TEST FUEL FORMULATIONS

Application

This test method describes the formulations required for preparing various test fuels. These test fuel blends are used to determine permeation and fuel compatibility of various materials used in automotive fuel systems. These fuels do not contain the additive packages (detergents, antioxidants, lubricity modifiers, etc.) found in most commercial fuels. Their use in engineering testing protocols should take this into consideration.

Nomenclature and Terminology

Fuel Designation Format

X[Y#(Y_2#)]Z

where
- X = Base fuel (a list of base fuel codes is below)
- Y = Oxygenate (a list of oxygenate fuel codes is below)
- # = Volume percent of oxygenate
- Y_2 = Second oxygenate (a list of oxygenate fuel codes is below)
- Z = Impurity (a list of impurity fuel codes is below)

Base Fuel Codes (X)

A = reference fuel A (100% iso-octane)
B = reference fuel B (70% iso-octane, 30% toluene)
C = reference fuel C (50% iso-octane, 50% toluene)
D = reference fuel D (60% iso-octane, 40% toluene)
E = reference fuel E (100% toluene)
F = reference fuel F (diesel fuel, Grade #2, 100%)
G = reference fuel G (fuel D 85%, anhydrous denatured ethanol 15%)
H = reference fuel H (fuel C 85%, anhydrous denatured ethanol 15%)
I = reference fuel I (fuel C 85% anhydrous methanol 15%)
K = reference fuel K (fuel C 15%, anhydrous methanol 85%)

These reference fuels are described in ASTM D471/ISO 1817. The fuel typically used for materials testing has been reference fuel C.

Date	Action	Revisions	Rev. 7
2016 07 05	Revised	See Revisions Section	L. Wetekamp, NA
2013 12 11	Revised	Added C[M85]A, C[E15]A, and WSS-M99C130-A	T. Covert, NA
1997 11 21	Activated		J. Spencer

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Oxygenate and Alternative Fuel Codes (Y)

Several oxygenates (alcohols and ethers) are in use or have been identified as potential candidates for use in reformulated gasolines. The most common include:

M = methanol
E = ethanol
ME= methyl tertiary butyl ether
EE = ethyl tertiary butyl ether
TE = tertiary amyl methyl ether

Higher molecular weight alcohols (isopropyl and t-butyl) and ethers (diisopropyl and ethyl t-amyl) may find some usage.

Alcohol based alternative fuels will consist of blends of ethanol (0 - 85%) or methanol (0 - 85%) and with a hydrocarbon mixture such as unleaded gasoline (15 - 30%).

Impurity Codes (Z)

P = auto-oxidized fuel
A = aggressive (mixture information is provided below)

Preparation of 'auto-oxidized' fuel is described in ISO 4639-3 annex A.

Nomenclature Examples:

X[Y#]Z = C[M15]A =	85% aggressive reference fuel C +15% aggressive methanol

Aggressive Mixtures

When making an aggressive mixture, for instance C[M85]A, 15% aggressive fuel C and 85% aggressive methanol would be used.

Fuel Blends for Elastomers and Thermoplastics*

*Aggressive blends recommended for thermoplastics.

Fuel C	High aromatic gasoline – represents field fuel
Auto-oxidized fuel (sour gas), PN 180, per ISO 4639-3 annex A.	Gasoline long term storage
C[M15]A per SAE J1681	Methanol aggressive fuel
C[M30]A per SAE J1681	Methanol aggressive fuel
C[M50]A per SAE J1681	Methanol aggressive fuel
C[M85]A per SAE J1681	Methanol aggressive fuel
C[E22]A per SAE J1681	Ethanol aggressive fuel
C[M20]A/[ME15]	MTBE
E93A per XE-M4CX652-93A	Aggressive Brazil field fuel
B10, Do not add aggressive pack to XE-M4CX754-B10-A	BioDiesel (APA, EU)
B30, Do not add aggressive pack to XE-M4CX732-B30B	BioDiesel (NA, SA)
Aggressive B10 per XE-M4CX754-B10-A	Aggressive BioDiesel (APA, EU)
Aggressive B30 per XE-M4CX732-B30-B	Aggressive BioDiesel (NA, SA)

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