IWT – Thermoselect Technology

- IWT has been in business since 1990. It is a development and technology company
- IWT licenses Thermoselect Conversion Technology from Vivera (a Swiss company) for use in the US and Caribbean
- The technology incorporates pyrolysis and gasification
- Processes MSW and produces a synthesis gas comprised of CO, H2 and CO2
- Syngas can be used to produce alternative fuels such as ethanol, methanol, diesel, jet fuel or to generate electricity
- Process also produces 5 recycled products which are sold
- Achieves 100% diversion of the waste it processes from landfills
Thermoselect Technology

• 43 patented processes – 300 patent awards worldwide
• Began operations in 1992 in Europe (110 tpd Demo Facility)
• 7 plants currently operating in Japan
• Facilities have operated reliably and safely for about 24 years processing millions of tons of waste.
• Major project announced for Antwerp, Belgium that will process 3.5 million metric tons of waste per year
• 2 facilities under development in US
Independent Third Party Evaluation Of Conversion Technologies

• The County of Los Angeles sponsored a comprehensive study to evaluate commercially available non-incineration waste processing technologies beginning in 2004

• URS (now AECOM), largest engineering firm in the US, conducted the study

• The County and URS concluded the following:
  Based on supplier credibility, existing operational experience, completeness of engineering, landfill diversion, permitability and economics, IWT and the Thermoselect technology were ranked #1

• The entire report is available on IWT’s website at iwtonline.com

• The ranking of the top 14 study participants is included on the following page
Evaluation of Conversion Technologies

SECTION 2.0
EVALUATION, SCREENING, AND RANKING OF TECHNOLOGIES

FIGURE 2-1
SCORES OF CONVERSION TECHNOLOGY BY SUPPLIERS

Score in (%)

Supplier

- Thermal Conversion
- Bioconversion
- Waste to Green Fuel
Vitreous Mineral Granulate

Iron-Copper Alloy

Salt

Sulfur

Zinc-Concentrate

Concrete Road Construction Sand-Blasting

Metallurgy

Chemical Industry, Additive for Metallurgy

Chemical Industry, Sulfuric Acid Production

Zinc, Lead, Copper Recovery
Projects in Japan
LanzaTech
Syngas To Ethanol Technology

• Over 200 patents granted; >400 pending
• Incorporates biological conversion of (H2 + CO) into ethanol through gas fermentation
• Uses microbes that grow on gases, rather than sugars as with traditional fermentation
• Proven technology used worldwide
  – 5 plants have operated since 2008
  – July 2015 announced partnership to construct $100 million biofuel production facility in Europe – startup Q4 2017
  – 4 commercial projects announced
The LanzaTech Process is Driving Innovation

**Novel gas fermentation technology captures CO-rich gases and converts the carbon to fuels and chemicals.**

- Process *recycles* waste carbon into fuels and chemicals
- Process brings underutilized carbon into the fuel pool via *industrial symbiosis*
- Potential to make material impact on the future energy pool (>100s of billions of gallons per year)
Environmental Benefits of Conversion Technologies Offered by IWT

• Uses non-incineration waste processing technology
• Diverts 100% of waste from landfills
• No ash is generated – No ash landfill is required
• Waste processing equipment produces no air emissions or process water discharges
• Minimal emissions from ethanol production equipment
• Produces the following approximate quantities of ethanol, RINs and LCFS credits per short ton of waste processed
  – 65 gallons of ethanol
  – 40 RINs
  – ½ ton of CO2(e) reduction
• Will reduce emissions from diesel trucks hauling waste to remote locations with the closure of landfills
• Reduces emissions from transporting ethanol from the mid-West to California
• Does not compete with food stocks such as corn
Contact Information

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