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Ecotane® and Tailpipe Emissions from Gasoline Fueled Vehicles

Background

Emission standards for passenger vehicles are tightening worldwide. Driving this trend are the three dominant regulatory programs coming from the US (including California), Japan, and the European Union. Emissions regulations in every other country of the world are derivatives of one of these programs, predominantly the EU program. This makes the EU emissions program important from a worldwide perspective.

Before passenger cars can be type approved for sale in the European Union they must meet certain standards for exhaust emissions. The current limits known as "Euro 3" (as specified in Directive 98/69/EC) were approved in Europe on January 1, 2000 and took effect there one year later. Certain other countries that are implementing motor vehicle pollution control efforts (e.g. China) have chosen to adopt the European emission limits, but on differing timetables.

Methylcyclopentadienyl Manganese Tricarbonyl (Ecotane®, sold under the various trademarks including Ecotane®, MMT®, HiTec® 3000, Octaburn™ 8000, RMC™ 3000 and RMC™ 3080) is an octane-enhancing gasoline additive that increases RON and MON while minimizing tailpipe emissions in gasoline powered vehicles. The positive effect that Ecotane® has on emissions is important in today's regulatory climate.

Studies have shown that the addition of Ecotane® to gasoline actually reduces emissions of hydrocarbons (HC), carbon monoxide (CO), and especially oxides of nitrogen (NO_x), while simultaneously increasing octane number[1]. This report briefly discusses the implementation of the EU emission limits and the beneficial effect of Ecotane® on emissions from gasoline-powered engines.

The Effect of Sulfur on Emissions

Stringent limits on emissions from gasoline powered vehicles can only be achieved by vehicles equipped with catalytic converters running low-sulfur fuels. This is because the performance of the catalytic converter (which reduces HC, CO and NO_x emissions) is inversely related to the sulfur level in the fuel. It is necessary that any attempt to achieve significant emission reductions in conjunction with Ecotane® be accomplished in vehicles designed for and running on low-sulfur gasoline.

Testing and Emission Limits

For all gasoline-consuming vehicles, the regulatory test cycle involves starting the engine when cold followed by driving a cycle simulating urban and suburban driving (ECE 15 + EUDC). The emissions are monitored for the whole cycle and, after dividing by the cycle's length (11.007 km), the emission standards are expressed in grams of pollutant per kilometer.

The EU Directive 98/69/EC imposes the following limits on tailpipe emissions for gasoline cars (< 2.5 tonnes and up to 9 seats for Euro 3), grams/kilometer (g/km)[2]:

	Standard Number of seats	Fuel	Directive	Limit values (gm/km)					Implementation Type Approval	Dates In-use
				CO	HC	NO_x	HC+NO_x	PM		
Euro 3	up to 9	G	98/69/EC	2.30	0.20	0.15	-	-	01/01/00	01/01/01
	up to 9	D	98/69/EC	0.64	-	0.50	0.56	0.05	01/01/00	01/01/01
Euro 4	up to 9	GP	98/69/EC	1.00	0.10	0.08	-	-	01/01/05	01/01/06
	up to 9	D	98/69/EC	0.50	-	0.25	0.30	0.02	01/01/05	01/01/06

Key: G- Gasoline, D - Diesel, CO - Carbon Monoxide
HC - Hydrocarbons, NO_x -Oxides of Nitrogen, PM - Particulate mass

Emission Timetables

The EU has established an aggressive timetable for the phase-in of emission limits for gasoline-powered vehicles. China has established a similar timetable, and has set a goal to achieve parity with the EU by 2010. The following table details the effective dates for compliance in various countries of the world[3].

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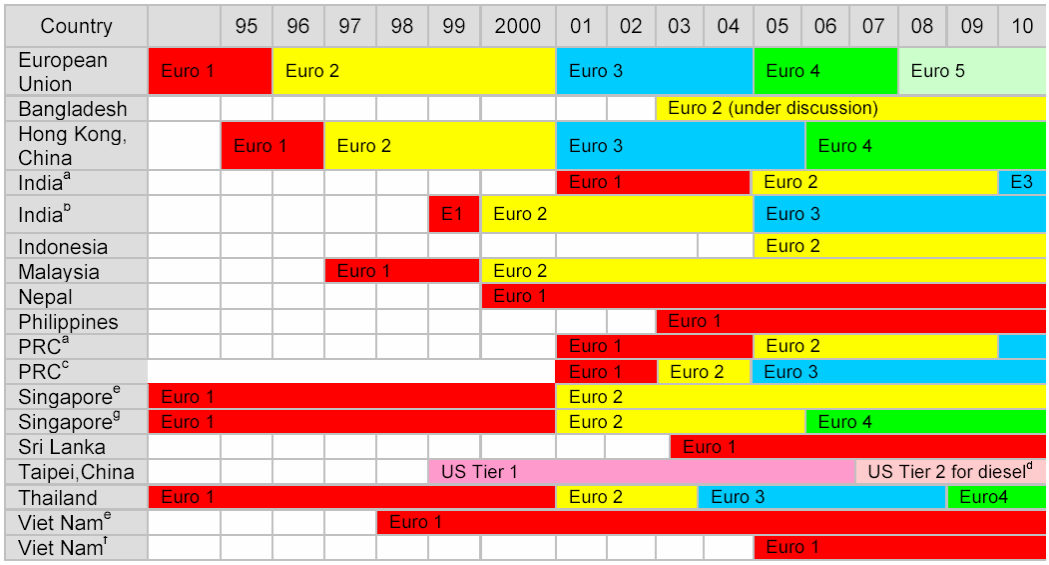

Effect of MCMT on Tailpipe Emissions

A significant body of data exists to support the positive effect of Ecotane® on emissions from gasoline-fueled engines. In 1993 the US EPA reported the following data from a 100,000 mile Emissions Field Test performed using gasoline containing Ecotane®

	Actual Tailpipe Emissions (gm/km)		
	CO	**HC**	**NO_x**
Unleaded Gasoline	1.39	0.11	0.35
Unleaded Gasoline with MCMT	1.26	0.10	0.23
% Emission Reduction with MCMT	**9.8%**	**4.5%**	**35.1%**

Conclusion

Ecotane® can be safely and effectively added to gasoline as an integral part of any intelligent emission reduction strategy, and is consistent and compatible with EU Euro 3 Directive 98/69/EC.

T2 Labs and Octane

T2 Labs is a company that develops and manufactures safe industrial chemical ingredients that replace more costly, more dangerous, or less desirable products. T2 Labs now manufactures Ecotane®, a manganese-based octane booster for gasoline that increases octane number more economically than other octane-enhancing additives including tetraethyl lead (TEL) and ferrocene.

For Further Information and Assistance

Call T2 Labs to discuss Ecotane®, the state-of-the-art environmentally-safe octane booster for gasoline. Ecotane® is a registered trademark of T2 Laboratories Inc.

[1] Enstrat International Ltd., "Motor Fuel Quality Improvements", Prepared for the Democratic Socialist Republic of Sri Lanka, Financed by the IBRD/IDA – The World Bank, December 26, 2002.
[2] UK Department for Transport, London, England, http://www.vcacarfueldata.org.uk
[3] Michael P. Walsh, walshcarlines.com, "Mitigating The Environmental And Health Effects Of Motor Vehicles And Fuels In Russia And The Cis", September 24, 2004