

IMPACT OF AUTOMOTIVE FUELS DIVERSITY ON VEHICLE BEHAVIOUR

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Fuel quality is important!

- **The engine and fuel are components of a single system, not to be treated separately**
- **Fuel quality must be matched to operating requirements for all circumstances:**
 - Cold starting / hot starting
 - Correct driveability, both cold and hot engine
 - Mechanical durability
 - Emissions compliance and emissions durability
- **Engine calibration constraints**
 - Increasingly severe emissions standards are forcing constructors to adopt engine calibrations that are narrowly defined and consequently less tolerant to fuel variations
 - Mismatching fuels to engines may be observed in widely different operating fields

Examples of gasoline-related problems

Type of fuel-related service problem	Country	Fuel parameter
Non-start in cold weather	Western Russia	Low volatility
Non-start or stalling in hot weather	Israel, Colombia, Peru Brazil	High volatility Ethanol
Combustion problems (low speed knock)	Colombia, China	Octane (RON)
Spark plug fouling Catalyst fouling	China, Argentina	Metallic additive

Examples of diesel-related problems

Type of fuel-related service problem	Country	Fuel parameter
Non-start in cold weather	Poland	Cold flow properties
Fuel filter clogging	Martinique, Réunion	Sulphur, sediment
Injection pump seizures	Turkey	Lubricity, sediment
White smoke	Cyprus	Sulphur

Coping with diversity

- **It is economically impossible to devise a separate engine calibration for each country, due to the diversity of climatic conditions and fuel qualities**
- **Constructors create groupings of countries with similar constraints for which a single engine calibration can be used.**
- **Reducing the number of groupings by reducing fuel parameter diversity will improve economies of scale for the constructors, ensure better vehicle behaviour and allow lower vehicle prices worldwide.**

Guidelines

- **Many countries are quick to apply low emission standards linked to the latest technology vehicles. However they omit to bring their fuel infrastructure and quality into line with the vehicle requirements.**
- **The World Wide Fuel Charter, edited by the worlds' constructors, provides a convenient guide to harmonise fuel specifications in relation to emissions and durability, so reducing diversity.**
- **Fuel specifications are not enough, the quality at the pump must be monitored and enforced to ensure the customer is getting fuel of adequate quality.**

Future diversity

Diversity of engine calibrations / variability of fuels

- **Gasoline and diesel fuel continue as major automotive fuels for the next twenty years**
 - Diversity challenge from blends containing ethanol, biodiesel, Fischer Tropsch...
 - Need to continue adaptation process between engines and conventional fuels
- **New engine combustion systems are being researched**
 - Controlled Auto Ignition, Homogeneous Charge Compression Ignition, will further strain our capacities to cope with diversity in engine and fuel specifications