RENEWABLES ARE COMING TO THE SYNGAS INDUSTRY

Dr. John Winter

2019 Global Syngas Technologies Conference

MSW->RDF

http://www.atec-ltd.com

https://video.tomra.com

Biomass

http://biomassmagazine.
OUTLINE

Constraints and Drivers, Past and Present

Why is Activity Increasing?

Challenges in Renewables Gasification

Schmidtsche Schack is Ready for Renewables
MANY FALSE STARTS IN THE LAST 40 YEARS

Many technologies and companies

Primary drivers were landfill avoidance and dioxin reduction; poor investment returns

Technologies were diverse and rarely financeable

Incinerator derived gasifiers were successfully deployed in Japan

http://www.viveracorp.com/index.htm

https://www.mhiec.co.jp/products/recycle/city/meltingsystem/index.html
NOW SEEING MULTIPLE PROJECTS WITH DIVERSE PRODUCTS, SERIOUS INVESTORS, FINANCEABLE RETURNS

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<thead>
<tr>
<th>Company</th>
<th>Products and Technologies</th>
<th>Status</th>
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<tr>
<td>Fulcrum Sierra Biofuels</td>
<td>MSW to Syncrude</td>
<td>In Construction</td>
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<td>Fulcrum Centerpoint Biofuels</td>
<td>MSW to Fuels</td>
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<td>Enerkem Alberta Biofuels</td>
<td>MSW to Alcohols</td>
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<td>Enerkem Rotterdam</td>
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<td>Aries Clean Energy, TN</td>
<td>Biosolids &amp; WW to Energy &amp; Biochar</td>
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<td>Red Rock Biofuels</td>
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<td>Velocys Bayou Fuels</td>
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<td>Velocys Altalto</td>
<td>MSW to Jet</td>
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WHAT HAS CHANGED?

New Drivers
- CO2 Reduction
- Sustainability
- Clean Ocean Initiatives

Technology Improving
- Biomass Gasification Technology Financeable
- Snygas Conversion for Small Scale

End User Demand

Public Policy Incentives

climate-change-guide.com
DRIVERS ARE DIFFERENT AND INCREASING

Strong demand for CO2 reduction from society and investors

Sustainability, Circular Economy more conceptual than substantive, but can affect incentives

Plastics pollution in Oceans

ExxonMobil and Renewable Energy Group partner with Clariant to advance cellulosic biofuel research
Pilot, Demonstration, and Commercial Operations have increased investor confidence and allowed insurable performance guarantees.

Velocys commercial scale demonstration
ENVIA Oklahoma
TECHNOLOGY IMPROVING

Syngas fermentation technologies and advances in catalysts and reactor technology have made syngas conversion economic at the smaller scales typical for renewables gasification vs. fossil.

www.velocys.com
info@velocys.com

Shougang
http://www.lanzatech.com
WHAT HAS CHANGED?

Fuel producers and major fuel consumers such as airlines are responding to existing mandates and incentives, and proactively trying to prepare for anticipated increases in carbon intensity reduction requirements. Premium Pricing beyond government incentives isn’t material yet, but end users are investing in technology and projects as long as returns are positive.
WHAT HAS CHANGED?

Public Policy Incentives

- RED II
- Biodiesel, ETOH, Imports
- Member State Patchwork
- Cellulosic /Advanced (non food) recognized
- Tall Oil
- Renewables Transport Fuel Obligation (GB) – Carbon Intensity Certification ?Pricing?

- US -RFS/RIN MSW vs Wood
- CA LCFS Impactful
- Can/Provinces – RFS, LCFS (BC)
- US incentives right on the margin
- MSW & Cellulosics Growing
TECHNICAL CHALLENGES FOR RENEWABLE SYNGAS

Feedstock Impurities – Halides

CSCC vs. acid resistance, wwt

Feed Density, Flow Characteristics

Size and complexity, pressure limits

Preprocessing Requirements

Size reduction, composition control

Tars and Oils

Catalyst fouling, non-catalytic efficiency

Feedstock Variability

Operability and cost
PROJECT DEVELOPMENT CHALLENGES FOR RENEWABLE SYNGAS

Lack of Installed Base – Financing
Capex, Capex, Capex
Low feed density
Feed variability
Capex and Opex
Feed preprocessing
Scale
Limited Suppliers – Transportation
Costs
SCHMIDTSCHE SCHACK HAS THE KNOW-HOW TO MEET THE CHALLENGES IN RENEWABLE SYNGAS

Partner with Technology Providers

Experience in Multiple Industries

Established Supply Chain

Strict Quality Control

Deep Know How

- Thermal and Mechanical Stress
- Corrosion
- Erosion
- Fabrication Techniques
- Cost Effective Solutions

1967
First oil gasification plant equipped with SCHMIDTSCHE SCHACK | ARVOS Syngas Cooler

1980
Metal dusting issue solved with technological innovation

2001
World’s first Integrated Gasification Combined Cycle (IGCC) demonstration plant with SCHMIDTSCHE SCHACK | ARVOS radiant and convective Syngas Coolers

2003
Patented solution to avoid high temperature H₂S corrosion

2012
World’s largest gasification plant with SCHMIDTSCHE SCHACK | ARVOS Double Tube & Oval Header Syngas Coolers

2015
World’s largest heavy oil gasification plant with SEC type Syngas Coolers

2017
Municipal solid waste gasification plant with SCHMIDTSCHE SCHACK | ARVOS reforming and Syngas Cooling solutions

Reactor Supply

Reformers with Heat Recovery

Turnkey Projects

O₂ → Steam Feedstock
THANK YOU FOR YOUR ATTENTION! ANY QUESTIONS?

WWW.SCHMIDTSCHE-SCHACK.COM