

These materials were developed under the auspices of CalRecycle for specific technical training presentations and are posted as reference documents for the local government and CalRecycle staff who attended this technical training series. They are not intended to stand alone as informational or training materials.

If you require assistance in obtaining access to the presentations, call the Public Affairs Office at (916) 341-6300 or Dennis Corcoran at (916) 341-6395.



Jeff Surma
President and CEO

Presented to

CIWMB



Presentation Overview

- Introduction to S4 Energy Solutions LLC
- S4 Energy Solutions Gasification Solution
- Clean Alternative Fuels – What are the Possibilities from a Gasification/Conversion Technology
- Q&A

Overview of JV - S4 Energy Solutions

- **Joint Venture Formed to Commercially Deploy Gasification Technologies Using Waste Feedstocks**
- **50/50 Joint Venture Between WM and InEnTec**
- **Venture Officially Launched in February 2009**
- **JV to Operate in Collaboration with, but Independent of JV Partners**

Waste Management Overview

- **Headquartered in Houston, Texas**
 - Operations in 48 states, District of Columbia, Canada and Puerto Rico
 - More than 45,000 employees
- **Nearly 20 million customers**
- **Collect about 66 million tons of waste**
 - 273 active landfills
 - Approximately 367 collection operations
 - 103 recycling facilities
- **16 Waste to Energy Facilities producing approx 520 mw's, energy for 650,000 homes**
- **111 Land fill Gas to Energy Facilities, producing approx 400 mw's, energy for 500,000 homes**



InEnTec Overview

- **Founded in 1995; located in Richland, WA**
- **Exclusive license for Plasma Enhanced Melter™ (PEM™) technology**
- **InEnTec has over 40 patents on PEM™ related technology**
- **PEM™ builds on 15 year \$300 million dollar DOE-sponsored research conducted at Battelle (Largest not for profit R&D company in the US) Pacific Northwest National Laboratory (PNNL) and MIT**
- **Proven Technology - installed seven commercial PEM™ systems**
- **Joint marketing agreements with Kawasaki Heavy Industries & Hitachi (Japan)**

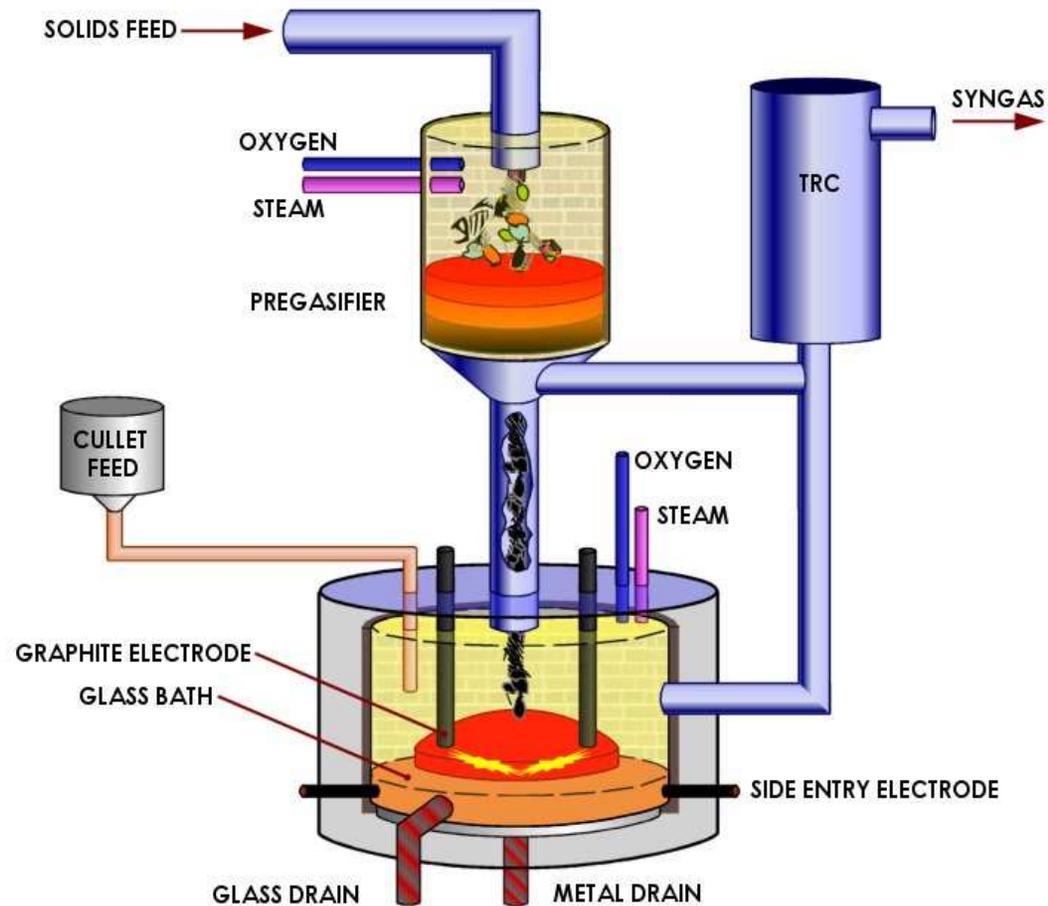
S4 Energy Differentiation

- **A technology and business organization, intends to provide entire solution**
 - Many competitors claim to have conversion capabilities, but much more is required to drive economic deployment
 - Feedstock management and handling experience
 - Information and analysis of feedstocks
 - Feedstock preparation know-how
 - Large national infrastructure
 - Funding capability
 - Energy off-take contracting experience
- **Leverage points**
 - 30 Years of Energy production and management
 - Waste management know-how and relationships
 - InEnTec Technology and competencies
- **Built in risk mitigation that other providers do not command**
 - Alternative disposal options – Large disposal network
 - Access and logistics of multiple waste streams
 - Strong community relations



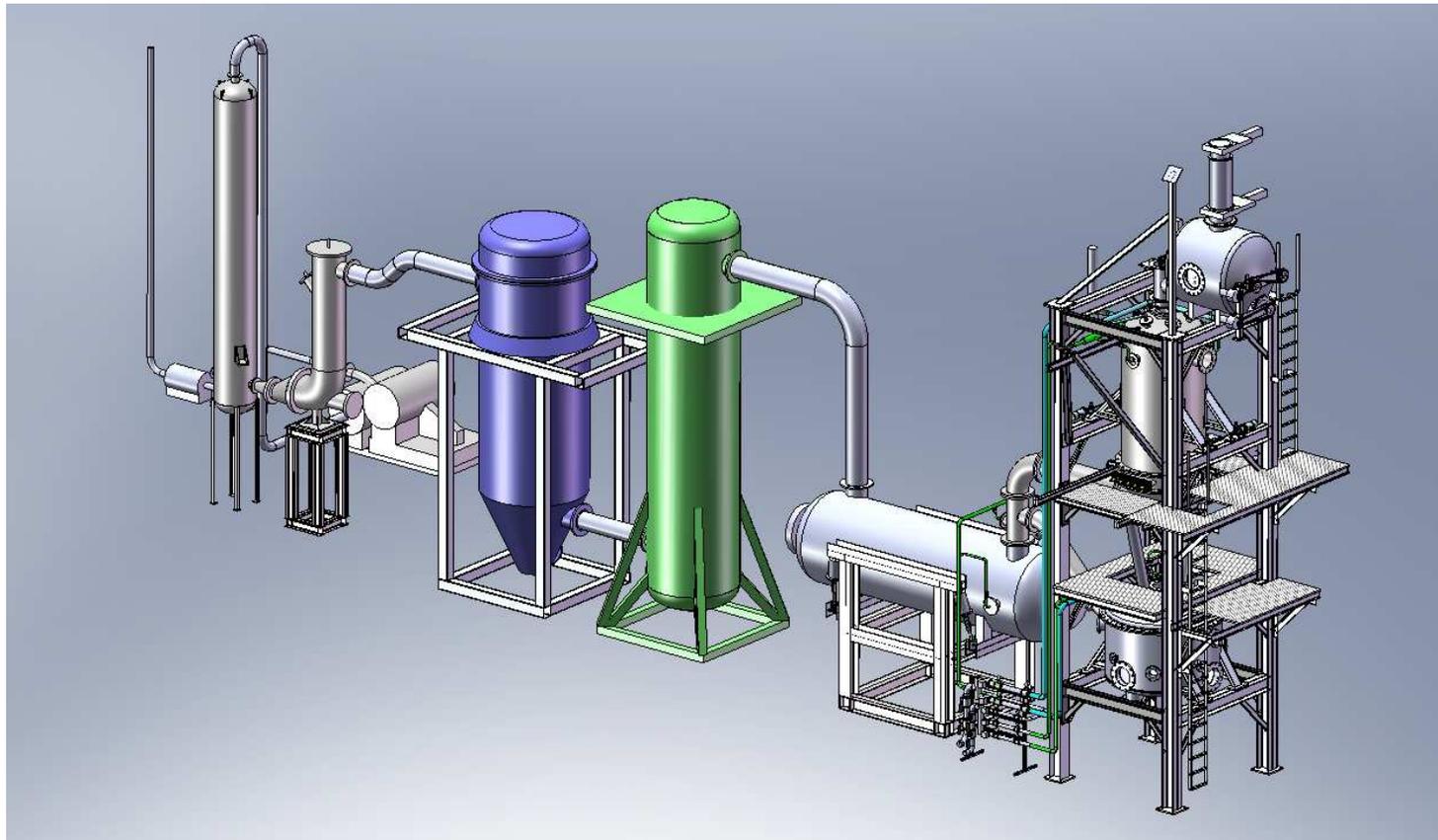
S4 GASIFICATION SOLUTION

PEM™ System Overview



S4 Standard Process Train

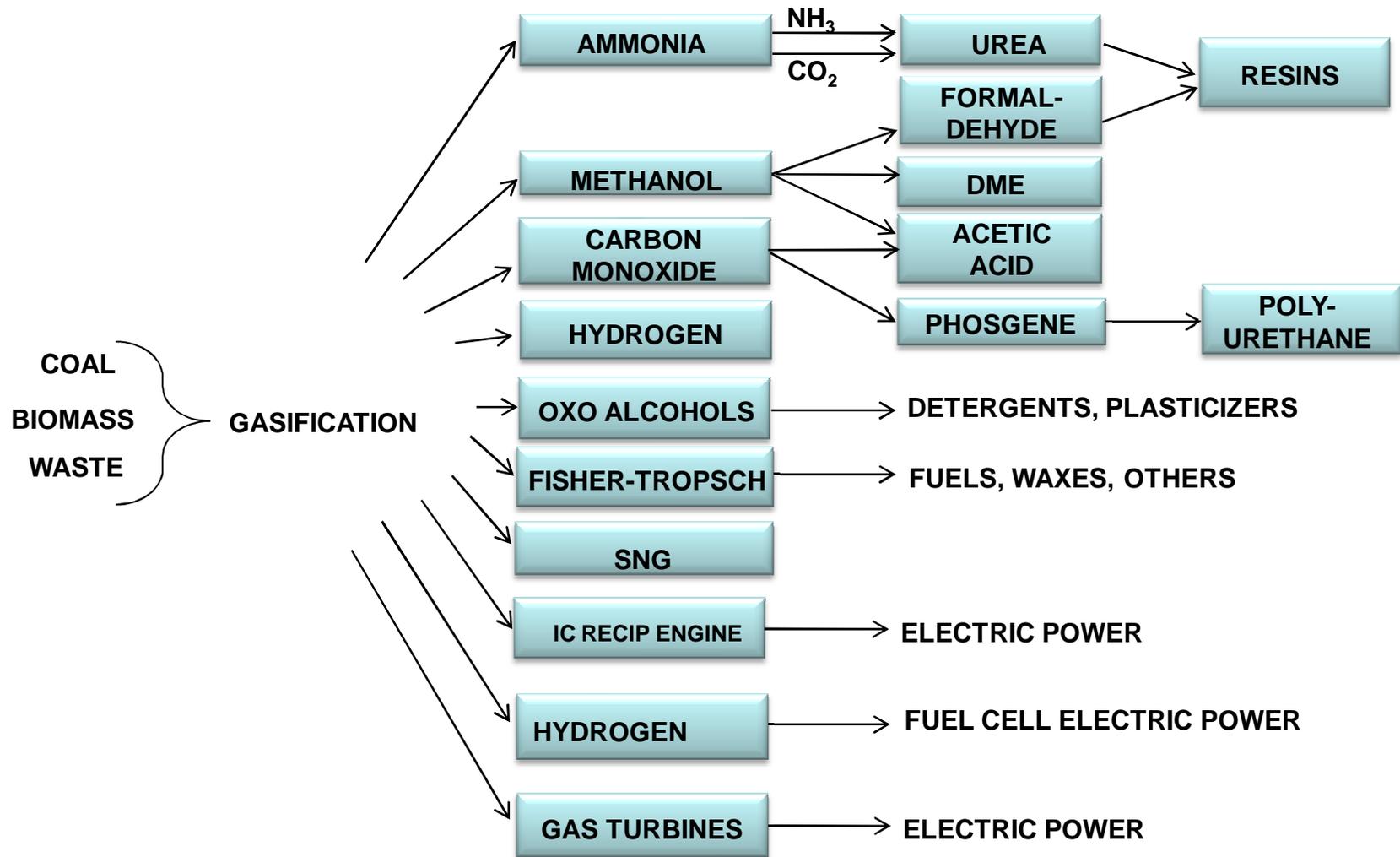
Standard Process Train Range – 25 TPD to 125 TPD



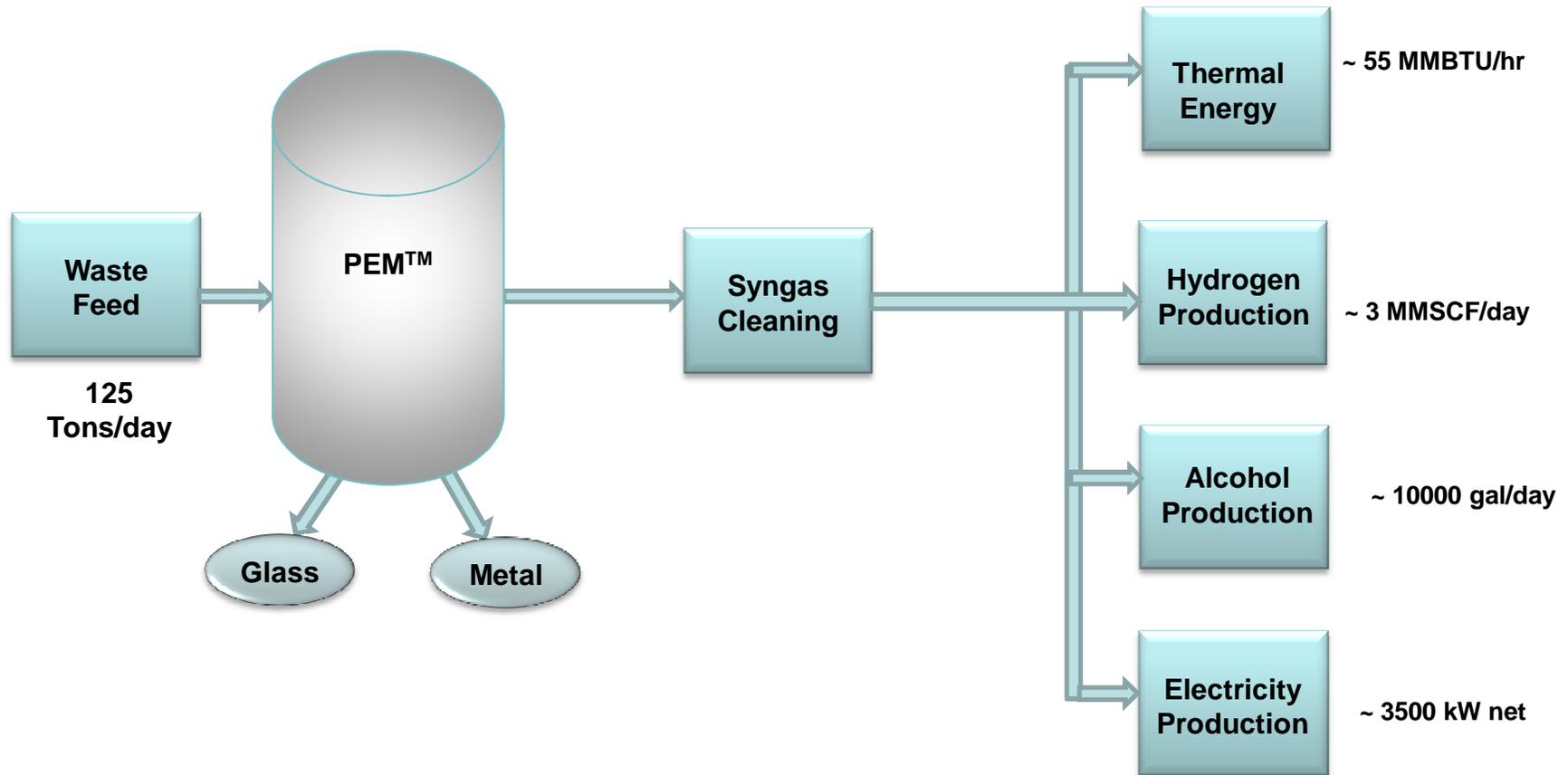
InEnTec PEMTM Unit (Richland, WA)



Potential Products from Synthesis Gas



Mass Balance Example (Varies with Waste Composition)



S4 Energy Commercialization Strategy

- Small 25 tpd Segregated Waste Streams
 - Medical
 - Industrial
 - E-waste
- Large Industrial
 - Parallel 25 tpd trains
 - 125 tpd
- Residential and Commercial Solid Waste
 - 125 tpd
 - Parallel 125 tpd trains

Environmental Performance

Extensive Emission Testing by EvTEC & Others

- EvTEC tests used three feed materials:
 - Simulated hazardous waste
 - Electronic scrap
 - Medical waste
- Demonstrated Destruction and Removal Efficiency (DRE) >99.999999% for chlorinated hydrocarbons
- Met EPA performance requirements by large margins (DRE, Dioxins, Metals, etc.)

Waste Volume Reduction



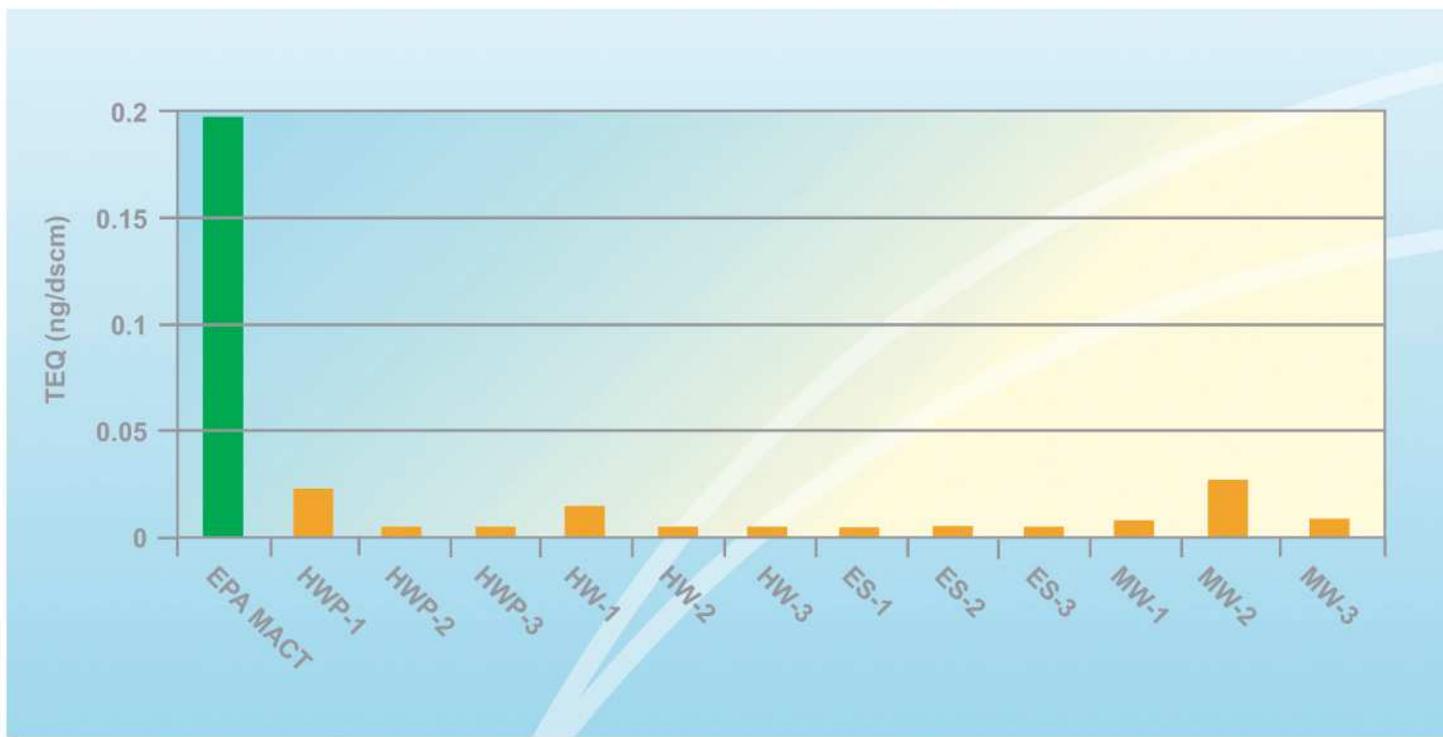
1 Ton = 182 Cu Ft



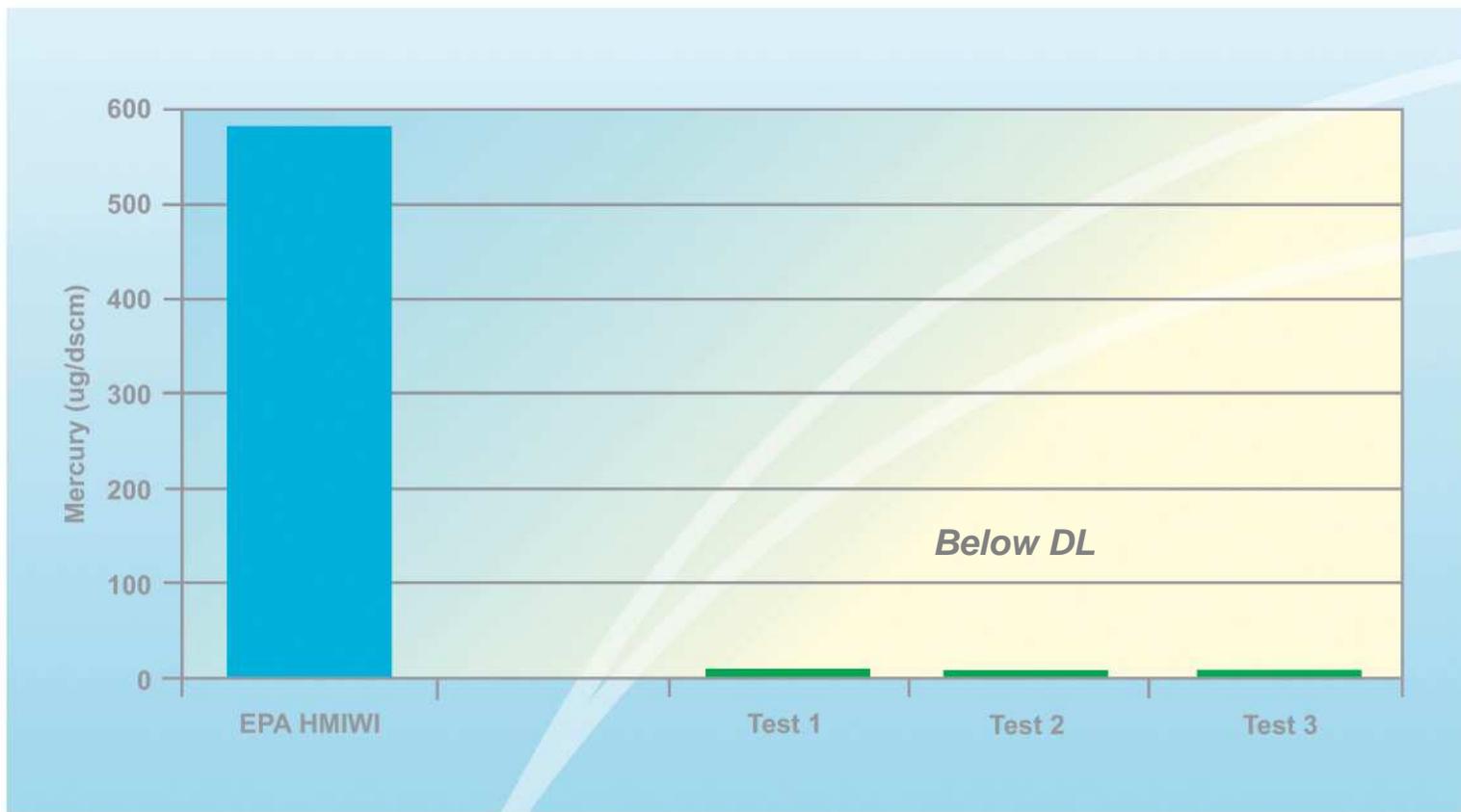
2 Cu Ft Recycled

Low Dioxin Emissions

Dioxin Emissions from Syngas Combustion Compared to EPA Haz Waste Incinerator MACT

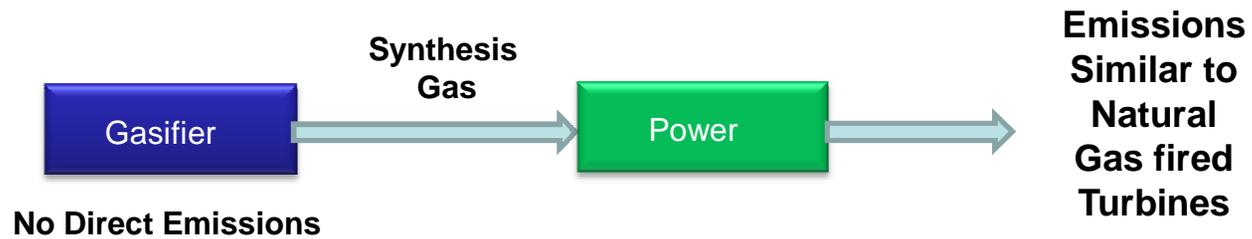


Low Mercury in Syngas (1% spiked waste)



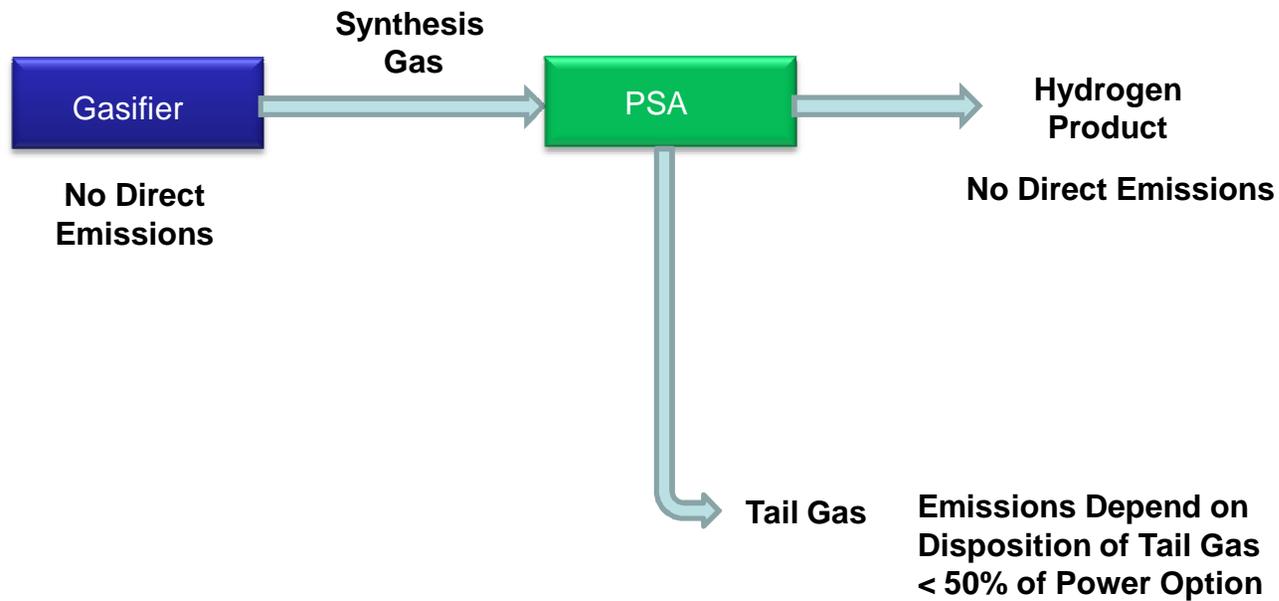
Potential Emissions Estimates from Gasification

Electric Power Production Scenario



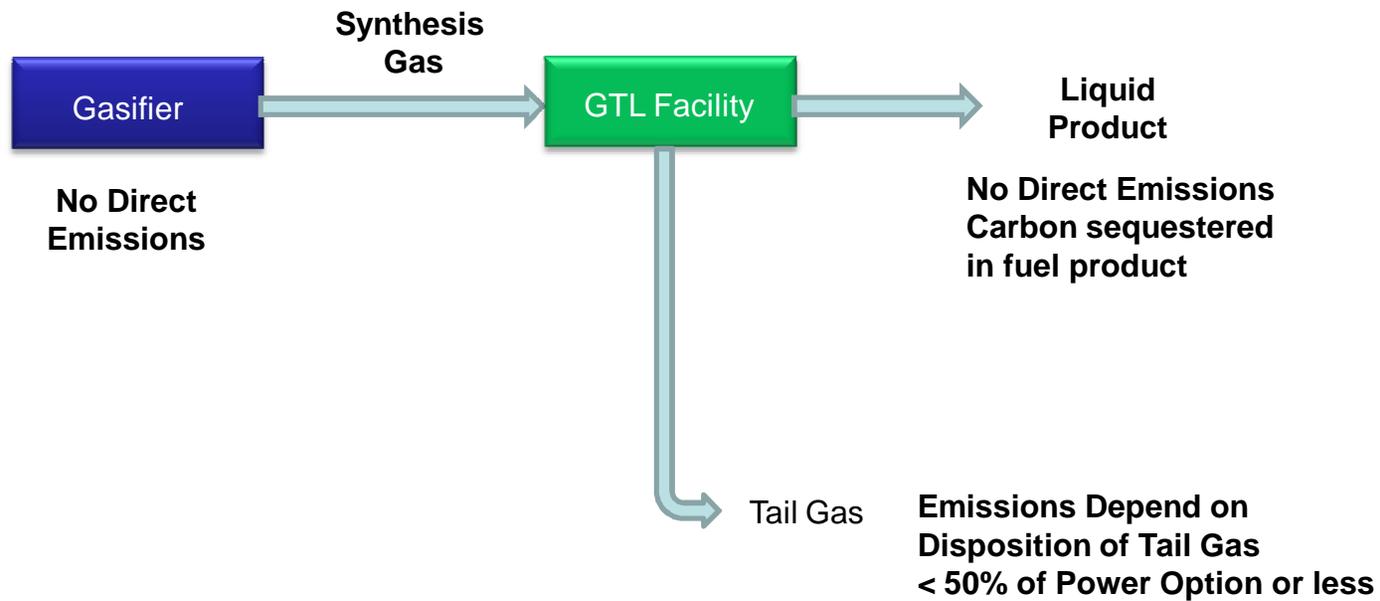
Potential Emissions Estimates from Gasification

Hydrogen Production Scenario



Potential Emissions Estimates from Gasification

GTL Scenario



Summary

- S4 is in a unique position to provide holistic waste conversion and flexible energy solutions
- S4's technology has a clean environmental profile
- S4 is first developing small commercial plants focused segregated commercial and industrial wastes
- S4 is actively looking for sponsors and/or partners to develop the larger scale 125 tpd solid waste facilities