



**ENSYN**

**BDC Symposium  
Ottawa, September 29, 2015**



# Our Business

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**Biomass  
Feedstock**



**Conversion  
to Biofuel**



*20-100 million litre/year RFO  
production facilities*

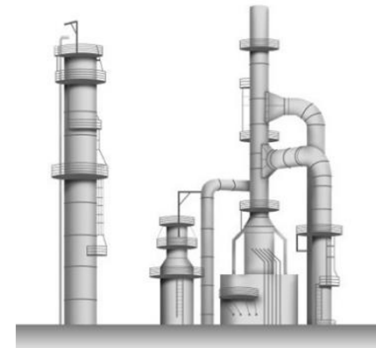
*Fuel Oil*



**Heating Oil**

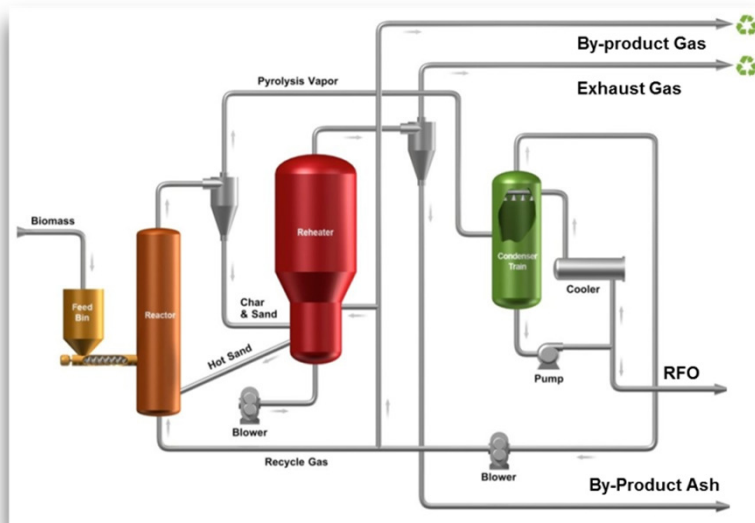
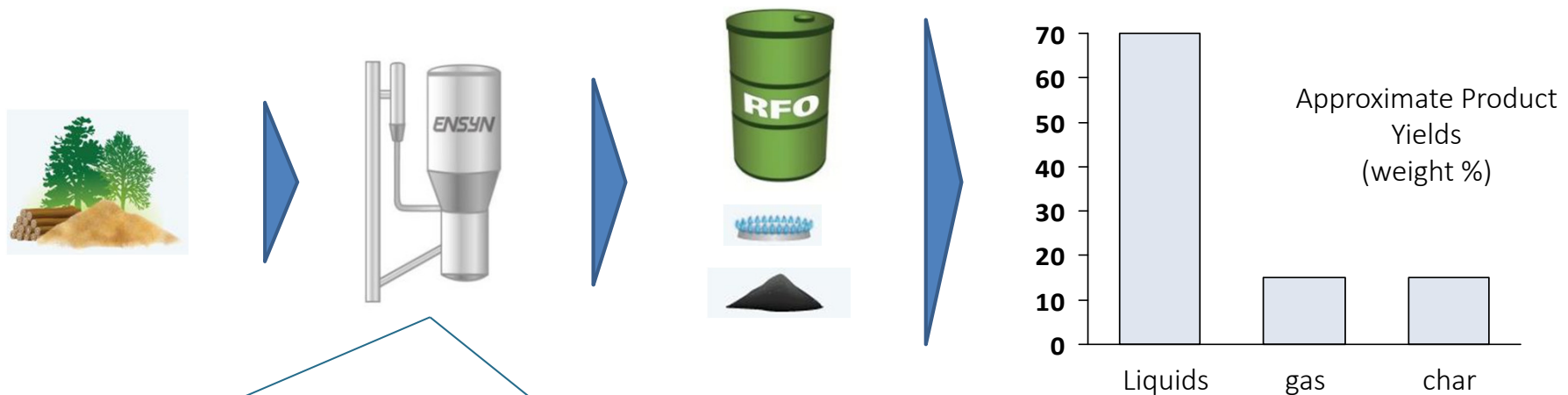


**Refinery  
Coproducting**



*Refinery Feedstock*

# Ensyn's RTP<sup>®</sup> Technology



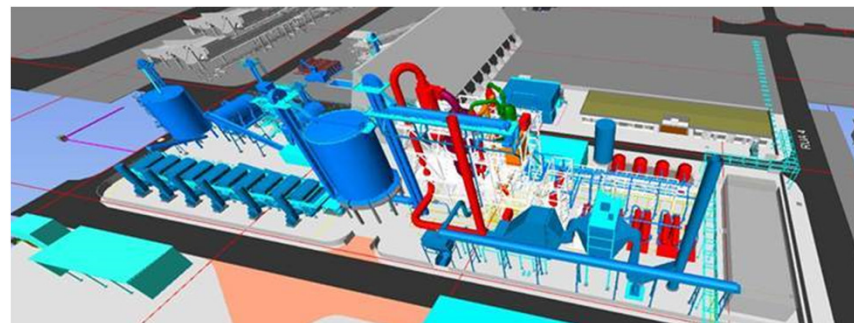
- Maximizes conversion of solid biomass carbon to the liquid phase
- non-catalytic, thermal process
- Similar to Fluid Catalytic Cracking (FCC)
- No need for catalysts, high pressure or hydrogen
- Gas and char used to run the facility and dry the biomass

Confidential

3

# UOP Alliance

- Broad technology alliance with Honeywell UOP
- Envergent Technologies Inc
  - ▶ (55% UOP, 45% Ensyn)
  - ▶ provides engineering services and RTP equipment to RFO production projects worldwide
  - ▶ Provides performance guarantees
- Ensyn and UOP are allied in the commercialization of refinery coprocessing



# Strategic Relationships



Conversion to RFO

RFO Coprocessing

RFO Heating



A Honeywell Company



A Honeywell Company



Institutional Shareholders



# RFO Heating Applications

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- Over 25 years of combustion of RFO on an industrial scale
- Approximately 20 million gallons combusted in industrial boilers
- Now demonstrated across a range of applications
  - ▶ Large commercial/institutional
  - ▶ District Heating
  - ▶ Mining (indurating furnace)



# RFO Heating Sales & Contracts

- Memorial Hospital, New Hampshire
  - ▶ 100% conversion to RFO over last 14 months
  - ▶ Generating D-7 RINs
- Valley Regional Hospital, New Hampshire
- Youngstown, Ohio District Heating
- ArcelorMittal, Quebec
- Strategic Alliances with infrastructure/heating oil suppliers



# Refinery Coprocessing

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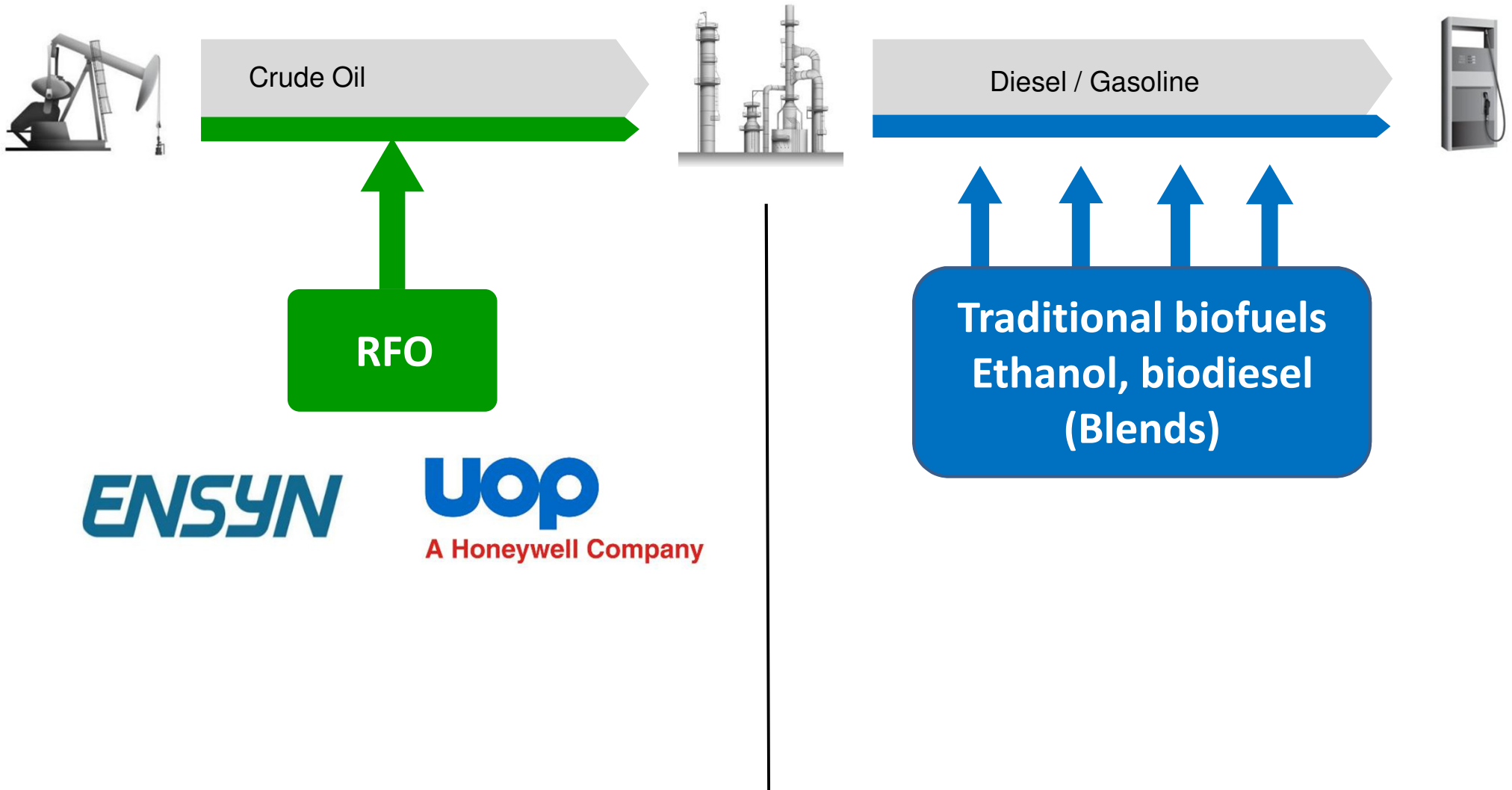


RFO Coprocessing leverages on existing refinery infrastructure

- ▶ Lowers total CAPEX & OPEX
- ▶ Facilitates implementation



# Refinery Coprocessing vs traditional approaches

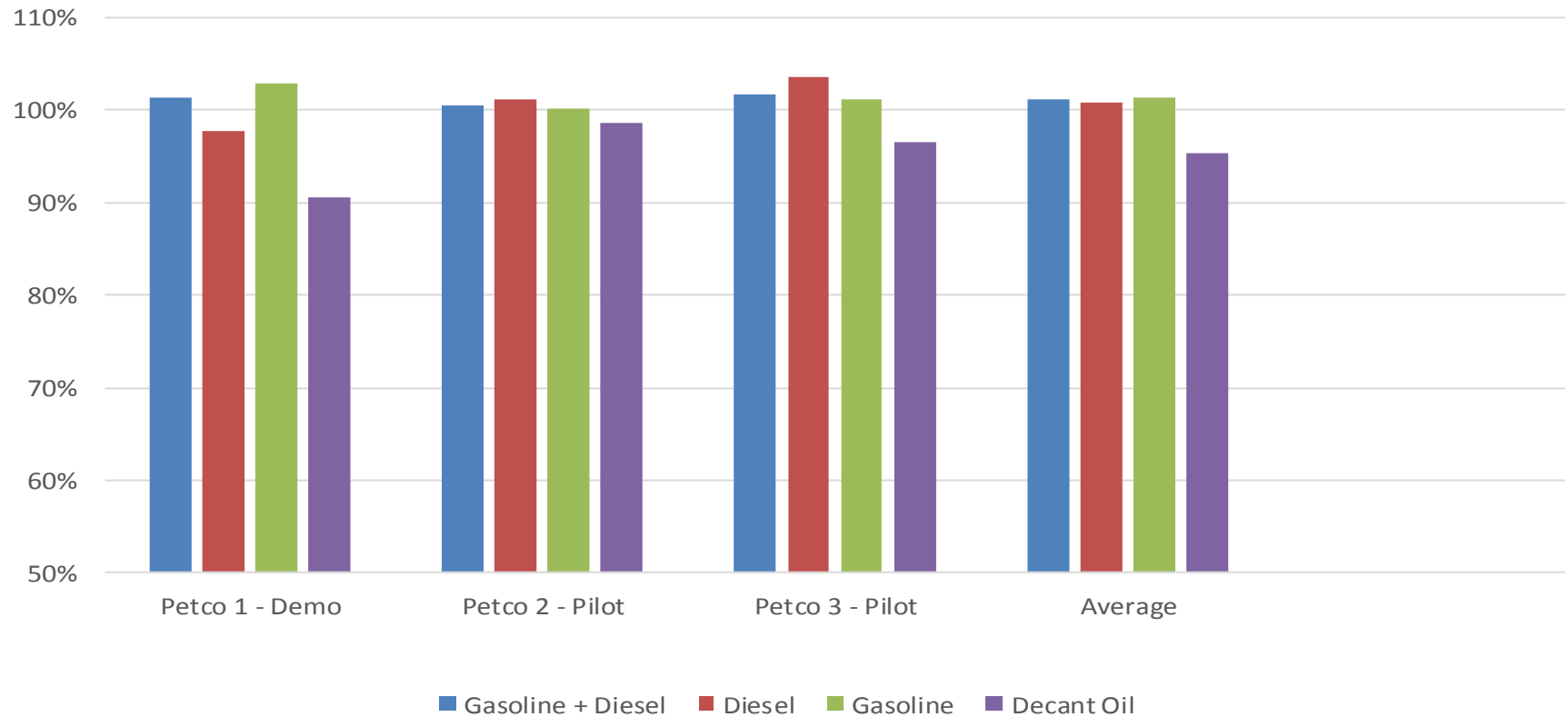


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**Uop**  
A Honeywell Company

# Coprocessing Yields

% Yields From Coprocessed RFO-VGO Compared to  
% Yields from VGO  
(ratio of yields)



- NREL, Petrobras & Ensyn in a Collaborative R&D Agreement
- Refinery Coprocessing
- Petrobras processed Ensyn's RFO & produced 800 gallons of diesel & gasoline
- Product used for Part 79 testing
- Confirmed Ensyn's RFO yields
- Results presented March 25, 2015 at DOE Bioenergy Technology Office (BETO)



 NREL  
NATIONAL RENEWABLE ENERGY LABORATORY

DOE Bioenergy Technologies Office (BETO)  
2015 Project Peer Review  
[2.4.2.303 Brazil Bilateral: Petrobras-NREL CRADA](#)



March 25, 2015

BETO Area: Thermochemical Conversion  
NREL AOP: Industry and Refinery Integration

Helena L. Chum, National Renewable Energy Laboratory  
 PETROBRAS Andrea Pinho, Petrobras / CENPES

 ENSYN In collaboration with Barry Freel, Ensyn Corp.



*Petrobras' 200 kg/hr (30 bpd)  
Demonstration FCC*

# Enablers of TEA: Yields/Catalyst

Weight %	100% VGO	95% VGO + 5% Bio-oil	90% VGO + 10% Bio-oil
Dry Gas	3.5	2.8	2.8
LPG (C3-C4)	13.8	13.8	12.5
Gasoline (C5-220°C)	39.9	40.6	38.8
Diesel (220-344°C)	20.3	19.6	19.2
Bottoms (+ 344°C)	16.1	14.4	14.4
Coke	6.4	6.0	6.5
CO	0.0	1.0	1.7
CO <sub>2</sub>	0.0	0.4	0.6
Water	0.0	1.4	3.5

- Negligible catalyst deactivation caused by alkaline metals was found with 5 wt.% bio-oil.
- Longer test runs are necessary to address this issue.

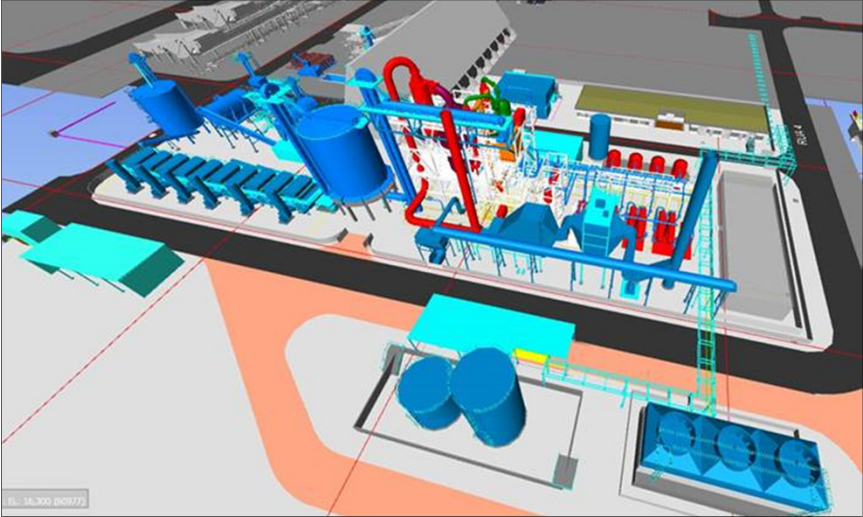
# Part 79

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- Part 79 process taking place over the past 12-18 months
  - ▶ RFO produced in Ontario facility, shipped to Petrobras in Brazil
  - ▶ 800 gallons of renewable diesel & gasoline produced at Petrobras SIX facility, shipped to a major oil co in the US for initial testing
  - ▶ Final testing carried out at Southwest Research (SwRI) in San Antonio
- Part 79 approval for Ensyn's renewable diesel granted in August 2015
- Results for renewable gasoline anticipated by year-end



# RFO Production Facilities & Projects



# Ontario Production Facility

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- 3 million gallons/year facility
- Commissioned in 2006 as chemicals/fuels merchant facility
- Enhanced in 2014 as Ensyn's anchor fuels facility
- Facility is qualified by the EPA under RFS program
- Sales to qualified users in the US are generating D-7 RINs



# Aracruz Project - Brazil



- Partnership with Fibria Celulose S.A., (NYSE: FBR), the world's largest market pulp producer
- First project in Brazil announced – sited at Fibria's pulp mill in Aracruz, Espirito Santo
- Permitting and engineering in progress
- Initiation of construction in early 2016





# 2015+ Production Build-out

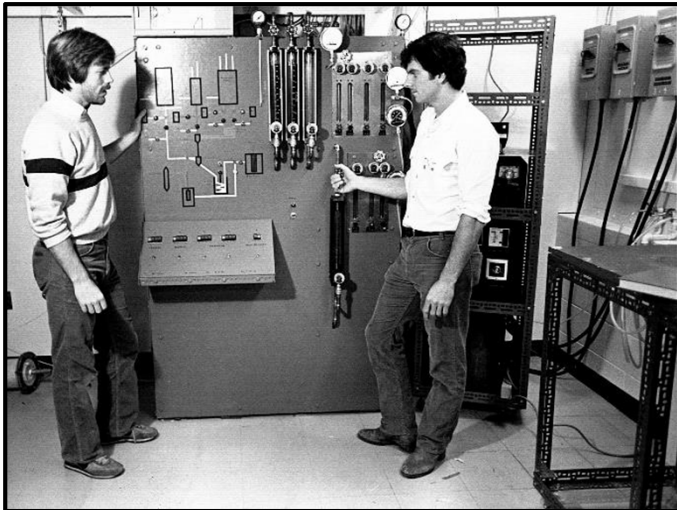
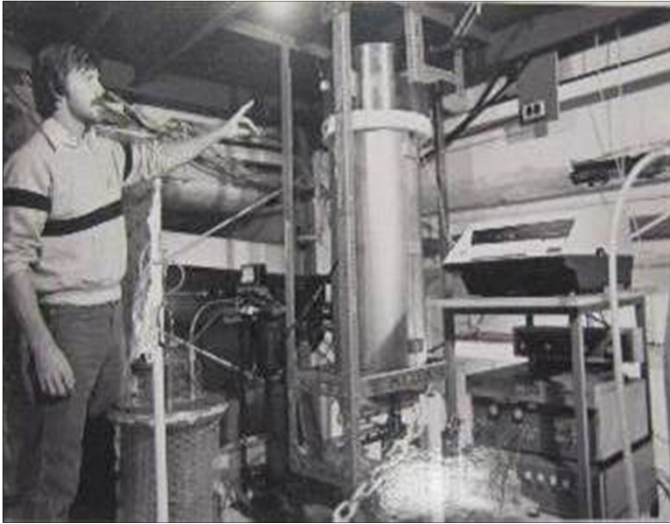


# How we got here - A 30+ Year Development Story

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# Early Days – 1980s and Early 1990s



- Concept to Commercial
- Initial scale-up
- First licensing transaction (Food Products)

# Mid 1990s

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- Scale up to 30-40 TPD
- RTP image at right
  - ▶ Commissioned 1996
  - ▶ Still in production
- Petroleum upgrading  
Opportunity identified



# Late 1990s & Early 2000s

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- Heavy oil upgrading
- Early funding by Gulf
- Sequential development
  - ▶ Concept
  - ▶ Pilot
  - ▶ 1,000 bpd demonstration
- Petroleum rights sold in 2005 at a \$100 M enterprise value
  - ▶ Proceeds delivered to Ensyn shareholders



# 2005 – 2014 – Return to Biofuels

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- Construction of Ontario plant - 70 TPD
- Alliance with UOP
- Alliance with Fibria
- Expansion of heating applications & sales
- Enhancement of Ontario facility
- Development of Refinery Coprocessing
- Multiple additional alliances
- Project development – Canada, Brazil, US



# 2015+ Production Build-out



# Keys To Survival

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**Competitive  
Technology**  
*Science Matters !*

**Perseverance**  
*Setbacks happen!*

**Funding**  
*Sources, timing,  
strategy*  
*Traversing the  
Valley of Death*

**Alliances**  
*Find strong friends*  
*Timing is key:*  
*be a dining  
partner, not the  
meal!*





***Thank You!***