

number 2 distillate fuel which meets both sets of specifications. Nonroad, locomotive and marine engines can be and are fueled with both low and high sulfur No. 2-D fuels.

During winter months in the northern U.S., No. 1 distillate, such as kerosene, is sometimes added to No. 2 distillate fuel to prevent gelling. Any No. 1 distillate added to No. 2 NRLM diesel fuel would become NRLM diesel fuel.

Highway diesel fuel, comprises about 57% of all number 2 distillate fuel. Eighty percent of highway diesel fuel will be capped at 15 ppm sulfur starting in 2006. However, because of limitations in the fuel distribution system and other factors, about one-third of non-highway, No. 2 distillate currently meets the 500 ppm highway diesel fuel cap. Thus, about 69 percent of number 2 distillate pool currently meets the 500 ppm sulfur cap, not just

the 57 percent used in highway vehicles. The result is that about one-third of the 24% of the distillate market comprised by NRLM diesel fuel currently meets a 500 ppm specification and is also expected to meet the future highway diesel fuel requirements even without this proposed rule. Thus, while this proposed rule would apply to all NRLM diesel fuel, the rule should only materially affect about two-thirds of all NRLM diesel fuel, or 16% of today's distillate market. EPA is not considering any national sulfur standards applicable to home heating fuel or power generation fuel at this time.

## 2. How Do Nonroad, Locomotive and Marine Diesel Fuel Differ From Highway Diesel Fuel?

Refiners blend together a variety of distillate blendstocks to produce both highway and non-highway diesel fuels.

These distillate blendstocks always include straight run material contained in crude oil, plus they often include light cycle oil from a fluidized catalytic cracker, light coker gas oil from a coker and hydrocrackate from a hydrocracker. The actual mix of these blendstocks in highway and non-highway diesel fuel at refineries producing both fuels can differ. However, in general, significant quantities of all of these blendstocks find their way into both low sulfur and high sulfur diesel fuel today. A survey of distillate fuel quality conducted by API and NPRA in 1996 indicated the following feedstock composition for low sulfur diesel fuel and high sulfur diesel fuel and heating oil.

TABLE IV-5—COMPOSITION OF LOW SULFUR DIESEL FUEL AND HIGH SULFUR DIESEL FUEL AND HEATING OIL: 1996 U.S. NON-CALIFORNIA AVERAGE OF SURVEYED REFINERS (VOLUME PERCENT)<sup>a</sup>

Feedstocks	Low Sulfur No. 2 Diesel Fuel	High Sulfur No. 2 Diesel Fuel and Heating Oil
<b>Hydrotreated</b>		
Straight Run Material .....	52	18
Light Cycle Oil .....	20	11
Light Coker Gas Oil .....	8	5
Hydrocrackate .....	4	9
<b>Non-Hydrotreated</b>		
Straight Run Material .....	12	45
Light Cycle Oil .....	3	11
Light Coker Gas Oil .....	1	1

### Notes:

<sup>a</sup> We plan to update these compositions to reflect greater use of heavier crude oils in future analyses.

The primary difference between low and high sulfur number 2 distillate fuels today is the fact that a greater volume percentage of low sulfur fuel feedstocks have been hydrotreated to meet the 500 ppm sulfur cap applicable to highway diesel fuel. As shown in the table above, high sulfur distillate fuels may contain significant amounts of hydrotreated material, but the final sulfur level of the blend is usually well above 500 ppm and currently averages 3400 ppm (see Draft RIA). Hydrotreating today typically involves combining diesel fuel with hydrogen and a catalyst under pressures of 400–1200 pounds per square inch and temperatures of roughly 600 degrees Fahrenheit. In general, the existence of the 500 ppm sulfur cap gives refiners an incentive to use low sulfur blendstocks, such as hydrocrackate and straight run, in their low sulfur diesel fuel. However, some

high sulfur blendstocks, such as light cycle oil and light gas coker oil, require hydrotreating to remove other undesirable compounds, such as olefins and metals. Once hydrotreated, they are suitable for use in low sulfur diesel fuel. Also, some light cycle oils and light gas coker oils contain so much sulfur and olefins and have such a low cetane number that they are unsuitable for direct blending into even high sulfur diesel fuel, since most high sulfur diesel fuel meets the ASTM sulfur cap of 5000 ppm and cetane number minimum of 40.<sup>258</sup> Where material is hydrotreated in order to blend into a high sulfur fuel, it is often easier to hydrotreat the material

<sup>258</sup> Non-highway diesel fuel often meets sulfur standards of 2000–3000 ppm in some states, particularly those in the Northeast. These states have limited the sulfur content of home heating oil to these levels. To ease fuel distribution, refiners and distributors sell the same fuel into the home heating fuel and non-highway diesel fuel markets.

further to meet a 500 ppm cap and blend straight run material directly into the high sulfur diesel pool. Thus, there is no bright line separating the blendstocks used to produce low and high sulfur diesel fuel today.

## 3. What Technology Would Refiners Use to Meet the Proposed 500 ppm Sulfur Cap?

Refiners currently hydrotreat some or all of their distillate blendstocks to meet the 500 ppm sulfur cap applicable to highway diesel fuel. Refiners would be able to meet the proposed 500 ppm sulfur cap for NRLM diesel fuel using this same technology. As will be discussed further in the next section, several alternative desulfurization technologies are being developed. However, these alternative technologies promise the greatest cost savings at very low sulfur levels, such as 15 ppm. Also, their ongoing development makes it