

 **DME** Local Solution for Global Problems

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Photo Credit: "Should It Be Illegal for Supermarkets to Waste Food?," *The Atlantic*, May 29, 2015.





*Despite the global nature
of these **PROBLEMS**?*

*the **SOLUTIONS**
are local.*

Cities & regions hold the key



Solution

Utilize waste streams to create own energy supply...



Landfill Gas?

Food Waste?



Industrial Waste Streams?

...creating circular economies and local resiliency

Oberon Solution

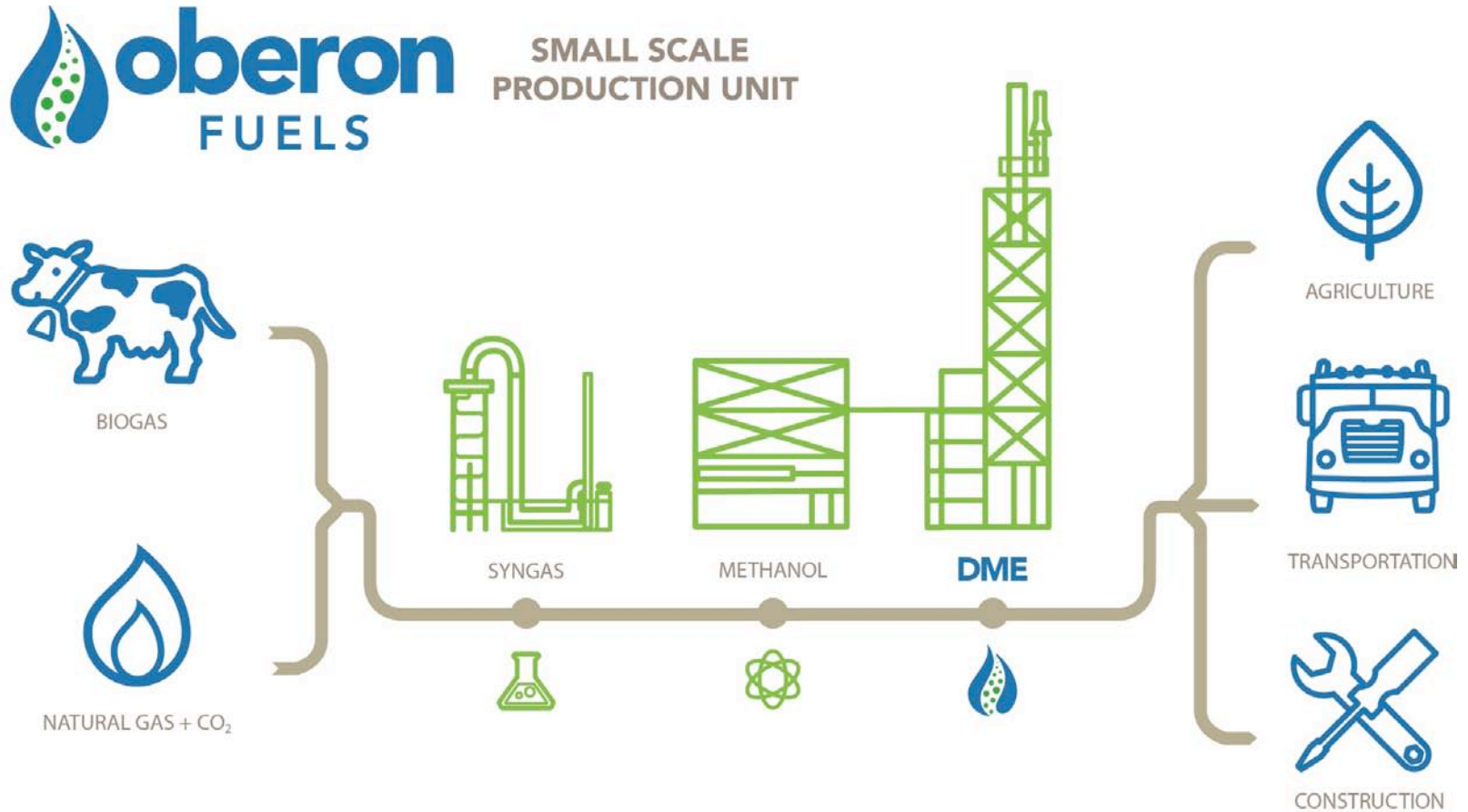
Connecting feedstocks with end-use applications



- **Monetizing** waste stream with small-scale production units
- **Creating** regional markets that can use the end products, distributed production
 - Resiliency, sustainability, controlling own fuel supply
- **Developing** small-scale production unit to convert to higher-valued product such as DME
- **Establishing** a market for DME as a transportation fuel/diesel replacement

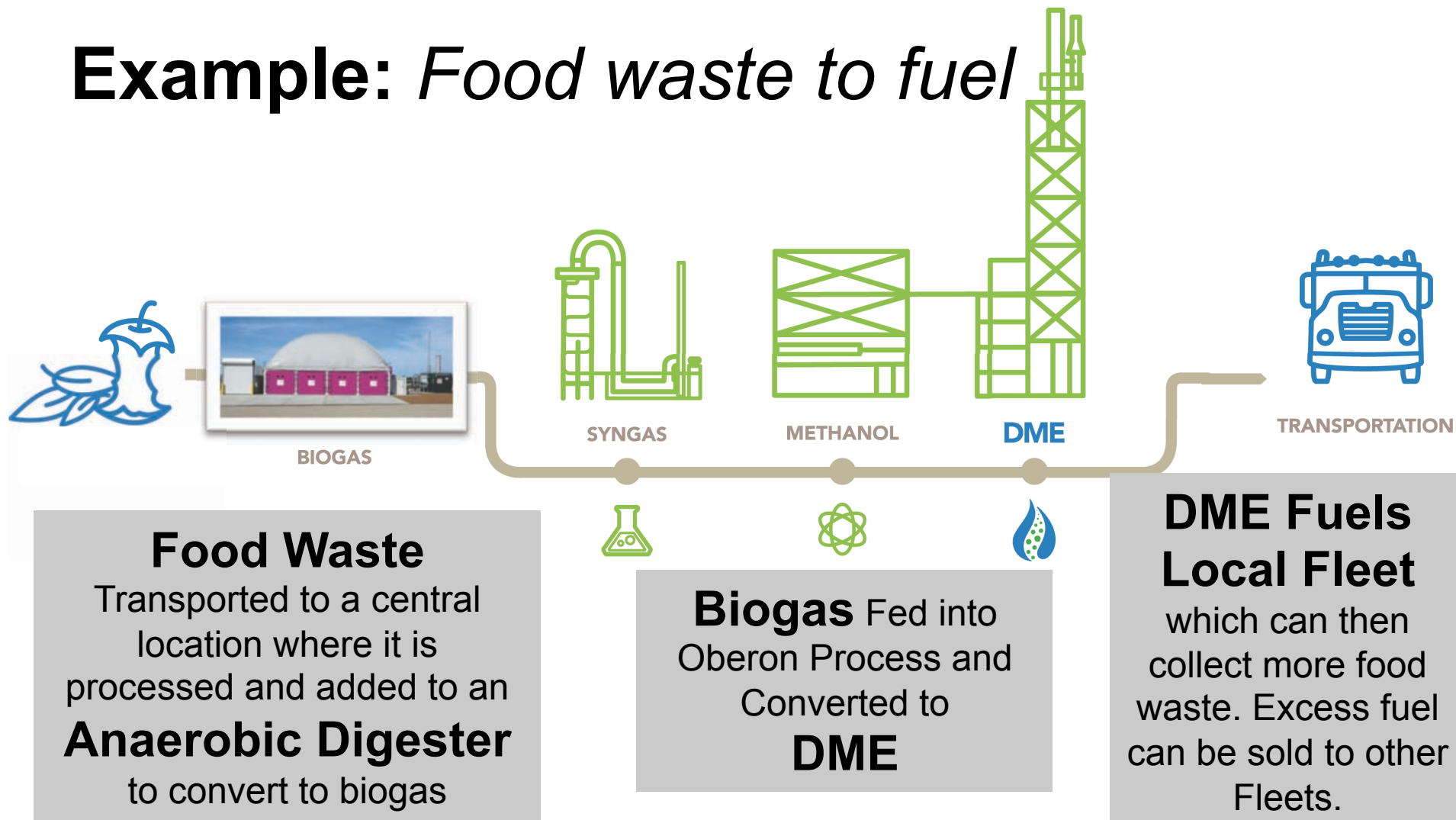
Oberon Solution: Small-Scale

Monetizing waste streams with small-scale production units



Oberon Solution: Small-Scale

Example: *Food waste to fuel*



Why Another Fuel?

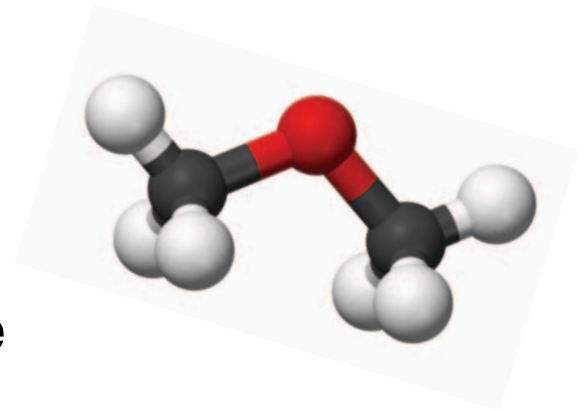


Driving force for DME is its ***SIMPLICITY...***

Solution: DME

- **Simple Fuel**

- Diesel-like performance
- Clean burning, no soot generated
- Made from methane and carbon dioxide



- **Simple Engine**

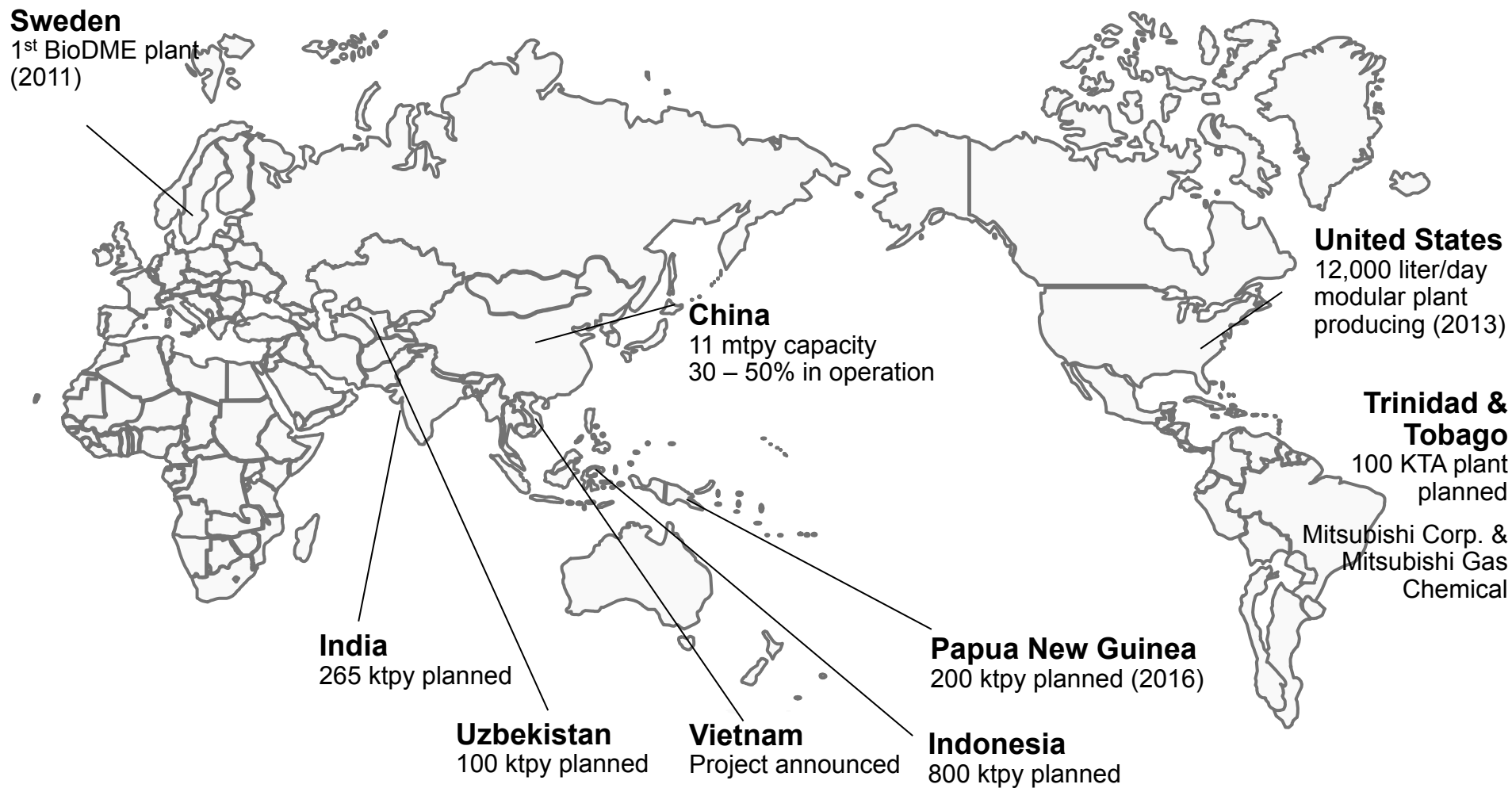
- Efficiency & torque of diesel engine with no soot produced
- Remove significant amount of after-treatment equipment

- **Simple Infrastructure**

- Propane-like Handling (cylinders/tank, only change seal)



DME Development



DME Status



Technology

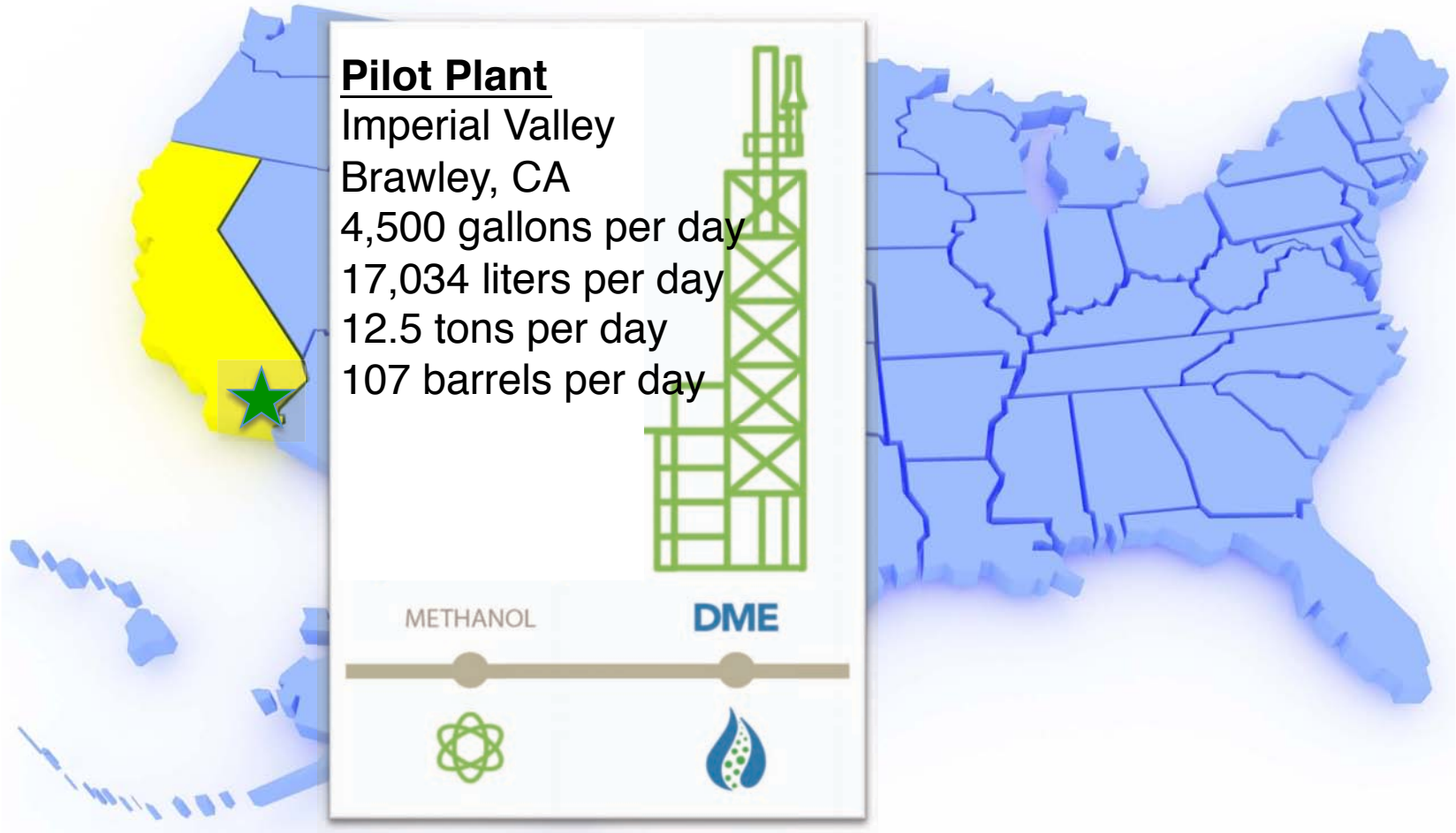


Regulatory Framework



Market Development

DME Production: Oberon Plant



DME Technology Development

1st Commercial DME Catalytic Distillation Column



Fuel Production: Large-Scale

- Distributed fuel production key to launching the market
- To reach true market penetration must be complemented with large-scale production
- **Opportunities for:**
 - Chemical producers?
 - Feedstock Suppliers?
 - Traditional fuel refiners?
 - End users?



DME Regulatory Development



ASTM Specification

Published 2014
ASTM D7901



Legal Fuel in CA

CDFA modified CA Code of Regulations to allow the legal sale of DME as a fuel effective January 1, 2015.



RINS Eligible

Renewable Fuel Standard (RFS) Pathway Approved



Tier 1 Report

As part of Multimedia Assessment process, CARB published DME Tier 1 report February 2015. Evaluated DME effects on air, soil, and water.



1st DME Truck Incentives in US

offered in Washington state.

DME Market Development

Diesel-like Performance, Propane-like Handling



DME fuel pump at ENN service station (Shanghai)



BioDME Project

Partners include
TOTAL, Preem, Delphi,
ETC, Chemrec, &
Haldor Topsoe



NAVISTAR[®]



DME Market Development



DME Market Development



xME Project in Germany

DME-powered Trucks

Demonstrations running in US



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SEARCH



DME

dimethyl
ether
a gas

OME1



11-SEP-2015 | AACHEN, GERMANY

FORD LEADS PROJECT TO DEVELOP NEAR ZERO PARTICULATE EMISSION DIESEL CARS THAT COULD RUN ON CONVERTED CO2

- Ford European Research & Innovation Center is to lead a €3.5 million project to investigate alternative fuels that could one day offer diesel car customers enhanced fuel efficiency while minimising environmental impact
- The project consortium will develop the first passenger cars, based on a Ford Mondeo, to run on environmentally friendly dimethyl ether (DME), and oxymethylene ether (OME1)
- Both fuels can be generated from CO2 captured from the air that is combined with wind and sun power, or waste products

Ford Motor Company is leading a €3.5 million research project to investigate the use of alternative fuels that could offer customers the power and performance of modern internal combustion engines with environmental benefits comparable to an electric vehicle.

The German government is co-funding the three-year project that will test the first-ever cars to run on dimethyl ether (DME), commonly used as a non-toxic propellant in aerosol spray gas, and oxymethylene ether (OME1), a



DOWNLOADS



DME Market Development



POWERING A MONDEO WITH CONVERTED CO₂:

how ethers can be used
as alternative fuels



DME
dimethyl
ether,
a gas C_2H_6O

OME1



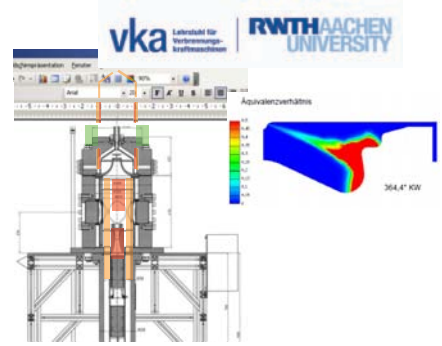

LVK
 Lehrstuhl für
 Verbrennungskraftmaschinen



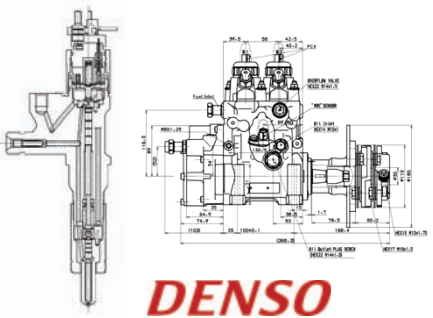
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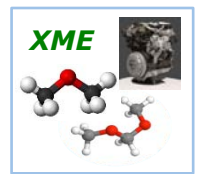


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automotive engineering **iau**



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Market Development



xME Project in Germany

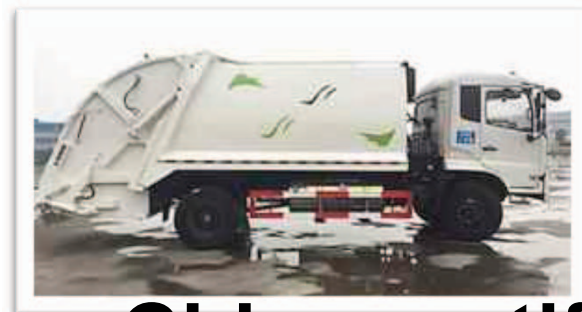
DME-powered Trucks

Demonstrations running in US

achatesPOWER



- Developed 2-stroke opposed piston engine
- Improves fuel economy by 32% vs. diesel



China certifies DME engine

Builds prototype garbage truck and street sweeper

DME Moving Forward

DME Production

- Made by small- and large-scale processes
- Feedstock dependent on area



Multiple DME Fuel Markets

Heavy-duty trucks, passenger cars, cooking fuel, stationary power generation

Addressing the world's energy, waste, and environmental challenges without sacrificing performance



Contact Information



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