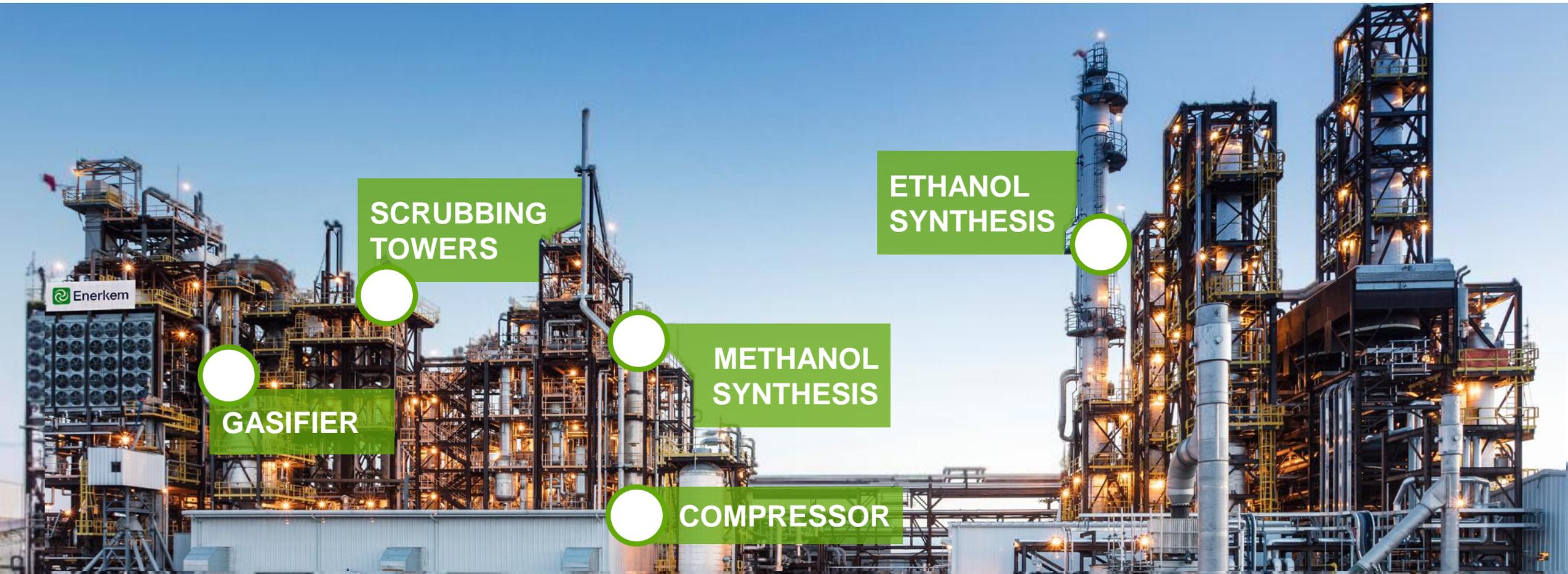


FEBRUARY 19 2020



WASTE TO CONVERSATION-READY FEEDSTOCK REQUIREMENT

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VP, Project Delivery



SCRUBBING
TOWERS

ETHANOL
SYNTHESIS

METHANOL
SYNTHESIS

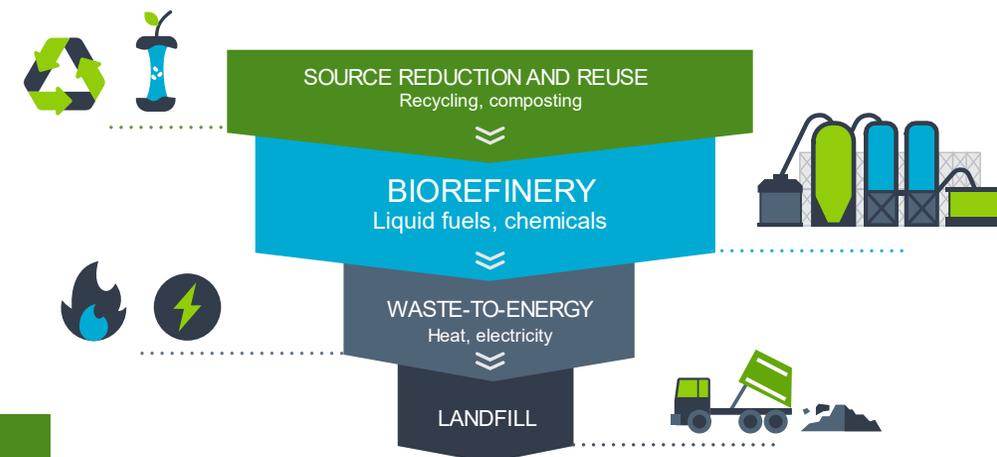
GASIFIER

COMPRESSOR

FEEDSTOCK REQUIREMENT & FLEXIBILITY

Enerkem converts waste into clean fuels and renewable chemicals

- We target feedstock that are rejected from recycling and composting programs or from industrial production
- Solves a waste problem and avoids methane or combustion emissions



DEFINITION	UNIT
The amount of heat released by combusting the material. This is directly correlated with syngas & product yield	GJ / mT
The quantity of ashes remaining after combustion. A higher inert content will reduce yield	% on a dry basis
The quantity of water in feedstock. If moisture is not removed by drying, yield will be lowered	% on a wet basis
Feedstock density is the weight by m ³ . A low-density feedstock will increase processing costs and reduce ability to convert CO ₂ into product	Kg / m ³
The biogenicity content is the % of Carbon in feedstock that is coming from an organic source drive most of the premium price for Low Carbon Fuel	% in end product

CALORIC VALUE (HHV)

INERTS

MOISTURE

DENSITY

BIOGENICITY

CHLORINE, SULFUR AND HEAVY METALS WILL IMPACT OUR COST RELATED MANAGEMENT AND WATER TREATMENT



BIOFUEL MARKET & CARBON RECYCLING INCENTIVES

While plastic packaging contributes to sustainability by keeping products fresh and reducing waste, plastic is difficult to recover and recycle. Breaking down plastic waste into their molecular building blocks with systems like Enerkem allow the possibility of achieving zero waste



CARBON-RICH WASTE

- Typical composition of MSW
 - 50-60% biogenic (Organics, paper packaging, cardboard, Organic textile)
 - 40-50% Fossil base carbon (plastic, textile, etc.)



DRIVERS OF CARBON RECYCLING

- Fuel blend (E10-E15) (RFS)
- Low Carbon Fuel Standard (LCFS)
- Landfill ban or tax (Tipping fees)
- Carbon recycling content in product

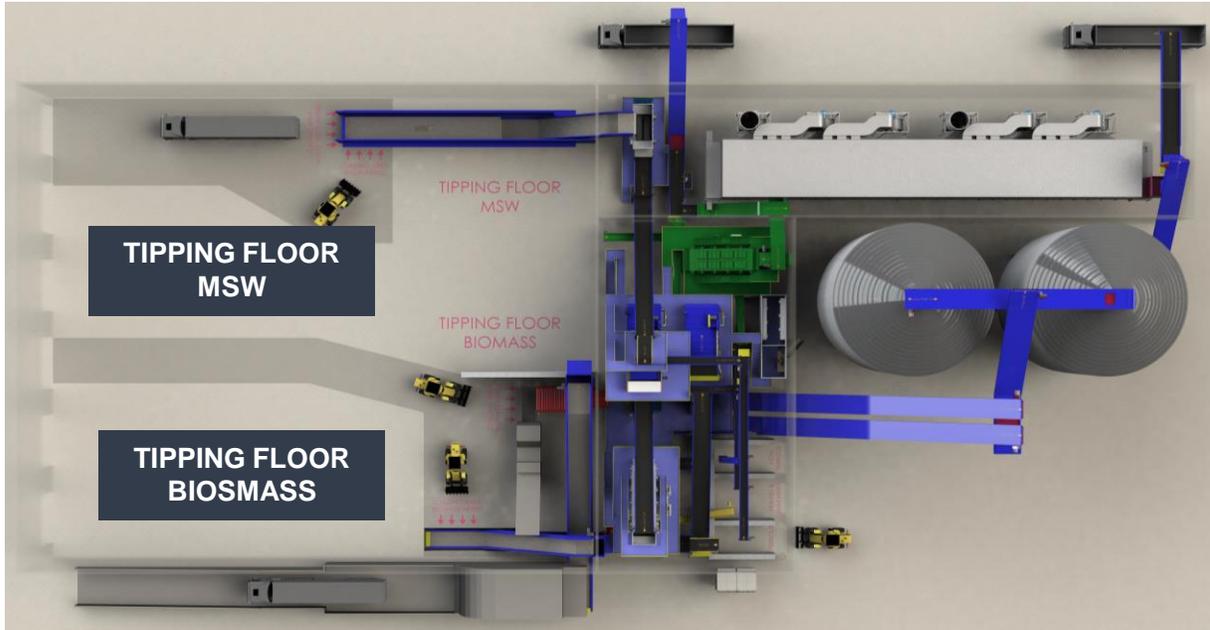


PRODUCT INCENTIVES

- Biofuel (incentives 250-500 \$/Mt of CO2) push the focus for biogenic
- Plastics and other fossil base waste generate more yield in the conversion process but still need incentive to compete with fossil base carbon or waste tipping fees

GASIFICATION STABILITY WITH ADEQUATE RDF REFINEMENT

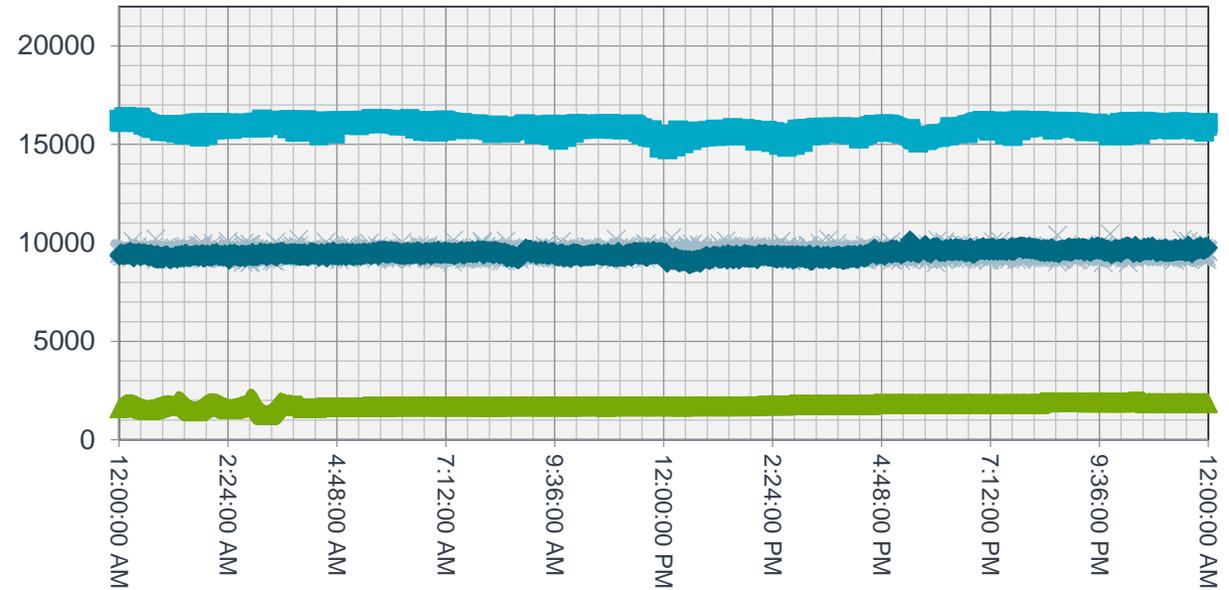
TYPICAL RDF REFINEMENT & DRYING



KEY REFINEMENT EQUIPMENT

- Waste reception mixing area
- Receiving Feeders and Buffers
- Pre-Shredder
- Trommel drum screen/ High frequency screener
- Ballistic separator
- Air Classifier
- Ferrous and Non-Ferrous Separation
- Primary shredder
- Silo-Buffer
- Low grade heat Dryer
- Air Treatment /Dust Collector

CONTROL OF WASTE HETEROGENEITY SNAPSHOT OF OCT 9TH 2016



- × Waste Feeding to Gasifier (kg/hr) - Coefficient of variation = 1.7%
- ◆ Syngas to Compressor Inlet (kg/hr) - Coefficient of Variation = 1.7%
- Syngas to Methanol Reactor (kg/hr) - Coefficient of variation = 1.2%
- ▲ Methanol Production (kg/hr) - Coefficient of variation = 4.0%

- Heterogeneity from waste lessens at molecular level
- There is mechanical buffering and feedstock uniformization through the feedstock preparation, feedstock storage, feed system paddle mixers
- Feeding and syngas flow rates are very stable