

MARKED GASOIL BS2869 CLASS A2: WINTER RECOMMENDATIONS**BACKGROUND**

All gasoil in the UK must be manufactured to BS 2869 Class A2. This specification contains seasonal requirements for summer and winter. A fuel certified for use during the summer period is only suitable for that period; winter fuel may be used all year.

These recommendations have been issued following operational difficulties in equipment and vehicles encountered during cold periods or when summer grade fuel may have been left in tanks during winter. They are valid for diesel fuel and especially for non-road diesel (Marked gasoil meeting BS2869 class A2).

These recommendations are to inform off-road diesel users of potential problems that may occur when using the product without respecting the seasonal specification and to make users aware of precautions to take when using gasoil during cold periods.

WHAT ARE THE POTENTIAL PROBLEMS OF USING THE INCORRECT GRADE OF GASOIL IN WINTER OR DURING COLD PERIODS?

During cold periods, it is possible that there might be starting problems with diesel engines. It is even possible that an engine that is already running might stop. These problems are mainly due to the formation of wax crystals and condensation of water in the diesel fuel causing blocking of filters and pipes. This generally occurs when the fuel storage and fuel systems of the vehicle have not been designed with sufficient thermal protection (insulation or heating) and / or when the recommendations detailed in this document have not been followed.

All diesel fuel (including non-road diesel) contains paraffins. The paraffin content is an important characteristic of diesel because it gives it the high cetane number that makes for efficient combustion.

Normally, the paraffins are dissolved (that is to say, in the liquid state) in the diesel. However, when diesel fuel is cooled, these paraffin molecules start to form crystals and to solidify. If the temperature is low enough, the amount and / or the crystal size formed will be sufficient to form a mat on the filter and block the fuel filter. In severe cases even the narrow bore pipe work, particularly at bends and unions may become totally blocked. The engine will no longer receive sufficient fuel and will fail to start or will stop due to fuel starvation. This is especially true when the temperature does not rise sufficiently for several days. The effect is the same when the incorrect grade is used or if extreme weather conditions prevail.

HOW TO IDENTIFY PROBLEMS WITH PARAFFINS?

When paraffins crystallize in diesel, enough to block filters and fuel lines, one can observe that the diesel has a milky appearance. One might also notice the presence of a reddish deposit on the bottom of the tank or on the surface of the fuel filter, if inspected.

HOW DO WE EVALUATE THE COLD PROPERTIES OF GASOIL?

According to the British Standard BS2869 the cold flow specification is expressed by the cold filter plugging point (CFPP) and has a specification -12 ° C maximum in the winter (-4 ° C maximum in summer). CFPP is measured in the laboratory by a method using the EN 116 standard. This European reference method, developed jointly by the vehicle manufacturers and oil companies, is used to characterize the resistance to cold for all current European gas oils. The method of measuring EN 116 uses a cool-down protocol and specific pumping conditions, and a filter mesh size of 45 micron. The CFPP test has been shown to accurately correlate to engine performance and is used throughout Europe for all grades of diesel and gasoil to determine the cold flow property of the fuel and is used as the specification parameter.

The seasonal requirements are stated in BS 2869 section 8.2

8.2 Gas oil

Gas oil shall have the following maximum cold filter plugging point (CFPP) temperature in the given seasons.

For class A2 and D fuels distributed from refineries and imported into the United Kingdom:

- Summer: 16 March to 15 October inclusive, -4 °C;
- Winter: 16 October to 15 March inclusive, -12 °C.

NOTE 1 The term "distribute" is as defined in the Motor Fuels (Composition and Content) Regulations 1999 [10].

For class A2 and D fuels for delivery from terminals:

- Summer: 16 March to 31 October inclusive, -4 °C;
- Winter: 01 November to 15 March inclusive, -12 °C.

For class A2 and D fuels for delivery to end users, the seasonality dates are as given in Table 1, Part 1 and Part 2 of this British Standard, i.e.:

- Summer: 16 March to 15 November inclusive, -4 °C;
- Winter: 16 November to 15 March inclusive, -12 °C.

The Total Lindsey Oil Refinery Limited (TLOR) winter season requirement commences 16th October for collections from the refinery and 1st November for terminals. Collection from service stations etc (not applicable for Total LOR) is from 15th November.

No analytical method can perfectly recreate conditions in the field, and the actual "temperature operability" of the system (storage, equipment machinery and vehicles) can lead to differences between the laboratory CFPP value and that experienced in practical usage.

The action of the wind in particular although it does not actually lower the temperature level, has the effect of accelerating the heat loss and thus causes more rapid cooling of the product contained in an unprotected or exposed storage tank. The presence of water in the fuel and the level of water in the filters is a contributing factor to their clogging. The age and condition of the filter may also have an impact; a partially blocked filter will be more susceptible to problems.

WHAT PRECAUTIONS CAN BE TAKEN?

FUEL

Gas oils have summer and winter seasonality with appropriate specifications: The summer quality has a limited resistance to cold, and is not appropriate for winter use. Winter quality is more resistant to cold (-12° C CFPP maximum) and is required, by law, to be available from 1st November to 15th March. However, to ensure the conformity of products in all terminals at 1st November direct supplies from the refinery will meet the winter requirement from October 16th (check with your supplier).

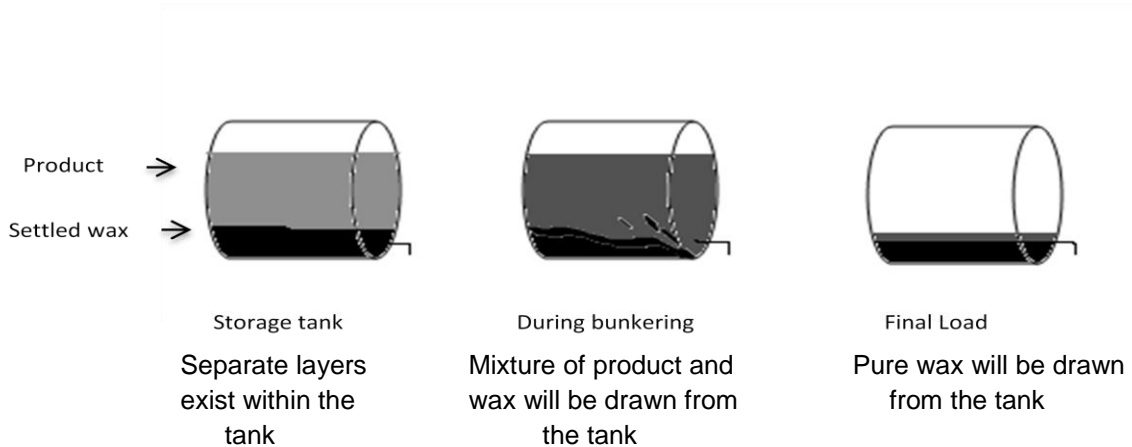
It is important that the summer quality fuels are not kept for winter.

It is important that users relying on one delivery per year replenish their stocks during the winter season.

It should also be remembered upon filling a tank with winter quality gasoil, if there is still summer quality gasoil at the bottom of the tank then the mixture will have poorer cold properties than pure winter grade product. It is recommended to ensure that the entire volume of the tank meets winter specification before the start of any cold weather.

It is also essential to ensure that a non-road diesel tank is not contaminated by the presence of water or bacteria. The tank vent pipe should be cleaned to allow it to breathe. For prolonged storage (more than 6 months) or if there is a large amount of summer quality fuel left in the tank at the approach of winter, you should contact your supplier to consider solutions to avoid encountering problems.

Fuel supplies left over from summer may exhibit some abnormal behaviour and as a consequence users may experience inconsistent quality from the storage tank.



ADDITIVES

Additives improving the cold resistance of non-road diesel fuel may be proposed by specialized suppliers but it is important to remember certain crucial facts.

Cold additives are often called Middle Distillate Flow Improvers and work by increasing the number of paraffin crystals to ensure they are smaller and to prevent the crystals agglomerating and forming larger plate like crystals which blind the filters.

It should be remembered that additives improving cold properties are already used in the production of the fuel in a very controlled way at elevated temperatures. The possibilities of improving cold flow properties of gasoil are very difficult to evaluate and must be assessed case by case. The previous addition of additive may have exhausted the sensitivity and response of the fuel to further additive treatment.

The additives will not dissolve paraffin crystals already formed in the gasoil. The additives alter the crystal structure as they are formed to prevent them blinding the filter. Further additive addition must be whilst the fuel temperature is higher than the crystal formation temperature (cloud point) as it will not alter the structure of crystals already formed.

Uncontrolled additives can have the opposite effect to that expected and cause problems of haze and water suspension.

Contact your supplier who can direct you to the best solution.

The additive has to be fully mixed to give a homogenized blend. Any secondary treatment must be pre diluted and free flowing.

COLD FILTER PLUGGING POINT (CFPP)

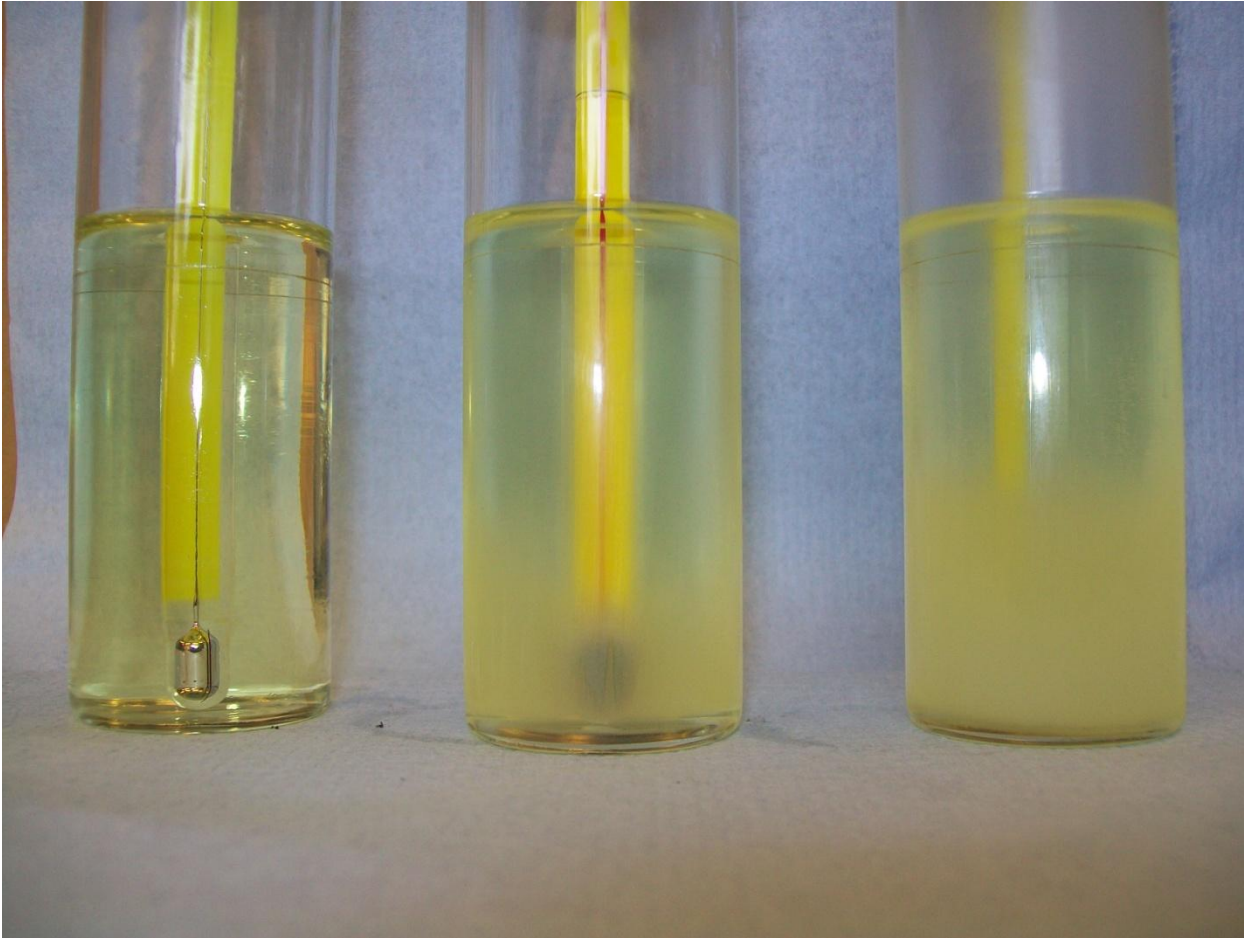
The CFPP test involves progressively cooling a sample down and drawing it through a fine mesh filter every degree Celsius. The temperature at which the filter blocks is the CFPP point and this is controlled by the use of additives. The porosity of the filter is 45 micron which is greater than most commercial filters however it has been shown that there is a direct correlation between the laboratory and the field use due to the difference in filter area, material used and the vacuum or pressure applied.

CLOUD POINT

The cloud point reports the temperature at which wax starts to crystallize and become visible to the eye. A sample is cooled in a test jar and at intervals of 1 degree checked to see if haze ring forms at the bottom of the test jar. For a fuel without any cold flow additive the cloud point and CFPP results will be very similar.

The cloud point for additised fuel is usually about 10 degrees Celsius above the CFPP level therefore it is expected to see a waxy appearance when fuels are below the cloud point.

Unmarked gasoil samples during cloud point testing



1 deg C above cloud point

3 Deg C below cloud point

6 Deg C below cloud

STORAGE

One of the most effective ways to reduce the formation of paraffin crystals is the insulation of tanks, filters and pipelines, facilities and vehicles.

- BS 2869 or EN590 do not recommend a minimum storage temperature, however for situations where extreme cold is anticipated or for storage for vital equipment it is recommended that a minimum storage and handling temperature should be 0° C to 5° C.
- Warehouse storage and handling equipment can suffer the effects of extreme cold.
- Summer stocks should be run down as far as possible before the first winter delivery.

- Users only requiring one delivery per year should ensure it is winter grade and will last until the following winter season.
- Equipment exposed to wind (tanks, pipes, pumps, vehicles) cools faster than that which is sheltered.
- Paraffin crystals can settle, agglomerate and accumulate in the bottom of tanks and prevent the gasoil being pumped.
- Do not forget to remove the water in the fuel that has come from condensation in the tanks. Without regular purges, the water present in the fuel will freeze from 0° C which will cause clogging of filters and pipes.
- Mixing or circulating the fuel especially during warm periods will help keep any waxes in solution.

WHAT NOT TO DO: MIXING WITH OTHER PETROLEUM PRODUCTS

Any non-diesel fuel mixture with other petroleum products is strictly prohibited and might contravene HMRC regulations in relation to payment for excise duty.

Gasoil is a fuel with a low sulfur content, limited to 10 mg / kg.

Remedial solutions by blending products such as kerosene do not allow compliance with the maximum sulfur content and generate particular risk for the use of modern equipment, mainly for high pressure injection systems sensitive to the loss of lubricity.

SAFETY

DO NOT HEAT THE STORAGE TANK OF ANY PART OF A VEHICLE FUEL SYSTEM WITH ANY SORT OF FLAME (FIRE OR TORCH).

NEVER ADD GASOLINE TO DIESEL.

Gasoline has a much lower flash point than diesel can cause fire and engine failure.

References

BS 2869 Fuel Oils for Agricultural Domestic and Industrial Engines - Specification

BS 6380 Low temperature properties and cold weather use of diesel fuels and gas oils.