ENSYN

The world's leading biocrude producer

Investing in the Bioeconomy

July 11, 2017

Ensyn's business – Forest biomass to high value products

Biomass Feedstock

Conversion to Liquid Biocrude

RTP Process

Chemical Feedstock

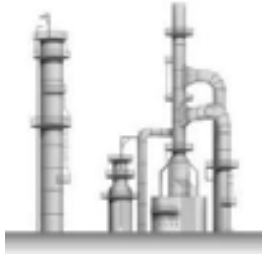
Food Ingredients & Renewable Chemicals

Renewable Fuel Oil (RFO)

Heating & Cooling

Refinery Feedstock

Refinery Co-processing



ENSYN Envergent Honeywell UOP

Over the past 30 years, Ensyn's has scaled its technology from low-volume chemical applications to high-volume energy applications

Licensed Chemical Facilities

Pilot scale to 2 Million GPY

- ✓ Ensyn scaled its technology building licensed facilities for use in specialty chemical applications
- ✓ Production capacity increased from pilot scale in 1984 to 2M gallons per year (GPY) by 1993
- ✓ Chemicals market demand does not require RTP® production capacity larger than 2M GPY

Ontario Facility

3 Million GPY

- ✓ Ensyn built a 3 million GPY facility in Ontario, Canada to serve as the foundation for Ensyn's entry into the energy markets
- ✓ Ontario facility initially operated on a merchant basis to supply co-processing trials, heating oil trials and excess demand for chemicals
- ✓ Began full time operations to supply heating oil customers ongoing refinery co-processing trials

Quebec Facility

10 Million GPY

- ✓ 10 million GPY biocrude production facility located in Quebec, Canada
- ✓ Started construction in July 2016 and is expected to begin commissioning Q1 2018
- ✓ Biocrude will be sold to heating oil customers in the U.S. Northeast and transition to refineries over time

Ensyn and Honeywell UOP are developing 20 million GPY biocrude production facilities that are scaled to meet the demands of conventional petroleum refineries

Ensyn's Renfrew, Ontario facility is the largest fast-pyrolysis plant in the world

- ✓ A 3 million gallon per year flagship commercial facility – a cornerstone of Ensyn's commercial development process, has attracted industry attention due to its scale and performance
- ✓ Commissioned in 2006
- ✓ Original design and use as a merchant plant, producing liquids for:
  - Renewable chemicals
  - Broad commercialization of heating fuels – including major trials at ArcelorMittal, QC
  - Initial trials of refinery co-processing for the production of low carbon transport fuels
- ✓ Underwent capital enhancements in 2014:
  - Conversion to a dedicated fuels facility
  - Established 24 by 7 operations
- ✓ Regulatory approvals in place under U.S. EPA (Part 80) and California's Low Carbon Fuel Standard
- ✓ Undergoing additional upgrades for production of biocrude for refinery co-processing
  - First phase of upgrades complete
  - Second phase to be completed in 2017

Specialty chemical and heating oil businesses serve as stable commercial platforms for growth

Specialty Chemicals Summary

- ✓ Ensyn scaled its technology in the specialty chemical sector (in the 1990's) by providing Red Arrow with licensed RTP facilities
- ✓ By using Ensyn's RTP® technology, Red Arrow reduced its production costs and became an industry leader
- ✓ Ensyn has built 13 licensed facilities for Red Arrow, 5 of which are still in operation today, and has been contracted to build a new plant
- ✓ Ensyn continues to operate multiple RTP facilities for Red Arrow under an Operating and Maintenance Agreement

KERRY

Kerry Group Plc is a global food and nutritional company serving the food, beverage and pharmaceutical industries

Red Arrow
Natural flavor, pure and simple.™

Specialty chemical company purchased by Kerry Food Group in 2015

Heating Business Summary

- ✓ Ensyn's biocrude is used as a replacement for heating oil or natural gas in commercial and industrial boilers
- ✓ Ensyn has sold biocrude for use in industrial heating for over 25 years
- ✓ Stable revenue from existing heating oil customers through biocrude sales and sale of RIN credits generated from use of biocrude in commercial boilers
- ✓ Ensyn is the largest producer of cellulosic renewable fuels generating D7 RIN credits sold under the U.S. RFS program
- ✓ Select heating oil customers include:

Memorial Hospital
MaineHealth

Replaced its entire heating oil requirement with 300,000 GPY of biocrude

youngstown thermal

Replaced natural gas with up to 4 million GPY of biocrude for its district energy loop

BATES

Replaced heating oil with 800,000 GPY of biocrude in its heating and cooling system

Ensyn's expanding specialty chemical and heating oil business serve as a platform for entry to the larger and more profitable refinery co-processing market

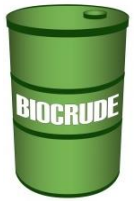
Ensyn’s Port Cartier, Quebec facility is under construction

- ✓ 10 million GPY biocrude production facility under construction with commissioning in early Q1 2018
- ✓ Project Partners include Arbec Forest Products and Groupe Remabec
- ✓ US$78M capital cost with prices guaranteed under fixed and maximum price contracts
- ✓ The RTP® technology and equipment is supplied by Envergent Technologies, while balance of plant equipment is supplied by Axor
- ✓ Project funded with partner equity and financing from SDTC, Investissement Quebec, the federal IFIT fund, and third-party equity investors
- ✓ Groupe Remabec will be supplying the project with 66,000 BDMT of feedstock per year under a long term agreement
- ✓ Initially biocrude production to supply heating oil customers in the U.S. Northeast with a transition to U.S. refinery customers

Ensyn is opening a new market of co-processing biocrude to low-carbon transportation fuels

Biomass Converted to Biocrude in Ensyn Facility

Biocrude Delivered to Refinery



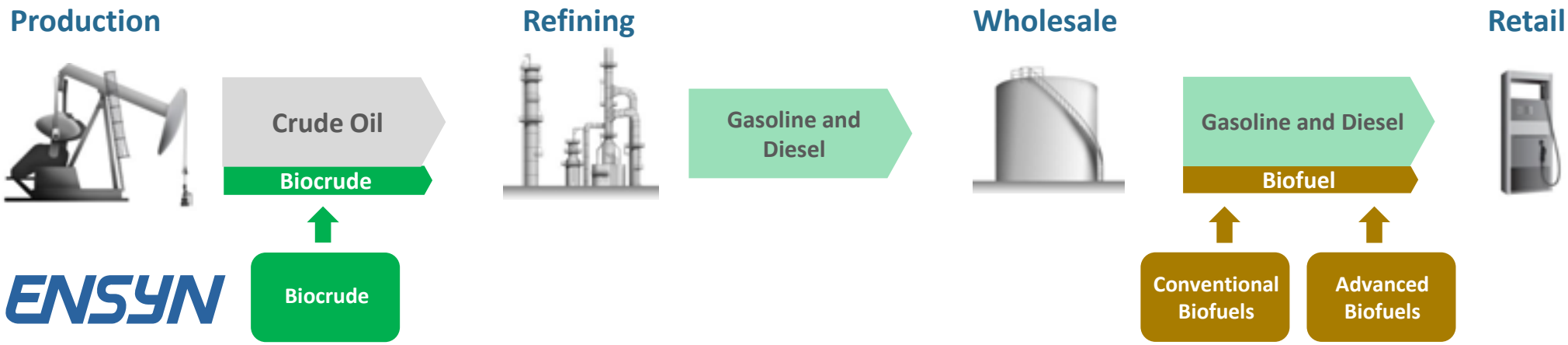
Refinery Upgrades Biocrude into Renewable Transportation Fuels

- ✓ Ensyn has spent the last 8 years working with its refinery partners to commercialize biocrude co-processing and overcome the high barriers to entry to the refining sector
- ✓ Co-processing takes place when biocrude is injected into a refinery's fluid catalytic cracker with crude oil and upgraded into low-carbon gasoline, diesel, jet fuel and other petroleum products
- ✓ Ensyn has conducted extensive testing from bench scale refining units all the way up to commercial demonstrations at refineries with its refining partners including Honeywell UOP , Chevron, Tesoro, Petrobras and NREL
- ✓ Results of tests and commercial refinery trials indicate that Ensyn's biocrude performs comparably to conventional petroleum, resulting in equivalent yields of gasoline, diesel and other petroleum products that are compatible with ASTM standards
- ✓ Ensyn has obtained Part 79 certifications from the EPA and provisional approval from the California Air Resources Board for its co-processing pathway, both of which are significant barriers to entry for new biofuel companies

Biocrude co-processing reduces the cost of producing renewable and low-carbon transportation fuels and is being adopted by the refining sector

Ensyn supplies refiners biocrude, not finished biofuels

Transportation Fuel Supply Chain with Biocrude



- ✓ Ensyn leverages installed global refining infrastructure by providing refiners with a biocrude produced from biomass, that is upgraded alongside conventional crude to produce gasoline and diesel – this process is known as Refinery Co-processing
- ✓ Ensyn's co-processing application provides significant benefits to refineries:
  - **No additional operational cost to refiner** - Biocrude performs similar to crude oil in the refinery and is indexed to crude oil resulting in no premium pricing to the refinery
  - **Protect market share** - Ensyn's biocrude displaces crude oil and doesn't compete for a refiner's market share of gasoline and diesel like conventional and advanced biofuels
  - **Significant regulatory value** - Biocrude co-processed in a refinery can generate hundreds of millions of dollars in regulatory benefits resulting in a high return value proposition for refiners
  - **No Blendwall Limitations** – With no existing competitors supplying biocrude, there are no near term market limitations to adoption

Ensyn does not compete with the refining sector, it supplies a lower cost compliance alternative

Ensyn has world-class strategic collaborations across the biocrude value chain

Feedstock

Fibria

PRODUITS FORESTIERS ARBEC

Roseburg
A Forest Products Company

RÉMABEC

Biocrude Production Technology

Honeywell UOP

Envergent TECHNOLOGIES
A Honeywell Company

Petroleum Refining

Honeywell UOP

Chevron Technology Ventures

Canada

PETROBRAS

NREL

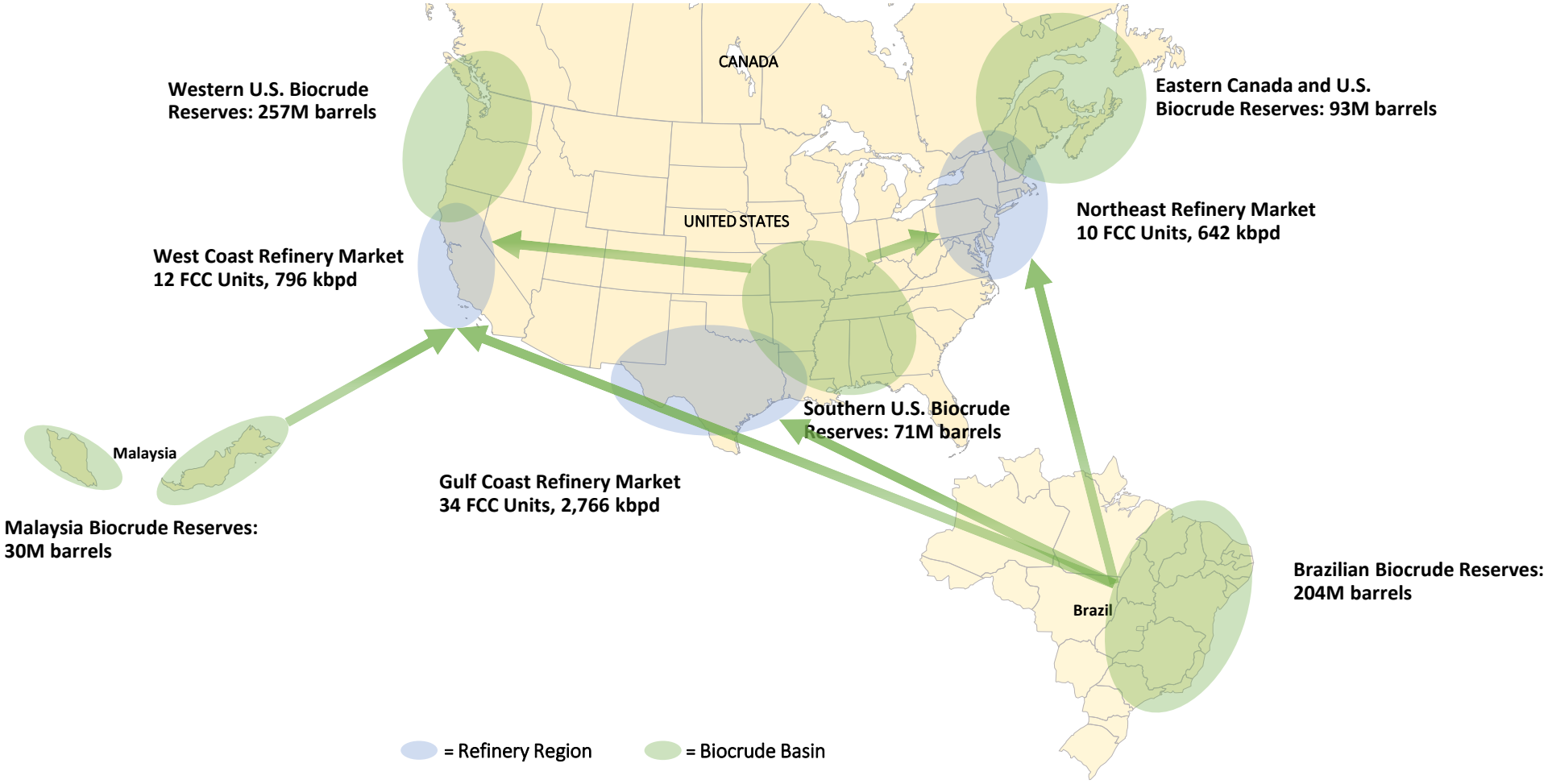
Honeywell UOP

Envergent TECHNOLOGIES
A Honeywell Company

- ✓ Honeywell UOP is the leading international supplier of petroleum refining technology
  - Over 60% of the world's gasoline is produced using Honeywell UOP refinery technology
  - Honeywell UOP is the leading global supplier of Fluid Catalytic Cracking (FCC) units
- ✓ In 2008, Ensyn and Honeywell UOP established a joint venture which operates under the name Envergent Technologies and has two objectives:
  - Licensing, design, manufacture and supply of RTP® production facilities with performance guarantees
  - Business development with existing Honeywell UOP refining clients to accelerate adoption of co-processing

Access to biomass resources equivalent to 625 million barrels of biocrude reserves

Renewable feedstock reserves with strategic partners enable Ensyn to supply major U.S. refining regions



To support refinery demand additional biocrude production capacity is moving to construction

United States

- ✓ 20 million gpy biocrude production facility in late stage development in Vienna, Georgia
- ✓ Roseburg Forest Products (one of the largest private forest companies in the U.S.) is supplying feedstock and the project site at their Vienna mill
- ✓ The project was awarded a conditional Loan Guarantee of US$70 million from the USDA with Citibank as the Lender of Record
- ✓ Ensyn and Roseburg will invest equity in addition to equity provided by third party financial investors
- ✓ The facility will sell biocrude to a major U.S. refinery

Brazil

- ✓ 22 million gpy biocrude production facility currently in late stage development in Aracruz, Espirito Santos
- ✓ Ensyn is developing the project with Fibria Celulose S.A. (the world's largest market pulp producer) at their mill site
- ✓ Ensyn and Fibria have a joint venture to produce biocrude in Brazil - the Aracruz facility is the first of several planned
- ✓ The project is negotiating a US$77 million debt financing from local sources
- ✓ Fibria and Ensyn are both expected to contribute equity in the facility
- ✓ The facility will sell biocrude to a major U.S. refinery

The Bioeconomy needs regulatory certainty to access the capital necessary for scale

- ✓ A reduction in cellulosic volume obligations runs counter to the objectives of the RFS
- ✓ Investors and lenders require stability and predictability
- ✓ The administration should support EPA staff in advancing
  - Use of biointermediates
  - Part 80 applications
  - Planted tree pathway
  - REGs rule
- ✓ Lastly, reform the RFS — legislatively or administratively — to encourage production of advanced biofuels from a broader range of wood-based feedstocks, including wastes and residuals