

Propelgol™ and World wide Fuels Harmonisation

Propelgol meets the standard for fuels as presented in this document. It furthermore reduces emissions further than the standard in this document says. Propelgol™ can safely be used in liquid fuels, it meets the standard in the world.

September 2013 Subject: **Worldwide Fuels Harmonisation** Dear Worldwide Fuel Charter Recipient:

On behalf of vehicle and engine manufacturers from around the world, the Worldwide Fuel Charter Committee is pleased to present the Fifth Edition of the Worldwide Fuel Charter. The Charter was first established in 1998 to increase understanding of the fuel quality needs of motor vehicle and engine technologies and to promote fuel quality harmonisation worldwide in accordance with those needs. Importantly, the Charter matches fuel specifications to the vehicle and engine specifications required to meet various customer needs around the world.

The Fifth Edition introduces Category 5 for markets with highly advanced requirements for emission control and fuel efficiency. As many countries take steps to require vehicles and engines to meet strict fuel economy standards in addition to stringent emission standards, Category 5, which raises the minimum research octane number (RON) to 95, will enable some gasoline technologies that can help increase vehicle and engine efficiency. For diesel fuel, this category establishes a high quality hydrocarbon-only specification that takes advantage of the characteristics of certain advanced biofuels, including hydrotreated vegetable oil (HVO) and Biomass-to-Liquid (BTL), provided all other specifications are respected and the resulting blend meets defined legislated limits.

Other changes from the previous edition include a new test method for trace metals and an updated gasoline volatility table. Significant changes relate to biodiesel: the Charter now allows up to 5% biodiesel by volume in Category 4 diesel fuel, has new diesel fuel oxidation stability limits and includes an alternative oxidation stability test method with correlations to other methods. The Charter also now references the E100 and B100 Guidelines published by the WWFC Committee in 2009.

As countries move toward more stringent vehicle and engine requirements, fuel quality's role in preserving the functionality of vehicles and engines continues to grow. Sulphur-free and metal-free fuels remain critical prerequisites for ultraclean, efficient and durable emission control systems. The most advanced vehicles and engines require the best fuel quality – as represented in Category 5 – to meet their design potential.

We appreciate the many comments submitted on this new edition of the Charter; they

have helped make it a better document. We look forward to working with you to support harmonised specifications for the continued benefit of society.




Ivan Hodac

Secretary General ACEA



Mitch Bainwol

President & CEO Alliance



Jed R. Mandel

President EMA



Yoshiyasu Nao

President JAMA

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BMW Group, Chrysler Group, Ford Motor Company, General Motors Company, Jaguar Land Rover, Mazda North America, Mercedes-Benz USA, Mitsubishi Motors, Porsche

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JAMA member companies

Daihatsu Motor Co. Ltd., Fuji Heavy Industries Ltd., Hino Motors Ltd., Honda Motor Co. Ltd., Isuzu Motors Limited, Kawasaki Heavy Industries Ltd., Mazda Motor Corporation, Mitsubishi Fuso Truck and Bus Corporation, Mitsubishi Motors Corporation, Nissan Diesel Motor Co. Ltd., Nissan Motor Co. Ltd., Suzuki Motor Corporation, Toyota Motor Corporation, UD Trucks Corporation, Yamaha Motor Co. Ltd.

Associate members

- › Asociación de Fábricas de Automotores de Argentina (ADEFSA)
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- › Brazilian Association of motor vehicle and motorised agricultural machinery manufacturers (ANFAVEA)
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- › Korean Automobile Manufacturers Association (KAMA)

- › National Association of Automobile Manufacturers of South Africa (NAAMSA)
- › Malaysian Automotive Association (MAA)
- › Society of Indian Automobile Manufacturers (SIAM)
- › Thai Automotive Industry Association (TAIA)
- › Vietnam Automobile Manufacturers Association (VAMA) **Supporting organisations:** › Organisation Internationale des Constructeurs d'Automobiles (OICA)

AAMA American Automobile Manufacturers Association, the U.S. trade association for Chrysler, Ford and GM from 1992 until 1998.

ACEA Association des Constructeurs Européens d'Automobiles (European automobile manufacturers association)

AIAM Association of International Automobile Manufacturers, the former name of Global Automakers

Alliance Alliance of Automobile Manufacturers

AMA Accelerated Mileage Accumulation

AQIRP Air Quality Improvement Research Programme (part of the US Auto Oil programme, 1989-1992)

ASTM ASTM International (formerly American Society for Testing and Materials)

Biofuel Liquid transport fuel produced from biomass

Biomass Biodegradable fraction of products, waste and residues from biological origin

BTL Liquid fuel made from biomass ('Biomass to Liquid')

CCD Combustion Chamber Deposits

CDPF Catalysed Diesel Particulate Filter

CEC Coordinating European Council for the Development of Performance Tests for Transportation Fuels, Lubricants and Other Fluids

CFPP Cold Filter Plugging Point

CI Cetane Index

CN Cetane Number

CO Carbon Monoxide

CO₂ Carbon Dioxide

CP Cloud Point

CRC Coordinating Research Council (US)

CR-DPF Continuously Regenerating Diesel Particulate Filter

DECSE Diesel Emission Control – Sulfur Effects, research program of the US Department of Energy

DEF Diesel Exhaust Fluid (for SCR systems)

DI Distillation Index

DIN Deutsches Institut für Normung (German Institute of Standardisation)

DPF Diesel Particulate Filter

DVPE Dry Vapour Pressure Equivalence

EMA Truck and Engine Manufacturers Association

EN European Norm

EPA Environmental Protection Agency (US)

EPEFE European Programme on Emissions, Fuels

and Engine Technology (part of the European

Auto-Oil I programme, 1993-1995)

EtBE Ethyl tertiary-Butyl Ether

FAEE Fatty Acid Ethyl Esters

FAME Fatty Acid Methyl Esters

FBP Final Boiling Point

FTP (US) Federal Test Procedure

FLTM Ford Laboratory Test Method

GHG Greenhouse Gas

GTL Liquid fuel typically made from methane gas using a gas-to-liquid/Fischer-Tropsch-type process

HC Hydrocarbons

HFRR High Frequency Reciprocating Rig

HVO Hydrotreated Vegetable Oil

IDID Internal Diesel Injector Deposits

ICP-AES Inductively Coupled Plasma - Atomic Emission Spectrometry

IP Energy Institute (formerly Institute of Petroleum)

ISO International Organisation for Standardization

IVD Intake Valve Deposits

JAMA Japan Automobile Manufacturers Association

JARI Japan Automobile Research Institute

JIS Japanese Industrial Standards

LEV Low Emission Vehicle

LTFT Low Temperature Flow Test

MECA Manufacturers of Emission Controls Association

METI Ministry of Economy, Trade and Industry (Japan) **MMT** Methylcyclopentadienyl Manganese Tricarbonyl

MtBE Methyl tertiary Butyl Ether

MON Motor Octane Number

NFM Norme Française - Industrie du Pétrole

(French Norm - Petroleum Industry)

NF T Norme Française - Industrie Chimique

(French Norm - Chemical Industry)

NO_x Oxides of Nitrogen

OBD On-Board Diagnostics

OFP Ozone Forming Potential

Oxy Oxygen

PAH Polycyclic Aromatic Hydrocarbons

pHe Acidity of ethanol

PM Particulate Matter

ppm Parts per million

PZEV Partial Zero Emission Vehicle

RON Research Octane Number

SCR Selective Catalytic Reduction

SULEV Super-Ultra-Low Emission Vehicle

TAN Total Acid Number

TGA Thermal Gravimetric Analysis

THC Total Hydrocarbons

TLEV Transitional Low Emission Vehicle

TWD Total Weighted Demerits

ULEV Ultra-Low Emission Vehicle

VDE Vegetable Derived Esters

The objective of the global fuels harmonisation effort is to develop common, worldwide recommendations for quality fuels, taking into consideration customer requirements and the performance of vehicle and engine emission technologies. These recommendations allow vehicle and engine manufacturers to provide consistent fuel quality advice to policymakers who may want to control vehicle or engine emissions, whether for the first time or to expand already implemented legislation. Regardless of the legislative context, access to the recommended fuels will benefit consumers and their communities in all markets around the world.

Implementation of the recommendations will:

Reduce the impact of motor vehicles on the environment by enabling reduced vehicle fleet emissions;

Facilitate the delivery of optimised fuels for each emission control category, which will minimize vehicle equipment complexities and help reduce customer costs (purchase and operation); and,

Increase customer satisfaction by maintaining vehicle performance for a longer period of time. Five different categories of fuel quality, described below, have been established for unleaded gasoline and diesel fuel:

Category 1: Markets with no or first level requirements for emission control; based primarily on fundamental vehicle/ engine performance and protection of emission control systems, for example, markets requiring US Tier 0, EURO I or equivalent emission standards.

Category 2: Markets with requirements for emission control or other market demands, for example, markets requiring US Tier I, EURO 2/II, EURO 3/III or equivalent emission standards.

Category 3: Markets with more stringent requirements for emission control or other market demands, for example, markets requiring US LEV, California LEV or ULEV, EURO 4/IV (except lean burn gasoline engines), JP 2005 or equivalent emission standards.

Category 4: Markets with advanced requirements for emission control, for example, markets requiring US Tier 2, US Tier 3 (pending), US 2007 / 2010 Heavy Duty On-Highway, US Non-Road Tier 4, California LEV II, EURO 4/IV, EURO 5/V,

EURO 6/VI, JP 2009 or equivalent emission standards. Category 4 fuels enable sophisticated NO_x and particulate matter after-treatment technologies.

Category 5: Markets with highly advanced requirements for emission control and fuel efficiency, for example, those markets that require US 2017 light duty fuel economy, US heavy duty fuel economy, California LEV III or equivalent emission control and fuel efficiency standards in addition to Category 4-level emission control standards.

Requirements for all markets: Fuel in the market will meet the quality specifications only if blendstock quality is monitored and good management practices are used. The following requirements apply broadly to fuel systems in all markets:

Additives must be compatible with engine oils, to prevent any increase in engine sludge or deposits of varnish.

Ash-forming components must not be added.

Good housekeeping practices must be used throughout distribution to minimize contamination from dust, water, different fuels and other sources of foreign matter.

Pipeline corrosion inhibitors must not interfere with fuel quality, whether through formulation or reaction with sodium.

- Dispenser pumps must be labelled adequately to help customers identify the appropriate fuels for their vehicles.
- Fuel should be dispensed through nozzles meeting SAE J285, 'Dispenser Nozzle Spouts for Liquid Fuels Intended for Use with Spark Ignition and Compression Ignition Engines.'
- Ethanol used for blending with gasoline, and biodiesel (FAME) used for blending with diesel fuel, should adhere to the E100 Guidelines and the B100 Guidelines, respectively, published by the WWFC Committee. Engine and vehicle technologies typically achieve improved performance and lower emissions with higher category fuels. These fuel quality recommendations are for the properties of the finished fuel as provided to the customer. Internal quality control methods are not dictated or restricted as long as the fuel meets these specifications. Where national requirements are more severe than these recommendations, those national limits have to be met. To meet ongoing environmental, energy and customer challenges, vehicle and engine manufacturers will continue to develop and introduce advanced and innovative propulsion technologies that may require

changes in fuel quality. Category revisions will occur as needed to reflect such changes in technology, as well as in petroleum refining, test methods and global market conditions.