1 General

At low outside temperatures, the viscosity of the diesel fuel can be negatively influenced due to precipitation of paraffin crystals. This can lead to delivery problems resulting from the filter and/or fuel lines clogging up. To prevent such problems, winter diesel fuels with improved cold viscosity characteristics are available on the market during the winter months. In most cases, these are suitable for the outdoor temperatures usually occurring.

Remedies when fuel is not sufficiently resistant to low temperature

When winter diesel fuels are not available within sufficient time or an exceptionally cold period is expected, it is advisable to add **kerosene or aircraft turbine fuel** in a percentage depending on the expected outdoor temperature. This can apply in central Europe depending on national standards for outdoor air temperatures below -9 °C to -15 °C when winter diesel fuel is used and below 0 °C when summer diesel fuel is used. On vehicles with fuel heater these values are approx. 8 °C better. As a guideline value adding 5 vol % of kerosene or aircraft turbine fuel improves the resistance to low temperatures by approx. 1 °C. This should be regarded as an emergency measure; continuous operation is not recommended, neither is any addition of more than 50 percent by volume. **The use of gasoline is not allowed because it impairs the fuel's oiliness and reduces safety (lowers inflammation point).**

Adding after the paraffin has already precipitated out has no effect. In this case the only remedy is to heat up the entire fuel system and then add the kerosene or aircraft turbine fuel.

Diesel fuel with improved cold viscosity properties

In some countries certain oil companies offer diesel fuel with improved cold viscosity properties. Other improved properties are also claimed frequently in this context.

We recommend using only winter diesel fuels which are guaranteed by the fuel suppliers for operation down to -20°C and below.

For safety reasons, mixing should be accomplished only in the vehicle fuel tank. When filling up the tank, add the specifically lighter additive fuel before the diesel fuel. Then the engine should be run until the entire fuel system is filled with the mixed fuel. Failure to do this can result in malfunctions due to unmixed fuel in the entire system.

Approved viscosity improvement additives can be used instead of kerosene or aircraft turbine fuel. Adding kerosene or aircraft turbine fuel reduces the flashpoint of the diesel fuel. This increases the risk for handling and storing such fuel mixtures; therefore always observe the applicable safety regulations (see Sheet 112.0).

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2 Flow improvers for diesel fuels

General information

Although viscosity improvement additives cannot prevent paraffin from precipitating out, they do have a great deal of influence on the shape and growth of the crystal. As the fuel cools off a large number of modified paraffin crystal forms, which can pass through the fuel filter. The fuel can still flow and be filtered, because formation of unsuitable crystals is prevented. 0.01 up to
Adding 0.01 to 0.2% of such additives by weight can convert summer diesel to winter diesel and improve the low temperature properties of winter diesel fuel. It should be noted that the effectiveness of these additives depends on the origin of the crude oil from which the diesel fuel was refined as well as the refining process and addition of flow improvers at the refinery. Reliable information can therefore be provided only by laboratory testing of the filtering characteristics (cold filter plugging point) or extensive bench tests in a refrigerated chamber.

Application

Measuring and mixing viscosity improvement additives is not unproblematic, therefore observe the manufacturer's recommendations exactly. Viscosity improvement additives provide good actuation characteristics only up to a certain mixing ratio; under certain circumstances excessive concentration can have a negative effect and should therefore be avoided.

When adding viscosity improvement additives, the diesel fuel should have a temperature of at least 8 °C above the cloud point in order to achieve high effectiveness. However, since the cloud point is not usually known, the fuel temperature for winter diesel fuel should be at least +/- 0 °C and for summer diesel fuel at least +8 °C. Adding after the paraffin has already precipitated out has no effect. In this case, the only remedy is to heat up the entire fuel system. After viscosity improvement additives have been added to the diesel fuel in the vehicle tank, the engine should then run until mixed fuel is present in the entire fuel system. Failure to observe this can result in the unmixed fuel in the lines and fuel filter causing malfunctions.

Viscosity improvement additives have a positive effect on the low temperature characteristics of a number of diesel fuels. However, it is not possible to give any guarantee with this, because with some diesel fuels they have no effect or, when a number of unfavorable factors occur simultaneously, the low temperature characteristic can even be influenced negatively, particularly when diesel fuels with the optimum additives are already present (e.g. "-22 °C guarantee"). In such cases, we do not recommend subsequent addition of viscosity improvement additives.