Fermentative Isobutanol Production from Woody Biomass and Conversion to IPK

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May 2016

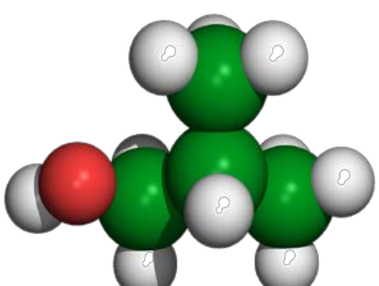
Forward-Looking Statements

Certain statements within this presentation may constitute "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. Such statements relate to a variety of matters, including but not limited to: the timing associated with achieving breakeven EBITDA at the Luverne plant, Gevo's ability to achieve targeted burn rates, including reductions in litigation spend, the timing and costs associated with completing Side-by-Side configuration at the Luverne plant, Gevo's future isobutanol, ethanol and animal feed production capacity, the timing associated with bringing such capacity online, the availability of additional production volumes to seed additional market opportunities, the expected applications of isobutanol, including its use to produce renewable paraxylene, PET, isobutanol-based fuel blends for use in small engines, and ATJ bio-jet, addressable markets and market demand, the timing for bringing customer commitments online, the achievement of advances to Gevo's technology platform, the suitability of Gevo's iDGs™ for the animal feed market, the expected cost-competitiveness and relative performance attributes of isobutanol and the products derived from it, the strength of Gevo's intellectual property position and its ability to profitably license its technology platform to third parties, the IRR and other plant economics associated with the Side-by-Side configuration, Gevo's intended use of the proceeds from this offering and other statements that are not purely statements of historical fact. These forward-looking statements are made on the basis of the current beliefs, expectations and assumptions of Gevo's management and are subject to significant risks and uncertainty. All such forward-looking statements speak only as of the date they are made, and Gevo assumes no obligation to update or revise these statements, whether as a result of new information, future events or otherwise. Although Gevo believes that the expectations reflected in these forward-looking statements are reasonable, these statements involve many risks and uncertainties that may cause actual results to differ materially from what may be expressed or implied in these forward-looking statements. For a discussion of the risks and uncertainties that could cause actual results to differ from those expressed in these forward-looking statements, as well as risks relating to the business of the company in general, see the risk disclosures in Gevo's Annual Report on Form 10-K for the year ended December 31, 2015 and in subsequent reports on Forms 10-Q and 8-K and other filings made with the Securities and Exchange Commission by Gevo, including any prospectus supplements related to this offering.

This presentation is based on information that is generally available to the public and does not contain any material, non-public information. This presentation has been prepared solely for informational purposes and is neither an offer to purchase nor a solicitation of an offer to sell securities.

Company Overview

Commercial scale renewable resource technology platform targeting the $1 trillion chemical and fuel product markets



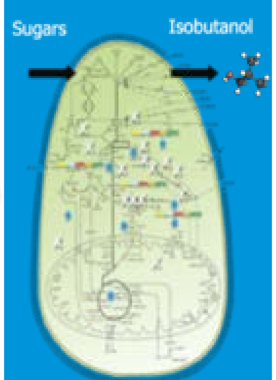
Why iBuOH? Low-Cost Renewables!

Feedstock

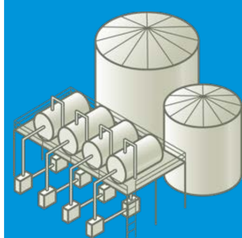
Proprietary Technology

Proven at commercial scale

Yeast Biocatalyst



GIFT® Separator



Commercial Markets

Price and performance attributes driving demand

Direct "drop-in"

Derivatives

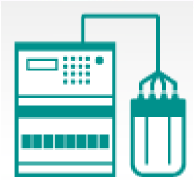
- Solvents
- Marine / Off-road blendstock (i16)
- Premium flex fuel (i60)
- Specialty blendstock (i12.5)
- PX / PET
- Jet fuel
- Isooctane
- Diesel fuel
- Chemical intermediates

Gevo's Role in NARA

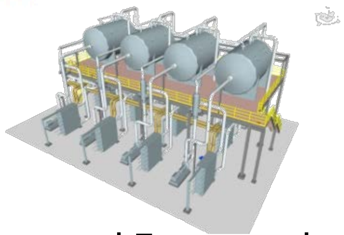
Gevo and NARA

Pretreated Woody Biomass Sugars

Hydrolyzate Screening and Yeast Adaptation



Fermentation Development

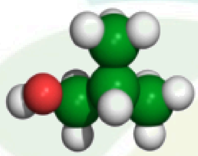


Integrated Fermentation & Recovery of Isobutanol

1. Leverage Gevo-made isobutanol fermenting yeast biocatalysts
2. Screen pretreated hydrolyzates to determine optimal feedstock and pretreatment combination for isobutanol fermentation
3. Adapt yeast to hydrolyzate as needed
4. Develop fermentation and GIFT process for hydrolyzate to isobutanol
5. Produce fuel-spec isobutanol from biomass sugars
6. Convert fuel-spec isobutanol into IPK for biojet blending
7. Secure ASTM Certification of Alcohol-to-Jet process

ASTM Testing & End Users: Commercial and Military

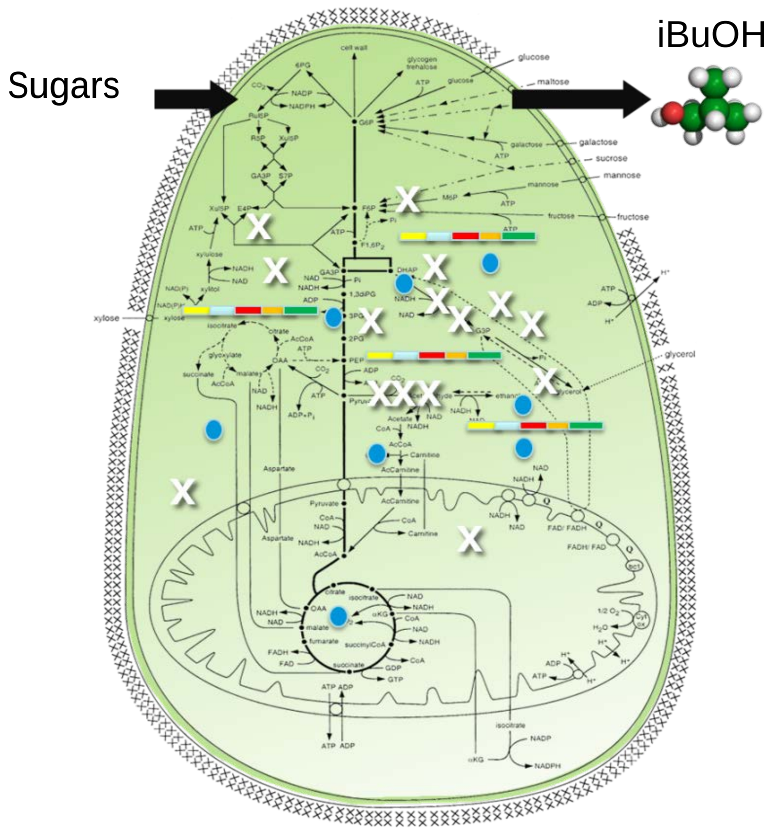
Biojet



Isobutanol

Gevo made a natural EtOH producing yeast into a homofermentative, iBuOH producing yeast

Yeast biocatalyst

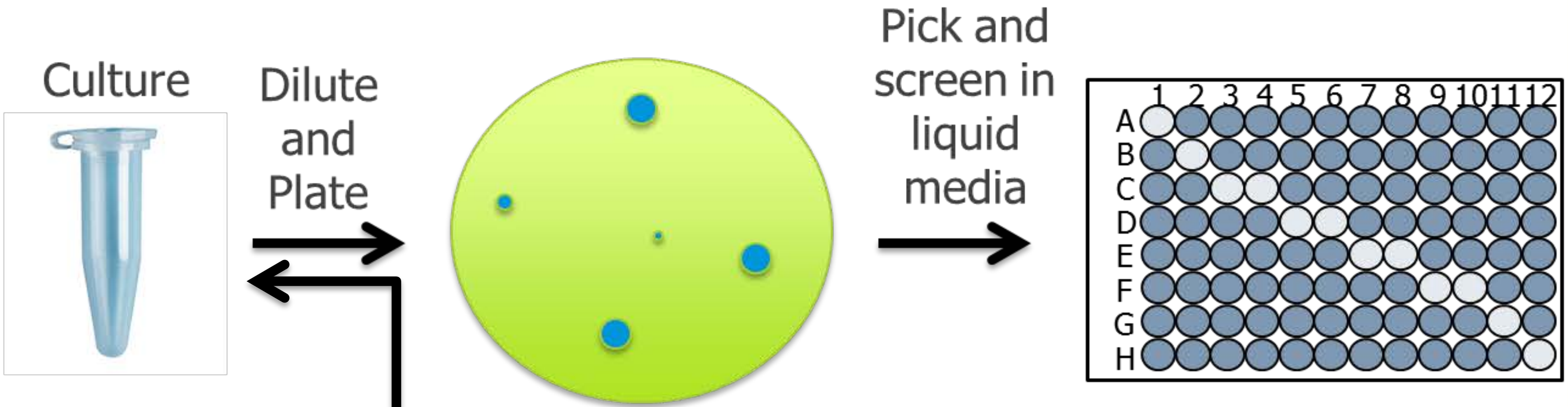


Commentary

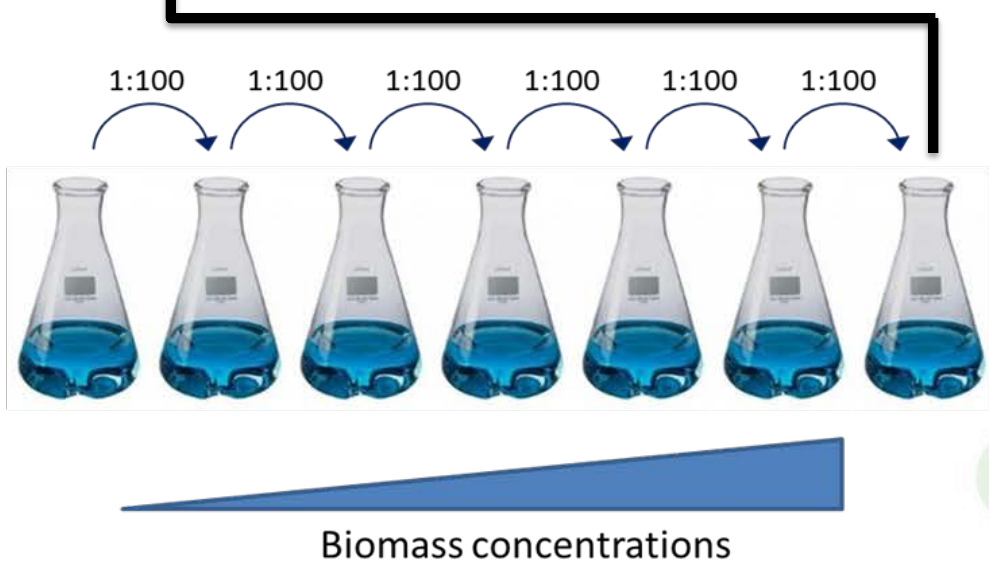
- Synthetic microbiology to modify existing commercial ethanol (EtOH) yeast to produce isobutanol (iBuOH)
- **Engineered 19 fundamental pathways to create multiple classes of iBuOH producing yeast**
- Library of >19,000 iBuOH producing strains in several classes of yeast (FRED, THOR, CB-1)
- Operate in million liter fermenters
- Meets commercial iBuOH production requirements
- Biocatalysts are engineered for "structural cross breeding" to speed pathway development
- Capable of using multiple carbohydrate feedstock (starch, sucrose, cellulosic)
- **Took 8+ years and 50+ people to re-program yeast!!!**

Adaptation of Biocatalysts to NARA Hydrolyzates

Direct selection (agar plates)

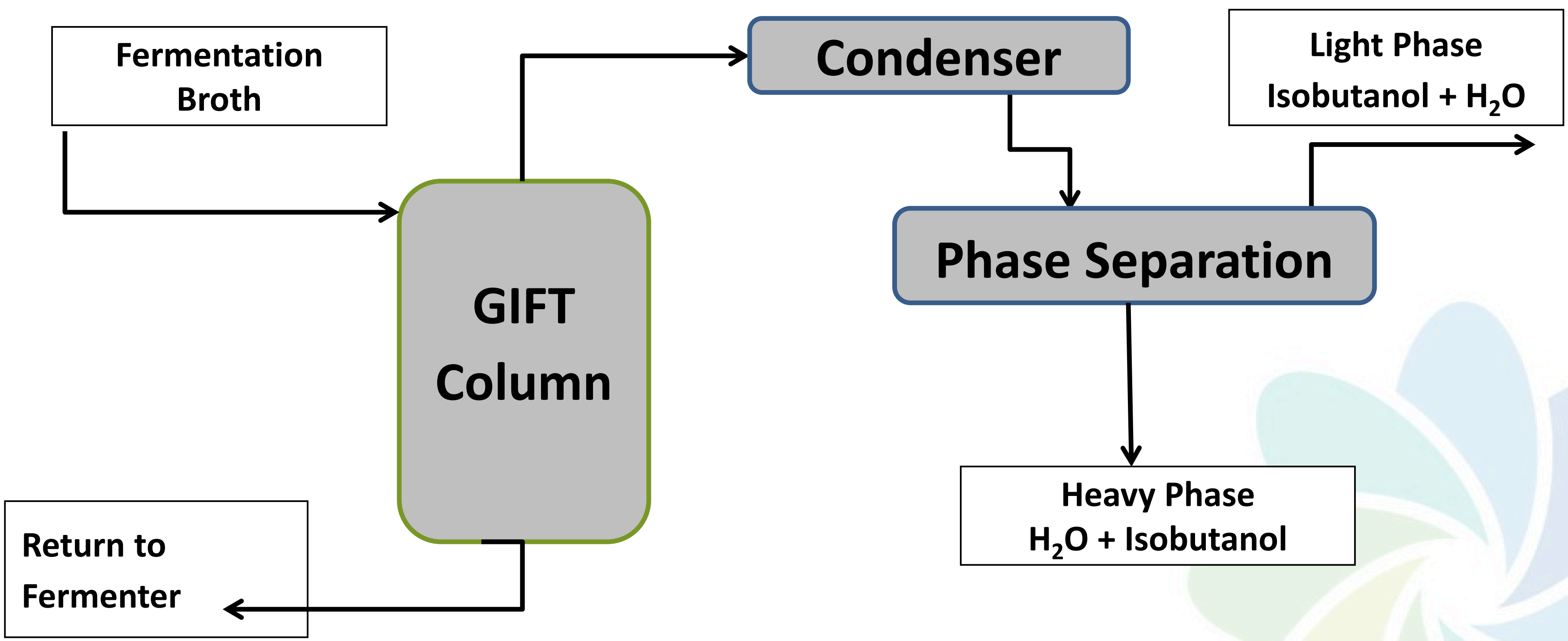


Serial transfer



GIFT®: Gevo Integrated Fermentation Technology

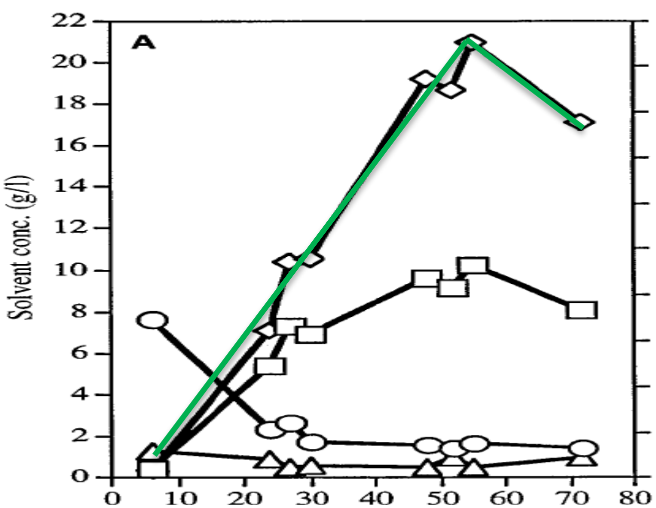
- NARA leverages Gevo fermentation technology developed and proven
- GIFT® is a patented, continual iBuOH removal and recovery system for fermentation



Benefit of GIFT® with Isobutanol

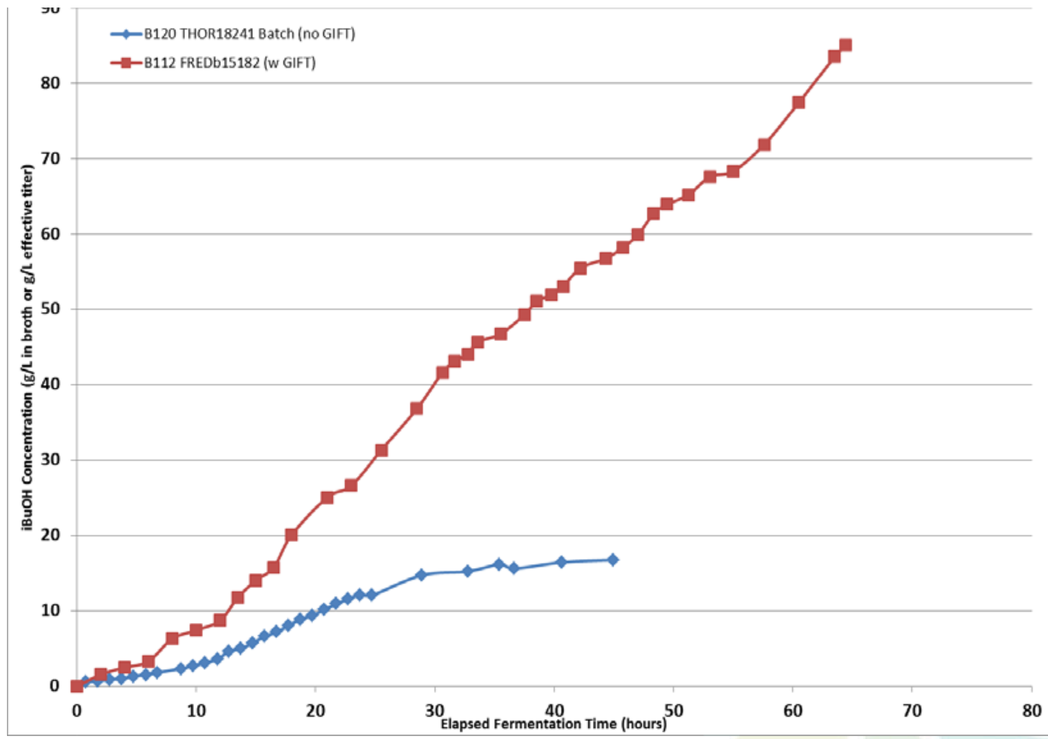
- Gevo has compared commercial fermentation at Luverne with and without GIFT
- The highest n-butanol concentration reported in literature (as of 2009) was 21 g/l in 50 hours.
- Without GIFT: Gevo achieved 16 g/l isobutanol in 35 hours using a yeast that is not our most isobutanol tolerant and under suboptimal fermentation conditions
- With GIFT: Gevo achieved ~90 g/L effective isobutanol titer in ~65h

Lab n-butanol fermentation from literature



Chen et al. Appl Microbiol Biotechnol (1999) 52: 170-173

Commercial Isobutanol Batch, no GIFT® vs Commercial Isobutanol Batch with GIFT®
THOR18241 – not our most tolerant yeast or optimum fermentation conditions
FREDb15182 – not our fastest yeast



Producing iBuOH From Woody-Biomass Sugars

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NARA

Northwest Advanced Renewables Alliance

1K IPK

WOOD TO WING

Scale-Up: 1kIPK Technology Demonstration

- 1kIPK Task Objective: Produce 1,000 gallons of jet fuel using the feedstock and process identified and researched by the USDA funded NARA project at a relevant scale.
- Use key aspects from the NARA project in the production:
  - **Feedstock**: softwood forest residues, primarily Douglas-fir and Western hemlock
  - **Pretreatment**: mild bisulfite variant of the SPORL process as developed by USDA/FPL and Catchlight Energy
  - **Enzymatic Saccharification**: use commercial enzymes from Novozymes
  - **Isobutanol Production**: via fermentation using Gevo patented organisms and fermentation process
  - **Jet Fuel Conversion**: via Gevo process

Western Hemlock

Douglas-fir

Developed Hydrolysis & iBuOH Fermentation Process from Woody Biomass in Lab, then Scale

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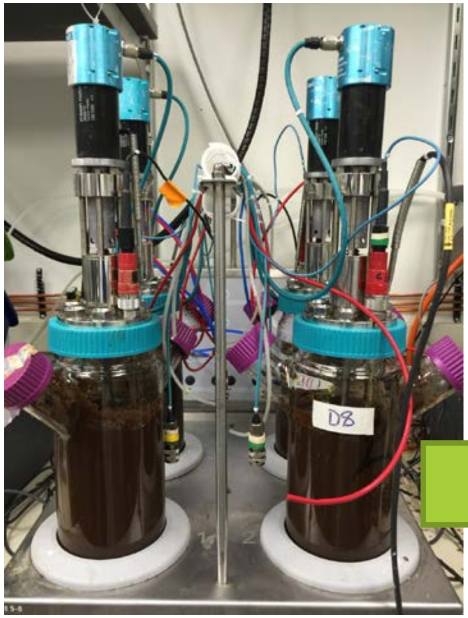
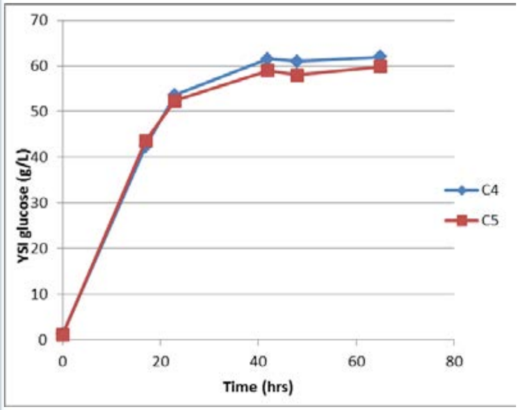
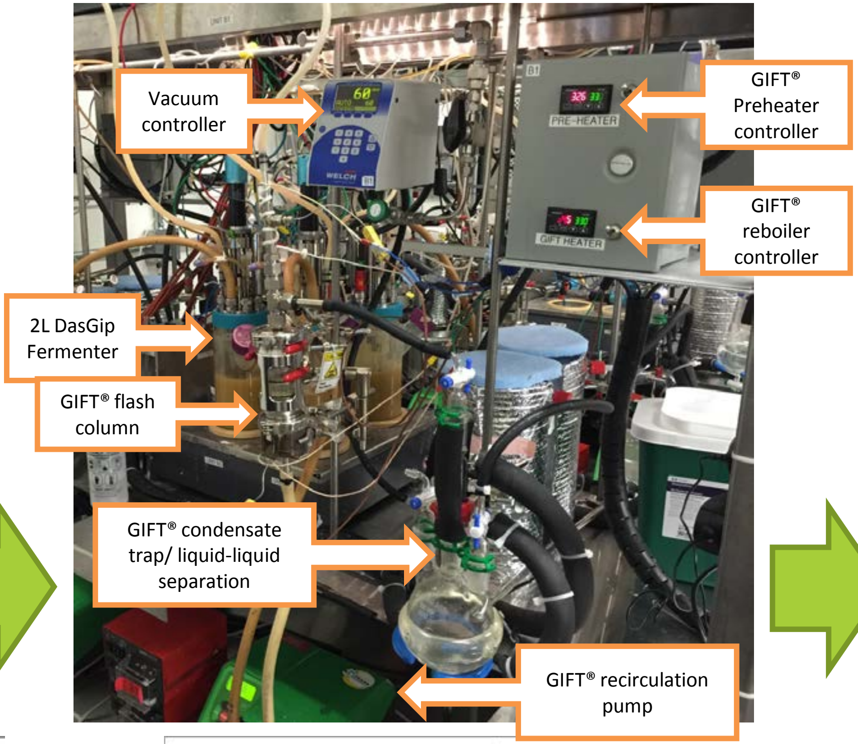
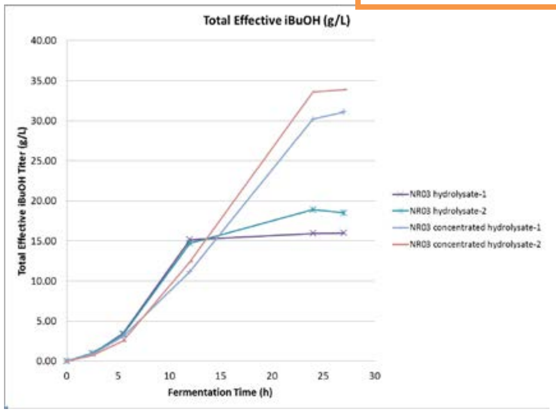
Hydrolysis



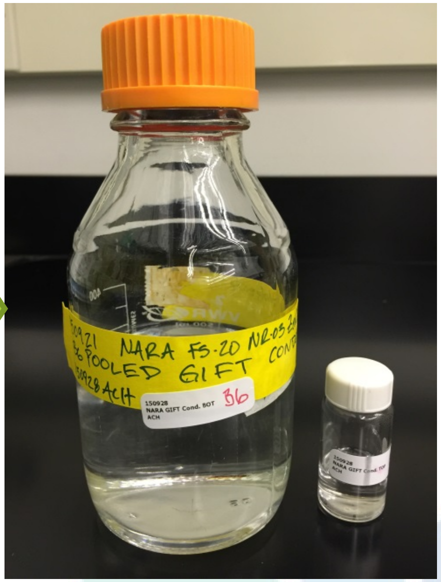


Fermentation

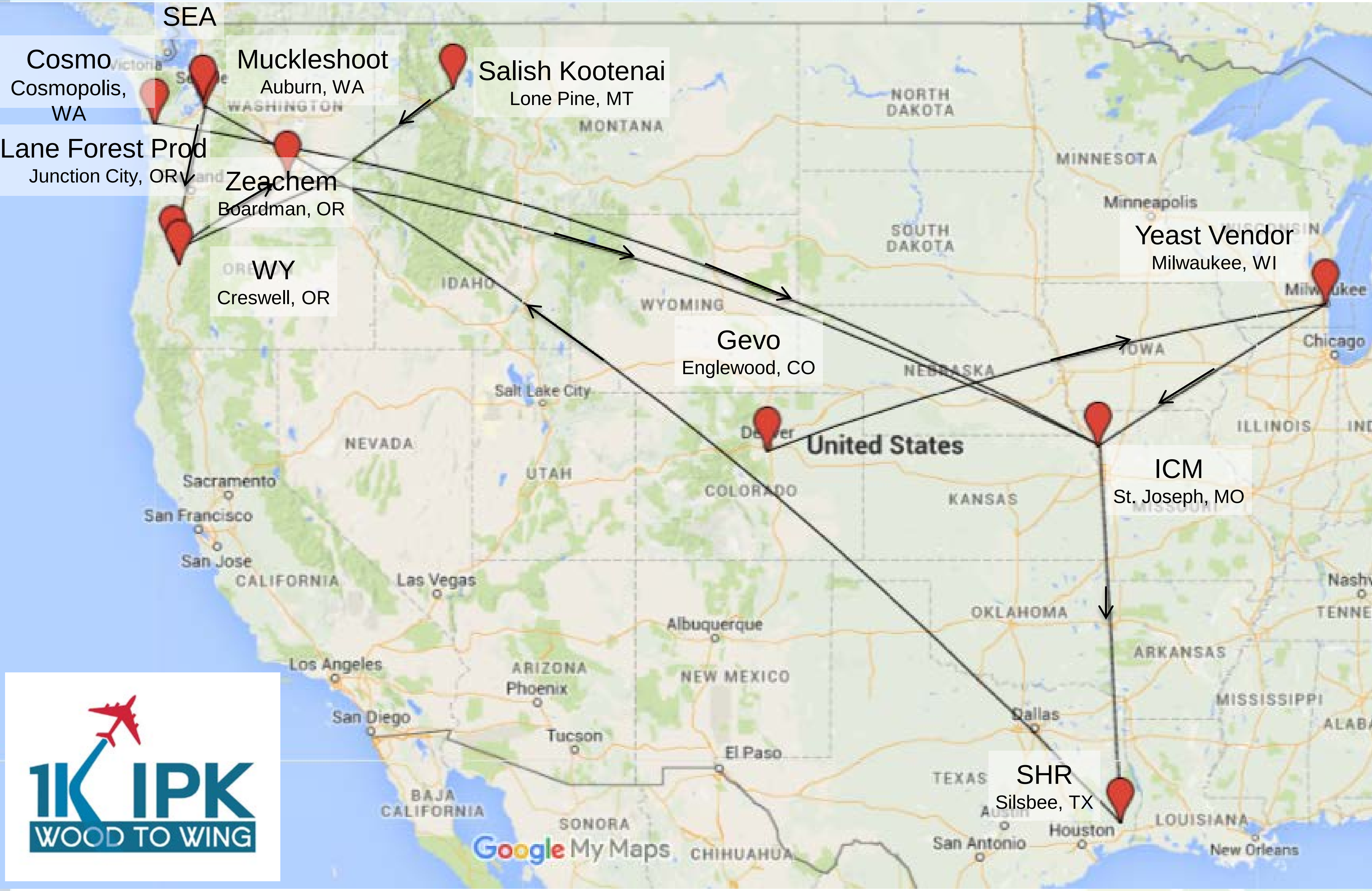




GIFT® Recovery of iBuOH



Locations Contributing to 1,000 gallons IPK



Producing Renewable Biojet from iBuOH and Why Biojet Fuel?

Gevo ATJ *Ready* for Commercial Deployment

Gevo ATJ technology benefits:

- **Replaces petroleum C with renewable C!**
- **Converts sugars to Jet Fuel** - Sugars are cheaper and more plentiful that oils.
- **Demonstrated technology** – Operational production asset for 4 years producing >100,000 gal of ATJ.
- **Efficient processing** – high yielding chemical conversion steps.
- **ASTM certification** –5 yrs of testing working across the supply chain



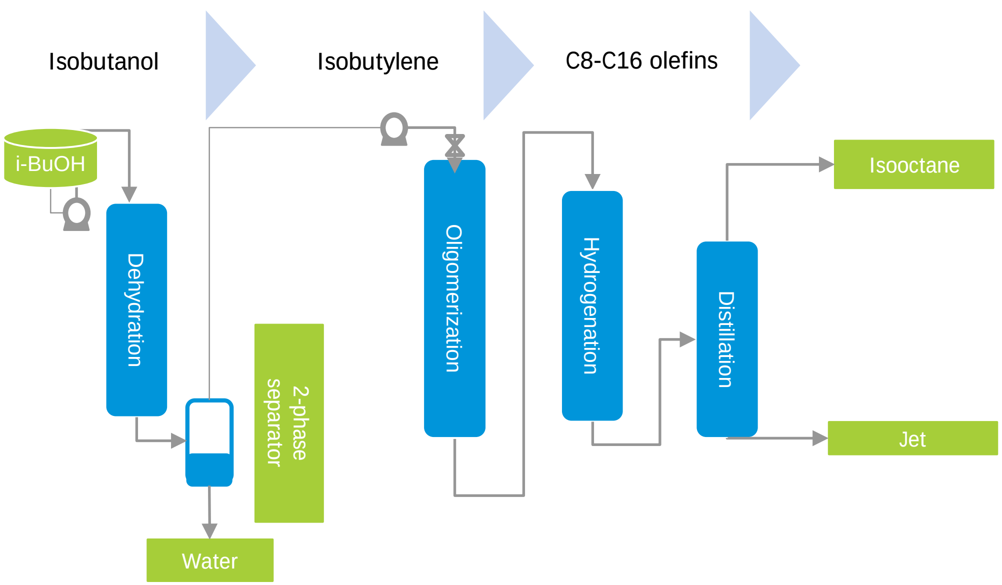
IBA to Hydrocarbons: Simple, Economic Process

Confidential

Technology overview

- Proprietary processing based on standard unit operations leads to high yields, with minimum of co-products.
- Gevo has been producing jet fuel and isooctane since 2011 and PX since 2013 at Silsbee, TX demo plant (~10,000 gal/mo input basis).
- Simple product mix of isooctane and jet.
- Isooctene has been converted to paraxylene (PX) and hydrogen.
- Processes work well. Ready for commercial engineering and deployment.

Process Flow



ASTM Specification Done! Process Protects YOU!

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Tier 1

Specification Properties

Tier 2

Fit-For-Purpose Properties

Phase 1 ASTM Research Report

GE, SAFRAN, BOEING, Honeywell, Rolls-Royce, Pratt & Whitney, AIRBUS

OEM Review & Tier 3 & 4 Requirements

Tier 3

Component/Rig Testing

Tier 4

Engine/APU Testing

Phase 2 ASTM Research Report

GE, SAFRAN, BOEING, Honeywell, Rolls-Royce, Pratt & Whitney, AIRBUS

OEM Review & Approval

FEDERAL AVIATION ADMINISTRATION

FAA Review

ASTM Review & Ballot

Accept → ASTM Specification

Reject → Re-Eval As Required

ASTM Ballotting Process

ASTM INTERNATIONAL Standards Worldwide

ASTM Specification

Gevo ATJ *Ready* for Commercial Deployment

- Gevo ATJ is technologically ready
- Pathway has been vetted through the ASTM process
- Gevo biojet believed to be the most scalable with lowest CapEx and OpEx
- Remaining challenge: ***FUND AND BUILD A FACTORY***

Property (Test Method)	ASTM D1655 Specification (Jet A/Jet A-1)	Typical Jet A-1 (CRC 647)	ATJ-SPK
Freezing Point (ASTM D2386)	-40°C max Jet A -47°C max Jet A-1	- 50°C	**-80°C**
Flash Point (ASTM D3828)	38°C min	48°C	**48°C**
Energy Density (Net Heat of Combustion) (ASTM D3338)	42.8 MJ/kg min	43.1 MJ/kg	**43.2 MJ/kg**
Thermal Oxidation Stability (JFTOT) (ASTM D3241)	pass	pass	**pass**
Total Sulfur Content (ASTM D2622)	0.3% max	0.05%	**<0.01%**

Thank you!

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GHG's from Airlines Coming Into the "Gunsights"

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- According to NYT, 2% of global GHGs are due to airline industry

The New York Times

Opinion | FREE TRIAL | LOG IN

EDITORIAL

Jets Will No Longer Get a Free Ride on Carbon Emissions

Airplanes on the tarmac at San Francisco International Airport.
JUSTIN SULLIVAN / GETTY IMAGES

By THE EDITORIAL BOARD
FEBRUARY 13, 2016

Isooctane Opportu

The New York Times | http://nyti.ms/23TGYfG

ENERGY & ENVIRONMENT

U.N. Agency Proposes Limits on Airlines' Carbon Emissions

By JAD MOUAWAD and CORAL DAVENPORT FEB. 8, 2016

After more than six years of negotiations, the global aviation industry agreed on Monday to the first binding limits on carbon dioxide emissions, tackling the fastest-growing source of greenhouse gas pollution.

The deal is the latest in a series of international efforts to address climate change. Until now, airplanes had not been included in any international climate change deals, like the recent Paris Agreement, or the Montreal Protocol, expected to be completed later this year.

The proposed new rules, announced in Montreal by the International Civil Aviation Organization, the United Nations' aviation agency, would apply for all new airplanes delivered after 2028.

Airlines account for about 2 percent of global emissions — about the same as Germany. But many analysts think the emissions could triple by the middle of the century given the expected growth in air travel over the next decades.

It took little time, though, for the announcement to set off a debate over how effective the proposed rules would be.

Some environmental groups, pointing to the airline industry's close involvement in crafting the deal, said the proposed rules were too weak and failed to include aircraft currently in use.

But advocates of the deal, including the Obama administration, praised it,

Airline Industry Expects to Double in Next 20 Years

Press Release No.: 57

Date: 16 October 2014

New IATA Passenger Forecast Reveals Fast-Growing Markets of the Future

Geneva – the International Air Transport Association (IATA) released its first 20-year passenger growth forecast, projecting that passenger numbers are expected to reach 7.3 billion by 2034. That represents a 4.1% average annual growth in demand for air connectivity that will result in more than a doubling of the 3.3 billion passengers expected to travel this year.

Binding Limits on CO_2 are Expected by 2020

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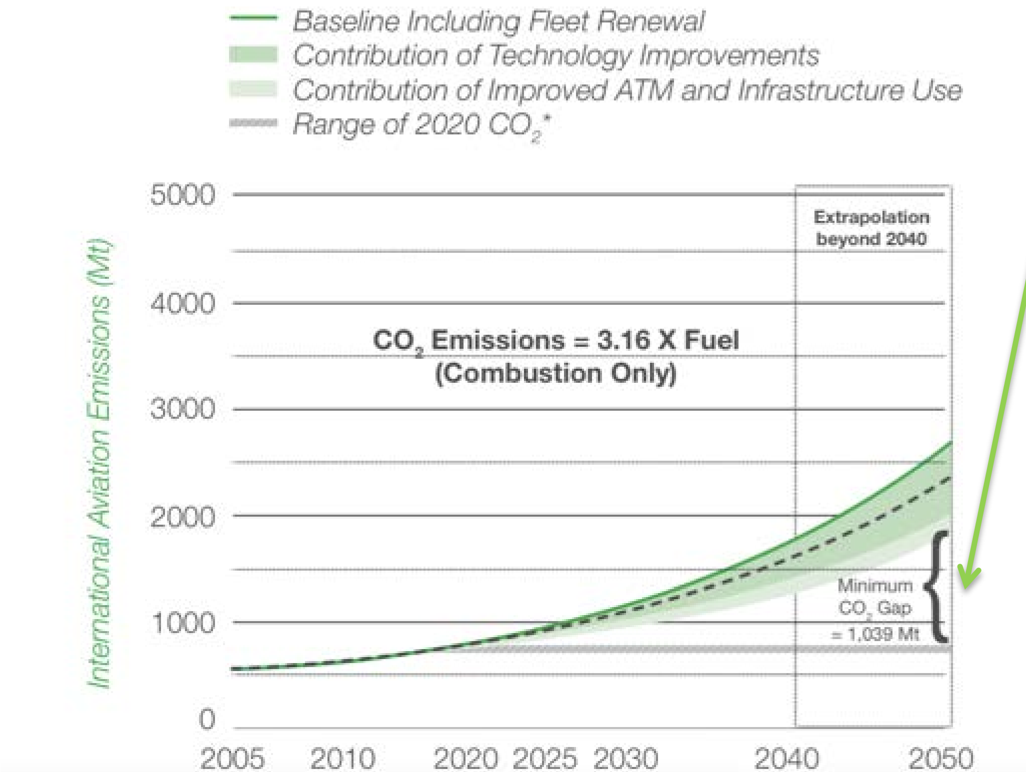
Environmental Goals of ICAO

- Carbon-neutral growth of aviation by 2020, compared to 2005 levels.

ICAO • OACI • ИКАО



Technological improvements cant close this gap, therefore, alternative fuels will be required.

Global Market-Based Measure (GMBM)

- Mandatory offsetting approach attain carbon neutral growth 2020.
- Offsetting through purchase of emissions units that certify emission reductions in other locations or sectors.
- Scope: International flights & CO2 only.
  - Lower Emissions from alternative fuels
  - Methodology of alternative jet fuels in GMBM - CAEP mtg Feb 2016

United States Environmental Protection Agency

Jet Fuel from IBA Included in Commercial Specification

- Gevo ATJ is one of three alternative jet fuel products included in spec, and believed to be the most scalable with lowest CapEx and OpEx

Designation: D7566 – 16

An American National Standard

Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons[1]

This standard is issued under the fixed designation D7566; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers the manufacture of aviation turbine fuel that consists of conventional and synthetic blending components.

1.2 This specification applies only at the point of batch origination, as follows:

1.2.1 Aviation turbine fuel manufactured, certified, and released to all the requirements of Table 1 of this specification (D7566), meets the requirements of Specification D1655 and shall be regarded as Specification D1655 turbine fuel. Duplicate testing is not necessary; the same data may be used for both D7566 and D1655 compliance. Once the fuel is released to this specification (D7566) the unique requirements of this specification are no longer applicable: any recertification shall be done in accordance with Table 1 of Specification D1655.

1.2.2 Field blending of synthesized paraffinic kerosine (SPK) blendstocks, as described in Annex A1 (FT SPK), Annex A2 (HEFA SPK), Annex A3 (SIP), synthesized paraffinic kerosine plus aromatics (SPK/A), or Annex A5 (ATJ) as described in Annex A4 with D1655 fuel (which may on the whole or in part have originated as D7566 fuel) shall be considered batch origination in which case all of the requirements of Table 1 of this specification (D7566) apply and shall be evaluated. Short form conformance test programs commonly used to ensure transportation quality are not sufficient. The fuel shall be regarded as D1655 turbine fuel after certification and release as described in 1.2.1.

1.2.3 Once a fuel is redesignated as D1655 aviation turbine fuel, it can be handled in the same fashion as the equivalent refined D1655 aviation turbine fuel.

1.3 This specification defines specific types of aviation turbine fuel that contain synthesized hydrocarbons for civil use in the operation and certification of aircraft and describes fuels found satisfactory for the operation of aircraft and engines. The specification is intended to be used as a standard in describing the quality of aviation turbine fuels and synthetic blending components at the place of manufacture but can be used to describe the quality of aviation turbine fuels for contractual transfer at all points in the distribution system.

1.4 This specification does not define the quality assurance testing and procedures necessary to ensure that fuel in the distribution system continues to comply with this specification after batch certification. Such procedures are defined elsewhere, for example in ICAO 9977, EI/JIG Standard 1530, JIG 1, JIG 2, API 1543, API 1595, and ATA-103.

1.5 This specification does not include all fuels satisfactory for aviation turbine engines. Certain equipment or conditions of use may permit a wider, or require a narrower, range of characteristics than is shown by this specification.

1.6 While aviation turbine fuels defined by Table 1 of this specification can be used in applications other than aviation turbine engines, requirements for such other applications have not been considered in the development of this specification.

1.7 Synthetic blending components, synthetic fuels, and blends of synthetic fuels with conventional petroleum-derived fuels in this specification have been evaluated and approved in accordance with the principles established in Practice D4054.

1.8 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D56 Test Method for Flash Point by Tag Closed Cup Tester

[1] This specification is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.J0.06 on Emerging Turbine Fuels.

Current edition approved April 1, 2016. Published April 2016. Originally approved in 2009. Last previous edition approved in 2015 as D7566 – 15c. DOI: 10.1520/D7566-16.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

A4.2 Other Detailed Requirements; SPK/A

	SPK/A	Test Method
Max	15	D2425
Max	20	D2425
	report	D2425
Min	99.5	D5291
Max	2	D4629/IP 379
Max	75	D6304 or IP 438
Max	15	D5453, D2622
Max	0.1 per metal	D7111 or UOP 389
Max	1	D7359

ET SYNTHETIC PARAFFINIC KEROSENE (ATJ-SPK)

NOTE A5.1—It is the ultimate objective of this committee to permit use of all C2 to C5 alcohols for production of ATJ-SPK once sufficient test data is available for these other alcohols.

A5.5 Detailed Batch Requirements

A5.5.1 Each batch of synthetic blending component shall conform to the requirements prescribed in Table A5.1.

A5.5.2 *Test Methods*—Determine the requirements enumerated in this annex in accordance with the following test methods.

A5.5.2.1 *Density*—Test Method D1298/IP 160, D4052 or IP 365.

A5.5.2.2 *Distillation*—Test Methods D86 or IP 123, and D2887/IP 406.

A5.5.2.3 *Flash Point*—Test Method D56, D3828, IP 170, or IP 523.

A5.5.2.4 *Freezing Point*—Test Method D5972/IP 435, D7153/IP 529, D7154/IP 528, or D2386/IP 16. Any of these test methods may be used to certify and recertify jet fuel. However, Test Method D2386/IP 16 is the referee method. An interlaboratory study (RR:D02-1572[16]) that evaluated the ability of freezing point methods to detect jet fuel contamination by diesel fuel determined that Test Methods D5972/IP 435 and D7153/IP 529 provided significantly more consistent detection of freeze point changes caused by contamination than Test Methods D2386/IP 16 and D7154/IP 528. It is recommended to certify and recertify jet fuel using either Test Method D5972/IP 435 or Test Method D7153/IP 529, or both, on the basis of the reproducibility and cross-contamination detection reported in RR:D02-1572.[16] The cause of freezing point results outside specification limits by automated methods should be investigated, but such results do not disqualify the fuel from aviation use if the results from the referee method (Test Method D2386/IP 16) are within the specification limit.

A5.5.2.5 *Total Acidity*—Test Method D3242/IP 354.

A5.5.2.6 *Thermal Stability*—Test Method D3241/IP 323.

ements; Alcohol-to-Jet (ATJ-SPK)

A5.6.2.1 *Cycloparaffins*—Test Method D2425.

A5.6.2.2 *Aromatics*—Test Method D2425.

A5.6.2.3 *Paraffins*—Test Method D2425.

A5.6.2.4 *Carbon and Hydrogen*—Test Method D5291.

A5.6.2.5 *Nitrogen*—D4629/IP 379.

A5.6.2.6 *Water*—Test Method D6304 or IP 438.

A5.6.2.7 *Sulfur*—Test Methods D5453 or D2622. Either of these test methods can be used to certify and recertify jet fuel. However, Test Method D5453 is the referee method.

A5.6.2.8 *Metals*—Test Method D7111 or UOP 389.

A5.6.2.9 *Halogens*—Test Method D7359.