Fermentative Isobutanol Production from Woody Biomass and Conversion to Biojet

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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, Side-by-Side configuration at the Luverne plant, Gevo's future isobutanol, ethanol and animal feed production capacity, 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, 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 United States Securities and Exchange Commission by Gevo.

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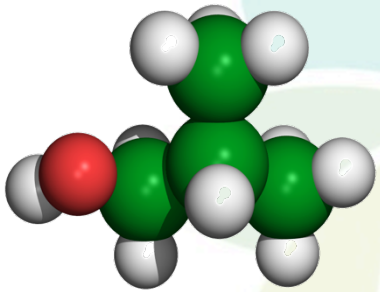
Company Overview

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

Luverne, MN: Commercial Isobutanol/Ethanol/Animal Feed Plant

- R&D and HQ in Colorado
- Small company, ~75 people at 2 sites
- Public on the NASDAQ market



Why iBuOH? Low-Cost Renewables!

Feedstock



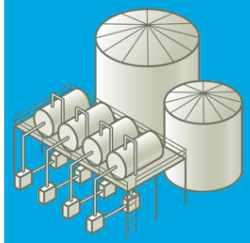


Proprietary Technology

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

USDA NIFA NARA

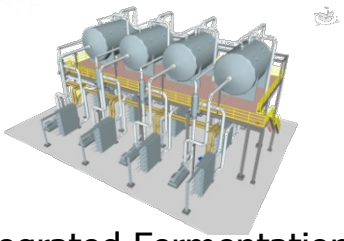
Gevo's Role in NARA

Gevo and NARA

Pretreated Woody Biomass Sugars

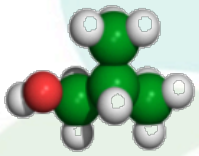
Hydrolyzate Screening and Yeast Adaptation

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. ***BONUS***: Secure ASTM Certification of Alcohol-to-Jet process



Isobutanol

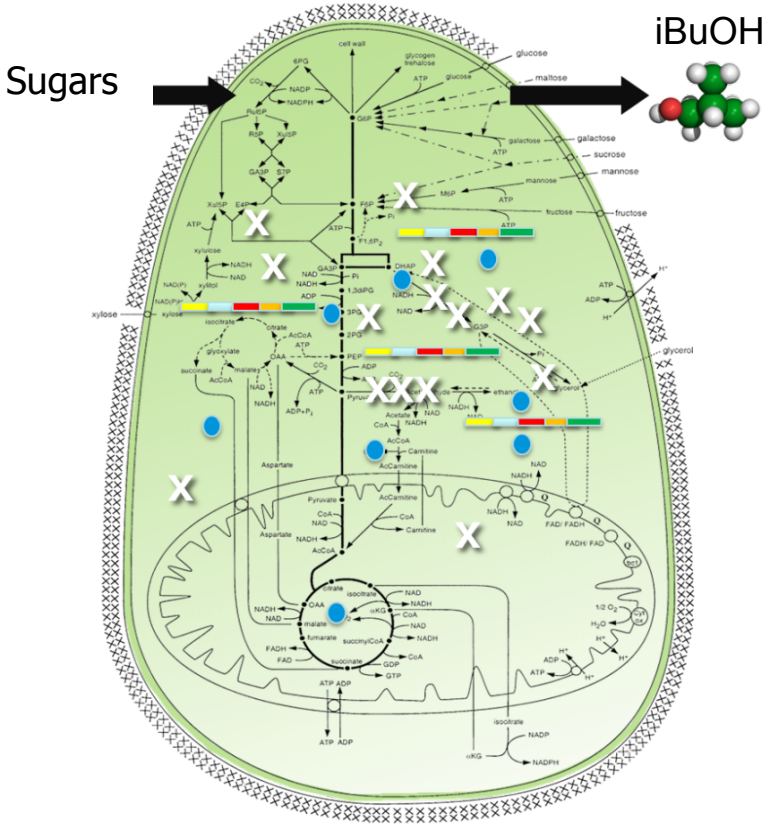
Biojet

ASTM Testing & End Users: Commercial and Military

NARA

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

Yeast biocatalyst



Commentary

- Synthetic biology & genetic engineering used 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 **>18,000** iBuOH producing strains in several classes of yeast (FRED, THOR, CB-1)
- Operate in **1,000,000** 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=NARA)
- Took **8+ years** and **50+ people** to re-program our yeast!!!

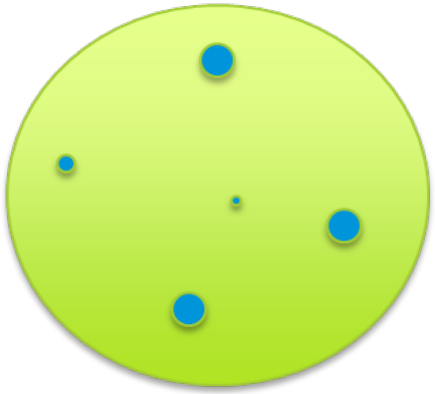
USDA NIFA NARA

Adaptation of Biocatalysts to NARA Hydrolyzates

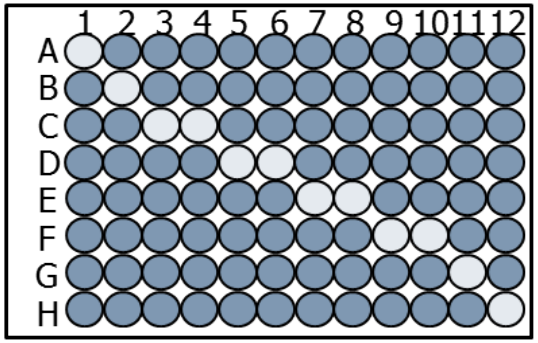
Direct selection (agar plates)

Culture

Dilute and Plate



Pick and screen in liquid media



Serial transfer

1:100 1:100 1:100 1:100 1:100 1:100

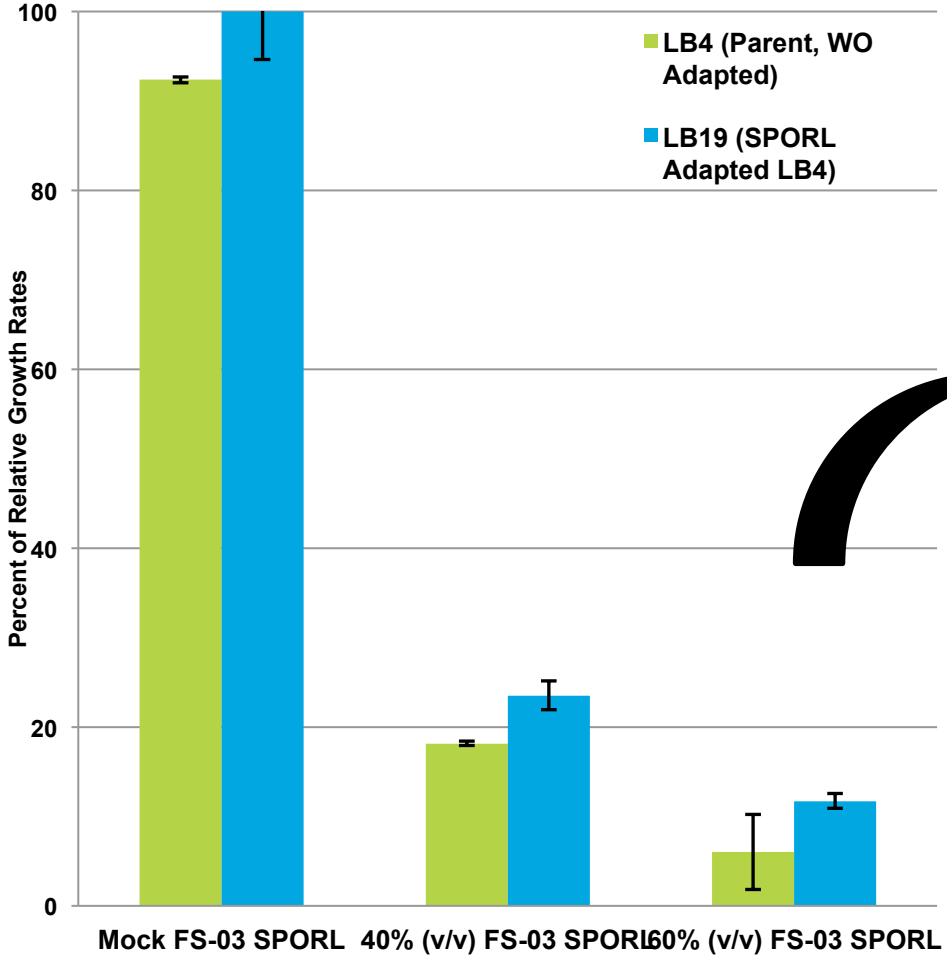
Biomass Hydrolyzate Concentration

NARA

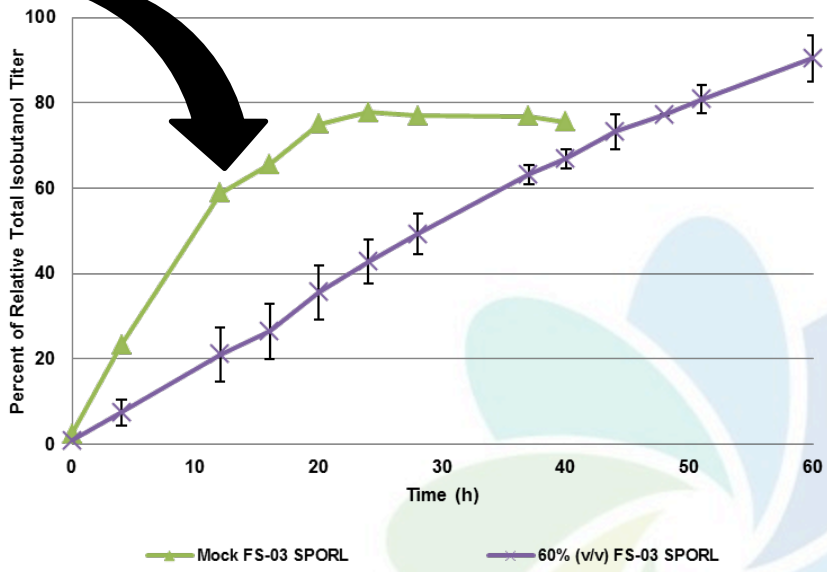
Adaptation of Biocatalysts to Hydrolyzate

years (engineering) ~3 mo ~2 mo years

LB1 → LB3 → LB4 → LB19 → LB23=THOR

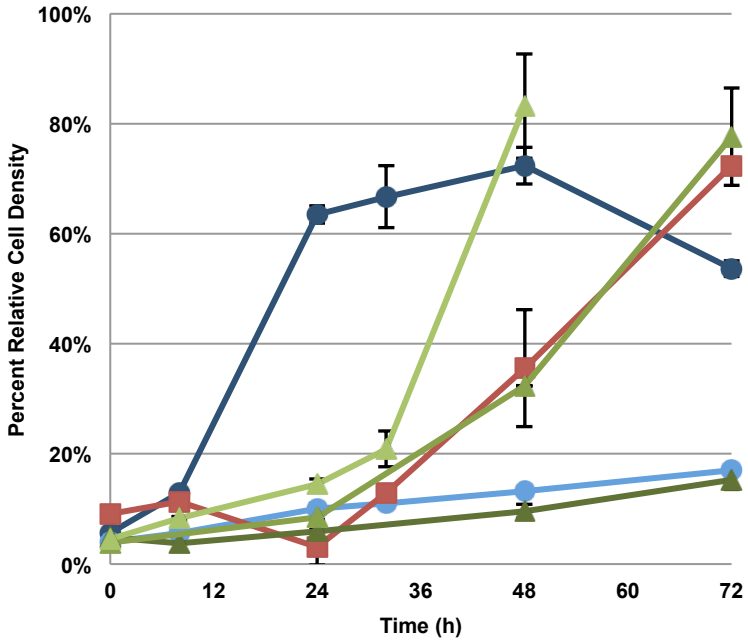


- Early isobutanol yeast strains would not grow in SPORL hydrolyzate past a 60%/40% blend with sugar water
- The power of adaptation led to yeast strains that could grow in and ferment sugars from hydrolyzate

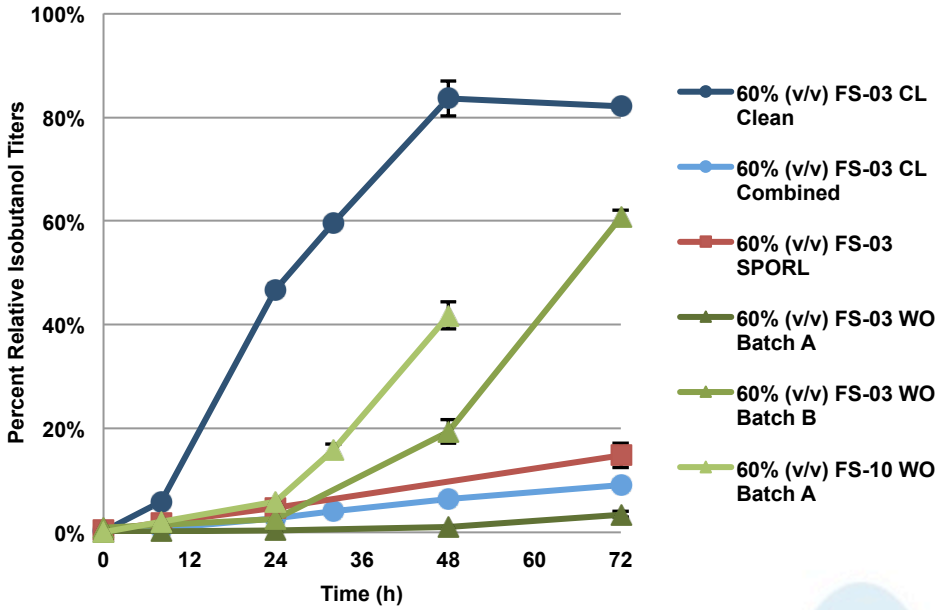


Pretreatment Characterization (Shake Flask)

Growth in Hydrolyzate



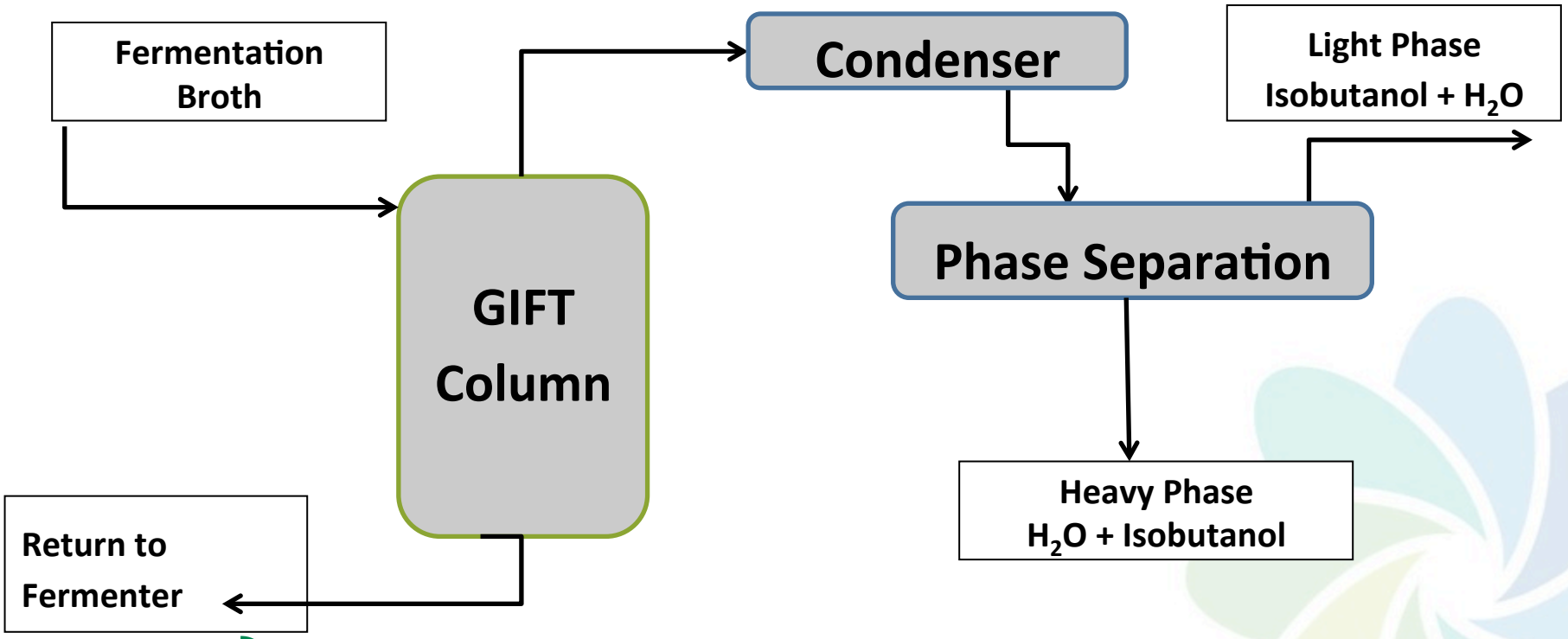
iBuOH Production from Hydrolyzate



- >60% hydrolyzate meant NO YEAST GROWTH!
- Shake flasks allow comparison of multiple strains, growth and iBuOH production with small volumes (50 mL) hydrolyzate/replicate
- Used for screening strains for fermentation performance before 2L fermenter scale

GIFT®: Gevo Integrated Fermentation Technology

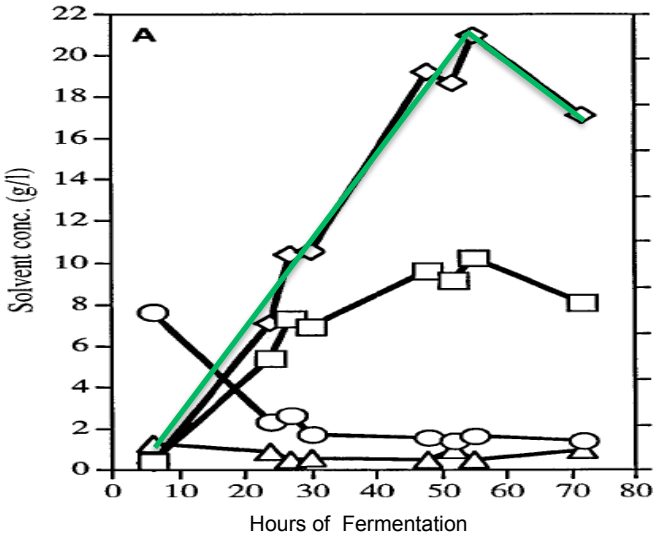
- GIFT® is a proprietary, continual iBuOH removal and recovery system for fermentation
- GIFT ® is essential for production of high amounts of iBuOH by fermentation



Benefit of GIFT and 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

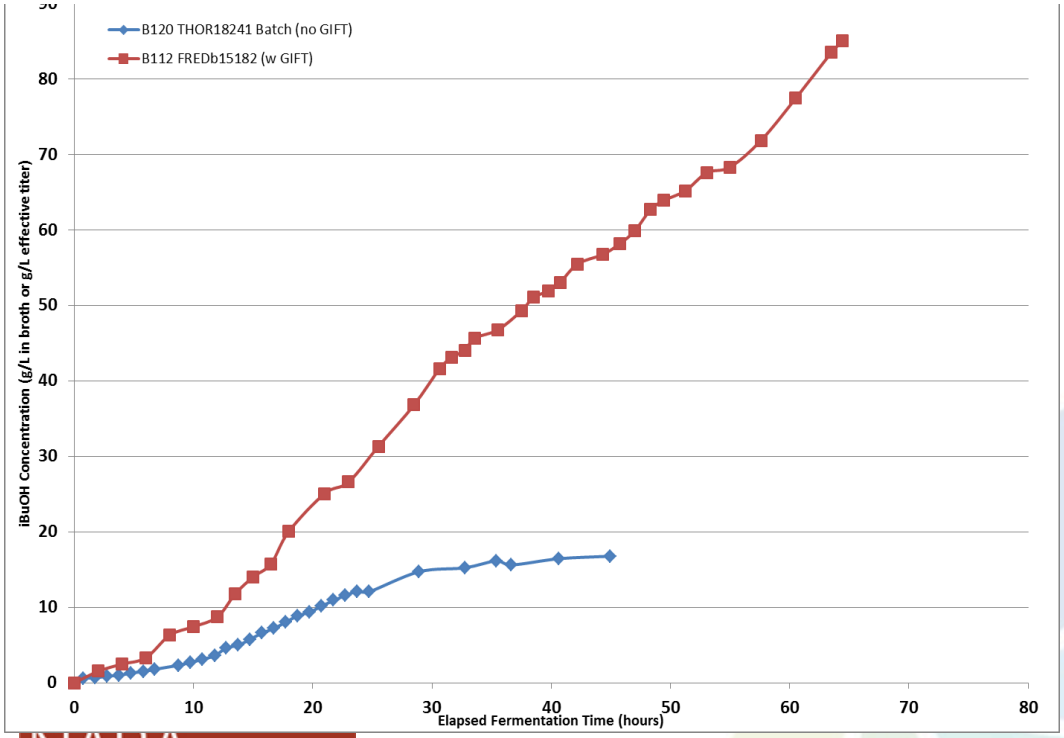


Chen et al. Appl Microbiol Biotechnol (1999) 52: 170-173

Commercial Isobutanol Batch, no GIFT® vs Commercial Isobutanol Batch with GIFT®

THOR18241 – not our most tolerant yeast or optimum fermentation conditions

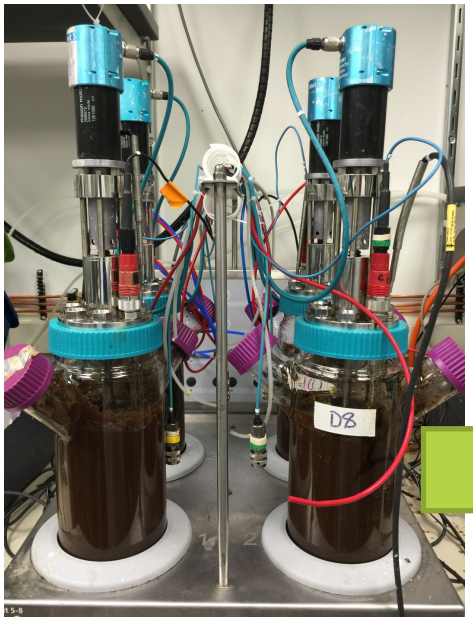
FREDb15182 – not our fastest yeast

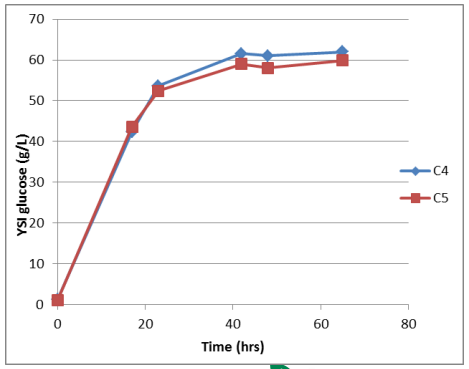


Producing iBuOH From Woody-Biomass Sugars

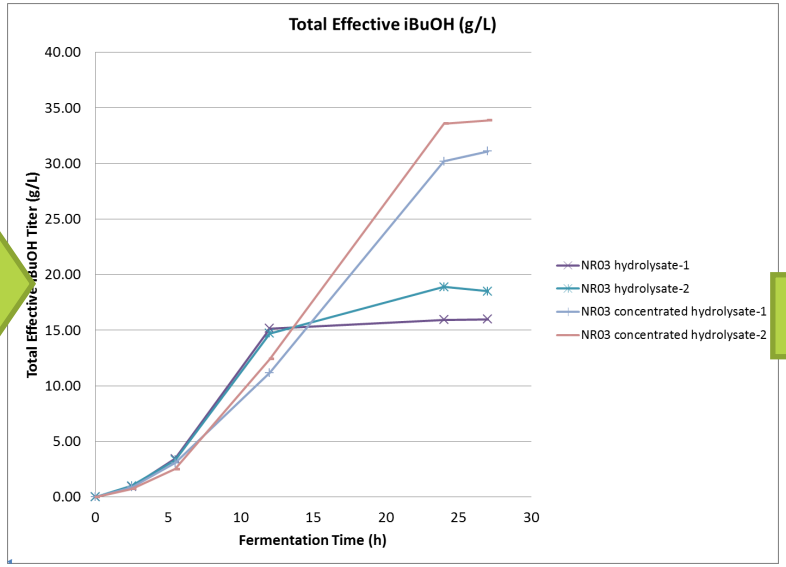
Developed Hydrolysis & iBuOH Fermentation Process from Woody Biomass in Lab

Hydrolysis

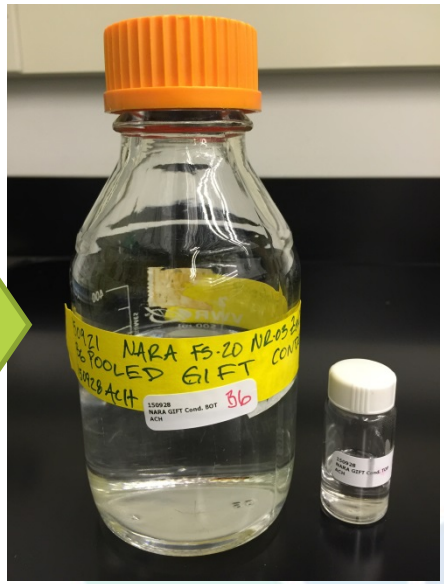




Fermentation



GIFT® Recovery of iBuOH



NARA

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; Cosmo Specialty Fibers pretreatment
  - **Enzymatic Saccharification**: use commercial enzymes from Novozymes
  - **Isobutanol Production**: via fermentation using Gevo patented organisms and fermentation process
  - **Jet Fuel Conversion**: via Gevo process

NARA

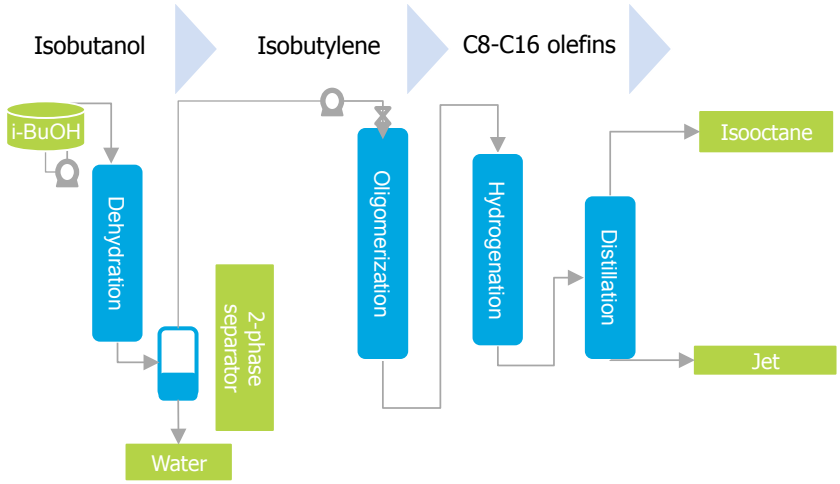
IBA to Hydrocarbons: Simple, Economic Process

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 at Silsbee, TX demo plant (~10,000 gal/mo input basis).
- Simple product mix of isooctane and jet.
- Processes work well. Ready for commercial engineering and deployment.

Process Flow



USDA NIFA NARA

Gevo ATJ Ready for Commercial Deployment

Gevo ATJ technology benefits:

- **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** –8 yrs of testing working across the supply chain
- **Replaces petroleum C with renewable C!**

NARA

Thank you!