

NAVISTAR, INC.		
CEMS (CORPORATE ENGINEERING MATERIAL SPECIFICATION)		NUMBER: CEMS BT-39
TITLE: Determination Of Nonabsorbable Gas In Air Conditioner Refrigerant		CURRENT ISSUE DATE: August 2009
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1.0 SCOPE

This is a method for determining the volume percentage of nonabsorbable gas in air conditioner refrigerant. (This method adapted from "Determination of Nonabsorbable Gas in Fluorocarbon Products", DuPont Test Method B-38.)

2.0 APPARATUS

- 2.1 Special absorption vessel, No. LG-11119, available from Labglass, Inc., Northwest Boulevard, Vineland, NJ 08360. (See Figure 1, page 4.)
- 2.2 250 milliliter leveling bulb.
- 2.3 Glass tee.
- 2.4 Pinch clamp.

3.0 MATERIAL

- 3.1 Distilled water.
- 3.2 Tygon tubing.
- 3.3 Reagent grade perchloroethylene (tetrachloroethylene).
- 3.4 "Siliclad" (silicone concentrate) obtainable from the Scientific Glass Apparatus Company, Inc., 737 Broad Street, Bloomfield, NJ 07003. **CAUTION: Perchloroethylene is toxic and Siliclad is both toxic and flammable. These materials must be used in adequate ventilation.**

4.0 PROCEDURE

- 4.1 Prepare the special absorption vessel as follows:
 - 4.1.1 wash the vessel in soap and water, and rinse in clear distilled water;
 - 4.1.2 prepare a solution of one part by volume "Siliclad" to 100 parts by volume distilled water;
 - 4.1.3 swirl the "Siliclad" solution inside the absorption vessel, completely coating the inner surfaces, allow to stand for at least 5 minutes, and then discard the excess solution;
 - 4.1.4 rinse the vessel with clear distilled water and dry at $212 \pm 3^{\circ}\text{F}$ ($100 \pm 1^{\circ}\text{C}$) for at least ten minutes;
 - 4.1.5 the absorption vessel must be re-treated in the foregoing manner when water begins to form droplets instead of a thin film on the vessel walls.

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4.2 After cooling the vessel, attach it to the leveling bulb with tubing. Add 20 to 25 milliliters of distilled water to the bulb and allow it to flow into the vessel. Fill the bulb and vessel with enough perchloroethylene previously saturated with both air and water to force the water in the vessel into the stopcock stem. Make certain that the water level reaches the top of the stopcock stem. Saturated perchloroethylene may be made by bubbling undried air through it.

4.3 Add sufficient water to the leveling bulb to form a water seal in the bulb, also. See Figure 2, page 5.

4.4 Attach the absorption vessel-leveling bulb combination and the glass tee-pinch clamp combination to the sampling source with Tygon tubing as shown in Figure 2, page 5.

4.5 Close the stopcock on the absorption vessel, open the pinch clamp and purge the lines to remove residual air. Purging must be done with the sample container inverted; also, purging must be conducted at a rate slow enough to prevent the introduction of liquid refrigerant into the connecting tube.

4.6 Close the pinch clamp and then close the valve on the sample source. Return the sample container to the upright position. Open the stopcock on the absorption vessel, and then open and adjust the valve on the sample source until the flow of gas is barely detectable. Care must be taken to avoid breaking the water seal when introducing the sample.

4.7 Allow the vapor to displace the fluid in the absorption vessel to a volume slightly greater than 100 milliliters. Close the sampling valve and the stopcock, and detach the absorption vessel-leveling bulb combination from the system.

4.8 Adjust the volume of the sample to 100 ± 1.0 milliliters by quickly turning the stopcock to vent excess sample. This should be done under a slight positive pressure to avoid the entry of extraneous air. Positive pressure can be maintained by keeping the sample vessel slightly below the leveling bulb. Close the stopcock after adjusting the volume to 100 ± 1.0 milliliters.

4.9 Tilt the vessel in such a way as to remove all of the water separating the perchloroethylene and refrigerant gas. See Figure 3, page 6. Do not allow any gas to escape into the lower chamber of the absorption vessel.

4.10 Allow the perchloroethylene to flow into the upper chamber and gently agitate the vessel to aid in the absorption of the sample gas.

4.11 After 80 to 90 percent of the gas has been absorbed, shake vigorously for 15 to 30 seconds.

4.12 Return the absorption vessel to an upright position and adjust the height of the absorption vessel and the leveling bulb until both upper water layers are at the same level.

4.13 Read and record the volume of the vapor remaining in the absorption vessel to ± 0.1 milliliter.

4.14 Open the stopcock and vent the remaining vapors.

4.15 Reconnect the absorption vessel-leveling bulb combination to the glass tee-pinch clamp-sampling source system.

4.16 Repeat steps **4.5** through **4.14**, (pages 1 and above), except that in step **4.6** do not return the sample container to an upright position, i.e., draw this sample from the liquid phase in the container. This second run is to compensate for the air introduced by dissolution of the air that was in the air-saturated perchloroethylene.

4.17 Approximately 35 analyses can be performed with each charge of perchloroethylene; at that point, it should be replaced with freshly saturated perchloroethylene.

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