ETHANOL USAGE IN AUTOMOTIVE FUELS

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WORLD FUELS CONFERENCE
Latin America & the Caribbean
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BIOMASS FEEDSTOCKS FOR FUEL ETHANOL PRODUCTION

**CROPS**
Sugar cane, Corn, Barley, Sorghum, Potatoes, Wheat etc.

**CELLULOSE**
Bagasse, Corn fiber, Grass, Rice straw & hulls, Forest & Agriculture residues, Fast-growing trees Sawdust, etc.

**WASTES**
Paper, Wine, Beer, Fruit juices, Cheese whey etc.

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Sugar Cane to Fuel Ethanol

Sugar Cane

Bagasse
Fuel &
Cogeneration

Neat Ethanol
or
Blends

Ethanol

Electric
Energy

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Fuel Ethanol Usage: Driving Forces

ENVIRONMENT & PUBLIC HEALTH

- Reduces Greenhouse gases
- Reduces air pollution
- High biodegradability in water & soil
- Relative low toxicity
- MTBE substitute
- Waste minimization

TECHNICAL

- Octane booster
- Anti-icer
Fuel Ethanol Usage: Driving Forces

**STRATEGIC**
- Renewable & Produced from domestic sources
- Lower dependence on imported oil
- Supply of electric energy to the public grid

**SOCIAL**
- Jobs in rural areas
- Alternative to illegal crops

**ECONOMIC**
- Competitive & High value co-products
- Agribusiness development & Economic growth
- Reduces external debt & negative externalities
Alternatives for Fuel Ethanol Usage

CURRENT USAGE

GASOHOL

- blends up to E10 – conventional gasoline system
- High ethanol content – optimized system
- Variable ethanol content from E0 to E100 – FFV

As ETBE - conventional gasoline system

E100/E95 - dedicated Otto / Diesel system or FFV

(diesel engines require ignition improver additive)
Alternatives for Fuel Ethanol Usage

POTENTIAL USAGE

DIESOHOL
- blends from E3 to E15 – experimental stage
- FUEL CELL – research stage
- DI Otto Engines (neat / blend) – research stage
- HYBRID SYSTEMS (neat / blend) – research stage
Examples of Fuel Ethanol Usage

- Brazilian E100 vehicle
- Swedish E95 + 5% Additive bus - Diesel engine
- Experimental US E15 Diesohol unmodified truck
- US E85 Flexible Fuel Vehicle
Examples of Ethanol Usage

Brazilian E20/E24 motorcycle

Baylor University E85 fueled plane

The U.S.FAA approved Aviation Grade E85 for planes with piston engines

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The Brazilian Experience

Current fleet:
Ethanol + Gasohol Vehicles +
Gasohol 2 wheeled vehicles

Ethanol Vehicle - 1925

1st commercial ethanol vehicle
1979

Ethanol %
in Gasohol

1977: 4,5%
1979: 15%
1981: 20%
1985: 22%
1998: 24%
2001: 20/ 24%

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Fuel Ethanol Production in Brazil

- Total
- Anhydrous
- Hydrated

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x1000

DIESEL
ALCOHOL
GASOHOL

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FUEL ETHANOL MARKET

INTERNATIONAL MARKET IS GROWING...

- Established: Brazil
- Being Structured: USA, Canada, Mexico, Sweden, South Africa, Australia, France, Netherlands, Italy, Spain, India and Paraguay
- New: Thailand and China
- Potential: Taiwan, Japan, South Korea, Colombia, Guatemala, Argentina, Peru, the Caribbean and East Europe
Fuel Ethanol should be viewed as a sound energy alternative. Its main characteristics are in line with Sustainable Development needs:

- High performance & versatile energy source
- Environmentally friendly & safe
- Renewable
- Energy efficient
- Driver of social & economic development