

May 2, 2006

Contact – Bob Marcolina

Workgroup Recommendations and Other Potential Control Measures
Diesel Initiatives Workgroup

DI008 – Use of Low Sulfur Fuel for the Maritime Sector

OVERVIEW

This white paper recommends the implementation of three approaches to reduce the sulfur content in fuel used by the maritime sector: 1) encourage EPA to apply for a SO_x Emission Control Area designation in anticipation of MARPOL ratification by Congress, which will reduce the sulfur content of fuel in the main engines of large container/cargo/tanker vessels; 2) adopt a regulation similar to California to limit the sulfur content of the fuel burned in the auxiliary engines of these large vessels; and 3) decrease the sulfur limit of fuel for the smaller commercial and recreational vessels.

DESCRIPTION

USEPA has mandated that petroleum refineries convert at least 80% of their highway diesel fuel production to 15 ppm sulfur (Ultra Low Sulfur Diesel or ULSD) by June 2006. In addition, USEPA has mandated that their production of non-road diesel fuel meet a 500 ppm sulfur standard (Low Sulfur Diesel or LSD) by late 2007 and a 15 ppm sulfur standard by 2010. However, the locomotive and marine sector do not have to meet the 15 ppm standard until 2012. Based on pre-compliance reports submitted to USEPA with regard to the highway diesel fuel conversion, approximately 95% of the highway fuel will be 15 ppm by June 2006, and the anticipated supply should meet the demand. The pre-compliance reports for the non-road diesel fuel conversion have not yet been released publicly. However, we know that in New Jersey, highway diesel vehicles consume approximately 800 million gallons of diesel per year while the non-road sector consumes only 170 million gallons annually. Marine fuel sales figures for New Jersey for 2004 show less than 1 million gallons.¹ Therefore, the use of LSD and ULSD for marine vessels prior to the federal mandates should not have a significant impact on supply of LSD or ULSD.

Large container ships, tankers and freighters are governed by the International Maritime Organization (IMO). The IMO produced two treaties, one in 1973 and one in 1976, which deal with accidental and operational pollution by ships in the world's waterways. These two treaties, along with several amendments, are known as MARPOL. One section of MARPOL deals specifically with air pollution from ships. This section is known as Annex VI. Annex VI has been ratified by 15 nations, which represent over half of the world's shipping tonnage.² Annex VI would limit the sulfur content of fuel that ships burn in their main engines to 45,000 ppm (4.5%). Annex VI also allows nations to apply for a SO_x Emission Control Area (SECA) which would impose a fuel sulfur content limit of 15,000 ppm (1.5%) for ships operating in the SECA. Alternatively, these ships could retrofit the exhaust of the main engines to achieve a similar SO_x reduction. Currently, the Baltic Sea and part of the North Sea are designated as SECAs.³ Other waterways throughout the world are in the process of seeking a SECA designation. In comparison, New Jersey's sulfur limits for heavy oil range from 0.3% to 1%. (2% had

May 2, 2006

Contact – Bob Marcolina

Workgroup Recommendations and Other Potential Control Measures
Diesel Initiatives Workgroup

DI008 – Use of Low Sulfur Fuel for the Maritime Sector

been allowed in limited areas, but is no longer used.) In the New Jersey port areas the limit is 0.3% (3000 ppm) for heavy oil fired boilers.

Currently the State of California is petitioning the EPA to both apply for SECA designation and to encourage Congress to ratify MARPOL. The Port of Long Beach and Port of Los Angeles are the two largest ports in the United States. NJDEP should encourage EPA to generate a SECA application in anticipation of Congressional ratification of MARPOL, since the Port of New York/New Jersey is the third largest Port in the United States with 4,900 vessel calls in 2003.⁴ Through SECA designation, the sulfur content of the fuel of these ships would decrease by 66%. Considering that 4,900 ships call on the Port of NY/NJ on a yearly basis, plus projections call for an increasing amount of ships the future, these reductions equate to 988.4 tons per year of SO₂ and 57.2 tons per year of direct particulates.⁵

An additional approach that the State of California is utilizing is adopting a regulation, which would limit the sulfur content of the distillate fuel that the auxiliary engines burn when these large ships are within 24 miles of the California Coast or are in a California port. Typically, the auxiliary engines for these large ships burn a fuel with a 1% sulfur content. This limit will be reduced to 0.5% starting January 2007; the limit then gets further reduced to 0.1% in January 2010.⁶ The auxiliary engines can be used to power the ship proximate to a coast, and to power the ship's electricity when the ship is docked. The latter is referred to as "hoteling."

In terms of the smaller vessels such as harbor tugs, small commercial vessels, ferries and diesel powered recreational vessels, the sulfur content of the fuel that they currently burn is approximately 3000ppm sulfur. If these vessels burned 500ppm or 15ppm fuel, this would translate to direct reductions of 82% and 99.5% of SO₂, respectively.

IMPLEMENTATION

Large ships would not have to modify their main engines if they switch to a 15,000 ppm fuel, provided that fuel met all current lubricity standards.⁷ Only a small fraction of the large ships (less than 10%) will have to be modified to burn the lower sulfur fuel of 5000 ppm in their auxiliary engines. Smaller vessels can convert from burning the typically 3000 ppm fuel to the 500 ppm fuel without having to incorporate any special equipment or without any engine performance penalty. There may be a minor performance penalty for ship engines if they burn the ULSD, but that penalty would be minimal, provided the fuel met the specified lubricity standards.

May 2, 2006

Contact – Bob Marcolina

Workgroup Recommendations and Other Potential Control Measures
Diesel Initiatives Workgroup

DI008 – Use of Low Sulfur Fuel for the Maritime Sector

COST

California has predicted that their auxiliary engine fuel sulfur limit will cost the container and bulk shipping industry to reduce sulfur content of the fuel from 1% to 0.5% approximately \$34 million in 2007. To further reduce the sulfur content of the fuel from 0.5% to 0.1% would cost approximately \$38 million in 2010.

EFFECTIVENESS

As mentioned previously, requiring large ships to burn 15,000 ppm sulfur fuel from burning 45,000 ppm sulfur could result in a minimum of 5% reduction of PM emissions and an approximate 40% reduction of SO₂ emissions from each ship. If you multiply that reduction by 4,900 ships for just the Port of NY/NJ, this translates to a large PM and SO₂ reduction initiative, not including the calculation of increased ship traffic in the near future. California has predicted that their auxiliary engine rule will yield the following savings: 2.7 tons per day (TPD) of Particulate Matter (PM) in 2007 and 3.7 TPD of PM in 2010. In terms of small ships converting from 3000 ppm sulfur fuel to LSD or ULSD, the PM reduction for each ship would be at least 10%. Given the large population of these vessels in and around the Port of NY/NJ, the PM reduction would also be significant.

SOURCES

- 1) Energy Information Administration Fuel Oil and Kerosene Sales for 2004
- 2) Assembly Joint Resolution #8, dated February 22, 2005, California State Legislature
- 3) West Coast Diesel Collaborative, Background Paper on SECA
- 4) U.S. Department of Transportation, Bureau of Transportation Statistics
- 5) Calculations based on Marine Vessel Emissions in Tons per Year, Starcrest Report April 2003
- 6) Section 2299.1, title 13 and Section 93118, title 17 of the California Code of Regulations.
- 7) Email correspondence with Dr. Vis of Viswa Lab Corporation, Houston, Texas.

Disclaimer – The recommendations contained within this white paper do not constitute official state decisions nor reflect any pending regulatory or nonregulatory actions. The NJDEP welcomes public feedback on this (or any other) white paper.