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TECHNEWS

2008-2009 Winter Distillate Fuel Program

The 2008-2009 winter distillate fuel program in the Midwest has been established. Again this year, the program will involve blending No.1 and No.2 distillate fuels to achieve acceptable winter performance. No.1 ultra low sulfur can be used to lower the cloud point of ultra low sulfur, low sulfur and high sulfur distillate. No.1 low sulfur having a sulfur content greater than 15 ppm, but less than 500 ppm, can only be used to lower the cloud point of low sulfur and high sulfur distillate. *Customers must ensure that off-highway No.2 distillate is discernibly dyed red when blended with No.1 and is never used for taxable on-highway applications whether or not it is blended with No.1.*

Marathon Petroleum Company LLC (MPC) terminals that offer ultra low, low and high sulfur No.2 will post unblended cloud points for all products in a timely manner. Customers who use No.2 fuel where fine filters are exposed to outside temperatures must blend the No.2 fuel with the No.1 fuel in order to protect against extreme low temperatures. Below is a description of the No.2 fuel properties that explain when and how blending must be done to protect customers.

Protection from Water Contamination

Water contamination in the bottom of a fuel tank will freeze when the temperature is +32°F or lower. Freezing water can result in plugging of filters or blockage in low spots in lines. Water freezing is a different problem than wax formation and can be a problem much earlier in the heating season. By keeping water drained from storage tanks, you can minimize problems related to water contamination. Also, the addition of **diesel fuel antifreeze** (Isopropyl Alcohol Type) can prevent the formation of ice resulting from small quantities of water.

No. 2 Distillate at Low Temperatures

All No.2 distillate fuel contains some wax that remains dissolved when the fuel is warm. However, when the fuel is cooled sufficiently, wax crystals form which can plug fuel lines, filters, valves and pump screens. Two terms describe the formation of wax in No.2 fuel: **cloud point** and **pour point**.

Cloud Point

As No.2 fuel is cooled, it reaches a temperature at which wax crystals begin to form. The fuel becomes “cloudy” due to the appearance of the wax. This temperature is called the **cloud point**. Below the cloud point, the fuel can be fluid, but will contain wax crystals that can collect on fine filters and cause plugging problems.

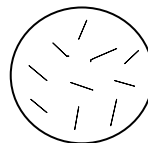
Pour Point

Cooling No.2 fuel below its cloud point promotes the growth of larger wax crystals. Eventually, a temperature is reached where the wax crystals become large enough that the fuel will not flow or “pour.” This temperature is called the **pour point** and is the lowest temperature at which the fuel will flow in bulk volume from tanks through valves and lines.

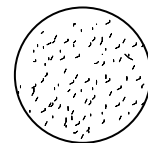
Flow Improver Additive

To provide improved low temperature handling this winter, MPC refinery produced No.2 fuel may contain a flow improver additive. This additive works by limiting the size of wax crystals that form when the fuel temperature falls below the cloud point. The smaller wax crystals allow the treated fuel to flow at a lower temperature. By modifying the way that wax crystals form, the pour point of our No.2 fuel is lowered and additional low temperature protection is provided against wax plugging of fuel lines, valves, and pump screens that are not finer than 30 mesh.

Effect of Flow Improver:



Untreated Fuel
Forms larger wax crystals



Flow Improver Treated Fuel
Decreased wax crystal size

10/30/2008

2008 2009 Winter Distillate Fuel

Low Temperature Protection Bulk Handling

Because MPC's No.2 fuel has a **typical** pour point of approximately 15 degrees below the cloud point, the fuel will flow from tanks and through most open valves and lines down to 0°F or below. This is especially helpful to customers who store No.2 fuel in basement tanks or underground tanks and where filters are not exposed to the outside temperature. However, below the cloud point, the No.2 fuel will not pass through pump screens that are finer than 30 mesh. Home heating customers with outside storage in locations where the temperature seldom goes below 0°F often do not need blended fuel if there are no filters in the lines exposed to the outside temperature.

However, some installations are especially vulnerable if the temperature drops very low. Characteristics of these installations can include:

- long, narrow lines
- no insulation
- tanks exposed to weather
- exposed filters
- no shelter from the wind

The temperature of the fuel itself is critical to the formation of wax that develops at the cloud point. Any steps that keep the fuel warmer than ambient temperature help prevent wax related problems. System modifications to help keep the fuel warmer than ambient temperature include wrapping exposed lines with insulation or heat tape (used only during extremely cold weather), and placing shields around lines or tanks to keep wind from hitting them.

Blending Recommendations

For diesel accounts and home heating accounts where engine filters and in-line filters are exposed to the outside temperature, the **cloud point** is the critical factor rather than the pour point. At temperatures below the cloud point, wax crystals that form in No.2 fuel can build up on filters and cause plugging problems.

To protect against these wax plugging problems, blending with No.1 fuel is required.

The table shown below can be used to find the amount of No.1 needed to reach the desired cloud point. At the top of the table, the cloud point of the unblended No.2 fuel is given. Each terminal posts the cloud point of both the low and high sulfur unblended No.2 fuel. At the left of the table, the desired cloud point of the blend is listed. The table contains the percentages of No.1 fuel needed to lower the cloud point to the desired temperature. No.2 distillate fuels with a **typical** cloud point of +10°F will be available to MPC supplied terminals during the 2007-2008 winter season.

Example:

- ◆ The unblended cloud point of No.2 is +10°F.
- ◆ A blended cloud point of 0°F is desired.

Use the chart below to find the intersection of the column labeled +10°F and the row labeled 0°F. The correct value is highlighted in blue. The "35" listed means that a blend of 35% No.1 and 65% No.2 fuel is needed to achieve a 0°F cloud point.

CLOUD POINT PROTECTION – Percent of No.1 Required for Blending									
Desired Cloud Point of Blend	Cloud Point of Unblended No.2 Fuel								
	-2°F	0°F	+2°F	+4°F	+6°F	+8°F	+10°F	+12°F	+14°F
+5°F						15	20	25	30
+0°			10	15	25	30	35	40	45
-5°F	10	20	30	35	35	40	45	60	65
-10°F	30	40	45	50	50	55	60	70	80
-15°F	45	50	60	65	65	70	70	90	95



Additives can permanently alter the characteristics and performance (e.g., cold flow, lubricity, cetane value) of the base fuel. Because the interaction of each additive and fuel are unique, MPC cannot be responsible for performance variations experienced with aftermarket additive.