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**SCIENTIFIC EVIDENCE AND REAL-WORLD EXPERIENCE  
ON THE SAFETY OF MMT IN FUELS: AN OVERVIEW**

(Prepared for consideration by  
UN GRPE Working Group 29 on fuel quality)

The following paper provides a factual overview of the extensive scientific evidence and real-world experience demonstrating the safe and effective use – in millions of vehicles for more than 23 years – of the Ethyl fuel additive Methylcyclopentadienyl Manganese Tricarbonyl (MMT). In so doing, the paper addresses unfounded allegations raised in a recent submission to the UN GRPE by ACEA, the European automobile manufacturers' association.<sup>1</sup>

**I. Facts Regarding MMT**

MMT is a cost-effective and environmentally friendly means of achieving higher octane levels in fuels. Employed in small amounts, it enables refiners to produce higher quality gasoline, and to do so with less reliance on other, less environmentally friendly materials, resulting in an overall reduction in refinery and vehicle emissions. Specifically, use of MMT will:

- Reduce crude oil and energy consumption, as well as refinery emissions of greenhouse gases, by enabling refiners to increase production efficiency;
- Enable refiners to produce cleaner burning gasoline, resulting in lower tailpipe emissions;
- Protect advanced catalytic control emissions systems from contaminants, which results in lower tailpipe emissions over the life of the vehicle;

<sup>1</sup> Circulated on behalf of OICA for GRPE as Informal Document No. 15 (43<sup>rd</sup> GRPE, 15-18 January 2002, agenda item 10.2), ACEA Position on Metal Based Fuel Additives.

- Protect against valve seat wear in older vehicles, upon which millions of drivers across the world remain dependent; and
- Reduce fuel injector deposits by enhancing the effectiveness of gasoline detergents.

MMT has been described by the U.S. Environmental Protection Agency (US EPA) as the most extensively tested fuel additive in history. The overwhelming weight of all such testing – and on top of that, the accumulated experience of more than two decades of real-world use – continue to affirm the safety and efficacy of the additive.

Over the past 15 years, MMT has been subjected to extensive automotive, regulatory and legal reviews of its use in unleaded gasoline. Based on these reviews, MMT has won formal approval for use in numerous, diverse markets around the world, including the United States, Canada, The Peoples' Republic of China, Australia and South Africa. MMT is currently used to produce cleaner burning gasoline by more than 80 refineries and fuel terminals across the world.

This unprecedented scrutiny has included examination by regulators of numerous scientifically designed fleet studies; these have involved more than 120 advanced emission-controlled vehicles, many of which have been tested over 160,000 kilometers.<sup>2</sup>

Moreover, since the mid-1970s, millions of vehicles have safely travelled more than 3 trillion kilometres on fuels containing MMT. Over that period, MMT has been successfully used in every new emissions control technology that has emerged, including low emission vehicles, vehicles with close-coupled catalysts, and vehicles with the same engine technology that auto manufacturers will use to meet Euro IV emissions standards.

## **II. Unfounded Allegations Raised in ACEA Submission**

Notwithstanding the overwhelming scientific and real-world evidence of MMT's safety, some auto manufacturers have on occasion made allegations against the additive. These allegations consist principally of unfounded claims that MMT can impair the performance of catalysts and spark plugs, and are repeated again in the ACEA submission to UN GRPE.

However, on every occasion that such allegations have been examined and reviewed, they have been found to be without substance.

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<sup>2</sup> Over the past two years, Ethyl Corporation has published two comprehensive papers (SAE 2000-01-1880 and SAE 2000-01-1952) demonstrating that vehicles running on unleaded gasoline containing MMT maintain higher catalyst performance. These are attached for reference.

After completing a multi-year evaluation of all available test data on MMT®, for example, the US Environmental Protection Agency concluded: "Ethyl has demonstrated that the use of HiTec 3000 (the commercial name for MMT®) will not cause or contribute to a failure of any emission control device or system."

MMT® has been used continuously in Canada in over 90% of unleaded petrol for more than 23 years, during which the Canadian vehicle fleet of some 14 million vehicles – the vast majority equipped with modern emission control systems – has operated entirely satisfactorily. MMT® has been approved by the Canadian Health Department, which has also determined that there is no scientific evidence to support the allegation that MMT® impairs catalysts, and which reconfirmed that view in February of 2001.

Similarly, the Canadian Government, after reviewing the allegations of spark plug fouling in Canada that the ACEA submission cites, concluded that MMT was not the cause.

There is in Ethyl's view a reason for the lack of substance behind the auto manufacturers' allegation: the negative opinions expressed are not reflective of real-world experience with the additive, and are not based on fundamentally sound science.

An example of the flawed work that can lead to false allegations is illustrated by the case of Delta Motor Corporation (South Africa), which is described in attachments to the ACEA submission.

Delta conducted several single engine test programmes that they allege demonstrate MMT® "plugging" of catalytic converters. Although Delta has been reluctant to disclose the details of their test methodology, they do openly acknowledge that they relied upon a test method that the US EPA and auto manufacturers themselves deem inappropriate and unreliable for testing of fuel additives. Moreover, Delta separately confirm that the plugging of the catalyst commenced prior to MMT® being added to the test fuel.

The Alliance of Automobile Manufacturers and the Association of International Automobile Manufacturers have stated that any procedures used to evaluate fuels and fuel additives must be "representative of the conditions the....additive would experience under normal driving.....". The US EPA has expressed a similar view, stating in August 2001 that "running a catalyst through an artificially accelerated and severe catalyst ageing cycle....does not necessarily tell you anything about how the additive would affect emissions deterioration over actual extended use," and adding that what is important is "the effects of fuel and fuel additives under more real-world driving conditions".

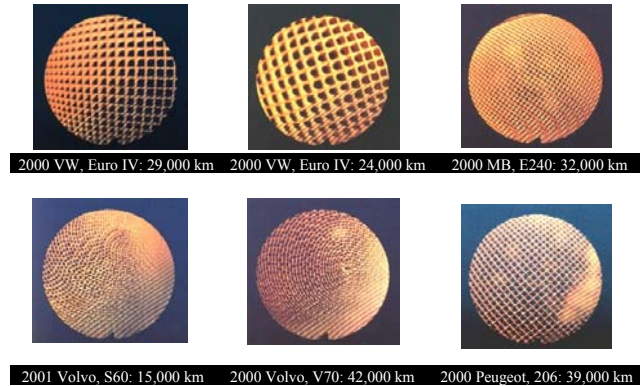
In spite of this, the Delta test employed an "accelerated aging cycle" (which essentially means running a vehicle engine under abnormal conditions of

extreme stress), a method that the US EPA specifically rejects as being unreliable. In contrast, Ethyl has documented evidence (below right) that vehicles running on MMT fuels in South Africa demonstrate no signs of catalyst plugging.

Zefire/Delta Accelerated Aging Test  
(South Africa)



Johannesburg: Commercial Vehicles  
MMT® Fuel - No Blockage or Plugging



Regrettably, the inappropriate methods employed in the Delta test also underpin other anecdotal test results that auto manufacturers point to as purported evidence of MMT® and catalyst problems.

**III. Auto Manufacturers’ Refusal to Engage in Scientific Dialogue**

Delta’s repeated refusal to provide a complete description of the test procedures employed, or to substantiate that the test procedures are representative of normal vehicle operation, also reflects a longstanding pattern of auto manufacturers’ refusal to engage in an honest and open dialogue about scientific findings regarding MMT®.

Ethyl Corporation has repeatedly offered to participate in and fund joint studies with auto manufacturers about the effects of MMT® in vehicle engines. In 1996, for example, just one year after MMT® received the US EPA’s approval, Ethyl offered to participate in a study of MMT® undertaken in the United States by the Alliance of Automobile Manufacturers and the Association of International Automobile Manufacturers. Ethyl’s offer was rejected.

Moreover, auto manufacturers have singularly failed to match Ethyl’s willingness to fully disclose – for scientific and public review – all necessary information regarding their testing of MMT®. On Ethyl’s part, all of the substantial test work that has formed the basis of US EPA and Canadian regulatory approvals of MMT® has been made fully available for scientific and

peer review, and is supplemented by numerous additional studies that Ethyl has conducted confirming the safety and efficacy of MMT®.

In sharp contrast, auto manufacturers making allegations about MMT® and catalysts have consistently refused to disclose essential details of their test methodologies and parameters.<sup>3</sup>

Absent such disclosure, there can be no certainty as to whether their purported results are scientifically valid, or whether – as in the case of the Delta test – they have been arrived at using flawed methodology (e.g., an accelerated ageing test), or have concealed findings (e.g., that catalyst blocking occurred before MMT® was added to the test fuel) that would undercut the auto makers' preferred result.

Throughout its experience with MMT®, Ethyl has sought to engage any and all interested parties in discussions that are reasoned, scientifically based, and reflective of real-world experience regarding the additive. Regrettably, the tendency still appears to exist for individual automotive manufacturers to air views, or even allegations, without adhering to even the most fundamental tenets of scientific evaluation.

#### Attachments:

SAE 2000-01-1880, *A Systems Approach to Improved Exhaust Catalyst Durability: The Role of the MMT Fuel Additive.*

SAE 2000-01-1952, *Analysis of Nitrous Oxide Emissions from Light Duty Passenger Cars.*

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<sup>3</sup> Indeed, the ACEA submission goes so far as to mischaracterise the review processes that have led to MMT's approval in the US, claiming that MMT was specifically banned and therefore in need of a special waiver. In fact, the waiver process reflects the US EPA's normal procedure for approval of any additive whose composition is not similar to those used in certification gasoline, including, for example, MTBE, ethanol and MMT.