For a Better Environment

DOR GROUP

OCTOBER 2019
DOR GROUP

60 years of excellence

ENERGY

INDUSTRY

ECOLOGY
SOLUTIONS FOR A BETTER ENVIRONMENT

METHANOL
Fuel Alternative

CARMEL BLUE
NOx reduction for transportation

MTBE
Fuel additive as lead substitute

HYDROGEN
Cell fuel to power vehicles and electric devices

SOLVENTS
Recycling and retrieval
METHANOL FOR TRANSPORT

FOSSIL FEEDSTOCK
- OIL
- COAL
- NATURAL GAS

RENEWABLE FEEDSTOCK
- BIOMASS
- MSW
- LANDFILL GAS
- POWER PLANT EMISSIONS

SynGas → METHANOL / BIO-METHANOL

M3
M15
M85
M100
GEM
MTBE
BIODIESEL
DME
MARINE
FUEL CELL
Methanol, Diesel, Gasoline - leakage from a tank creating a pool fire in an area of 100 sq. meters.

LPG – leakage develops to tank explosion (BLEVE).

Comparison of risk ranges (Meters) - Methanol vs Diesel vs Gasoline vs LPG
Methanol Vs. Gasoline Prices (Euro/MT)

European Gasoline Spot Prices vs. European Methanol Spot Prices (Calorie Adj & Non Adj) vs. European Diesel Spot Prices

- Euro / Ton
- Diesel
- Gasoline
- Methanol Cal. Adjusted
- Methanol Spot
DOR and Israel Electric Company (IEC) developed Methanol application for Power plants

Converted a Pratt & Whitney 50 MW Gas Turbine Unit in Eilat, Israel from Diesel to 100% Methanol firing

The turbine has been active for six years
INTERNAL COMBUSTION ENGINES

Car sharing – Fiat 500 Enjoy
Natural Energy
Methanol

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M15 - A Newly approved Fuel Standard

Joint cooperation with Fiat Chrysler on M15

- Over 3 Million KM accumulated

Fiat 500 Enjoy Natural Energy Methanol
## FCA Emission Test Results

<table>
<thead>
<tr>
<th>Type</th>
<th>Units</th>
<th>95 RON</th>
<th>M15</th>
<th>Improvement %</th>
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<tbody>
<tr>
<td>HC</td>
<td>mg/km</td>
<td>37</td>
<td>24.5</td>
<td>33.78</td>
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<tr>
<td>CO</td>
<td>mg/km</td>
<td>241.5</td>
<td>228.5</td>
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<tr>
<td>CO2</td>
<td>g/km</td>
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<td>132</td>
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<tr>
<td>NOx</td>
<td>mg/km</td>
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<td>18.5</td>
<td>2.63</td>
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<td>NMHC</td>
<td>mg/km</td>
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<td>6</td>
<td>40.00</td>
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<tr>
<td>PM</td>
<td>mg/km</td>
<td>1.36</td>
<td>1.1</td>
<td>19.12</td>
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</table>
Combustibile alternativo ad elevato numero di ottano a base di alcool (A20)
Requisiti e metodi di prova

Alternative Alcohol-Based High Octane Fuel (A20) - Requirements and test methods

Lo scopo del documento è di definire le proprietà chimiche e gli standard di un combustibile alternativo a basso contenuto di carbonio e alto numero di ottano per nuovi motori dedicati ad accensione comandata e per tutte gli autoveicoli compatibili con E10.

A20 = M15 + E5
Two binding reduction targets for fleets of each manufacturer:

- **15% in 2025**
- **30% in 2030**

As compared to the 2019 baseline (= average of all manufacturers).

- Unit: g CO2/t km

**Compliance assessment**

Penalties for exceedances of targets:

- EUR 4,250 per gCO2/t km in **2025**
- EUR 6,800 per gCO2/t km in **2030**

* Regulation (EU) 2019/1242
M100 - 100% methanol solution

A generator working on 100% Methanol

FPT engine inside
The Future for Commercial Transportation

100% DOR mix to replace diesel fueled trucks

M100 – DOR MIX

100% METHANOL
THE BEST AVAILABLE LIQUID FUEL

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CONCLUSIONS

Engine Manufacturers and Methanol Industry Should Collaborate in the development of internal combustion engines in order:

- Lower emissions
- Improve energy efficiency
- Reduce total cost of ownership
- Establish DOR mix distribution
THANK YOU