

DISTRIBUTED PRODUCTION OF METHANOL

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DISTRIBUTED PRODUCTION OF FUELS
MAKES SENSE IF

- Raw material is highly distributed
- OR
- Fuel use points are highly distributed

DISTRIBUTED RAW MATERIAL

- Shale gas: highly distributed
 - 50 – 100 times smaller than conventional
- Gas associated with shale oil
 - Median < 50,000 scfd in Bakken
- Biogas from waste water treatment
 - 50-100 thousand scfd
 - Uses methanol for denitrification: closed loop
- Biogas from animal waste impoundments
 - 100,000 to 1 MM scfd

DISTRIBUTED FUEL USAGE

- Methanol for blending with gasoline
- Methanol for boats
- DME for trucks, trains and LPG blending
- Hydrogen for automobiles

NEED SMALL SCALE GAS TO FUELS

- Liquids transportable even in small volumes
- Challenges the orthodoxy in chem. engineering
- Replacing economies of scale with economies of mass production and better catalysts
- Jobs distributed, not concentrated at ports
- Reduces pipeline infrastructure

“Just-in-Place” Manufacturing

Mass Manufacture and Scaling by Numbers

- Cost reduction from producing large numbers
- Units could be short lived

Small Unit Size

- Centralized (clustered) or distributed deployment
- Locate close to raw material or market demand (DME for trucks)

Fast Deployment and Replacement

- Reduce business risk, and risk of obsolescence



Engine-based Reformer

Flexible Feedstock



Flared Gas, Stranded Gas, Bio-gas

Oxidant

Air
Enriched Air
Oxygen



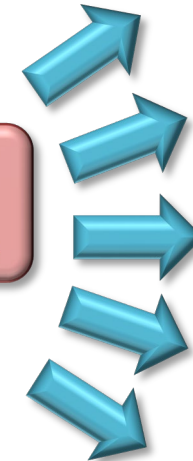
Syngas Generation



Clean Up
Conditioning
Compression

Balance of Plant
Controls

Flexible Product Slate



Methanol
RTI 10 bbl/day unit

FT Liquids

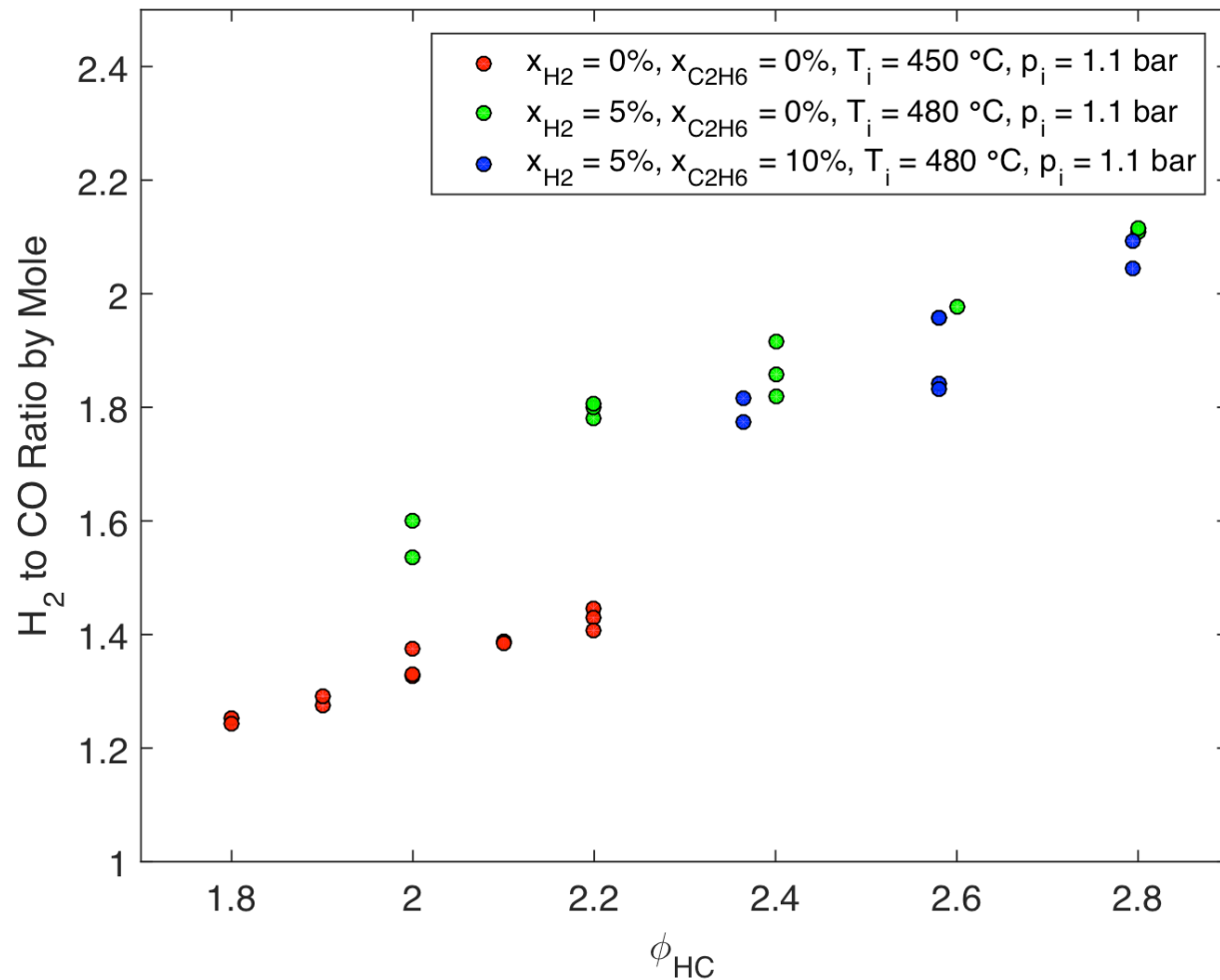
Olefins

Ammonia

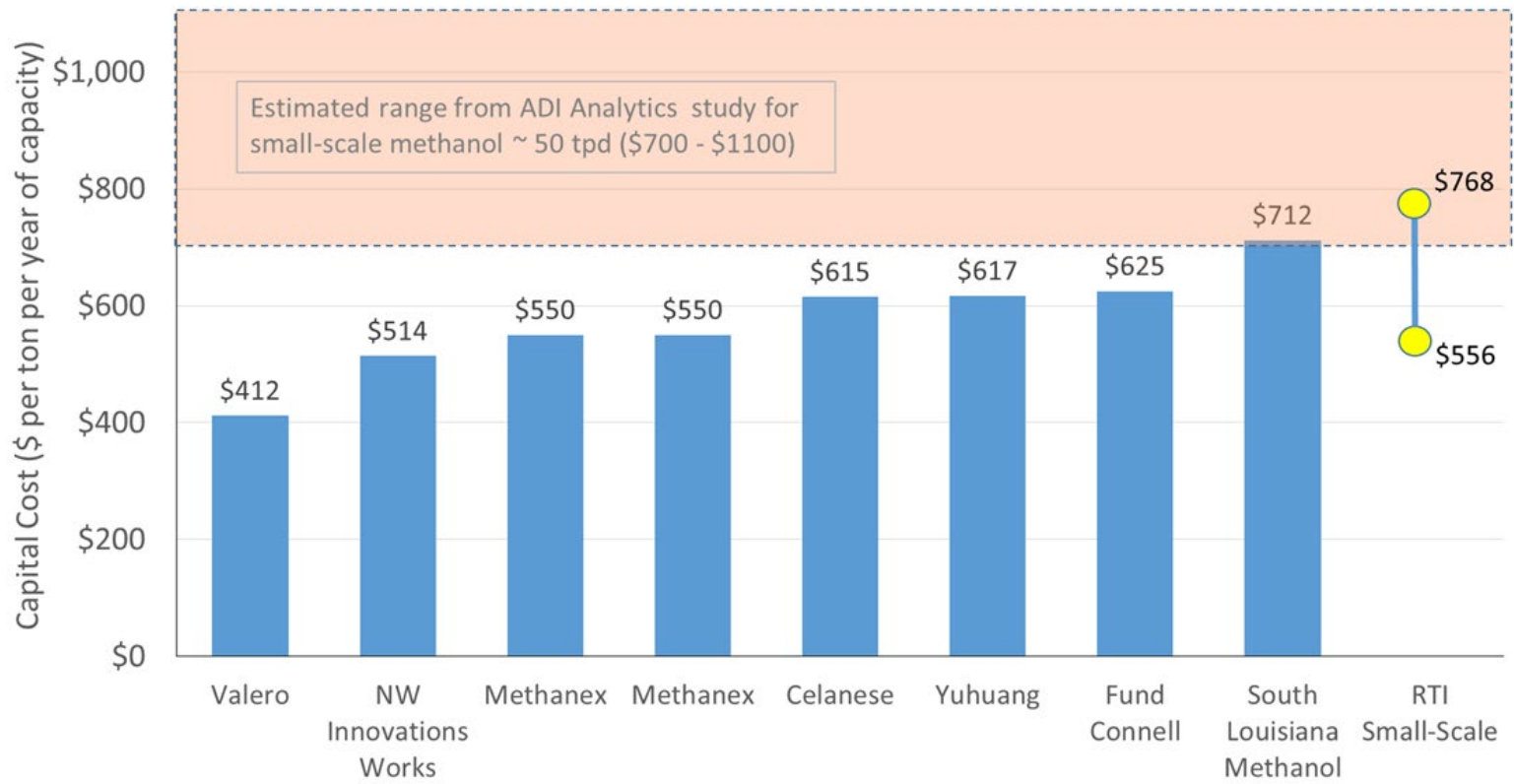
Hydrogen
Filling stations

*The engine is the key enabler for these technologies
Methanol is the simplest molecule to produce*

Syngas composition as function of equivalence ratio



Can Small-Scale Systems be Competitive?



Courtesy RTI International

Horses for Courses

One size does not fit all

