14. Stability and Cleanliness of Liquid Fuels
- 25. Performance Assessment and Validation of Process Stream Analyzer Systems for Petroleum and Petroleum Products

# Coordinating Subcommittees

## 5 Coordinating Subcommittees

- **92. Interlaboratory Crosscheck Programs**
- **93. International Standards and Related Activities**
- **94. Quality Assurance and Statistics**
- **95. Terminology**
- **96. In-Service Lubricant Testing and Condition Monitoring Services**

# ASTM Standardization Concept

- A balance of interests exists



**Users**      **Producers**  
**Consumers**  
**General Interests**

# ASTM Balloting Process

**COMMITTEE ON  
STANDARDS**

**SOCIETY & MAIN  
COMMITTEE D02**  
60% Return  
90% Approval

**SUBCOMMITTEE**  
60% Return  
2/3 Approval

**SECTION  
/ TASK  
GROUP**

The ASTM standards development process is driven from the bottom up, by the technical experts.

In the balloting process extensive consideration is given to negative votes. Standards are not approved until all negatives are resolved.

# Ethanol Standards

- Subcommittee D02.A on Gasoline and Oxygenated Fuels
  - Over 295 members that include participation from more than 25 countries
  - Ethanol standards included in scope of D02.A

# Ethanol Specifications

## ■ ASTM Fuel Specifications Governing Ethanol

- **D 4814**, “*Standard Specification for Automotive Spark-Ignition Engine Fuel*”

This specification covers automotive fuels for use in spark-ignition engines. Spark-ignition engine fuels are gasoline and its blends with oxygenates, including gasoline containing up to 10 volume % ethanol (E10)

- **D 4806**, “*Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel*”

This specification covers nominally anhydrous denatured fuel ethanol intended to be blended with gasoline at 1 to 10 volume % ethanol for use as spark-ignition engine fuel

# Ethanol Specifications

- D5798, Specification for Fuel Ethanol (Ed75 Ed-85) for Automotive Spark-Ignition Engines

*Covers a fuel blend, nominally 75 to 85 volume % denatured fuel ethanol and 25 to 15 additional volume % hydrocarbon use in ground vehicles with automotive spark-ignition engines designed to use such a fuel*

# Biodiesel Standards

- Subcommittee D02.E on Diesel Fuel
  - Over 375 members that include participation from 26 countries
  - Biodiesel specifications included in scope of D02.E



# Biodiesel Standards: Philosophy of Standard

## ■ Develop Stand Alone Specification

- Biodiesel producers will be different companies than Petrodiesel producers
- Based on potential markets, a pure biodiesel trading standard is needed
- If fuel meets pure biodiesel spec, it can be blended with diesel in any percentage
- Similar to status of # 2 and #1/kerosene



# Biodiesel Standards: Philosophy of Standard

## ■ Base the Specification on Physical and Chemical Attributes

- Not on Feedstock Source
  - Most likely will be mixtures of oils and fats
- Not on Processing Methods
  - Similar to how petrodiesel specs are set
- Base it on the Properties Needed for Satisfactory Operation of the Vehicle and Engine: “Fit for Purpose”



# Biodiesel Standards: Philosophy of Standard

- Start with Petrodiesel: ASTM D 975
- Eliminate Specifications Not Applicable to Biodiesel:
  - Distillation Curve
  - Cetane Index
  - Aromatics



# Biodiesel Standards: Philosophy of Standard

- Extend to D 975 Tests as it is Updated
- Add Biodiesel Specific Properties:
  - Acid Number
  - Total and Free Glycerin
  - Phosphorous
  - Ca/Mg, Na/K
  - Stability

# Biodiesel Specifications: Written Definition

- *biodiesel*, n. -- a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100.
- *biodiesel blend*, n. -- a blend of biodiesel fuel with petroleum-based diesel fuel designated BXX, where XX is the volume percent of biodiesel.



# Biodiesel Specifications: Written Definition

## ■ Eliminates:

- Coal Slurries
- Raw Vegetable Oils and Fats
- Non-Esterified Oils
- Partially Esterified Oils
- Blends With Diesel
- Hydrotreated oils/fats

## ■ Needed to secure auto, engine, and fuel injection equipment OEM acceptance

- ASTM B100 spec based on existing specs for #1 and #2 petrodiesel in ASTM D 975
- If #1 and #2 meet specs, blends are OK
  - No separate set of specs for blends of #1/#2
- If B100 meets D 6751 and diesel meets D 975, up to 20% biodiesel may be used
  - Blends up to B20 are approved
  - No separate set of specs for the blend
- This has worked well in the marketplace

# Biodiesel Specification Background

- Some users, regulators and OEM's wanted blended fuel specs for biodiesel blends
    - What do you measure if the parent fuel quality is not known? Bid specs, enforcement easier
  - Blended fuel specifications are being set so blends will always be in-spec if two good parent fuels are used
  - The key is getting B100 that meets D 6751
  - Buying from BQ-9000 companies provides added assurance B100 will meet D 6751
- Key Learning: Specs must be enforced!



# ASTM Current Status

- ASTM D 6751 is the approved standard for B100 to be used for blending up to B20
  - ASTM has approved D6751 for B100 only B20 in the final blend
  - Higher blends upon consultation with the OEM
- B5 being balloted into the petrodiesel specifications: D 975, D 396 (heating oil)
  - No changes to D975, D 396
  - B100 must meet D 6751 prior to blending
- B6 to B20 for on/off road diesel engines will be a stand alone specification
  - Widest of #1/#2 specifications, T-90 5 C increase
  - Addition of stability and acid number for final blend

# ASTM D 6751 Activity

- Changes to D 6751 so that no change is needed for B5 in D 975, D 396
  - Completed: lower acid number; add stability parameter, add Ca/Mg, Na/K
- Precipitate above the cloud point issue identified in the market in 2005:
  - Most due to out of specification biodiesel
  - Small portion caused by minor components not controlled in the spec
- ASTM is in process of adding a specification to D 6751 that will address this issue in D 6751
- Once addressed, blended fuel ballots can move forward for approval

# ASTM Activity

- New ‘Blended and Alternative Fuels’ category for D 975 and D 396
- All non-petroleum fuels would fall into this category, which would identify:
  - ASTM spec for the blend component
  - Maximum allowable concentration
  - Test method for measuring the component
- No parameters added and none changed compared to current D 975 or D 396

# ASTM Activity

- Category was needed to address deficiencies in blend stocks not covered by D 975 or D 396
  - i.e. 5% raw vegetable oil could be blended into D 975 and meet properties of D 975 but could have severe problems not prevented by existing D 975 parameters
  - Biodiesel is covered through meeting D 6751 prior to blending
- Issue: Where do mostly hydrocarbon fuels like FT and hydrotreated oils/fats fall?
  - Are they already ‘covered’ by existing D 975 or D 396?
  - Do they need an ASTM spec prior to blending?
  - Are there minor components in these fuels that can cause problems which are not covered by D 975 or D 396?
- Task Force set up by ASTM to address these questions
  - Larger issue than just biodiesel, FT, hydrotreated oils/fats
  - Avoid one bad apple spoiling it for all renewables

THANK YOU!

Questions?