



## **Producing Commercial Liquid Fuels from Cellulosic Biomass**

# Ensyn's Renewable Fuel from Cellulosic Biomass

What we do

Produce a liquid petroleum replacement from cellulosic non-food biomass - Renewable Fuel Oil or "RFO"

Economics

Powerful unit economics - cash cost of \$45 BOE & capital light

Technology

Commercially proven RTP technology with over 30M gallons of RFO produced - UOP/Honeywell performance guarantee

Markets

Targeting large global petroleum markets – leverages existing fuel oil and refinery infrastructure

Strategic Relationships

Strong Strategic Relationships – UOP Honeywell (Envergent), Chevron & Biomass Owners

Roll-out

Significant capacity expansion in progress

# RTP™ History & Accomplishments

**1**

1989:  
Commercial  
production, fuels  
and chemicals for  
food sector & \$20+  
MM Liquidity

1984:  
Foundation



1990-1998:  
Scale-up, fuels and  
chemicals for food  
sector



**2**

1998-2005:  
Development & sale of  
petroleum application for  
US\$100 MM



**3**

2006-Present:

- Focus on renewable fuels
- Strategic partnerships
  - Project rollout
- Chemicals upside



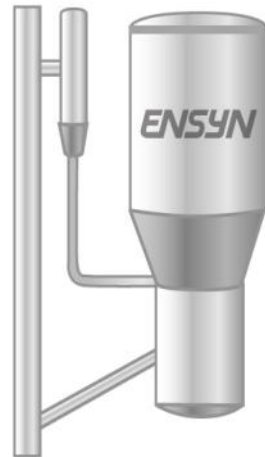
# From Cellulosic Biomass to a Barrel of Oil

**Maximizes the conversion of carbon in solid biomass to liquid carbon  
(in less than a second)**

## Biomass Feedstock



## RTP Process



## Petroleum Replacement Fuel



## Broad and Deep Addressable Markets

Engine Fuel  
(for power)

**Heating Oil**  
*RFS2 Approval in Process*

**Refinery Feedstock**  
(transportation fuel)  
*RFS2 Approved*

**Stand-Alone Upgrading**  
(transportation fuel)  
*RFS2 Approved*

- *Non-catalytic process maximizes carbon conversion from solid biomass to liquid fuels – and generates high liquid yields*
- *Gas and Char co-products used as source of energy to run the facility*

**The RTP Edge**

**ENSYN**

# Natural Progression to Transportation Fuels

*Natural Evolution of the Market Applications for RFO*



*A consequence of:*

- Rapid RFO Technology Development
- RIN approval / EPA
- Strategic/Industry interest
- Massive market potential
- Strong RFO unit economics



# RFO as Heating Oil – Enormous Project Opportunities

- 20+ years of combustion experience in Wisconsin – over 15 million gallons combusted for heat
- Multiple recent commercial RFO demonstrations in different boilers - Hosted at Ensyn's partners & customers
- RFO can be co-fired or used alone in conventional commercial and industrial boilers
- RFO combustion emissions compare favorably with fossil fuel
  - SOx Reduction: > 99%
  - NOx Reduction: > 36%
  - CO Reduction: > 72%



# Heating – Canadian Iron Ore Pelletizing Mill

- Iron Ore Mill - Boiler Ops
  - Ran up to 22 GJ/hr
  - Fired one burner exclusively on RFO replacing HFO
  - Application was ideal for RFO



RFO Flame

Iron Ore  
Pelletizing  
Furnace



# RFO in Refineries: Drop-In Transportation Fuel

*Utilizes existing refinery capital equipment and infrastructure*

RFO



Refinery Processing



Transportation Fuel

(fully fungible hydrocarbon)



Minimum of **70 gallons per Ton** of wood biomass in pilot plant trials  
(**80 gallons per tonne**)

More than **100 gallons per Ton** demonstrated (**110+ gallons per tonne**)



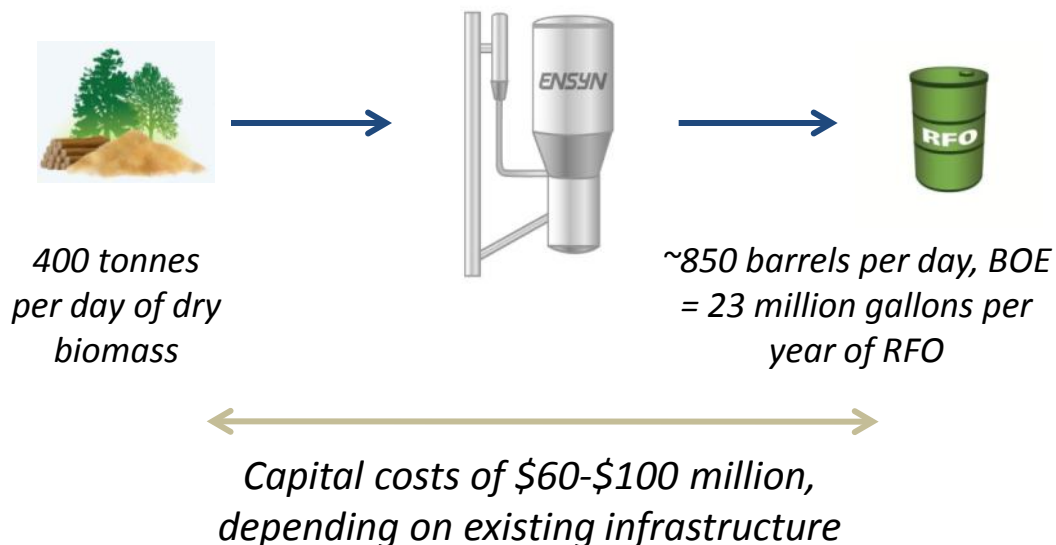
# Ensyn's Standard RFO Production Facility

- Yield, availability, product quality consistent with historical production
- Scale of reference facility minimizes the delivered cost of biomass
- Standard 400 tpd design (maximizes economies of scale while minimizing biomass price risk)

## Facility Profile

|                     |  |
|---------------------|--|
| Input               | 400 tpd biomass                            |
| Output              | 850 BOE/day<br>(23 MM Gallons/year of RFO) |
| Capital Cost        | \$60 - \$100 mm                            |
| Cash Operating Cost | \$45 / Barrel of Oil Equivalent (BOE)      |
| Construction Period | 18-24 months                               |

## Modular, Repeatable Facility



# Key Strategic Relationships with Ensyn

## Key Strategic Relationships



Chevron Technology Ventures



FELDA PALM INDUSTRIES



## Shareholders



Chevron Technology Ventures



FELDA PALM INDUSTRIES

**ENSYN**

Since 1996, Ensyn has returned 3x the amount it has raised in equity funding

# Implementation Plan – Strategic Partners

Ensyn's Core Competency



+

Strategic Partners

Fiber  
+  
Technology  
+  
Offtake

+

Business Model

Build-Own-Operate



*Market leadership with extraordinary long-term returns*

# Ensyn RFO: Best-in-Class Commercial Option for Liquid Fuels from Cellulosics

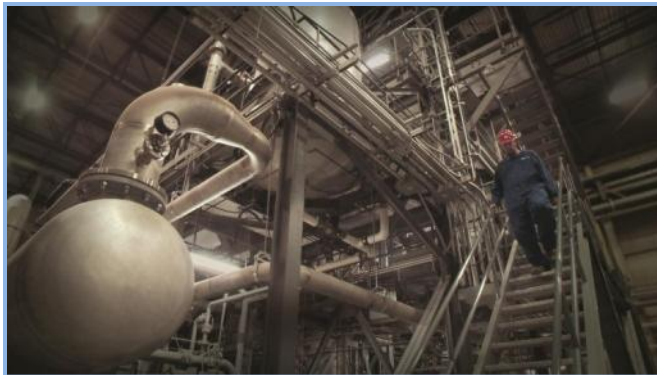
## Projects with Strategic Partners



## Massive Heating Oil Markets and RINs



## Commercially Proven Tech



## Transportation Fuels and RINs

