



International Fuel Quality Center

OVERVIEW OF LEADED GASOLINE AND SULFUR LEVELS IN GASOLINE AND DIESEL

November 14, 2002

The *International Fuel Quality Center* is pleased to provide an overview of the world situation on leaded gasoline and sulfur levels in gasoline and diesel. This document has been prepared as background material for the first steering committee meeting of the WSSD Partnership on Cleaner Fuels and Vehicles that will be held in New York at the United Nations Secretariat, 14-15 November 2002.

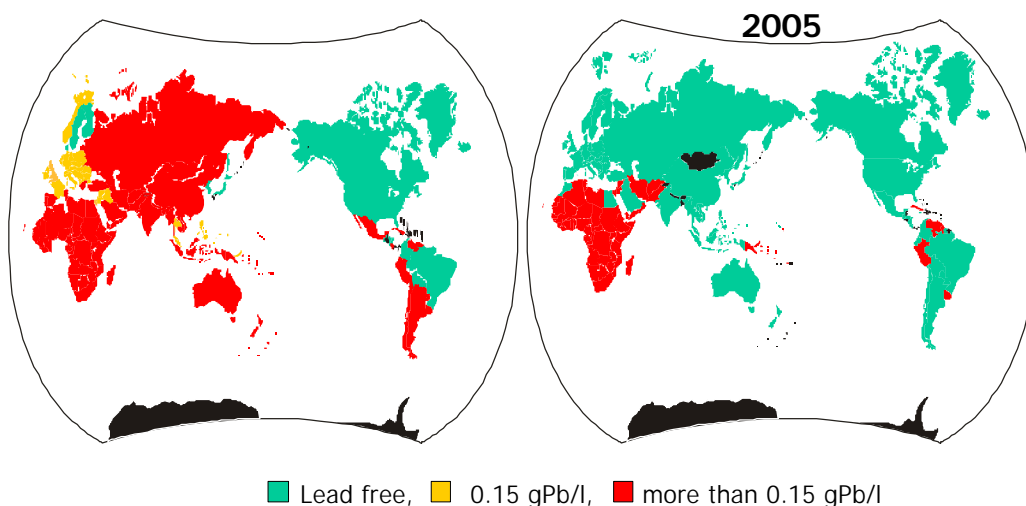
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Lead in Gasoline

When the first major step in fuel quality improvement was taken in the early 1970s, nearly all the world's gasoline contained lead, generally at levels about 0.4 g/L or more. Since that time, however, countries have progressively phased down lead due in part to health concerns, as well as to enable the use of catalytic converters, which further facilitate additional exhaust pollutant reductions of hydrocarbons (HCs), carbon monoxide (CO), nitrogen oxides (NOx) and air toxics.

In 1990, leaded gasoline represented more than 57% of the total worldwide gasoline market. However, in the four years from 1996-2000, the market for leaded gasoline shrunk from 40% to less than 20%. About 35 countries (both developed and developing economies) had completely phased out lead by 1999. As of mid 2002, the International Fuel Quality Center estimates that 88 countries still supply leaded gasoline although the total leaded gasoline volume is less than 10% of the global pool. As shown in the figure of the world, these countries are mainly located in East Europe and Africa.

Leaded Gasoline Availability as of 1996 versus 2005.



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In **South America** there are still five countries supplying leaded fuels: Uruguay, Venezuela, Cuba, Peru and French Guinea. Also, some of their Caribbean Islands still use leaded fuel. The International Fuel Quality Center believes that lead will be completely phased out in the next decade.

Although lead phaseout started in **Western European** countries in the early 80's, it was not until January 2000 that sales of leaded fuel were prohibited in the Europe Union. Only countries that could show that the stipulated fuel changes would cause technical difficulties could get derogation (i.e., exception from the rule). Today, only Portugal is still supplying small amounts of leaded fuel. As of January 2003, Portugal has to follow the European regulations.

Many **Central and Eastern European** countries are preparing themselves to become members of the European Union and have to meet their requirements for gasoline which includes a phase out of lead. Although, Russia no longer produces leaded gasoline it is still marketed.

In 2002, the following Central, Eastern European and Former Soviet Union countries still consume leaded gasoline:

Leaded Gasoline in Central and Eastern Europe and Former Soviet Union

- | | | |
|---------------|----------------|-----------------|
| 1. Albania | 8. Cyprus | 15. Romania |
| 2. Armenia | 9. Georgia | 16. Tadjikistan |
| 3. Azerbaijan | 10. Yugoslavia | 17. Tukmenistan |
| 4. Belarus | 11. Kazakhstan | 18. Turkey |
| 5. Bosnia | 12. Kyrgyzstan | 19. Ukraine |
| 6. Bulgaria | 13. Macedonia | 20. Uzbekistan |
| 7. Croatia | 14. Moldova | 21. Poland |
| | | 22. Russia |

Most **Asian** countries phased-out lead in a very short period of time, known as the switch-out, typically between 1998 and 2000. Leaded fuels are still available in the following Asian countries:

Leaded Gasoline in Asia

- | | | |
|--------------|--------------|---------------------|
| 1. Pakistan | 4. Sri Lanka | 6. Papua New Guinea |
| 2. Nepal | 5. Cambodia | 7. Bhutan |
| 3. Indonesia | | |

In **Africa**, only three countries have banned the use of lead (Egypt, Mawi and Western Sahara), although unleaded gasoline is offered for sale in many countries. The 2001 Dhakar declaration, headed by ExxonMobil and IPIECA, helped emphasize the need to phase out lead and helped accelerate the timeline of a full phase out. Many African country officials have subsequently expressed a desire to phase out lead completely by 2006.

In the **Middle East**, Kuwait is the forerunner in promoting cleaner burning automotive fuels and was the first country to complete lead phase out in 1998. Over the past two years, many other countries have followed. The Gulf Cooperation Council has set 2003 as the dead line for their members to finalize their phase out of leaded gasoline. Leaded fuels are still available in the following Middle East countries:

Leaded Gasoline in the Middle East

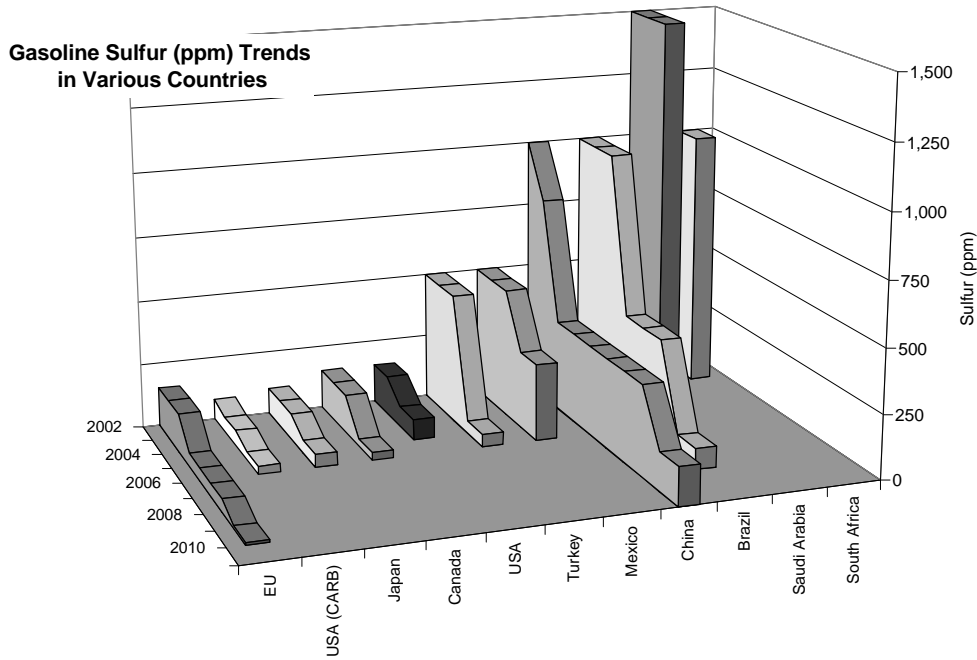
1. Iran
2. Israel
3. Jordan
4. Syria
5. Yemen

Gasoline & Diesel Sulfur Content

The more recent drive in fuel quality improvement focuses on sulfur reductions. Sulfur in fuel is found to be the main contributor to sulfur dioxide and particulate matter emissions. Also, sulfur is found to reduce the efficiency of exhaust after-treatment systems that are essential to meet future emission requirements.

The following indicates that the degree of required reduction in sulfur levels varies around the world. In the industrialized countries where vehicles soon have to follow the most advanced emission limitations for NO_x and CO₂, ultra low sulfur fuels have been requested by the automotive industry.

Gasoline Sulfur Trends in Various Countries



Diesel Sulfur Trends in Various Countries

