

estimate that the potential need for lubricity additives in non-highway diesel engine fuel under this proposal would be the same as that for highway diesel fuel meeting the same sulfur standard.

2. A Voluntary Approach on Lubricity

In the United States, there is no government or industry standard for diesel fuel lubricity. Therefore, specifications for lubricity are determined by the market. Since the beginning of the 500 ppm sulfur highway diesel program in 1993, refiners, engine manufacturers, engine component manufacturers, and the military have been working with the American Society for Testing and Materials (ASTM) to develop protocols and standards for diesel fuel lubricity in its D-975 specifications for diesel fuel. ASTM is working towards a single lubricity specification that would be applicable to all diesel fuel used in any type of engine. Although ASTM has not yet adopted specific protocols and standards, refiners that supply the U.S. market have been treating diesel fuel with lubricity additives on a batch to batch basis, when poor lubricity fuel is expected. Other examples include the U.S. military, Sweden, and Canada. The U.S. military has found that the traditional corrosion inhibitor additives used in its fuels have been highly effective in reducing fuel system component wear. Since 1991, the use of lubricity additives in Sweden's 10 ppm sulfur Class I fuel and 50 ppm sulfur Class II fuel has resulted in acceptable equipment durability.²⁶⁸ Since 1997, Canada has required that its 500 ppm sulfur diesel fuel not meeting a minimum lubricity be treated with lubricity additives.

The potential need for lubricity additives in diesel fuel meeting a 15 ppm sulfur specification was evaluated during the development of EPA's highway diesel rule. In response to the proposed highway diesel rule, all comments submitted regarding lubricity either stated or implied that the proposed sulfur standard of 15 ppm would likely cause the refined fuel to have lubricity characteristics that would be inadequate to protect fuel injection equipment, and that mitigation measures such as lubricity additives would be necessary. However, the commenters suggested varied approaches for addressing lubricity. For example, some suggested that we need to establish a lubricity requirement by

regulation while others suggested that the current voluntary, market based system would be adequate. The Department of Defense recommended that we encourage the industry (ASTM) to adopt lubricity protocols and standards before the 2006 implementation date of the 15 ppm sulfur standard for highway diesel fuel.

The final highway diesel rule did not establish a lubricity standard for highway diesel fuel. We believe the issues related to the need for diesel lubricity in fuel used in non-highway diesel engines are substantially the same as those related to the need for diesel lubricity for highway engines. Consequently, we expect the same industry-based voluntary approach to ensuring adequate lubricity in non-highway diesel fuels that we recognized for highway diesel fuel. We believe the best approach is to allow the market to address the lubricity issue in the most economical manner, while avoiding an additional regulatory scheme. A voluntary approach should provide adequate customer protection from engine failures due to low lubricity, while providing the maximum flexibility for the industry. This approach would be a continuation of current industry practices for diesel fuel produced to meet the current federal and California 500 ppm sulfur highway diesel fuel specifications, and benefits from the considerable experience gained since 1993. It would also include any new specifications and test procedures that we expect would be adopted by the American Society for Testing and Materials (ASTM) regarding lubricity of NRLM diesel fuel quality.

Regardless, this is an issue that will be resolved to meet the demands of the highway diesel market, and whatever resolution is reached for highway diesel fuel could be applied to non-highway diesel engine fuel with sufficient advance notice. We are continuing to participate in the ASTM Diesel Fuel Lubricity Task Force²⁶⁹ and will assist their efforts to finalize a lubricity standard in whatever means possible. We are hopeful that ASTM can reach a consensus early this summer at the next meeting of the ASTM's Lubricity Task Force. We request comment on what actions EPA should take to ensure adequate lubricity of non-highway diesel engine fuel beyond those already underway for highway diesel fuel.

3. What Other Impact Would Today's Actions Have on the Performance of Diesel and Other Fuels?

We do not expect that the proposed fuel program would have any negative impacts on the performance of diesel engines in the existing fleet which would use the fuels regulated today. In the early 1990's, California lowered the maximum allowable level of sulfur content of highway and nonroad diesel fuel to 500 ppm, and at the same time California significantly lowered the aromatic content of diesel fuel. California required a cap on total aromatics of 10 percent by volume, while the in-use average at the time was on the order of 35 percent. The lowering of the total aromatic content resulted in some problems with leaks from the fuel pump O-ring seals in some diesel engines due to a change specifically in the polynuclear aromatics content (PNA). In the process of meeting California's 10 percent total aromatic content requirement, the end result typically lowered PNA's from approximately 10–15 percent by volume to near-zero. In the early 1990's, some diesel engine manufacturers used a certain material (Nitrile) for O-rings in diesel fuel pumps. The Nitrile seals were found to be susceptible to leakage with the use of diesel fuel with very low PNA content. Normally, the PNA in the fuel penetrated the Nitrile material and cause it to swell, thereby providing a seal with the throttle shaft. When very low PNA fuel is used after conventional fuel has been used, the PNA already in the swelled O-ring would leach out into the very low PNA fuel. Subsequently, the Nitrile O-ring would shrink and pull away, thus causing leaks, or the stress on the O-ring during the leaching process would cause it to crack and leak. Not all 500 ppm sulfur fuels caused this problem, because the amount and type of aromatics varied, and the in-use seal problems were focused in California due to the 10 percent aromatic requirements and the resulting very low PNA content. This was not a wide-spread issue for the rest of the U.S. where highway diesel fuel also had a 500ppm sulfur cap because the federal requirements did not include a lower aromatic cap. While the process of lowering sulfur levels to 500ppm does lower PNA, it does not achieve the near-zero levels seen in California. Since the 1990's, diesel engine manufacturers have switched to alternative materials (such as Viton), which do not experience leakage. We believe that no issues with leaking fuel pump O-rings would occur with the changes in diesel fuel sulfur levels

²⁶⁸ Letter from L. Erlandsson, MTC AB, to Michael P. Walsh, dated October 16, 2000. EPA air docket A-99-06, docket item IV-G-42.

²⁶⁹ ASTM sub committee D02.E0.