SERVICE BULLETIN

Title: 19XL Oil
Models Affected: 19XL

Number: C9410
Date: 11/10/94
Supersedes:
Date:

File: Installation-Startup-Operation

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Situation:

The 19XL Start-up, Operation and Maintenance manuals, both 19XL-1SS and 19XL-2SS, have an error regarding the oil specification allowed in the compressors that use HCFC-22 as the refrigerant. The only approved oil for use in 19XL, HCFC-22 machines is an Alkyl-Benzene based oil, Carrier part number PP23BZ101. The polyolester (POE) based oil is only recommended in machines with HFC-134a, and must not be used in machines containing HCFC-22.

From about 5/93 to 11/14/94 POE was used to run in all compressors in the factory and then was drained. In some cases the amount of residual POE is too high.

Whenever an oil analysis is performed on a 19XL with HCFC-22 from this time period, it is advisable to test for the percentage of POE in the oil sample. HCFC-22 machines should have the complete oil charge and filter changed if the oil sample analysis indicates that the oil sample contains more than 5% POE.

It is further recommended that all HCFC-22 19XL machines that have not been commissioned and were built before Week 46 of 1994 (Nov. 14) be analyzed for POE content in the oil before the machine has been started.

Field Measurement Of POE Percentage In Alkylbenzene Oil

Forward:

Polyol ester (POE) lubricants have been measured in machines that are supposed to contain alkylbenzene based oil. This document contains information on how to measure the degree of contami-

nation on any particular compressor oil sample. This test method is also good for the measurement of mineral oil mixed with POE oils and any other oil mixtures.

Background:

Alkylbenzene lubricants are used (in general) primarily with refrigerants which do not have good miscibility with mineral oil, such as HCFC-22 on the 19XL. This oil is not miscible with R-134a.

Polyol ester lubricants were developed to be miscible with HFC-134a and other new refrigerants. Polyol ester oils are not acceptable for 19XLs with HCFC-22 because the oil entrains too much refrigerant.

Determining Residual POE Oil In Alkylbenzene Oil Using Refractive Index:

General Procedure:

Obtain a small amount (as little as 1 teaspoon, 5mL) of new alkylbenzene oil. Label this "new oil".

Take a sample of oil (the same amount as noted above) from the compressor. Label this sample "used oil". Treat this according to **Sample Preparation** below.

Obtain a sample of new POE oil and label "POE oil".

Sample Preparation:

Incorrect (low) readings on a refractometer will result if refrigerant contaminates the oil. Therefore, it is important to remove as much refrigerant as possible from the oil sample. This is easiest to do by heating and agitating the sample. No specific method is recommended. In the laboratory, essen-

tially all of the refrigerant is removed by heating the sample on a hot plate for several hours. In the field, refrigerant removal may be accomplished by placing an open container of the oil sample (such as a small jar, beaker, or test tube) in hot water while agitating it for several minutes or longer. The smaller the sample used, the easier it will be to remove the refrigerant. Also, spreading the sample out so that it will have a large exposed surface area will help. Only a drop or two is required for each measurement on the refractometer, so a teaspoon (5mL) or less should be prepared for analysis. Treat each sample which has been exposed to refrigerant the same way.

Using A Refractometer:

The refractometer should measure refractive index (RI) in the range of 1.435 to 1.520. Below is an instruction manual for the Atago N3000, a hand-held model. This is available for about $250.00 (U.S.) from:

Cole-Parmer Instrument Co.

7425 N. Oak Park Avenue

Niles, IL. 60714

Phone # (800) 323-4340 Catalog # G-02940-10

This procedure assumes the use of this or a similar refractometer. Refer to your particular refractometer manual for more information.

- Open the cover plate. Make sure the prism is clean.
- Apply one or two drops of the sample on the prism. The sample should cover the surface of the prism. An eye dropper (pipette) or a small spatula will work. Do not scratch the surface of the prism.
- Close the cover plate, then raise and lower the cover several times. This serves to help to remove any remaining refrigerant from the sample.
- Inspect the sample through the cover plate. There should be no bubbles present, which will interfere with the readings.
- Point the end of the refractometer toward a bright light. Look through the eyepiece. Turn the ring around the eyepiece to focus the scale.
- The field of vision will be divided into a light (upper) and a dark (lower) portion. Read the scale where it intersects the boundary line. Try to read to the nearest 0.005 value (estimate the last digit). This is the refractive index. Record this value.
- Open the cover plate. Wipe the prism clean with a damp tissue or lens cleaning cloth. Do not scratch the prism. Usually solvents are not needed to clean the refractometer.

Determining Residual POE In Alkylbenzene:

Measure the refractive index of three oil samples:

- New oil (alkylbenzene)
- Old oil (in compressor now)
- POE oil (new POE oil)

The same person should take all the readings.

The samples should be at room (ambient) temperature.

The refractive index reading is influenced by temperature. The effect of temperature can be removed by taking all three samples at the same time (and therefore the same temperature). If possible, avoid using the refractometer in very hot or very cold environments.

Calculation:

$$\%\ POE = \frac{(NEW\text{-}OLD)}{(NEW\text{-}POE)} \times 100$$

OLD = Oil sample that you are measuring for % POE

NEW = New AlkylBenzene oil sample

POE = New POE oil sample

Typical Questions Answered:

What Is The Accuracy Of This Method?

Under the very best conditions, you should be accurate to within 5%. The accuracy depends on many factors such as refrigerant contained in the sample, the index readings from the POE and alkylbenzene standard samples, and accuracy in reading the scale.

What Is The Effect Of Water And Other Contaminants?

We have found water contamination to have very little effect on the refractive index. Work by a lubricant company showed that contamination by metal particles did not have a large effect on the index. We do know that refrigerant contamination has a very large effect.

What Kind Of Light Should I Use With The Refractometer?

Either natural or artificial light will work. Try to use the same light source for all three of your measurements. In a dark situation, a flashlight should work well.

What If The Scale Is Blurry, Or The Boundary Line Is Blurry?

This may be because of refrigerant trapped in the oil sample, and it is coming out. Make sure you have properly degassed the sample. Try cleaning the prism and start over.

Can I Use The Method For Finding The Percent Mineral Oil In POE?

Yes, and because the index differences in these two oils are wider, the percent of accuracy is better. The calculation is as follows:

$$\%\ MINERAL\ OIL = \frac{(FLUSH\text{-}NEW)}{(OLD\text{-}NEW)} \times 100$$

FLUSH = Sample of oil from the compressor you are measuring.

NEW = New POE oil sample.

OLD = New or original mineral oil sample.

Can I Use The Same POE Index For Different Machines At Different Sights?

As long as you are using the same POE oil, you can use the same sample of POE oil to get the refractive index for different machines, however, make sure to re-measure the refractive index of the oil at each location to account for ambient temperature changes.

Do All POE's Have The Same Refractive Index?

No. Different brand names and viscosities will have different RIs. Typical values for these kinds of oil are:

- POE = around 1.45
- Alkylbenzene = around 1.48
- Mineral Oil around 1.50

What If I Get A Negative Amount Of POE Percent?

This usually means that you did not remove enough refrigerant from your sample. Also, if you have a very low percentage of POE in your system, you may calculate a percentage of zero or slightly below.

Are There Any Other Ways To Measure The Percent POE?

There are no kits to measure POE percentage in alkylbenzene, however there are kits for measuring % mineral oil in POE oil.

Many oil analysis laboratories may have the capability of measuring the percent POE in the alkylbenzene, as long as you can supply them with the three oil samples mentioned above.