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TECHNEWS

2007-2008 Winter Biodiesel Blending Program

Similar to Marathon's Winter Diesel Fuel program in the Midwest, a 2007-2008 Winter Biodiesel Blending Program has been established for standard soy biodiesel / #2 diesel fuel blends designated as B2, B5 or B11. These standard biodiesel fuels will be blended with #1 diesel fuel at specified Marathon terminal locations for winter performance. No.1 ultra low sulfur diesel can be used to lower the cloud point of all biodiesel blends made with ultra low sulfur diesel, low sulfur diesel (on and off-highway) and high sulfur (off-highway) diesel. Number 1 low sulfur (on and off-highway) diesel with a sulfur content greater than 15 ppm, but less than 500 ppm, can only be used to lower the cloud point of biodiesel blends made with low sulfur (on and off-highway) and high sulfur diesel (off-highway). Customers must ensure that off-highway No.2 diesel and biodiesel blends are 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 terminals that offer ultra low, low sulfur and high sulfur (off-highway) No.2 will post unblended cloud points for all products in a timely manner. Customers who use biodiesel / No.2 fuel blends where fine filters are exposed to outside temperatures are recommended to be blended with No.1 fuel in order to protect against extreme low temperatures. Below is a description of the biodiesel / 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 winter 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. These additives should only be used in emergency situations and must be used judiciously.

Biodiesel Blended Fuel at Low Temperatures

All biodiesel blended 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 fuel: **cloud point** and **pour point**.

Cloud Point

As the biodiesel blended 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.

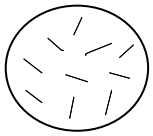
Pour Point

Cooling biodiesel blended 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.

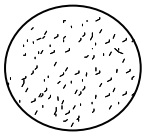
Cold Flow Improvement

To provide improved low temperature handling, biodiesel blended fuels will be blended with #1 diesel fuel, except at St. Paul Park, where the biodiesel blends will be blended with Marathon's Polar Plus package. These products work to limit 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 biodiesel blended fuel is lowered, providing lower temperature protection 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

Low Temperature Protection Bulk Handling

Because Marathon's biodiesel blended 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 ambient temperature or below. This is especially helpful to customers who store biodiesel blended fuel in basement tanks or underground tanks and where filters are not exposed to the outside temperature. However, below the cloud point, the biodiesel blended fuel will not pass through pump screens that are finer than 30 mesh. The temperature of the fuel itself is critical to the formation of wax that develops at the cloud point.

Blending Recommendations

For biodiesel blend 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 biodiesel blend cloud point, wax crystals that form in the blended fuel can build up on filters and cause plugging problems.

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

The tables below first show the Biodiesel blend and terminal location (top line in white). The second and third lines show the cloud point of the unblended No.2 diesel fuel (highlighted in brown and posted at each terminal) and the cloud point of the biodiesel blend containing #1 diesel fuel and percentages of each (highlighted in blue). Each terminal location will post the cloud point of the ultra low, low, and high sulfur unblended No.2 diesel fuel.

Example: For B2 Blend at St. Paul Park Containing 60% No.2 ULSD, 38% No.1 ULSD, 2% Biodiesel

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

Cloud Point Protection B2 Blends at St. Paul Park									
Cloud Point of Unblended No.2 Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point with 60% No. 2 Diesel +38% No.1 Diesel +2% B100 Blend									
-12° F	-10° F	-8° F	-6° F	-4° F	-2° F	0° F	+2° F	+4° F	+6° F

Cloud Point Protection B2 Blends at Champaign, Robinson									
Cloud Point of Unblended No.2 Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point with 70% No. 2 Diesel +28% No.1 Diesel +2% B100 Blend									
-10° F	-8° F	-6° F	-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F

Cloud Point Protection B2 Blends at Louisville Kramers Lane									
Cloud Point of Unblended No.2 Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point with 78% No.2 Diesel + 20% No.1 Diesel +2% B100 Blend									
-8° F	-6° F	-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F

B2 Blends *Without* No.1 at St. Paul Park, Louisville Kramers Lane, Champaign & Robinson									
Cloud Point of Unblended No.2 Ultra Low Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point of Neat No. 2 Diesel +2% B100									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F

Cloud Point Protection B5 Blends at Louisville Kramers Lane									
Cloud Point of Unblended No.2 Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point with 75% No. 2 Diesel +20% No. 1 Diesel +5% B100 Blend									
-6° F	-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F

B5 Blends *Without* No.1 Diesel at Louisville Kramers Lane									
Cloud Point of Unblended No.2 Ultra Low Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point of Neat No.2 Diesel +5% B100									
-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F	+16° F

Cloud Point Protection B11 Blends at Champaign and Robinson									
Cloud Point of Unblended No.2 Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point with 62% No. 2 Diesel +27% No. 1 Diesel + 11% B100 Blend									
-8° F	-6° F	-4° F	-2° F	+1° F	+2° F	+4° F	+6° F	+8° F	+10° F

B11 Blends *Without* No.1 Diesel at Champaign and Robinson									
Cloud Point of Unblended No.2 Ultra Low Diesel									
-4° F	-2° F	0° F	+2° F	+4° F	+6° F	+8° F	+10° F	+12° F	+14° F
Cloud Point of Neat No.2 Diesel + 11% B100									
-1° F	+1° F	+3° F	+5° F	+7° F	+9° F	+11° F	+13° F	+15° F	+17° F

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, Marathon cannot be responsible for performance variations experienced with aftermarket additive.