

MIDEL Storage and Handling Guidance:

Synthetic Ester Fluids

Introduction

MIDEL 7131 is a very robust liquid, and studies have demonstrated its long-term stability, even at elevated temperatures. For years, it has been successfully used worldwide in breathing and sealed transformer systems. However, it is still necessary to take precautions when handling and storing MIDEL 7131 to ensure that it is kept in optimum condition.

Miscibility

Miscibility gives an indication of the compatibility between different liquids. MIDEL 7131 is fully miscible with transformer mineral oil, high molecular weight hydrocarbons and other transformer ester liquids. It is not miscible with Silicone oil. If unsure about the miscibility of a specific insulating liquid with MIDEL 7131, please contact M&I Materials for recommendations.

Receiving New MIDEL 7131

MIDEL 7131 can be delivered in 7 gallons (24.5kg) drums, 53 gallons (195kg) drums or 272 gallons (1000kg) IBC sealed containers; bulk tanker deliveries are available for > 5440 gallons (20 tonnes). Prior to filling the containers, the liquid is dried and degassed.

With the IBCs it is possible that users may notice a slight deformation of the containers. This is due to the degassed liquid absorbing the small amount of air in the headspace, thus creating a vacuum. This is perfectly normal and a good indication that the seal has not been compromised. In contrast 53 gallons (195kg) drums of MIDEL 7131 are not likely to deform. This lack of deformation does not mean that the drum seal has been compromised.

The vacuum seal in 272 gallons (1000kg) IBCs needs to be broken and the recommendation is to contact IBC supplier Schütz to obtain the correct lid removal tool (part no.16659).

It is recommended that MIDEL 7131 not be stored for a period greater than 6 months in the flexitanks but instead transferred to a suitable tanker truck or fixed storage tanks.

Storage

If properly stored indoor in temperature climate of - 40°C to + 40°C and away from direct exposure to sunlight, unopened containers of MIDELE 7131 have a shelf life of 10 years. Once opened, precautions should be taken to avoid contact with moist air for prolonged periods because the liquid is hygroscopic and will absorb atmospheric moisture. If a partially emptied container is used for storage the head space should ideally be backfilled with dry nitrogen or dry air prior to resealing. If this is not possible, then ensuring the lid is properly sealed will help keep the liquid dry.

It should be noted that MIDELE 7131 is a very robust dielectric liquid which has proven to give many years of service to the harshest of transformer applications and the shelf-life figure of 10 years is given as a guideline only. This is not a strict limitation on the length of time that MIDELE 7131 can be stored for and if stored beyond this time users can establish the suitability of the liquid for service by checking properties such as water content and breakdown voltage. It is fully expected that in a well-maintained transformer, the Midel liquid will provide many years of good dielectric performance, and that the length of the Midel working life is not limited to the stated shelf life.

If the liquid is kept in intermediate bulk containers the ideal location will be indoors to avoid extremes of temperature and exposure to the weather. Where outdoor storage is unavoidable exposure to direct sunlight should be prevented using a simple covering.

Storage tanks which are suitable for standard transformer mineral oil can be used for MIDELE 7131. It is recommended that the tank headspace has a dry nitrogen blanket to keep out moisture. If this is not possible then dry air should be used in the headspace and a suitable breather unit fitted to any vent system. If a silica gel breather is used to dry the headspace air, then this must be properly maintained to ensure that the liquid quality is preserved.

STORAGE TANK & TANKER TRUCK HANDLING

Cleaning:

For a storage tank or tanker truck previously filled with transformer mineral oil, it is recommended to thoroughly clean it before filling it with MIDELE 7131. If steam cleaning is performed, ensure that the storage tank or tanker truck is completely dry before filling it with MIDELE 7131. If MIDELE 7131 is used to flush remaining transformer

mineral oil from a storage tank or tanker truck then the user must ensure that a sufficient volume of MIDEAL 7131 is used to remove all residual transformer mineral oil. A rinse of MIDEAL 7131 of the bottom pipelines and valve and or pump on the storage tank or tanker truck system is also recommended.

Inspection:

The storage tanks and tanker trucks should be inspected to ensure that the tank is clean and free of contaminants. Contaminants may include but not limited to dust, paint, rust, fabrication debris, oil sludge or water. Inspection of MIDEAL 7131 should be done to similar methods as transformer mineral oil. Before filling the tanker, certificate of compliance by the supplier should be checked to make sure that MIDEAL 7131 meets all the specification requirements.

Headspace:

The headspace of the tank should ideally be filled with dry nitrogen or dry air. If this is not possible, then ensuring the valves are properly shut off and covered will help keep the liquid dry.

Unloading:

MIDEAL 7131 should be unloaded in similar method as transformer mineral oil but attention should be paid to the filters, pumps, valves, seals and hoses. Dedicated equipment for MIDEAL 7131 will yield optimal performance.

Filtration:

MIDEAL 7131 should be filtered before filling the tanker truck and after unloading it in the storage tank or in a transformer. The filters recommended for MIDEAL 7131 are 1 micron of a type suitable for use with transformer oil. A cartridge type filter with a synthetic filter medium may be used. If unsure about a particular filter, please contact M&I Materials for recommendation. A good general practice is to filter MIDEAL 7131 every time it is transferred.

Table 1 - Viscosity Values Versus Temperature

Temperature °C	Absolute Viscosity mPa s	Kinematic Viscosity mm ² /s
0	229	233
20	73	75
40	28	29
60	13	14

Data quoted above are typical values

Hoses, Seals, Pumps and Valves:

All the hoses, seals, pumps and valves should be compatible with MIDEL 7131.

The recommended hoses to use for pumping MIDEL 7131 are: Goodyear SAE J30R3 (Inner only compatible), Gates Premoflex, Trelleborg Chemikler D-UPE (Inner only compatible). If the user is interested in using any other hoses, please contact M&I Materials to check for compatibility prior to use.

The seals recommended for use with MIDEL 7131 are: Nitrile Rubber (BS2751), Silicone Rubber, Polyurethane Rubber, Fluorocarbon Rubber (Viton), PTFE (Teflon), Nylon and Fluorosilicone. If the user is interested in using any other seals, please contact M&I Materials to check for compatibility prior to use.

Valves suitable for use with transformer mineral oil should be suitable for use with MIDEL 7131. If unsure about a particular valve, please contact M&I Materials. Any power take-off (PTO) pump attached to the tanker truck or any auxiliary pump that is suitable for operation with transformer mineral oil may be suitable for MIDEL 7131.

The viscosity of MIDEL 7131 is slightly higher than transformer mineral oil at ambient temperatures and this must be taken into account when specifying pumping systems. A higher capacity pump will be needed to maintain the same flow rate as transformer mineral oil at a given temperature. Table 1 shows viscosity values versus temperature for reference.

As with any dielectric liquid there is a possibility of static charge build up when MIDEL 7131 is flowing through the pipes. The user should ensure that all pumps, lines and vessels are adequately bonded and earthed during pumping operations.

It is highly recommended to have dedicated hoses and pumps for MIDEL 7131. This will prevent cross-contamination. In the case where same hoses and pumps are used

for transformer mineral oil and MIDELE 7131, it is recommended to thoroughly flush the hoses and pumps with MIDELE 7131 prior to use and to discard the liquid used for flushing.

Transformer Filling and Cellulose Impregnation

To avoid air entrapment in the transformer cellulose the tank should be filled from the bottom or if possible, under vacuum.

In order to aid impregnation of the cellulose it is recommended that MIDELE 7131 be heated to approximately 60°C when filling. At 60°C the viscosity of the liquid is very close to that of transformer mineral oil at 20°C, and a similar impregnation rate has been observed in laboratory testing. It is further recommended that the transformer is filled slowly to aid impregnation and left for at least 24 hours prior to energising for the first time.

Throughout all stages of the filling operation, it is essential that the introduction of moisture or particulate matter be avoided. The outlet side of any pump used during filling should be protected by a fine mesh or paper element filter. The use of degassing and vacuum filling is possible with MIDELE 7131, using the same type of equipment and methods employed with transformer mineral oil.

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