

16th STS-AIChE Southwest Process Technology Conference

Bio Diesel & Renewable Diesel

▶ **Market Review**

▶ **Paul Wicker**

▶ **Rosnik Solutions**

Sept 22-23, 2025, University of Houston



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Paul Wicker

Chemical Engineer – Purdue University 1981

Oil & Gas Industry for 40+ years

Last 7 years Decision Analyst working on
Renewable Projects

Retired from Chevron in 2024

Currently – Decision Analysis Consultant for
Rosnik Solutions

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About Rosnik Solutions



- ✓ Strategy Development - Maximize ROI
- ✓ Engineering : Minimize Project Cost
- ✓ Operational Excellence : Maximize Margin
- ✓ Training courses (10)
- ✓ Presence in US, India & Middle East
- ✓ Focused on the Downstream & Chemicals Value Chains

Strategy Development

- ✓ Decision Analysis (DA)
- ✓ Risk Value Balance
- ✓ **Agentic AI based DA (Unanimous)**
- ✓ **Enterprise heat map development (Accelare)**

Engineering

- ✓ Develop Business Cases
- ✓ Early-Stage Project Development
- ✓ FEED & Detailed Engineering
- ✓ **Advanced Work Packaging (AWP - CX)**
- ✓ India Emissary Service

Operational Excellence

- ✓ Troubleshooting
- ✓ Safety system studies
- ✓ Documentation
- ✓ **Visual workflow management tool for individuals & teams, DA & AI supported (Optimality)**

Problem Solving Course, offered through PetroSkills

Interactive workshop with specific industry case studies targeting individuals responsible for operations and operations support of process plants with focus on Refining, Petrochemicals & Chemicals value chain

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Introduction to Biofuels

Agenda

- Renewables USA Market Uncertainty
- What are biofuels?
- Environmental Benefits
- Production Technologies
- Renewables Feedstocks
 - Types - Supply Issues
 - Unintended Consequences
- Global Biofuel Production
 - Supply Expansions
- Economic and Regulatory Drivers
- Challenges and Barriers
- Questions



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Renewables USA Market Uncertainty

- The change in leadership in the US has introduced further uncertainty about biofuel tax credits into the renewables market.
- Nearly \$8 billion in clean energy investments have been canceled or downsized in early 2025.
- One renewable diesel refinery - Braya Renewable Fuels Plant in Canada has halted production, putting the facility on “warm idle”.



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Biofuels

- **Renewable Diesel**

- Chemically nearly identical to fossil diesel but made from Renewable Feedstocks
- Fully compatible with diesel engines @ 100% concentration

- **Biodiesel**

- Must be blended with fossil diesel to use in current diesel engines
- Typically used at a 20% blend with fossil diesel fuel
- B20 approved by most diesel OEMs
- Higher concentrations require engine modifications

- **SAF- Sustainable Aviation Fuel**

- Typically blended at 50-50 with fossil jet fuel
- Working to test and approve 100% concentrations





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Environmental Benefits

- Renewable Diesel: 65–90% GHG reduction, cleaner tailpipe emissions, lower particulates/NOx, no sulfur
- Biodiesel: 41–74% GHG reduction, biodegradable, 79% less wastewater, 96% less hazardous waste
- SAF: Up to 80% GHG reduction, aviation decarbonization



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Production Technologies

- Renewable Diesel - Hydrotreating, pyrolysis, gasification
- Biodiesel - Transesterification, algae cultivation
- SAF - Hydrotreating, Fischer-Tropsch, Hydro-processed Esters and Fatty Acids (HEFA), Alcohol-to-Jet
- Catalyst providers - ExxonMobil, Haldor Topsoe, Honeywell, Johnson Matthey, Axens
- Innovation focus - Feedstock flexibility, efficiency, emissions reduction





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Renewable Feedstocks

- Main feedstocks: soybean oil, canola, UCO, animal fats
- Emerging: algae, camelina, jatropha, agricultural residues
- Challenges: feedstock availability, food displacement, tariffs



Soybeans



Canola



Algae



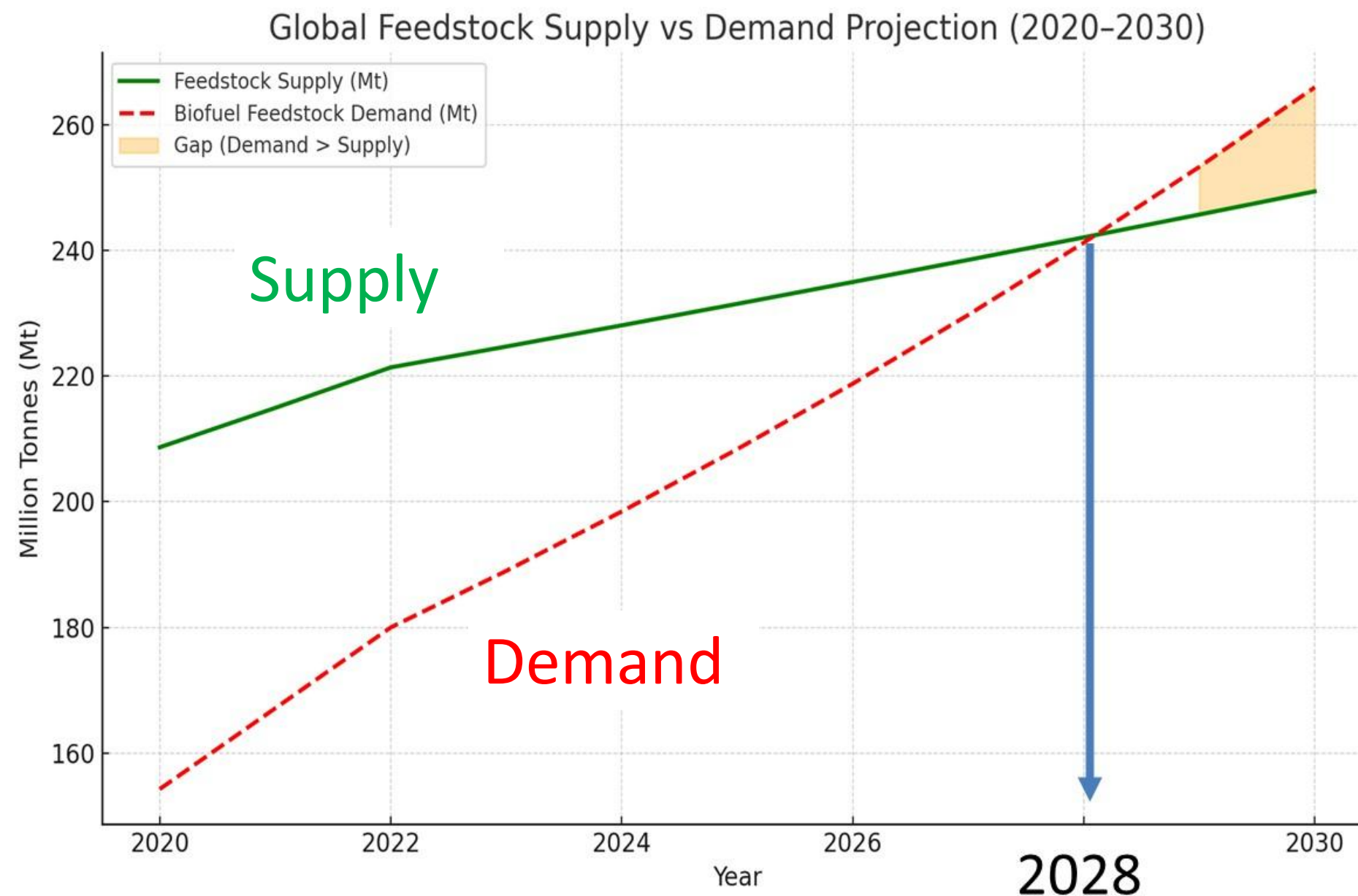
Bad and Good News of Feedstock Supply

Bad News

- Shortage Forecast by 2028
- Global Biofuel use doubled - 2015-22
- Feedstock production grew only 25%
- Rising Use of Crop Oils in Biofuel Production
- Europe consumes 130,000 barrels/day of UCO—eight times more than it can sustainably collect

Good News

The industry is investing heavily – even with the 2025 cutbacks – in new plant variants, UCO collection and bean crushing capacity





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Feedstock Unintended Consequences

The Palm Oil Story

Palm oil is a type of edible vegetable oil derived from the fruit of the oil palm tree.

It is a versatile oil found in:

- Processed foods (cookies, chips, etc)
- Cosmetics (lipstick, shampoo)
- Cleaning products (detergents)
- **Biofuels**

Cheap to produce and very efficient: oil palms yield more oil per hectare than any other oil crop.



Tesso Nilo National Park



Sources: Sat. Image ©2022 Planet Labs Inc; Globalforestwatch.org; UNEP-WCMC/IUCN

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Global Renewable Diesel & SAF Production

- North America
 - 22 renewable diesel plants, 56 biodiesel plants, growing SAF capacity
- Europe
 - Strong in biodiesel, Neste & TotalEnergies lead renewable diesel/SAF
- Middle East
 - Early stage, emerging SAF projects
- Global Biofuel Diesel ~4% of total diesel usage
- Global SAF <1% of total aviation fuel usage





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Biofuel Supply Expansion

- North America: Major expansions/conversions in renewable diesel
 - Phillips 66, Chevron, REG Geismar, Imperial, Enerkem
- Europe: SAF & renewable diesel expansions
 - Neste, ENI, Repsol
- Middle East: SAF projects in Saudi Arabia, UAE, Oman
 - UAE roadmap for 185 MMgy SAF by 2030

Renewable Diesel Plants Under Construction

- Imperial Oil – Strathcona Refinery (Alberta, Canada) – Up in 2025
- Enerkem – Varennes Carbon Recycling (Québec, Canada) – Up in 2025



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Economic & Regulatory Drivers

Country / Region	Biofuel Type	Incentive / Credit
USA	Biodiesel / Renewable Diesel	\$1/gal credit; +\$0.10 for small producers; 45Z sliding scale; D4 RINS; LCFS
USA	SAF	Up to \$1.86/gal (2025 rate); D4 RINS; LCFS
Canada (BC)	Renewable Diesel	Canada LCFS credits + federal CFR credits
EU	Biodiesel / Renewable Diesel	Sustainability compliance under RED II; tax rebates in some countries
Indonesia	Biodiesel	Subsidies via export levies + blending mandate (B40)



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Challenges & Barriers

- Regulatory: Uncertain and fragmented global policies, approval delays,
- Economic: High cost and short supply of feedstocks, competing with fossil diesel in the market, heavy reliance on credits for acceptable margins
- Technological: Scaling advanced SAF, Researching viable feedstock crops, catalyst contamination with some feedstocks, converted refineries experience large reduction in capacity
- Environmental: Food vs fuel debate, land-use impact



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Questions?

