

ASTM Committee D02
Development of New ASTM Specifications - Discussion Forum
Summary
December 8, 2013
Tampa Florida

Committee D02 on Petroleum Products, Liquid fuels, and Lubricants held a committee-wide discussion forum on the aspects of progressing through the specification development process and realizing a new specification, on Sunday afternoon December 8, 2013 at the Marriott Waterside Hotel in Tampa, Florida.

The principle moderator of the forum was the Committee D02 Second Vice-Chairman, assisted by a panel of subcommittee representatives and assistant moderators.

The moderator opened the forum by welcoming the committee members and guests, introduced the panel representatives, and issued an introductory statement as follows;

The intent of this forum, in short, is to provide an educational platform for “Helping us to develop specifications in D02”.

Seated here on the riser with me are representatives from several specification subcommittees, who will be able to provide insight into their operations regarding development of specifications. They will assist in responding to questions and comments that are brought forward in the discussion, providing all of us with a better understanding of whether we are doing enough or need to find ways to do more.

We are NOT here to debate the merits of the ASTM process, or the merits of any specific material, we are here to educate and assist ourselves on how we can navigate the specification process, hopefully to a successful conclusion.

We must remember that ASTM is a consensus process, it is the premier process for producing quality and applicable standards, though there may be disagreement on some issues, this is the process that produces internationally renowned standards.

Following the introduction, presentations were provided by Subcommittee J (on Aviation Turbine Fuels) and Subcommittee E (on Diesel and Burner Fuels) representatives on their experiences in developing specifications. The presentations are attached to this summary.

Following the presentation the forum was opened to general discussion. A summary of the questions and comments heard are presented below grouped by the nature of the topic.

Basic actions/understandings for your standard to be developed

There must be an identifiable need and benefit for the material.

Develop initial collaboration with users (OEMs) or trade associations and provide supporting information. Do not expect ASTM to be your only source of research.

There are two approaches – developing new specifications and adding new materials to existing specifications.

If you want a specification to be adopted you need to participate and expect to take a leadership role.

Fuels and end users (OEMs) are inextricably combined – need input from OEMs they must be part of the development.

Identify specific scope of application of the material, investigate whether it can conform to existing specification or should have a focused specification, generally a single specification is not inclined to cover all materials.

Original specifications [e.g. D975, D1655, D4814] are based on petroleum sources where every specific property is not necessarily identified as they were inherent to wide boiling range petroleum products, introduction of new materials can require extensive research to confirm applicability, and additional properties may need to be identified.

Specifications will be used by the OEMs and regulatory bodies, therefore they must be thoroughly vetted before approval.

Just because a fuel meets the current ASTM specification it does not mean that it is fit for purpose. It may only be fit for purpose when it is blended to a certain level.

Inherent hurdles in standard development

OEMs are focused on meeting regulations so it is difficult for them to find resources for testing proposed new materials – CRC and other groups beyond ASTM can provide a resource to do testing.

Existing regulations or legislation can impede the development of specifications.

The threat of litigation the U.S. can be an obstacle to some developments, especially if historical issues are involved.

A new material may not be approved for use by the OEM until there is a specification, on the other hand then a new material may not get a specification until that material is approved for use by the OEM.

Terminology used by various groups is not consistent which leads to misunderstanding of specifications and applications.

New material proponents are unsure of who or where to begin the process of standard development. Individual subcommittees have their own development approaches.

What can Committee D02 do to improve the system?

When someone asks for a new fuel specification, the Subcommittee typically sets up a working group and the requester becomes the working group chair. The working group submits a ballot, data is always helpful. Negative votes are adjudicated and if it passes subcommittee it will go onto D02.

Current standards should be updated to meet current and future applications.

Subcommittees could develop documented guides to assist new requests.

Consider a mentor system to guide new requests and members.

Consider appendix to include historical issues such that context and significance of standard is clear.

What can ASTM Headquarters do to improve the system?

“Click box” when joining to state that you are interested in developing a new fuel standard followed by assignment of a mentor

Consider some type of provisional specification or standard with at least a 5 year life, extendable up to 10 years.

The role of ASTM

ASTM is a consensus organization and ASTM members write standards and not regulations. If you want to influence ASTM specifications you should join ASTM and participate.

The international impact of an ASTM standard which is written for USA use needs to be considered.

If you don't know where to go with your fuel you can send in a request to ASTM HQ and they will attempt to place it in the correct subcommittee through discussion with the various specification subcommittees .

Search for ways to bring stakeholders to the table.

Provide educational opportunities.

Committee D02 Second Vice-Chairman – Michael Collier (PAC LP)

Committee D02 Secretary – Heather Hamje (ExxonMobil)

Subcommittee Representatives

D02.H0 Andrew Pickard (consultant)

D02.E0 Steve Westbrook (Southwest Research Institute)

D02.B0 Joseph Franklin (Intertek Automotive Research)

D02.J0 Roger Organ (consultant)

D02.A0 Chuck Corr (Archer Daniels Midland)

Assistant Moderators

E A Hap Thompson (Global PPL Standards Assocs.)

W James Bover (WJB Consulting LLC)

Subcommittee J Presentation – Roger Organ

Subcommittee E Presentation – Steve Westbrook

Subcommittee A Example – Coleman Jones (GM)

Attach 1 – List of ASTM D02 “New” Fuel Specifications (compiled by A. Pickard)

Attach 2 - Subcommittee J Presentation

Attach 3 - Subcommittee E Presentation

LIST OF ASTM D02 'NEW' FUEL SPECIFICATIONS Rev 20131226a

Numerical order, with Subcommittee and date of original issue (in brackets)

- D4806 – SC A Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel (1988) - a BLENDSTOCK specification.
- D5797 – SC A Fuel Methanol (M70-M85) For Automotive Spark Ignition Engines (1995)
- D5798 – SC A Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines (1996) - a FINISHED FUEL specification (ethanol with gasoline)
- D6751 – SC E Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels (1999 as PS 121-99; 2002) note this is a BLENDSTOCK, not a finished fuel specification.
- D7223 – SC J Aviation Certification Turbine Fuel (2005) (wide boiling range fuel)
- D7467 – SC E Diesel Fuel Oil, Biodiesel Blend (B6 to B20 (2008) – FINISHED fuel spec.
- D7544 – SC E Pyrolysis Liquid Biofuel (2009) – intended for use in purpose built industrial burners.
- D7547 – SC J Unleaded Aviation Gasoline (2009)
- D7566 – SC J Aviation Turbine Fuel Containing Synthesized Hydrocarbons (2009) – a manufacturing specification – several Annexes define requirements for specific fuels - once certified it becomes D1655 jet fuel.
- D7592 – SC J Grade 94 Unleaded Aviation Gasoline Certification and Test Fuel (2010) -
- D7666 – SC P Triglyceride Burner Fuel (2012) – intended for use in purpose built industrial or commercial burners.
- D7719 – SC J High Octane Unleaded Test Fuel (UL 102) (2011) Originally approved as a test fuel; balloted at D02 in 2013 as a production specification with title change to “High Octane Unleaded Fuel”.¹
- D7794 – SC A Standard Practice for Blending Mid-Level Ethanol Fuel Blends (2012) – A blending practice rather than a fuel specification.
- D7862 – SC A Butanol for Blending with Gasoline for Use as Automotive Spark-Ignition Engine Fuel (2013) – BLENDSTOCK.
- D7901 – SC H Dimethyl Ether [DME] for Fuel Purposes (2013) – intended for use in purpose built diesel engines.

Failed: SC E Paraffinic diesel fuel / Paraffinic middle distillate – 6 ballots failed; proponents discontinued their efforts for an ASTM specification.

Europe: CEN

CWA 15940 'Workshop Agreement' (2009) Paraffinic Diesel from Synthesis or Hydrotreatment - working document / draft specification for paraffinic diesel fuel

¹ Subcommittee J has subsequently decided that if they approve a “test fuel” they will assign a new specification number when the document becomes a production specification.

Guidance on Establishing New Aviation Alternative Fuels

R J Organ
Consultant



The Role of Renewables

- The world needs all kinds of energy sources – Oil, gas, unconventional and renewables – Need to meet the growing demand in an environmentally sound manner
- Renewables in scale and with economic advantage may not be available for years, but the real and challenging work needs to be done now
- Developing infrastructure to produce and distribute new forms of energy such as biofuels on a large scale and developed in a sustainable way will be a significant challenge
- The goals are energy solutions that are socially acceptable, practical, innovative, sustainable and enduring

Alternative Fuels

- There are four major criteria that are essential elements in developing alternative fuels:
 - Good Science (or more particularly no junk science)
 - Real Cost Effectiveness – Not something based **primarily** on tax subsidies or government mandates
 - Life Cycle Analysis (With societal/government agreed upon boundaries and discount levels)
 - **Fitness for Purpose** – Here is where ASTM comes in

Fitness For Purpose

- Just because the “alternative fuel” meets the current ASTM fuel specification does not make the alternative fuel acceptable and Fit for Purpose.
- Current specifications were developed around the known properties of traditional petroleum derived fuels. Not all the critical properties to assess “Fitness for Purpose” are included in the current ASTM petroleum specifications.
 - e.g. Bulk Modulus - Compressibility

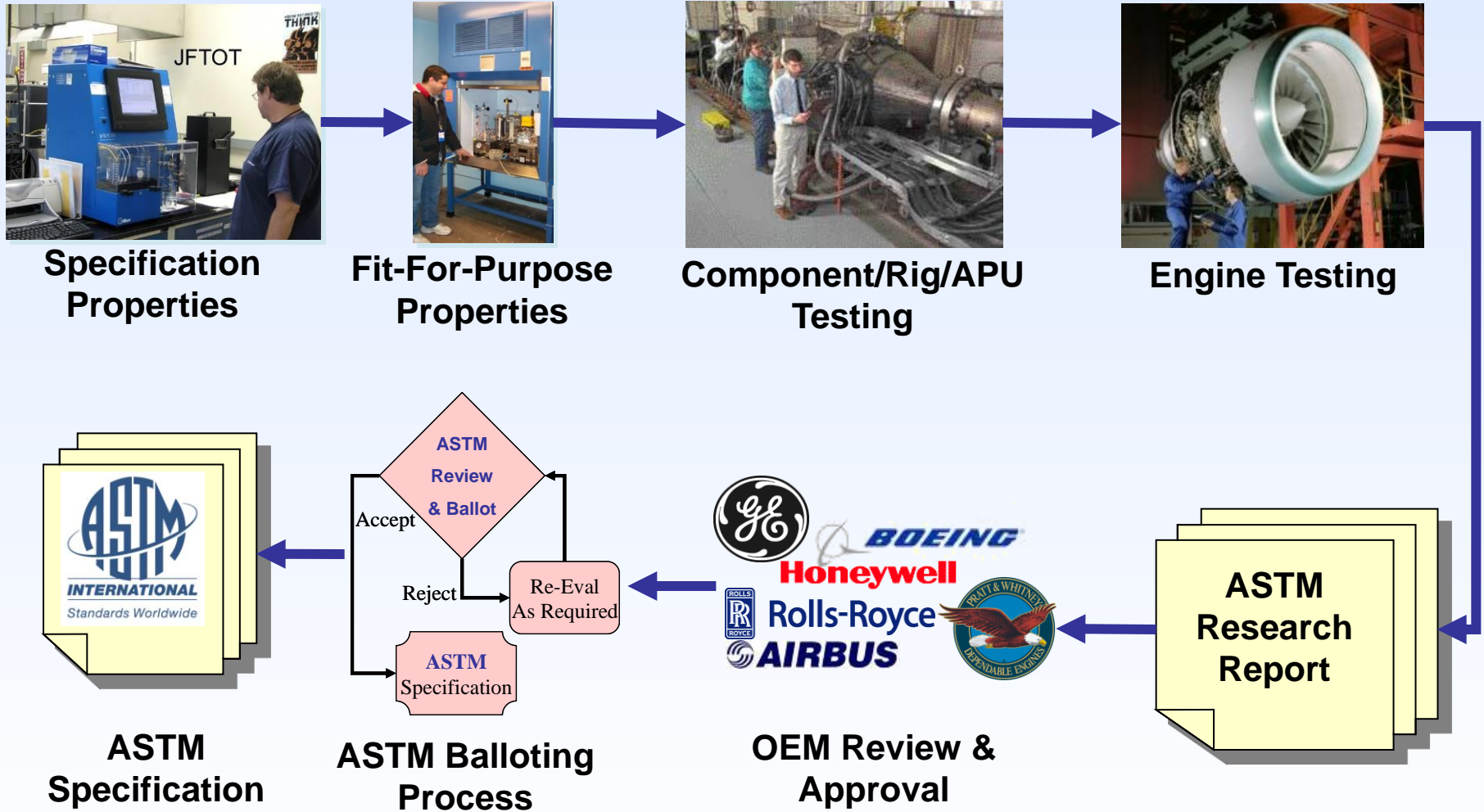
Fitness For Purpose

- In many cases the “Alternative Fuel” is acceptable when blended to a given percentage level but only up to that percentage level. Need Good Science and good data in determining and setting that blend percentage level

A Specification Process For Alternative Fuels Has Been Worked Out In ASTM Subcommittee J

- ASTM D1655 is historically based on the use of petroleum and not all requirements for a “fit for purpose” fuel are given in that spec
- A carefully designed process worked out in ASTM Subcommittee J and the Certification group of CAAFI (Commercial Aviation Alternative Fuels Initiative) www.caafi.org
- Emphasis of Safety of Flight paramount
- All stakeholders were involved with major work being done by the OEM’s to decide on criteria that new fuels must meet
- Started with SASOL’s Fischer Tropsch CTL being allowed up to a 50% blendstock. Decision made to qualify such alternatives through a separate ASTM spec because not all requirements for “fit for purpose” aviation fuel are given in the Jet Fuel Spec ASTM D1655
- **ASTM D7566 was born.** “Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons”
- Along with ASTM D7566 the need for a “Drop In” fuel was considered crucial
- Applicant must show a need for his product by convincing airlines of the need to the point where airlines ask the engine and airframe suppliers for the product to be certified.

Industry Qualification And The Generation of a Research Report Comes First



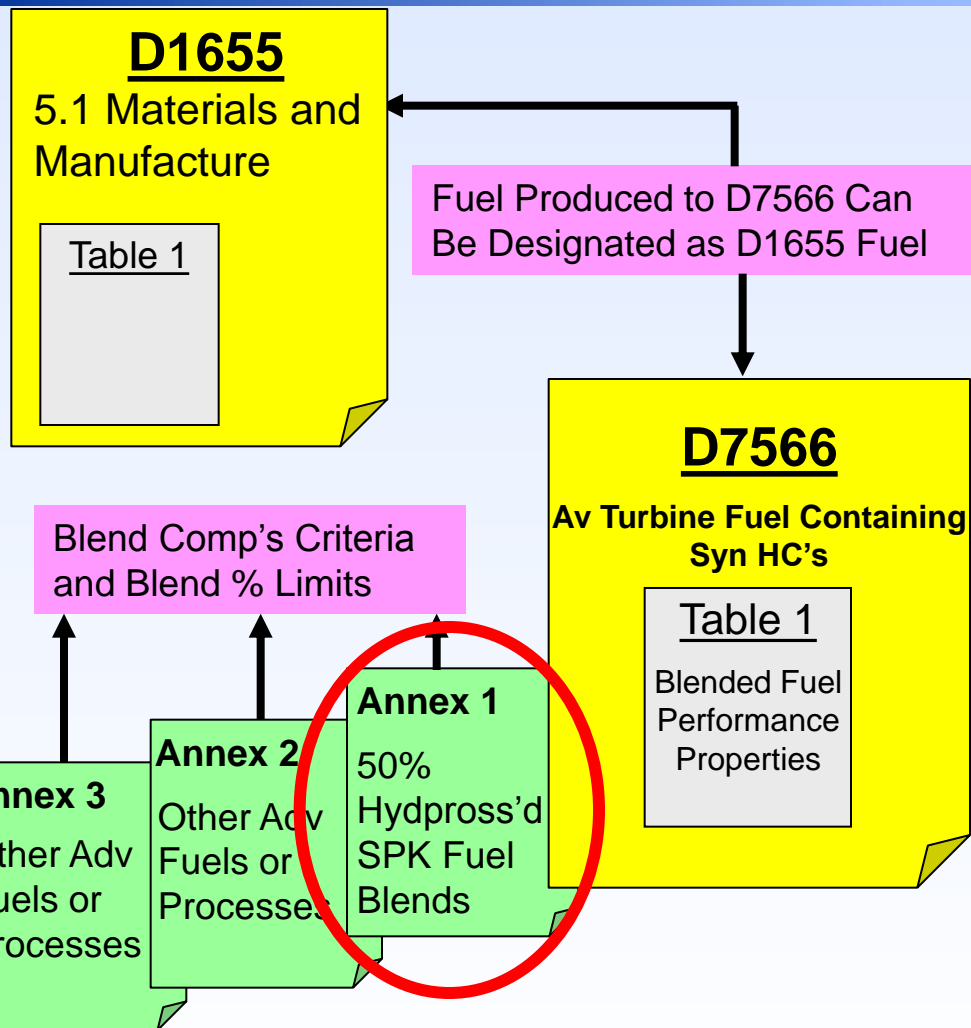
What You Have to Do To Show Fit For Purpose

- There is a practice/guidance material for jet fuel
 - ASTM D4054 “Standard Practice for Qualification and Approval of New Aviation Turbine Fuels and Fuel Additives”
- And a brand new guide for aviation spark ignition fuels expected to be approved
 - ASTM D7826 “Standard Guide For the Evaluation of New Fuels and New Fuel Additives for use in Aviation Spark-Ignition Engines and Associated Aircraft Installations”
- The applicant should consult the practice and guide to understand the processes to be followed

What You Have to Do To Show Fit For Purpose

- ASTM D4054 and ASTM D7826 may be adjusted by the OEM's to fit the particular chemistry of the alternative fuel.
- The applicant will need to get a lot of data up front
- Don't come to the OEM's or ASTM Sub Committees with half a story or suppositions. Must have good data. Getting that data can be expensive and is a cause for concern.
- Alternative Fuels need good funding to get through the "Valley of Death" from research to commercialization

ASTM D7566 Specification – The Way It Works



- Body of Spec Applies to Finished Semi-Synthetic Fuel
- Annex for Each Class of Synthetic Blending Component
- Allow Re-Certification to D1655
 - **Hydro-processed SPK**
 - Includes 50% FT Fuel Annex A1
 - **HRJ/HEFA Fuels approved June 2011**
 - Includes 50% HEFA Annex A2

What Do You Need To Get Through The Full Process

- Capital and Funding – It is not a cheap process to develop the technical data needed to show acceptability and “Fitness For Purpose” . Can extend into the millions of dollars to get the required data
- Talk to the OEM’s early and often – (and with a customer and market based sponsor). They will work with you under NDA’s.
- Understand the ASTM processes – and understand that there is no short cut to going through that process
- Fortitude – Don’t think it is going to be a slam dunk. Don’t expect altruism to carry the day
- Be Prepared to Lead the Process Through ASTM
 - Have good technical data and be capable of explaining it.
 - Have good cost effectiveness that you can demonstrate
 - Have good Life Cycle Analysis

Wrap Up – When it Comes to Alternative Fuels, At This Point In Time, It's All About Finding and Encouraging The Best Options ...Enabling the Winners

- There is no single solution
 - Issues of dependency, reliability of supply, environmental footprint and cost apply to all fuels to some degree
- All economic fuels--Plus much higher levels of conservation--Will be needed to meet future energy demands
 - Market-based competition amongst technologies and fuels should not be inhibited –ASTM can and should be viewed as an enabling process
 - Consumers have the means to conserve and are beginning to respond
- Most alternative fuels are not currently cost sustainable without subsidies. Should they be subsidized? There are other sustainability issues – water, phosphorus, Land Use Changes etc.
- Allow time for technology to advance and society acceptance of full and improved life cycle analysis
 - New technologies like new generation biofuels must offer tangible benefits to consumers and real-world well-to-wake benefits to the environment



The Tao of Subcommittee E0

How We Approach Burner, Diesel,
Non-Aviation Gas Turbine, and
Marine Fuels Specifications

Points to Remember

- **ASTM is a consensus standards organization**
- **If you want to influence ASTM specifications, you should join ASTM and participate**
- **ASTM writes standards but does not write regulations**
- **ASTM is not an enforcement body**
- **ASTM is not the arbiter of whether a given fuel meets the specification – in other words, ASTM will not give an official judgment on a fuel**

D975 (As An Example)

- **When D975 was first written, it described a cut from a barrel of petroleum crude. This was an underlying assumption of the specification**
- **Because of that assumption, it was not really necessary to specify every possible, performance-affecting property of diesel. Some of the properties were inherent**
- **Subsequent changes in fuels manufacturing processes, engine technology, government regulations, and emissions control technology have necessitated changes in D975**

D975...

- **But the underlying assumption that the fuel is petroleum-based meant that many properties of the fuel were still “taken for granted”**
- **With the introduction of biofuels, renewable fuels, alternative fuels, etc. into the market, some properties that were previously taken for granted are now of concern (energy content is an example)**
- **In addition, some “new properties” are now important and perhaps “specification-worthy” (total glyceride content is an example)**

Do Current ASTM Diesel Fuel Specifications Adequately Protect Engines and Users?

- **There are always exceptions; but, the answer is generally yes**
- **They protect because they have gone through the ASTM process, meaning producers, users, and general interest parties all have input**
- **They protect equipment manufacturers because OEMs can design equipment to operate on D975 fuel**
- **They protect users because users can rely on fuels that meet D975 to give acceptable performance**

Can D975 Fuels Cause Problems

- **Yes, they can. But thankfully this is still rare**
- **There have been occasions when changes in the fuel, or changes in engine technology, occurred before all the potential consequences were fully known or understood. The change in fuel lubricity that accompanied the change to 15 ppm sulfur is an example**
- **At those times there can be a somewhat “turbulent” period of transition until the specification is revised to address the problem**
- **The presence of unexpected/unintended contaminants that are not covered by the specification can also cause problems**

What About New, Alternative, Renewable Diesel Fuels?

- **Some of the new fuels that have shown up in the market place**
 - Fischer-Tropsch Fuels (Gas-to-Liquid, Coal-to-Liquid); Ethanol-emulsified diesel fuel; Water-emulsified diesel fuel; Raw vegetable oil; Raw vegetable oil blended with petroleum diesel or other blend components; Hydrodeoxygenated fats, oils, and greases; Others
- **Do these fuels meet D975?**
 - Some may; each must be addressed on a case-by-case basis
- **Will they provide acceptable engine performance?**
 - Some may; use as a blend stock may be better; must address on a case-by-case basis

Why Address on a Case-by-Case Basis?

- **The short answer is that these fuels have more differences than similarities in many cases**
- **The potential concerns/problems with one fuel may be very different from those with another**
- **All OEMs have some similar concerns with new fuels but there are still some differences. Each OEM must consider a new fuel through their company-specific lens. (Approval for B5, B20, BXX use in a given engine is an example.)**
- **Because of the variety of possible fuels and their specific chemistries / properties, there is no widely accepted protocol to assess the adequacy of every fuel. Many concerns and properties are fuel specific.**

Subcommittee E0 Procedures Regarding New Specifications

- **Set up a working group – typically the requestor becomes the working group chair**
- **The working group meets to prepare a ballot item – applicable data are always helpful because there will be questions**
- **Subcommittee E conducts a ballot – if there are negative votes (and there are always negative votes on something new), the working group prepares a plan for the next step**

Subcommittee E0 Procedures Regarding New Specifications

- **The next step is either adjudicate the negative votes or withdraw the ballot item for additional work. This is an iterative process that helps to vet any new proposal**
- **If the item clears subcommittee balloting it then moves on to Committee D2 for balloting. This will probably involve more negative votes and adjudications.**
- **Throughout the process, concerns can be raised and addressed.**

Thank You

Specifications Related to Diesel/Compression Ignition Fuels

- **D975: “Specification for Diesel Fuel Oils”**
 - Shall be hydrocarbon oils (defined in D975) except for B5 allowance. Addition of chemicals to enhance performance, if required, is allowed; must conform to Table 1
 - Diesel fuel oil containing up to 5 vol% biodiesel shall meet requirements of appropriate grade per Table 1
 - If biodiesel is a component, the biodiesel shall meet D6751 and the blend must meet Table 1
- **D6751: “Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels”**
 - “...fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100”
 - Does not include raw vegetable oils or animal fats
- **D7467: “Specification for Diesel Fuel Oil, Biodiesel Blend (B6 to B20)”**
 - The biodiesel component shall meet the requirements of D6751 and the remainder shall conform to either grade No. 1-D or No. 2-D of D975