

Memo

To: Whom It May Concern
From: Michael P. Walsh
Date: June 12, 2005
Re: Status Report: Low Sulfur Diesel Fuel Trends Worldwide

1. Background and Introduction

Over the past few years, as the major OECD countries have moved toward tight vehicle emissions standards and very low sulfur fuels, a number of rapidly industrializing countries have begun to follow suit. A number of efforts have subsequently been initiated to assist these countries in their efforts to move forward, including those of the International Council for Clean Transportation, the Clean Air Initiative-Asia, and the Partnership for Clean Fuels and Vehicles. However, up to now there has not been a clear road map for progress in part because there has not been a comprehensive picture available regarding the status country by country around the world.

The purpose of this memo is to make a first attempt at compiling such a comprehensive overview of low sulfur diesel fuel trends worldwide for road vehicle use.

2. Methodology

The first step was to obtain diesel fuel consumption data for each country of the world from the International Energy Agency.¹ IEA was able to provide annual consumption for most countries from 1971 to 2002. The data was then extrapolated year by year to 2010 by taking the latest year and adding the average increase in the previous three years, probably a conservative estimate for some of the more rapidly industrializing countries.

Next, based on personal knowledge and experience as well as consultation with government officials in various countries, each country was put into one of five categories regarding fuel sulfur levels:

1. Over 500 ppm

¹ Personal communication with Lew Fulton and Pierpaolo Cazzola

2. Maximum of 500 ppm
3. Maximum of 350 ppm
4. Maximum of 50 ppm
5. Maximum of 10/15 PPM

Recognizing that the US and Canada require diesel fuel to meet 15 ppm at the pump whereas the EU requires fuels to meet 10 ppm at the refinery, these levels were considered equivalent under the 10/15 ppm case.

Estimates were made for three calendar years – 2005, 2008 and 2010. An additional case was included for 2010, a so-called aggressive case which assumes that several countries that are considering more stringent requirements are successful in implementing them. These aggressive scenario assumptions for diesel fuel were as follows:

- The Central America countries adopt a maximum sulfur level of 500 ppm by 2010. Active discussions toward adoption of this level prior to 2010 are underway. Countries affected would include - Costa Rica, Guatemala, Nicaragua, El Salvador, Panama, Honduras
- Hong Kong decides to adopt a maximum of 10 ppm. This is under consideration at this time.
- India not only requires a maximum of 50 ppm in all the major metros as already decided but requires this fuel across the entire country.
- Thailand decided to set a maximum limit of 10 ppm by 2010, which is under discussion between the government and the fuels industry.
- Vietnam proceeds with implementation of its current plan to adopt Euro 4 vehicle and fuel specs by 2010.
- As China has already adopted Euro 4 light duty vehicle standards for 2010, it is assumed that they are successful in adopting 50 ppm maximum for 2010.
- As part of its movement toward EU membership, it is assumed that Turkey achieves a maximum sulfur level of 10 ppm in gasoline by 2010.
- Brazil is moving toward 50 ppm maximum for the major cities; this assumption is that they adopt the requirement for the entire country.

3. Results

Figures 1, 2, and 3 show the results.

Figure 1: Global Distribution of On Road Diesel Fuel Sulfur Content (PPM)

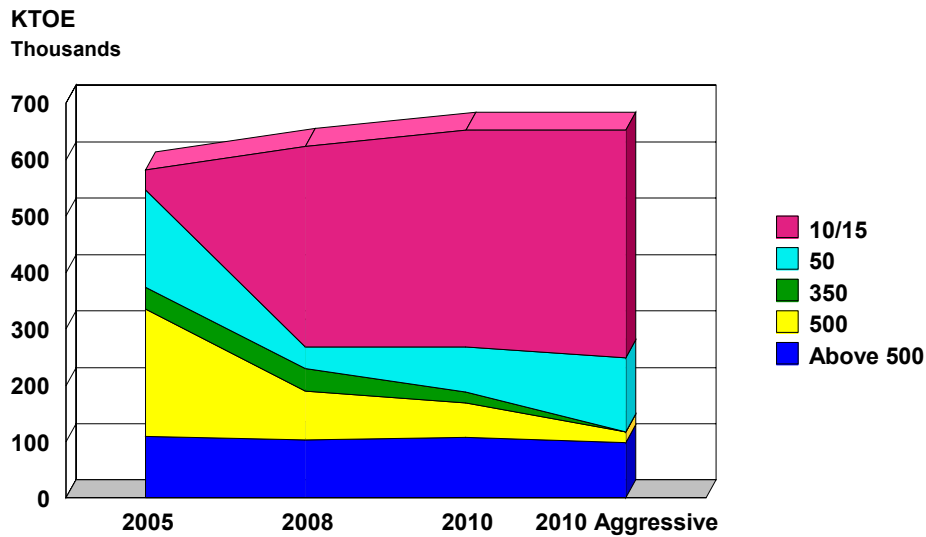


Figure 2: Global Distribution of On Road Diesel Fuel Sulfur Content (PPM)

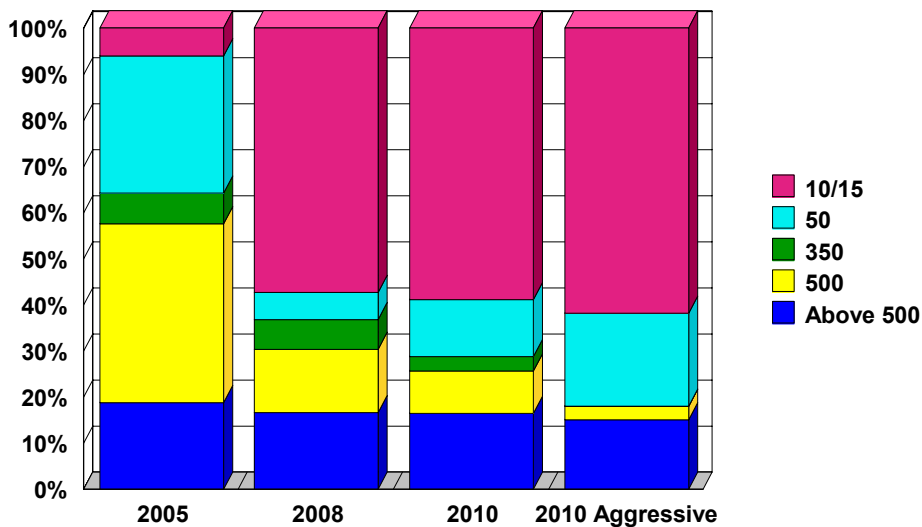
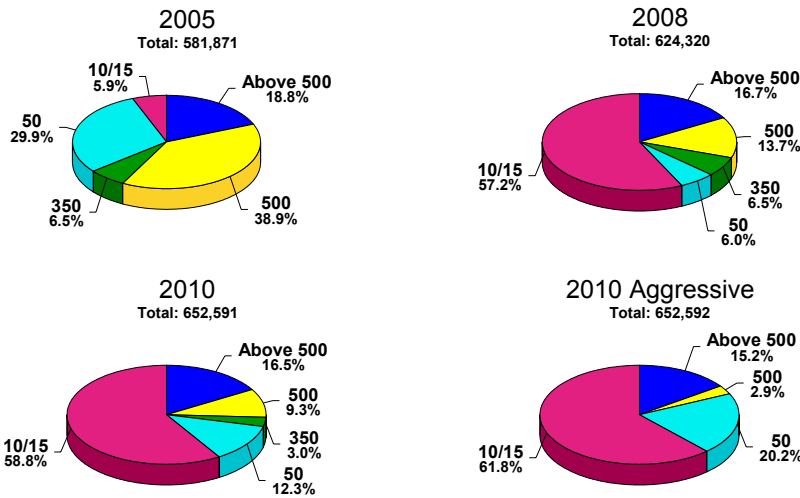


Figure 3: Global Distribution of On Road Diesel Fuel Sulfur Content (PPM)

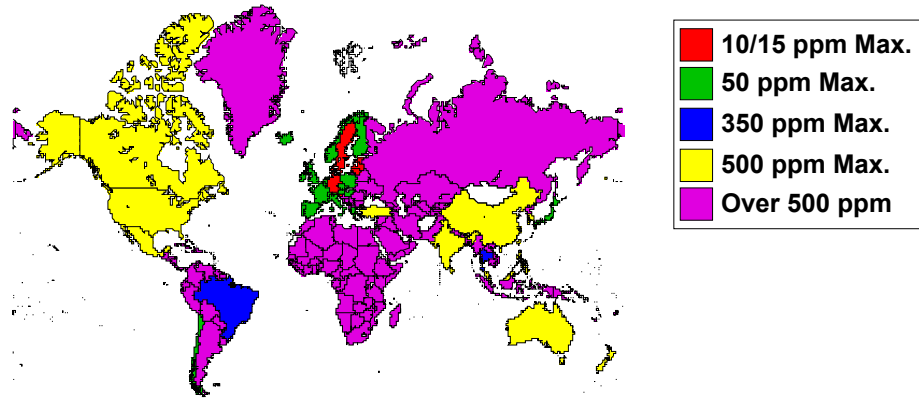


A careful examination of these figures leads to the following conclusions with regard to diesel fuel sulfur levels:

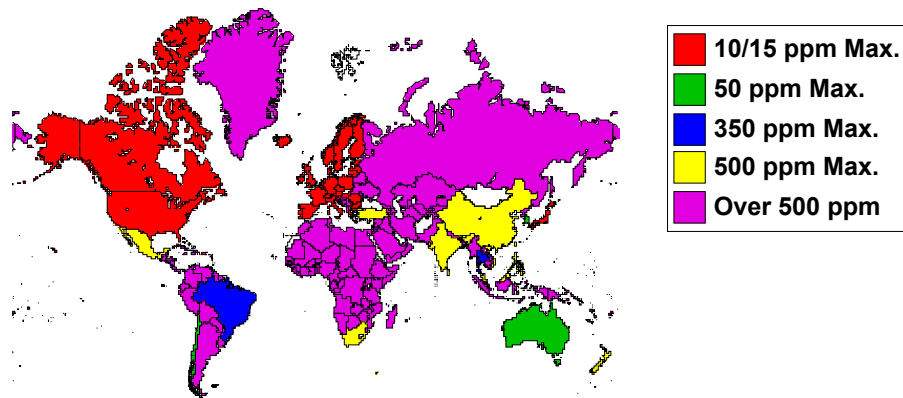
1. Diesel fuel consumption is likely to grow steadily over the next several years,
2. Over 80% of all diesel fuel sold worldwide this year for road vehicle use should meet a 500 ppm sulfur maximum or less.
3. By 2010, under business as usual, almost 70% of all diesel fuel should meet a maximum of 50 ppm sulfur or less.
4. If the aggressive scenario were achieved, over 80% of all diesel fuel will meet 50 ppm or less and over 60% will meet 10 ppm or less.

The next four maps show the global distribution of these fuels over the next five years.

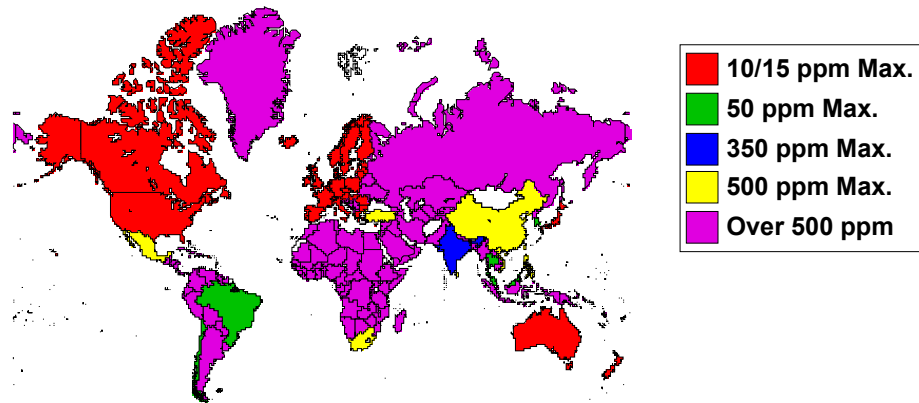
Diesel Fuel Sulfur Levels 2005



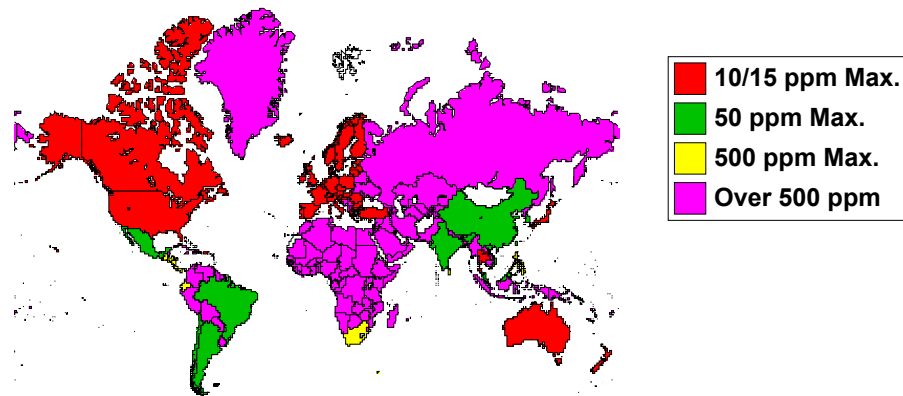
Diesel Fuel Sulfur Levels 2008



Diesel Fuel Sulfur Levels 2010



Diesel Fuel Sulfur Levels Aggressive Scenario 2010



4. Challenges

Of course the first priority should be to assist those countries which have already laid out a clear road map for cleaner vehicles and fuels, to enable them to implement their plans successfully. Then one can look to the aggressive case opportunities, all of which seem potentially feasible. In parallel, attention should be focused on these countries which have made very little progress to date, to enable them to at least reduce their sulfur levels to a maximum of 500 ppm. In terms of volume of fuel

consumed, priority countries would include Russia and several former Soviet republics as well as most of Africa.