

Compressor oils

What you need to know about DENSO compressor oils!

Part 3 Storage & Handling

In the first publication we have explained the basic differences between DENSO ND-oils and (ordinary) PAG oils. In the second part we have more deeply explained the properties of ND-oils against ordinary PAG oils and in this bulletin we explain how to store and handle the Denso ND oils.

This time we will also include ND-oil 11, which is used in the DENSO electric driven Scroll compressors.

DND08250	DND12250	DND11250
ND-OIL 8 R134A	ND-OIL 12 R134A & R1234YF	ND-OIL 11 R134A & R1234YF
		

ND-oil 11

ND-oil 11 is a so called Polyol Ester Oil. (POE oil) ND-oil 11 is used in the DENSO electric driven scroll compressors, because POE oils have a very high isolation resistance. POE oil is less hygroscopic, compared with PAG oils. However, POE- and PAG oil react differently on water ingress. PAGs are hygroscopic and therefore absorb water from their environment, and they have high water saturation points. Hence this ingressed water hydrogen bonds directly to the PAG molecules without causing a chemical reaction. This hydrogen-bonding prevents water from freely existing in the system and reacting with system components, so the bonded water molecules will not contribute to problems such as metal corrosion. The same cannot be said of POEs. As water inevitably ingresses into the system, POEs are likely to undergo a reverse esterification reaction, like any other ester. This reverse esterification reduces the POE back into its constituent acidic and alcoholic components, which then go on to attack metallic and rubber components, causing corrosion. Furthermore, these contaminants are particularly disadvantageous in new R1234yf systems because of the instability of the refrigerant. The alcoholic and, most notably, the acidic contaminants further chemically destabilize the R1234yf in the system, with predictable consequences to system stability and lifespan.

Storage

Denso ND-oils are only sold in steel cans, with steel caps, to prevent moisture ingress. ND-oils needs to be stored in a dry place. Immediately close the cans after use, to reduce moisture ingress to a minimum.

Shelf life

Compressor oils in general have a limited shelf live. The shelf life for DENSO ND-oils is,

SHELF LIFE: 36 MONTHS



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SHELF LIFE: 36 MONTHS



Expiry date is printed on the label of the cans

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Production code is printed on the bottom of the can

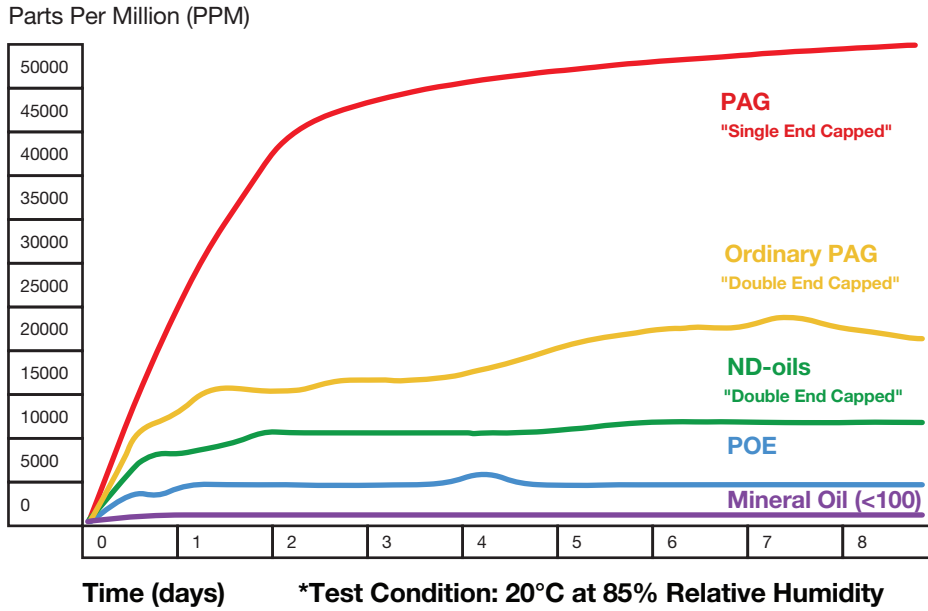
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Ordinary filling bar

Most A/C refilling machines are using plastic bottles for fresh oil, old oil and UV-Dye. The problem is that most of those plastic bottles have a connection to the open air, which causes the oil to absorb moisture and age faster. In the diagram you can clearly see what the effect is on the moisture content of the oils after .. days. The maximum moisture content is 800 ppm.

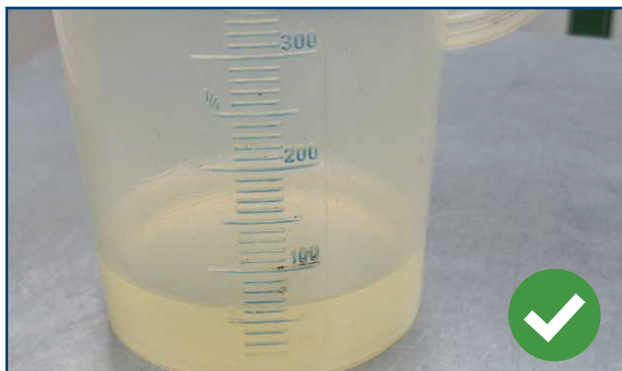
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Handling the oils



ND-oil: Clear & Transparent



ND-oil: saturated with moisture

To keep the moisture level as low as possible, it is important to refresh the oil on a daily basis and clean the fresh oil container thoroughly, before adding new oil. The oil film inside the fresh oil container contains a lot of moisture, so cleaning before topping up is important. Compressor oil which looks like brandy is saturated with moisture. When the refilling machine is “parked” in the corner of the workshop, after the A/C season is finished, don't forget to empty and clean the oil bottles.



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Oil type?



Which oil type is used in the fresh oil bottle of the machine?

Another important thing is that in many cases there is no indication of which type of oil is used in the plastic bottle for fresh oil. This easily can lead to mistakes with filling oil in the A/C system. Especially when hybrid or electric vehicles are also serviced with the same machine.

Oil feed system for A/C refilling machines

A producer of A/C refilling machines offers their so called “moisture free oil feed system” to the market. In this patented oil feed system it is impossible that moisture is entering the oil during daily operation of the machine. In this way it is also clear which oil type is used during service, as it is indicated on the laminated cans.



Moisture free oil feed system



Laminated cans



Oil type printed on can

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Copper plating

Copper plating is a condition in which metal parts in the compressor become coated / plated with copper. This condition is often observed in compressors which have a high moisture content in the A/C system.

One possible cause of copper plating is that as moisture (water) combines with the refrigerant, it forms an acidic solution; this chemical may then dissolve or leach copper from other components in the A/C system which are copper or contain copper-based alloys such as brass or bronze. The method by which the copper is deposited on metallic parts of the compressor (i.e. Races, Bearings, Centering ball, Fixed gear etc) is not known for certain, but this occurrence would have to be facilitated by the circulation of refrigerant, oil and moisture in the A/C system. Although copper plating alone does not cause a specific failure of the compressor, the conditions under which it is likely to occur are very detrimental to compressor durability.

Moisture Contamination occurs as a result of moisture being allowed to enter and remain in the A/C System. This condition can be caused by the following:

- > System leaks
- > Improper Vacuuming of A/C system
- > Contaminated system components
- > Contaminated refrigerant and / or oil
- > Use of cheap imitation oils
- > Saturated or malfunctioning receiver dryer

Copper and / or brass A/C components, like evaporators and tubing can mainly be found in bus or agricultural applications.



Conclusion

After reading this bulletin, you could have the impression that ND-oil 11 (POE oil) is of a lower quality than ND-oil 8 and ND-oil 12 (PAG oil). This is certainly not the case. All three oil types meet the high quality requirements of DENSO. As explained earlier, a POE oil is used for its high insulation property, because the electric motor of the E-compressor is cooled with a mix of refrigerant and (POE) oil. Moisture ingress will greatly reduce this high insulation property of the oil. For this reason a POE oil requires even a better care during storage and handling than their stablemates ND-oil 8 & ND-oil 12. In particular in combination with R1234yf type refrigerant as this type of refrigerant is less chemically stable.

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