Why did the Auto Industry Undertake this Study on MMT?

Automakers have been concerned about the use of the fuel additive, methylcyclopentadienyl manganese carbonyl (MMT), which is commonly used in Canada to increase the octane of gasoline, because of its potential impacts on motor vehicle exhaust emissions and customer satisfaction, as well as on engine and emission control system durability. Several independent studies have been reported in the past. Studies by automakers and others have shown increases in emissions, spark plug misfire, catalyst plugging as well as on-board diagnostic (OBD) malfunctions with fuel containing MMT.

To help resolve MMT-impact related issues, the automobile industry decided to conduct a comprehensive, statistically-designed test program.

What did the Test Program Involve?

The test program, which studied the long-term comparative results of fueling vehicles with and without gasoline containing MMT, began in 1996 and was carried out in two phases. Fifty-six (56) vehicles from 6 automobile manufacturers underwent mileage accumulation of up to 160,000 km (100,000 miles) and were emissions tested at specific intervals during the program. A total of 5.84 million kilometers (3.65 million miles) were driven during the six-year evaluation.

Who was Involved in the Study and How Much Did it Cost?

The study was conducted jointly by the Alliance of Automobile Manufacturers, the Association of International Automobile Manufacturers and the Canadian Vehicle Manufacturers’ Association. The study, which cost more than $8 million USD, is the most comprehensive MMT test program conducted to date.

What are the Key Findings of the Study?

The Study results showed that MMT impaired catalyst and emission control performance and caused low emission vehicles to fail hydrocarbon (HC) emission standards.

The Study also showed that, compared to low-emission vehicles driven on clear gasoline over time, MMT-fueled low emission vehicles had these significant impacts at 100,000 miles (160,000 km):

- 31% higher hydrocarbon (HC) emissions
- 24% higher oxides of nitrogen (NOx) emissions
- 14% higher carbon monoxide (CO) emissions
- 2% higher emissions of carbon dioxide (CO2), a greenhouse gas
- 2% lower on on-road fuel economy

What is MMT and where is it used?

Methylcyclopentadienyl Manganese Tricarbonyl (MMT) is a highly toxic organo-metallic compound used by refiners to improve the octane rating of gasoline. MMT, which was first introduced into the
Canadian marketplace in 1972, is currently used in 80% of Canadian gasoline at various concentration levels.

MMT has been banned from use in California and in areas of the United States where reformulated gasoline (RFG) is required by law. While MMT is allowed in conventional gasoline in the U.S., the U.S. Environmental Protection Agency (EPA) has stipulated a maximum allowable level of MMT of 1/32 (0.031) grams manganese per gallon of gasoline (8.26 milligrams per litre). No such national regulatory limit currently exists in Canada, although the Canadian General Standard Board (CGSB) has adopted a voluntary limit of 18 milligrams per litre, which is specified by some Canadian provinces.

What Has the Auto Industry Done to Reduce Vehicle Emissions?

To achieve air quality goals, automakers have invested billions of dollars to develop increasingly advanced new motor vehicle emission control technologies to comply with increasingly stringent emission standards in the U.S., Canada and other countries. These sophisticated vehicle systems control engine operation and use advanced catalysts that can reduce pollutant levels from the tailpipe exhaust. In addition, manufacturers have developed onboard diagnostic (OBD II) systems capable of alerting vehicle owners when emissions increase too much and provide information needed to help bring the vehicle back to the designed emission performance level.

Today’s new vehicles are designed to reduce hydrocarbon emissions by over 99% and NOx emissions by 95% compared to pre-controlled levels, when operated on the appropriate quality fuel. It would take twenty-two 2002 model year vehicles to produce emissions equal to one 1987 model year vehicle.

Further substantial emission reductions can be expected, as the auto industry works toward introducing 2004 model year vehicles that meet Tier 2 emission standards, which are the most stringent national standards in the world.

Compliance with current and proposed future standards will require both sophisticated and advanced emission control technologies, as well as reduced allowable tolerances with respect to emissions performance over the lifetime of the vehicles. Commensurate improvements in OBD II systems also will be required. As a result, factors that could be ignored or tolerated in the past, even though known to increase emissions or otherwise affect system durability, are now of critical importance. In addition, these new technologies are usually more sensitive than older technologies to these types of factors. The use of MMT in unleaded gasoline is one of these factors.

Passenger Car Exhaust Emission Reductions Compared to Pre-controlled levels:

<table>
<thead>
<tr>
<th>Time Period</th>
<th>HC</th>
<th>CO</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-controlled</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>1975 (Canada)</td>
<td>81%</td>
<td>70%</td>
<td>24%</td>
</tr>
<tr>
<td>1988 (Tier 0)</td>
<td>96%</td>
<td>96%</td>
<td>76%</td>
</tr>
<tr>
<td>1994 (Tier 1)</td>
<td>98%</td>
<td>96%</td>
<td>90%</td>
</tr>
<tr>
<td>2001 (LEV)</td>
<td>99.3%</td>
<td>96%</td>
<td>95%</td>
</tr>
<tr>
<td>2004* (Tier 2)</td>
<td>99.3%</td>
<td>96%</td>
<td>98.8%</td>
</tr>
</tbody>
</table>

Comparisons at 80,000 km (50,000 mile)

* Regulations in place in the U.S. and proposed in Canada. Both U.S. and proposed Canadian programs phase-in the standards between 2004-2006, with two additional years allowed for heavier vehicles. The regulation affects passenger cars, light trucks and medium-duty passenger vehicles.
What is the History of Canadian Policy Decisions Related to MMT?

In June 1997, the Manganese-based Fuel Additives Act, which restricted the trade of MMT, went into effect. In a news release on July 20, 1998, Environment Canada announced it was lifting restrictions on inter-provincial trade and import of MMT in response to a recommendation by a dispute-settlement panel established under the Agreement of Internal Trade (AIT). In that same release, Environment Canada acknowledged that:

“Studies in Canada and the U.S. are proceeding on the impact of MMT and other fuel additives on health and automobile tailpipe emissions. When the results of these studies are made available to the Government of Canada, they will be reviewed by an independent, third party in consultation with stakeholders and provinces. If subsequent federal government action is warranted, it will act, using the Canadian Environmental Protection Act.”

What is the Chronology of MMT and Vehicle Emission Controls in Canada?

- 1970's  MMT enters Canadian market in unleaded gasoline
- 1975  Canada’s specific unique vehicle emission control standards (1975-87 model years). Use of catalysts and unleaded fuel increases. The standard allows for less stringent and lead-tolerant emission control systems compared to U.S.
- 1978  Canadian General Standard Board (CGSB) adopts MMT limit for Unleaded Gasoline Standard (18 mg manganese / L max.). National gasoline regulations do not limit MMT level¹. U.S. EPA denies use of MMT in unleaded gasoline due to impact on vehicle hydrocarbon (HC) emission control.
- 1984  Environment Canada requests CGSB evaluation of the impact of MMT on vehicles meeting EPA Tier 0 emission standards.
- 1985  CGSB study determines that vehicle HC emissions are increased, but environmentally acceptable at this time. It recommends that the issue be reviewed on the introduction of more stringent emission controls.
- 1989  Leaded gasoline banned from on-road use.
- 1993  Auto industry Memorandum of Understanding with government for phase-in of more stringent and harmonized Tier 1 emission control technology (1994-95 Model Years).
- 1995  Implementation of harmonized Tier 1 emission regulations delayed due to continued use of MMT.

- 2001 Canadian auto industry and Environment Canada sign a Memorandum of Understanding to voluntarily retail vehicles with low-emission vehicle (LEV) emission controls (2001-2003 Model Years).

- 2002 Environment Canada proposes more stringent Tier 2 vehicle emission regulations with in-use emission performance requirements (2004+ Model Years).

1 To date, the Government of Canada has not imposed national limits on MMT in gasoline. Individual provinces adopting CGSB gasoline standards allow MMT up to 18 mg Mn/L, and gasoline is regularly found to contain MMT to this level. Since 1996, U.S. conventional gasoline (not Federal Reformulated or California) is allowed to contain up to 1/32 g Mn / US gal (about half of CGSB max.). The most recent North American Fuel Survey, conducted in January 2002 by the Alliance of Automobile Manufacturers, revealed a small amount of usage in regular unleaded gasoline sold in New Mexico at 0.02 Mn g/gal, the first such usage seen in several years.

What should the Governments be Doing?

The U.S. and Canadian federal governments both need to adopt a comprehensive national clean fuels policy that will ensure that the appropriate fuel quality is available in the marketplace coincidently with the introduction of advanced vehicle emission control technology (Tier 2). The automobile industry strongly encourages all governments to use the World Wide Fuel Charter as the basis for developing national clean fuel strategies.

As vehicles use increasingly advanced emissions control systems, their need for clean fuels of consistent quality becomes more crucial.

Improvements in fuel quality also would help reduce emissions from the entire in-use fleet of 14 million vehicles in Canada providing immediate and significant environmental benefits.

In the Federal Agenda on Cleaner Engines, Vehicles and Fuels issued in the Canada Gazette Part I, February 17, 2001, Environment Canada acknowledged the need for consistent fuel quality availability. Its Planned Action item 4, “Policy on International Alignment for Fuels with Other Jurisdictions”, reads:

“Environment Canada plans to continue its approach of generally aligning Canadian environmental fuel requirements with those of the United States, while taking into consideration environmental standards developed by the European Union. There may be instances, however, where Canada takes additional action to protect the health of Canadians and the environment.”

Environment Canada has recognized the benefits associated with improved fuels. Considering the impacts of the additive demonstrated in the study, it needs to move quickly to eliminate its use in Canadian gasoline.
What are the pertinent reference links for additional information?

Canada Gazette Part I -- Federal Agenda on Cleaner Vehicles, Engines and Fuels

http://www.ec.gc.ca/press/mmt98_n_e.htm

World Wide Fuel Charter
http://www.autoalliance.org/fuel_charter.htm

Auto Makers’ Choice
http://www.cvma.ca/Programs/Choice.html

Canadian Vehicle Manufacturers’ Association (CVMA)
http://www.cvma.ca

Association of International Automobile Manufacturers of Canada (AIAMC)
http://www.aiamc.com

Alliance of Automobile Manufacturers (AAM)
http://www.autoalliance.org/

Association of International Automobile Manufacturers (AIAM)
http://www.aiam.org