



Danish Methanol Association

IEA-AMF Annex 56 Methanol as Motor Fuel – Annex 3 M85 Recipe





Recipe.

105 octane M85 is a mixture of

1. 85 parts methanol
2. 15 parts gasoline
3. Q.S. lubricant
4. Q.S. anti-corrosive additive
5. Q.S. ignition Improver

The fuel shall comply with ASTM International Designation: D5797 – 17; Standard Specification for Methanol Fuel Blends (M51–M85) for Methanol-Capable Automotive Spark-Ignition Engines. This specification is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is under the direct responsibility of Subcommittee D02.A0.02 on Oxygenated Fuels and Components. The specification is adopted as Danish Standard.

Methanol

The methanol shall comply with the IMPCA METHANOL REFERENCE SPECIFICATIONS issued by International Methanol Producers & Consumers Association, Avenue de Tervueren 270 Tervurenlaan - 1150 Brussels – Belgium. The specification limits water to max 0,100 % w/w acc. to ASTM E1064-12 and limits purity on dry basis to min 99.85% w/w acc. to IMPCA 001-14.

For the test run Sunoco Racing Methanol has been used. The product complies with the IMPCA METHANOL REFERENCE SPECIFICATIONS.

Gasoline

The gasoline blendstock is a liquid hydrocarbon component suitable for use in spark-ignition engine fuels such as conventional gasoline blendstock for oxygenated blending (CBOB), and reformulated gasoline blendstock for oxygenate blending (RBOB).

For the test run 15 vol% 95-octane gasoline has been used. The product complies with the CEN-standard EN228.

To adjust the vapor pressure of M85 the right BOB is chosen as described in Annex 1.

Lubricant

Alcohol is considered very dry without lubricating properties. Therefore, a lubricant is supplied in a quantity recommended by the lubricant manufacturer.

For the test run 1 ‰ Redline SI Alcohol has been used. SI-Alcohol is a new additive for alcohol fuels (E85, ethanol and methanol) designed for daily use for so-called FlexiFuel or BioPower engines as well as for Rally / Racing.

In addition, used a fully synthetic engine oil compatible with methanol - SYNTURO RACING 10W60 from Sunoco (Sun Oil Europe aps)



Anti-Corrosive agent.

ASTM D5797 – 17 places demand on the used gasoline blendstock and also mentions “*that unprotected aluminum and an unlined nitrile rubber dispensing hose should be avoided in methanol fuel blend distribution and dispensing systems*”. GB/T 23799-2009 – Chinese M85 Specification - mentions more specifically that “*an effective metallic corrosion depressor and motor gasoline detergent meeting the requirements of GB 19592 should be added*”.

On 2010 International Conference on Advances in Energy Engineering a test was reported “*Metal corrosion by methanol and methanol-gasoline has become a key problem for methanol as one of substitute fuels. Many kinds of metal samples were dipped in methanol and methanol-gasoline. No obvious corrosion happened with the samples in pure methanol and M85, but the copper sample in M15 was obviously corroded.*”

Corrosion inhibitors (e.g. a combination of cyclohexyldimethylamine, xylene, and ethylbenzene) are widely used in E85.

Innospec Inc. offers as part of their corrosion inhibitors range:

- **DCI-11** for fuel alcohols and a Treat Rate (TR) equivalent to 6-12 mg/l in finished fuels – typical 9 mg/l.
- **DCI-11 Plus** for alcohol fuel blends with TR of 30-86 mg/l blend. Both are registered by EPA as gasoline additives.
- **Biostable E85 G-Plus** – an all in one - containing a lubricant and a TR of 350 mg/l. The product is not registered by EPA, literature is scarce, and the lubricant may be overkill in our Recipe.

Eco-Energy, LLC and Gevo Inc. specify TR min 10 PTB DCi-11 Plus; LINCOLNWAY ENERGY, LLC, NORTH PIPELINE and Magellan Midstream Partners specify min. 6 PTB DCi-11 Plus. 1 PTB (Pounds per thousand Barrels) =2.853 mg/l. A few mention as alternative vendors: Ashland, G E Betz, Midcontinental, Nalco, Petrolite, and US Water Services.

For a long-term test run 50 mg “DCI-11 Plus” is being added per liter.

Ignition Improver

15% gasoline raises vapor pressure to prevent cold start problems. Sometimes an ignition improver is added. Beraid® 3555M (Trade mark of the ignition improver manufactured by the Akzo Nobel Surface Chemistry AB) is a non-ionic polyethylene glycol derivative, specially developed as an ignition improver in alcohol fuels. Recommended dosage is 5% usual applied in high ethanol fuels.

In the test run no ignition improver were used. With a Flex Fuel kit on board, the built-in thermometer will adjust engine control and cope with cold weather – a kind of electronic choke (cold start enrichment).

Co-solvent

In M85 there is no need for a co-solvent.