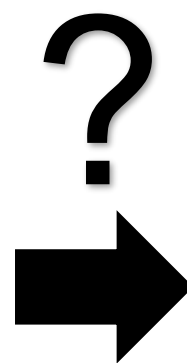




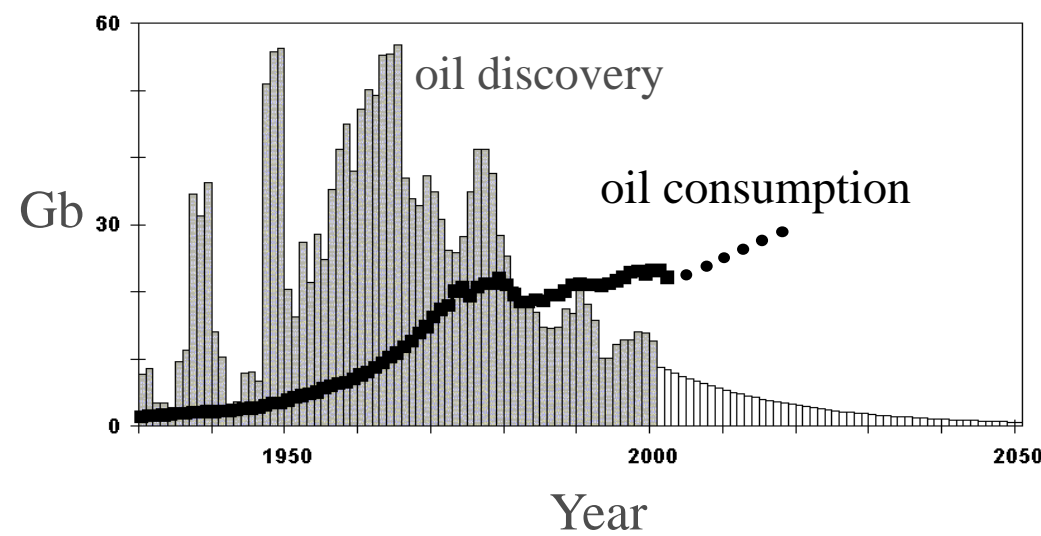
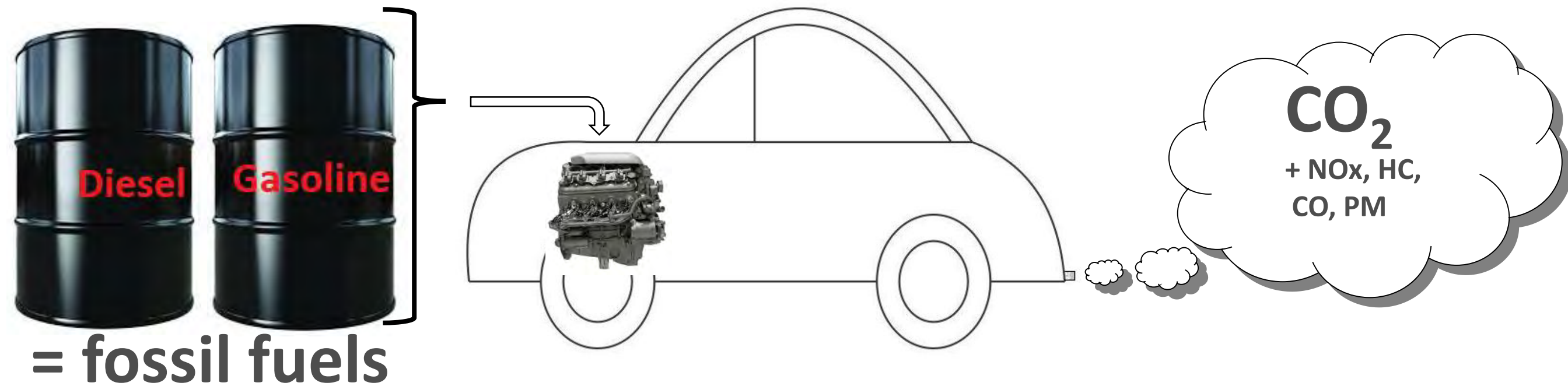
**GHENT
UNIVERSITY**

ALCOHOL AND DRIVING: ALWAYS A BAD IDEA?

Louis Sileghem



PROBLEM WITH TRANSPORT?



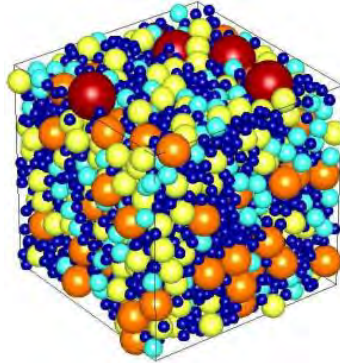
- Finite resource
- Growing energy demand

- Climate change
- Bad air quality

CRITERIA FOR ALTERNATIVES



- Sustainability, of energy source, harvesting technology, energy carrier and powertrain materials (e.g. recyclability)



- Storability (Compact): need sufficient power & energy density



- Scalability, i.e. abundance of energy source, and of resources needed for building the harvesting technology and resources for the powertrain


SCALABILITY



CONSUMER | RETAIL | AUTOS | FOOD AND BEVERAGE | RESTAURANTS | FASHION

Technology is fueling the growing demand for the once-obscure element cobalt

- Cobalt prices more than doubled in 2017, fueled in part by demand and investor interest.
- Rising demand for electrified vehicles could lead to cobalt shortages.



COMPARE EVs CHARGER GUIDE CATEGORIES FORUM

Home > Sales > In 2017, Electric Car Market Share Nearly Hit 1% In Western Europe

In 2017, Electric Car Market Share Nearly Hit 1% In Western Europe

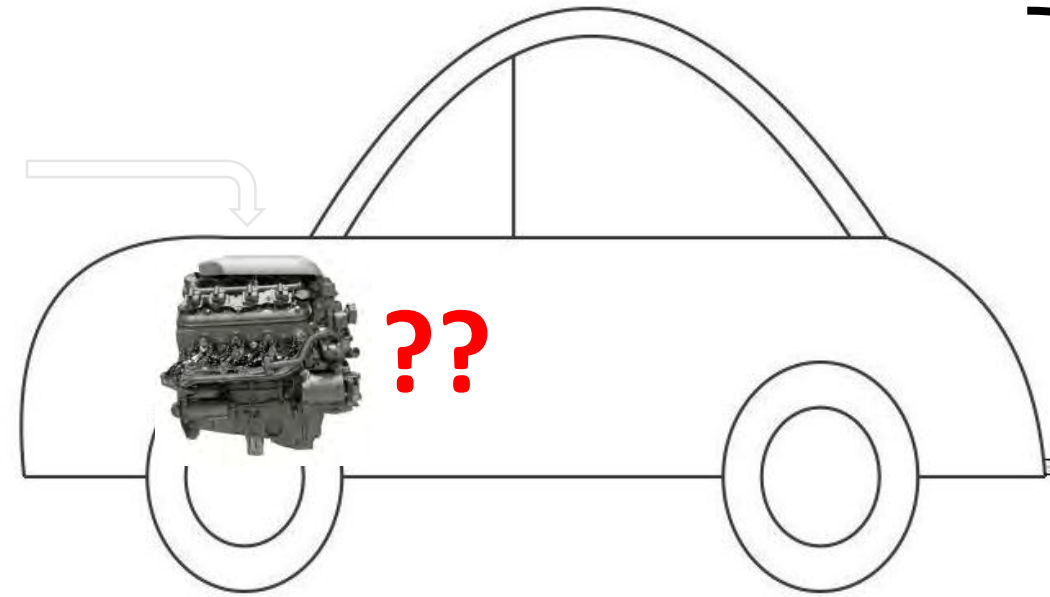


May 14 2018 at 3:25 PM
Updated May 14 2018 at 4:13 PM

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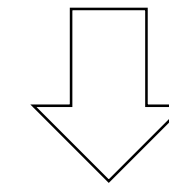
Battery makers pushing for ten 10-year lithium contracts: Albemarle

IS THERE A FUTURE FOR THE INTERNAL COMBUSTION ENGINE?



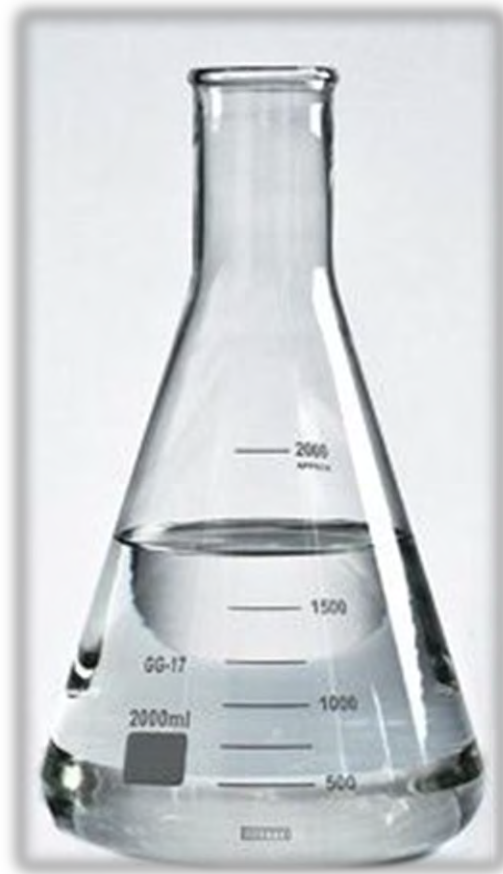
- Cheap and sustainable
 - Abundant materials
 - Recyclable
 - Low energy demand
- Flex-fuel
- Efficiency still improving

**Keep the engine,
change the fuel!**

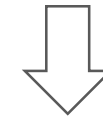


Alcohol!

WHY ALCOHOL (METHANOL OR ETHANOL)?



Liquid at atmospheric pressure

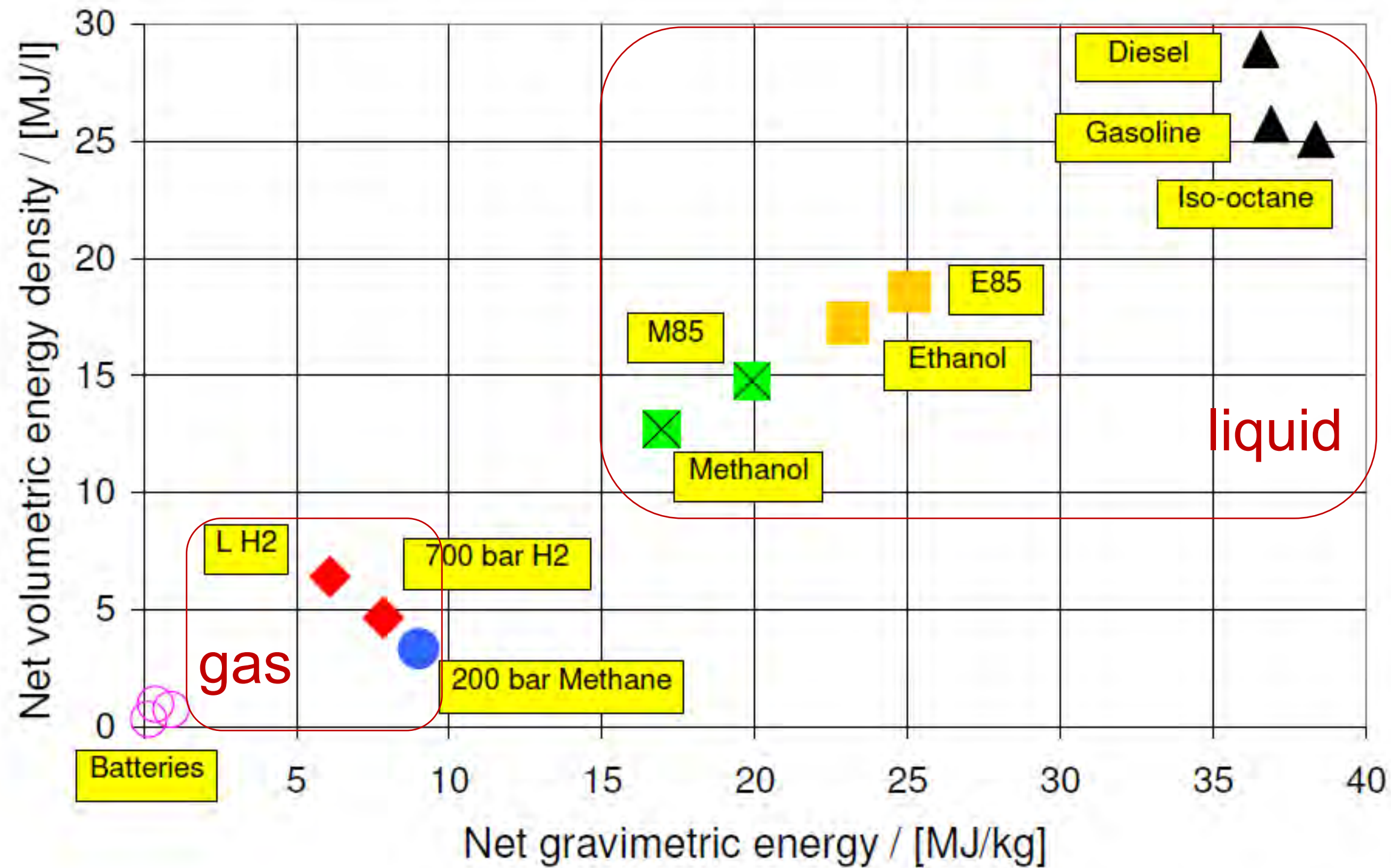


High energy density

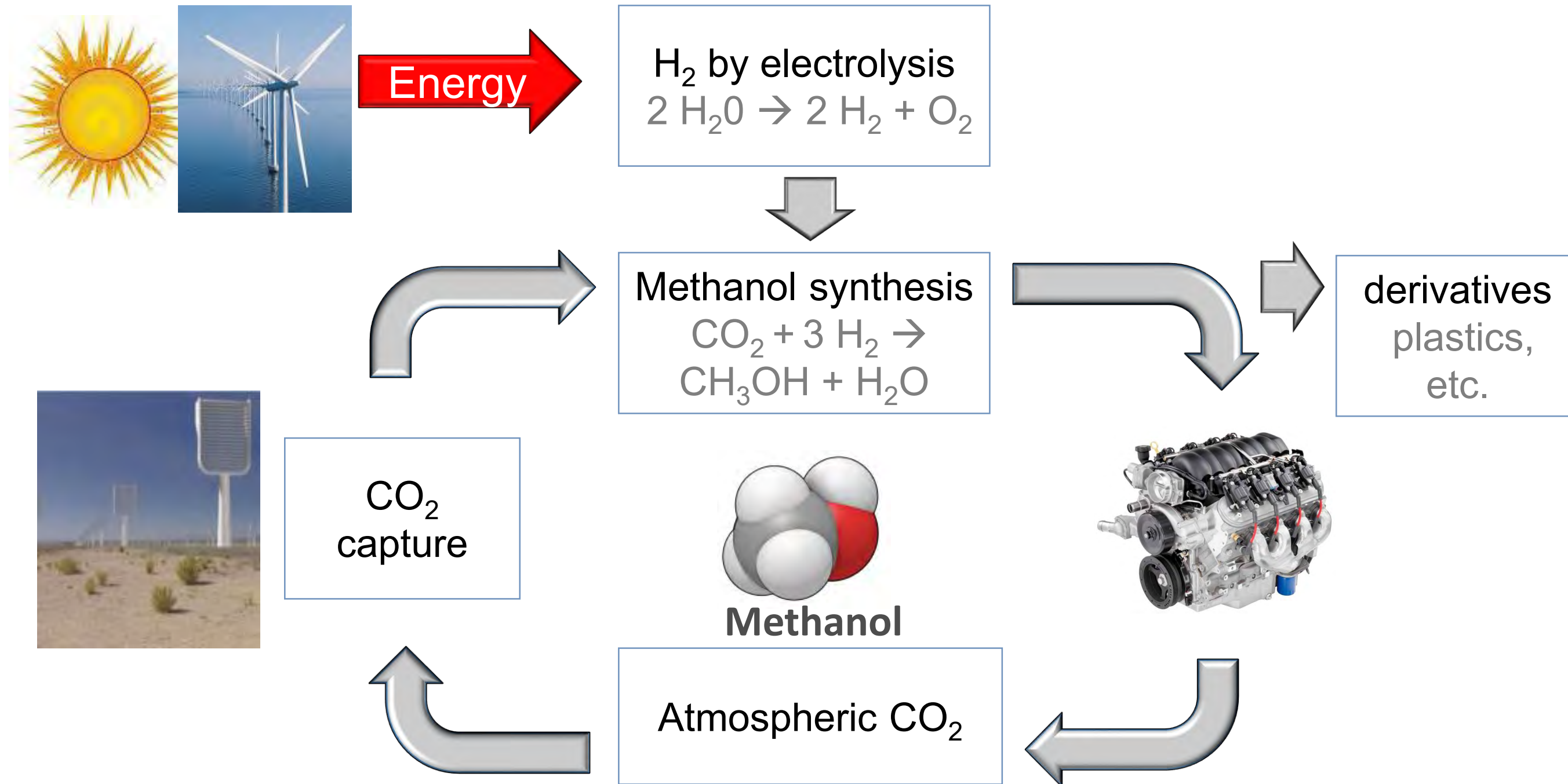
+

**Existing fuel infrastructure
can be used
(distribution and storage)**

WHY ALCOHOL (METHANOL OR ETHANOL)?



SUSTAINABLE PRODUCTION OF ALCOHOLS: SYNTHETIC FUELS ('ARTIFICIAL PHOTOSYNTHESIS')

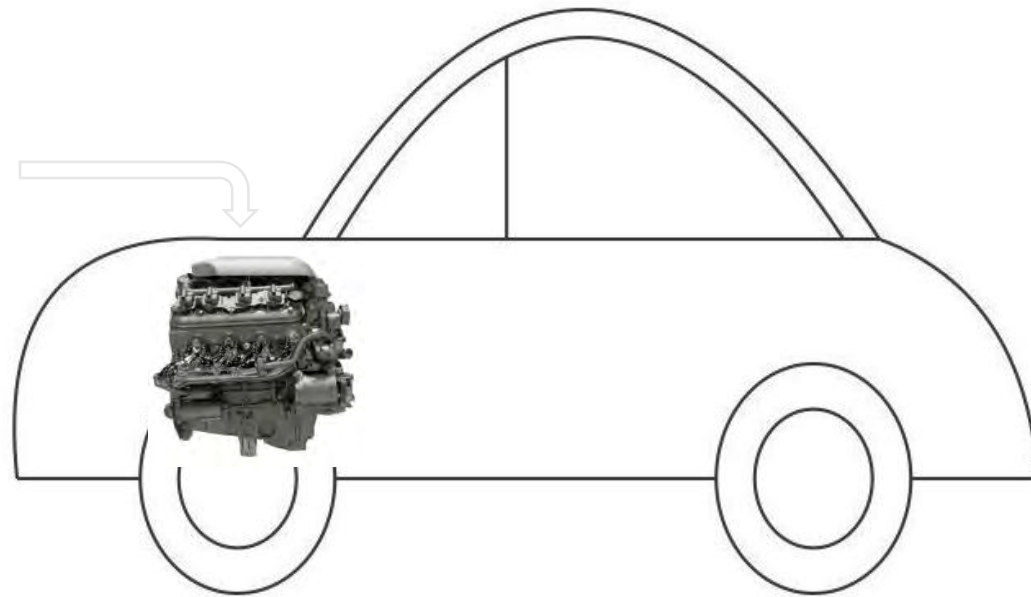


Renewable alcohol fuels

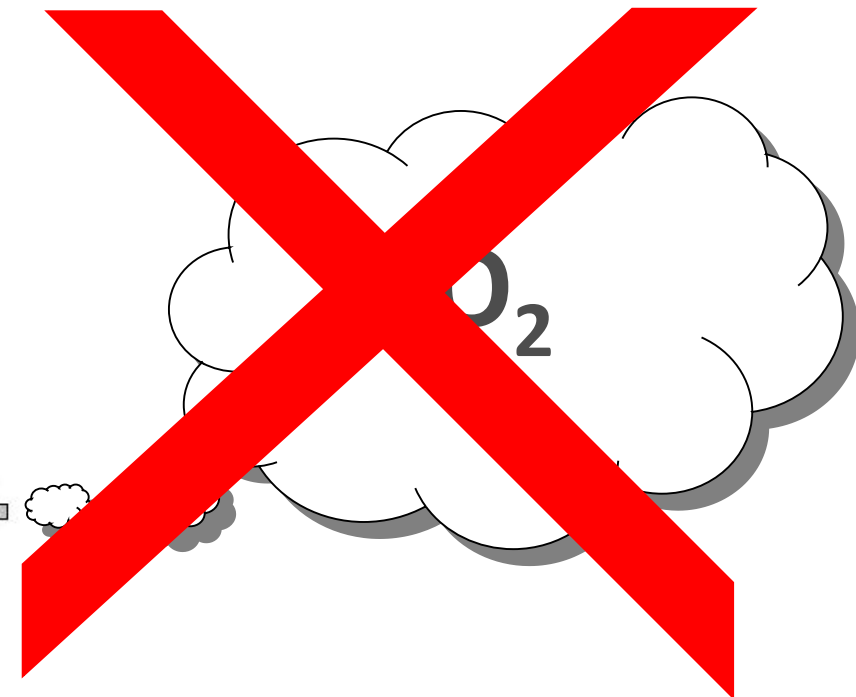
no fossil fuels



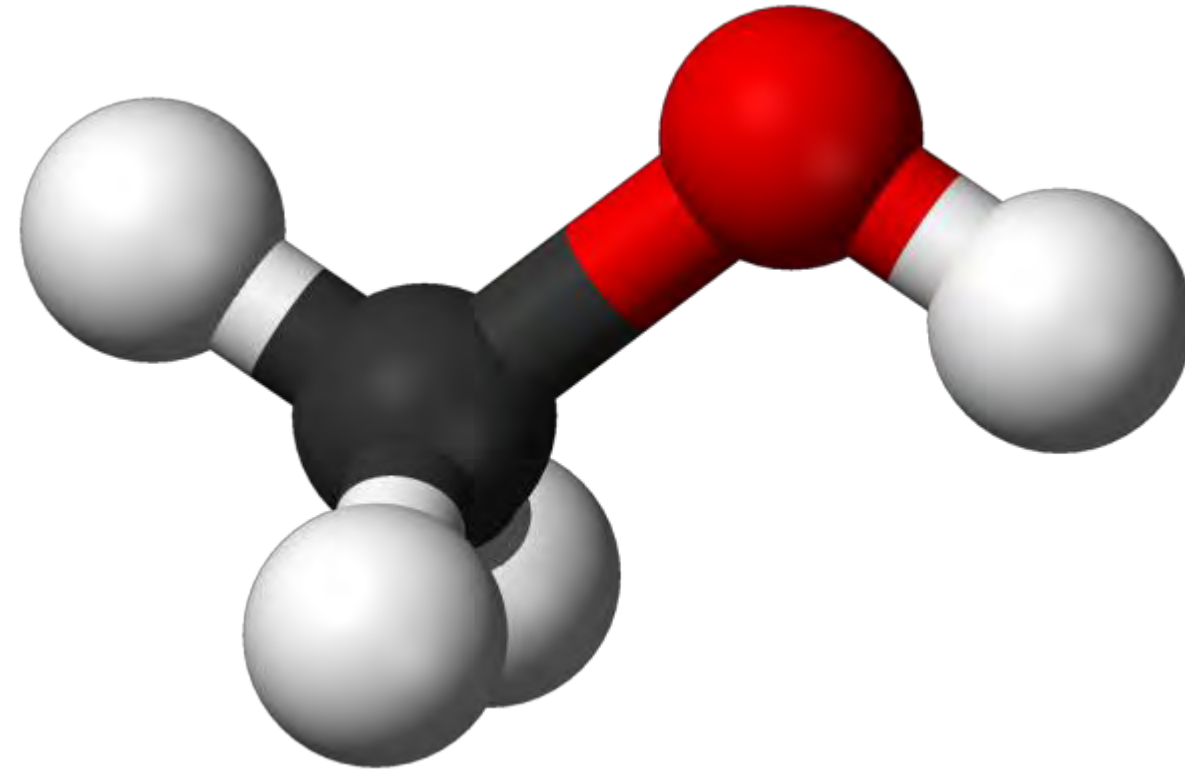
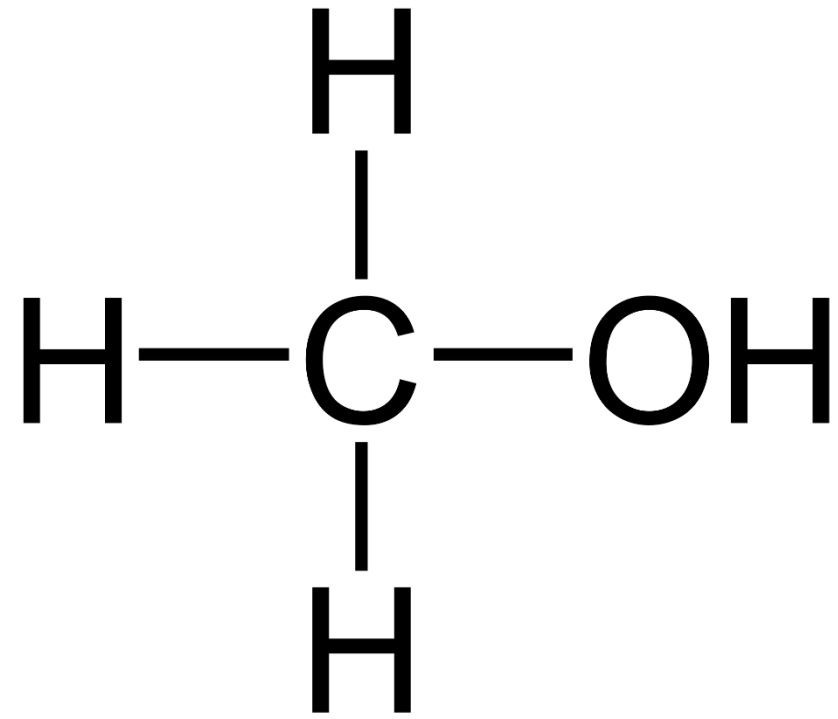
cheap, sustainable
and scalable
powertrain



closed CO₂ cycle



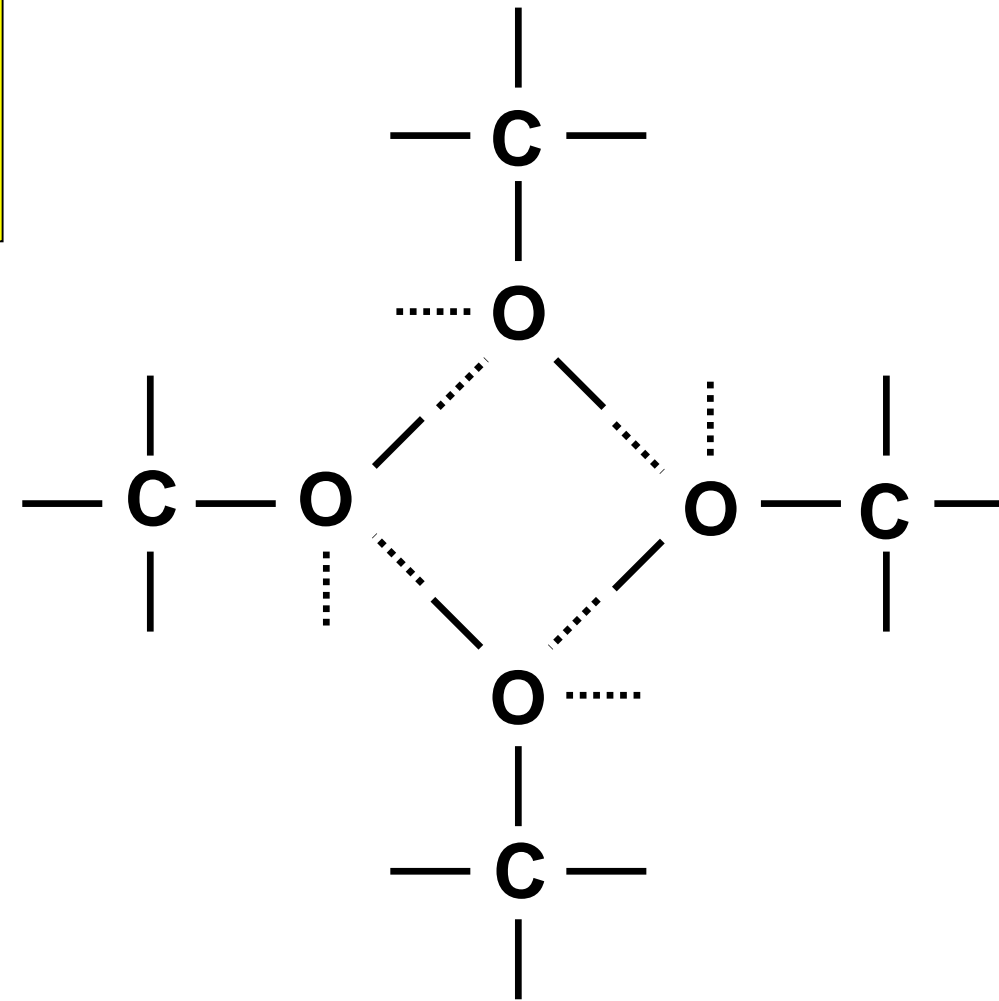
PROPERTIES OF METHANOL AS A FUEL



– Molecular weight CH_3OH : 32 g/mol-> liquid?


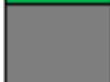
PSEUDO SUPER-MOLECULES...

Thus methanol has an 'effective' molecular weight of 128 and ethanol has 184 – both 'liquid'



This effect also gives rise to other characteristics – high latent heat, low vapour pressure and the azeotropic effect in gasoline blends

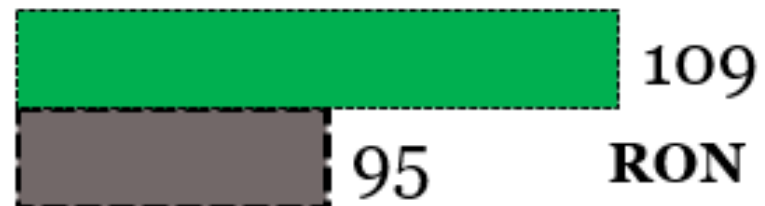
ENGINE RESEARCH @ UGENT

Properties:  Methanol
 Gasoline

- High heat of vaporization

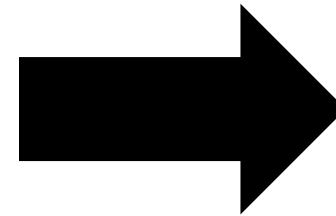
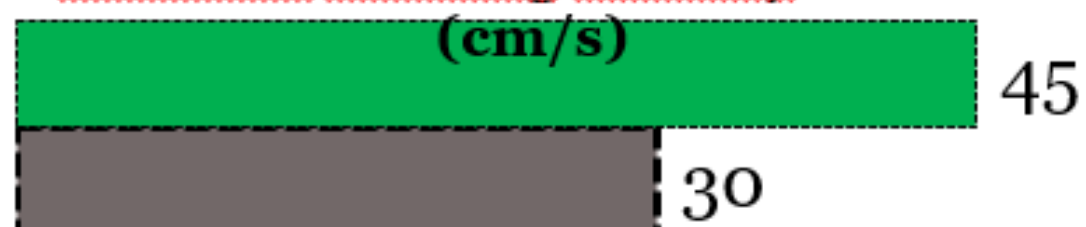


- High octane number



- High flame speed

Laminar burning velocity at NTP

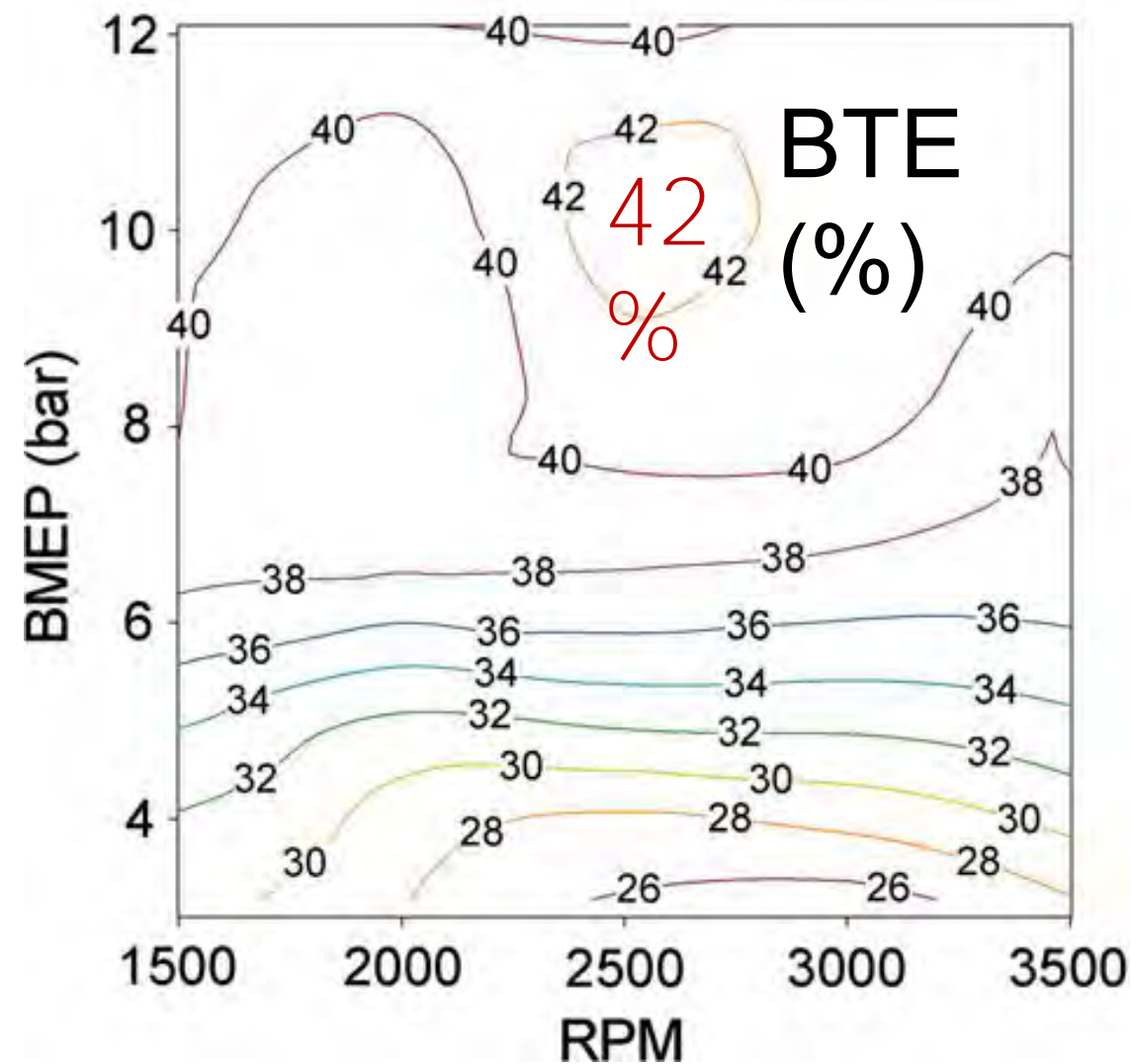


- High compression ratio
- Optimal ignition timing
- Downsizing
- High EGR ratios

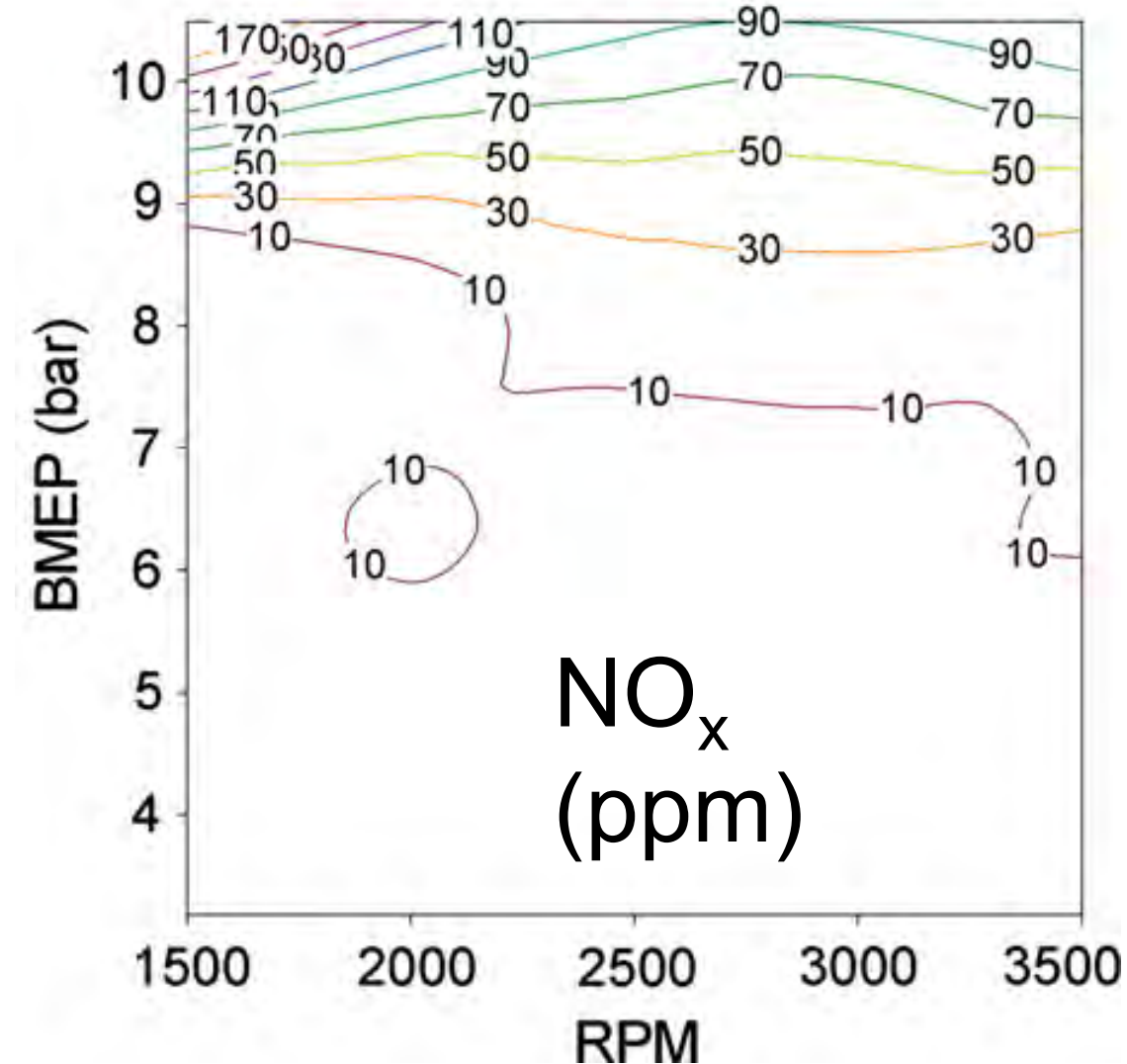


Engine type	VW TDI
Cylinders	4-in-line
Valves	8
Swept volume	1896 cc
CR	19.5:1
Injection	PFI
Induction	TC

ENGINE RESEARCH @ UGENT



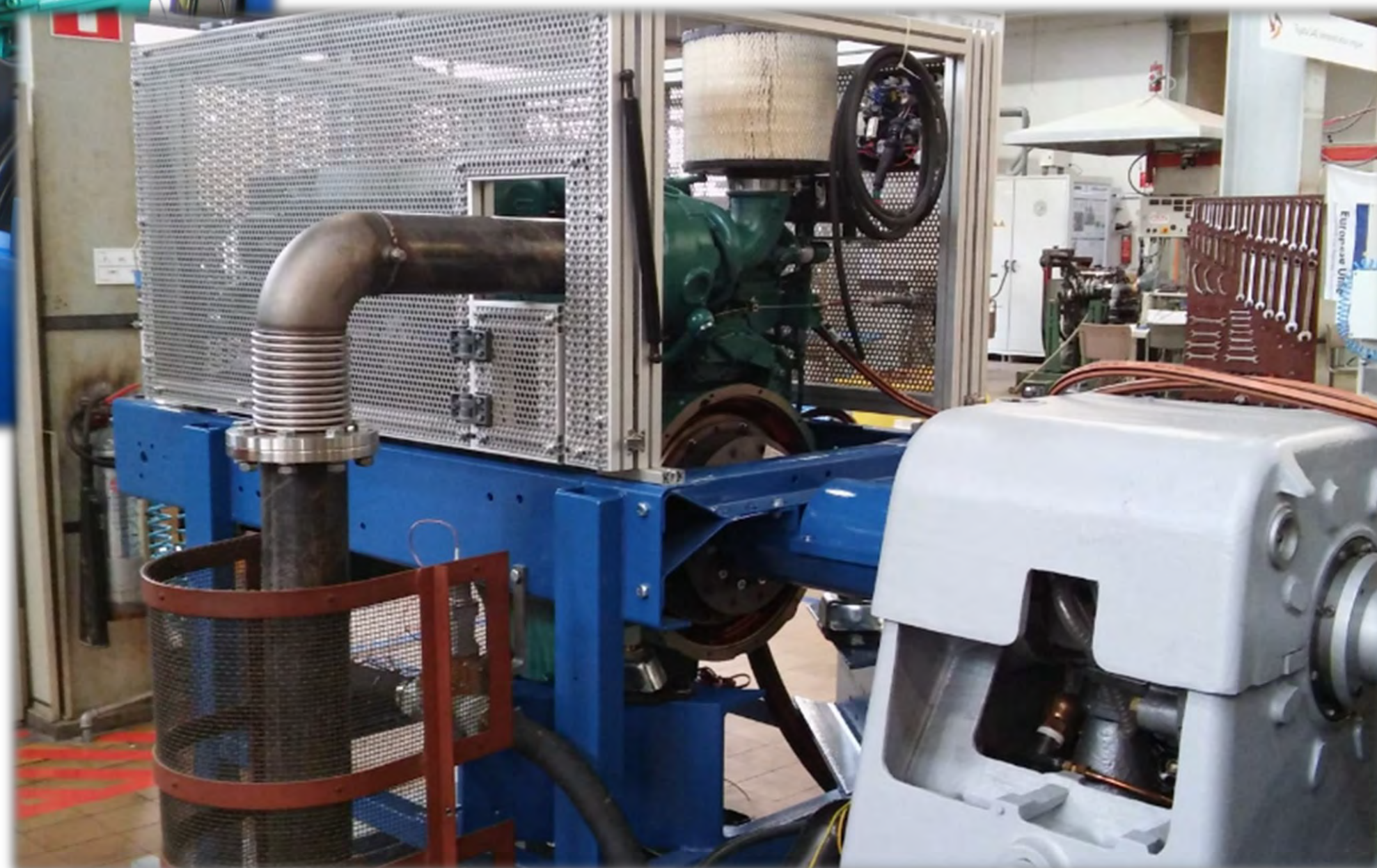
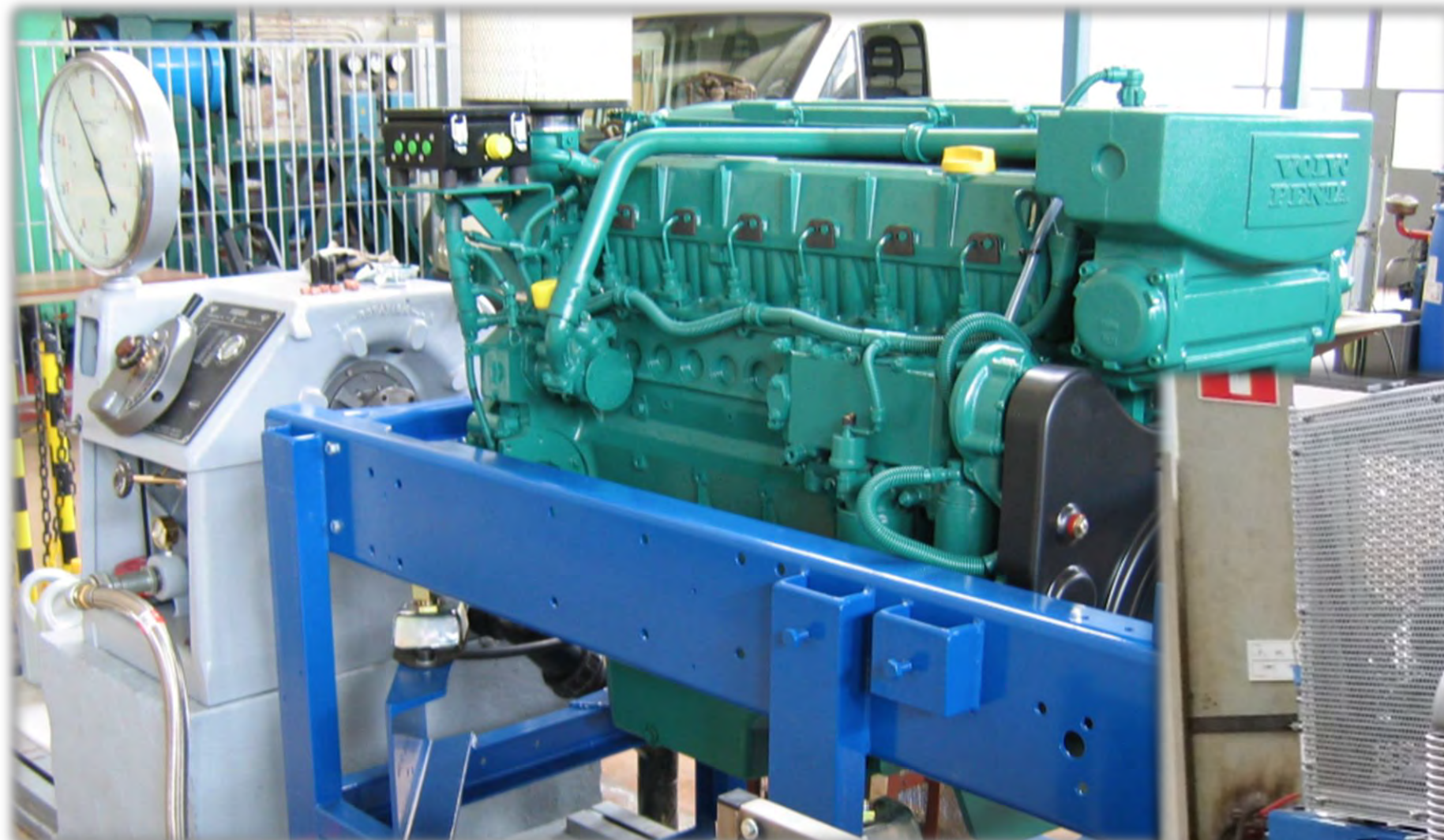
*Diesel-like peak efficiency
Part load efficiency gains
up to 20% (compared to
throttled operation)*

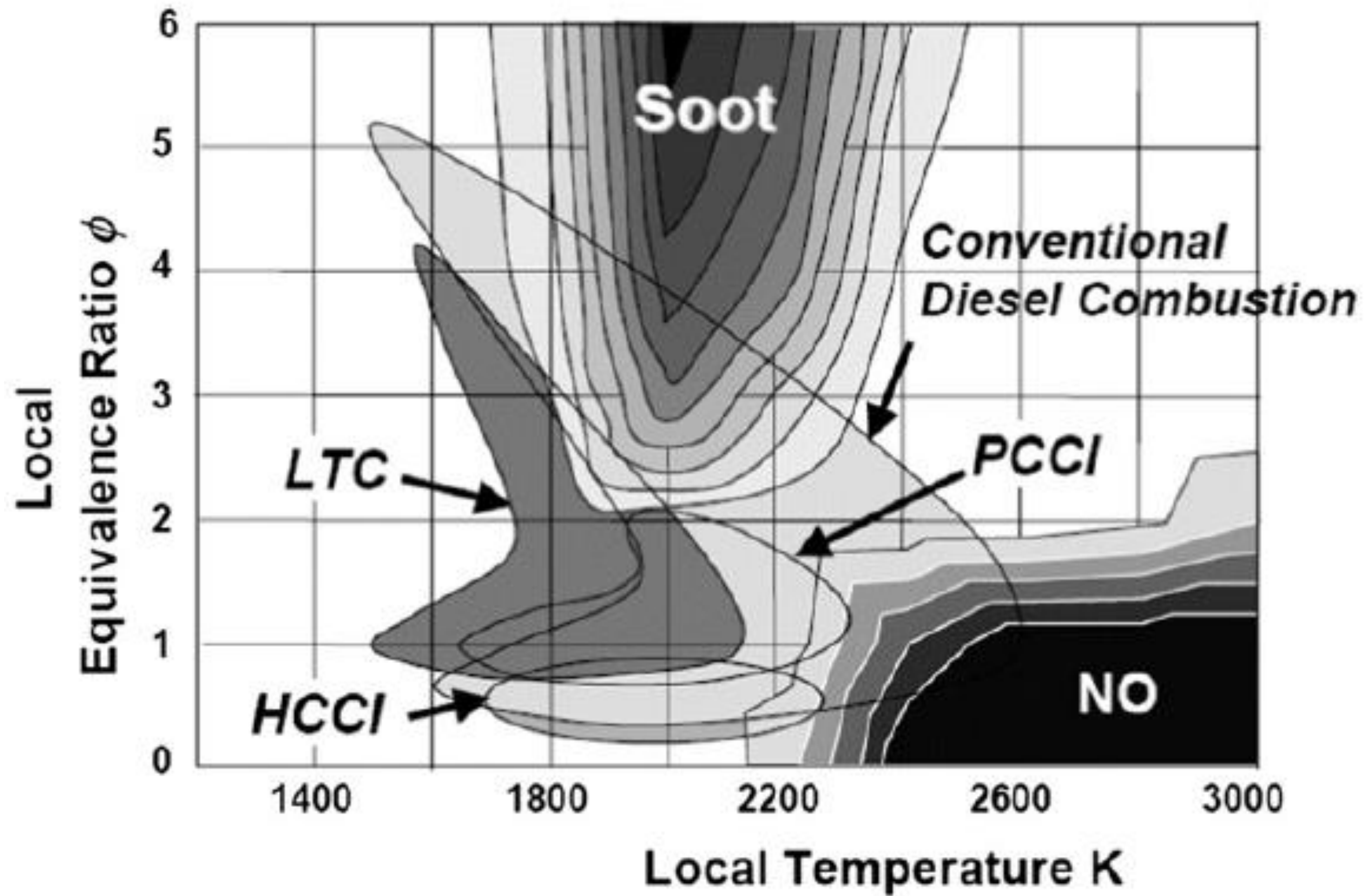


Vast engine-out NO_x reductions (ppm)

**Diesel-like efficiencies while using
cheap aftertreatment systems**

LEANSHIPS





DEMONSTRATOR PROJECT METHANOL SHIP

Stena Germanica



-> Reported emissions: 90% reduction in SO_x and PM,
60% reduction in NO_x

Louis SILEGHEM

Post-doctoral assistant of Internal Combustion Engines

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COMBUSTION MECHANICS

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