TOTAL SYSTEM PROTECTION

1 Monitor Acid Levels of Refrigeration Systems

Phase III® Refrigeration Oil Acid Test Kit

2 FLUSH and CLEAN Refrigeration Systems after Burnouts or for R-410A Line-set Conversions

Rx11-Flush®

3 Protect Refrigeration Systems from Acid Contamination and Burnouts

Rx-Acid Scavenger®

Nu-Calgon
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Air conditioning, refrigeration compressor

The compressor is considered to be the heart of a refrigeration system. And despite the great care taken during its manufacture and installation, compressors do fail occasionally, even under ideal operating conditions. Examination of many compressors and the oil taken from their systems indicates that the oil or refrigerant are often affected by an abnormal condition somewhere in the system, causing the formation of contaminants. As more contaminants are formed, a burnout is inevitable if these contaminants are not removed.

Compressor burnouts can be divided into at least three broad categories: contamination failures, electrical failures and seizure failures. Electric failures are those which can be traced to electrical malfunctions such as short circuits which cause hot spots in the system. The excessively high temperatures associated with these hot spots can be enough to cause the oil to begin breaking down.

Seizure failures can be caused by copper plating, metal particles or sludge. Sludge formations require the motor and compressor to operate under a heavier load. This generates more heat leading to further oil breakdown, more sludge formation and, eventually complete failure or burnout.

Contamination failures usually result from incomplete de-aeration and/or drying of the system. In fact, the presence of moisture and non-condensables (such as air) have been found to be the prime sources behind failures caused by contamination. For example, chlorine and fluorine (from the refrigerant) and moisture can combine to form acid (hydrochloric or hydrofluoric) which leads to further degradation and burnouts.

Whether it is clean up after a burnout, or regular maintenance, component change out or retrofitting (i.e. R-22 to R410A), Nu-Calgon's Total System Protection™ offers the tools and procedures to adequately maintain the refrigeration system.

1

Detection of Acid

Of all the factors contributing to oil breakdown and eventual compressor burnouts, moisture seems to be a contributing factor in all three categories discussed above. Since moisture will, under most conditions, form highly corrosive acids which are readily absorbed in the oil, the acid content of the oil can be a good indication of the health of the compressor system. This is especially true because the oil necessarily migrates with the refrigerant throughout the entire system.

In addressing this situation, the technician's refrigeration oil acid test kit has become indispensable, and Nu-Calgon's Phase III® Refrigeration Oil Acid Test Kit is the most reliable test kit available.

PART NUMBER: 4320-W8

ADVANTAGES

- Simple – Phase separation makes it easy to see color changes in acid indicator.
- Universal – Works with mineral oil, alkylbenzenes and POE's.
- Convenient – Only two bottles to work with.
- Precise – PHASE III is highly accurate service tool that can save expensive compressor repair and replacement costs.
- Unique packaging – Both vials are made with a highly specialized boro-silicate glass that protects the integrity of the reagents.
- Effective in the presence of dyes - Many systems will contain dyes, such as fluorescent colored dyes, for leak detection purposes. These dyes render most acid test kits useless; not PHASE III. Because of its phase separation, PHASE III makes it easy to test such systems.

APPLICATION

The concentration of acid in refrigeration oil is expressed as an acid number in mg (milligrams) of acid. Generally, it is an industry standard that total acid number (or TAN) at or below 0.05 mg is considered safe for mineral oil or alkylbenzene systems. For POE's, the generally accepted maximum is 0.16 mg, although some industry experts consider numbers as high as 0.21 mg as marginally safe.

In the PHASE III test, an acid number of 0.05 mg per gram of oil has been set as the maximum acceptable acid concentration in mineral oil and alkylbenzene oil. In polyol esters, the number is 0.16 mg. Mineral and alkylbenzene oils with an acid number less than 0.05 mg or POE's with an acid number less than 0.16 mg are acceptable and will cause no change in the color of the test kits acid indicator. However, if the respective oils have an acid number greater than these limits, it will cause the acid indicator to change from purple to pink or clear indicating that the oil is contaminated.

2 System flushing after burnouts, retrofits or component change outs

As discussed earlier, refrigeration and air conditioning systems suffer failures that result in contamination. The most common such failure is a compressor burnout, although contaminants can also form as the result of electrical failures, moisture ingress, etc. During such an event, the refrigeration system becomes contaminated with large quantities of disintegrating particulate, sludge, acids, carbon residues, and moisture. All of these contaminants must be removed before the system is returned to duty.

At the same time, flushing can become necessary when changing out components, or when retrofitting (i.e. R-22 to R-410A). In these instances, various levels of flushing may be necessary, from flushing the entire system to flushing line sets.

For all of these flushing requirements, Nu-Calgon has developed Rx11-Flush®. Used exactly like the old R-11 flushing process, Rx11 is strong enough to rinse away particulate, sludge, carbon residues, acids, oils and water. It enhances system service and avoids the need for time-consuming repeat visits. It should become an integral part of standard procedures for any major system repair, oil change-out or retrofit.

Packaging

Starter Kit:	**4300-08**
1 lb. Canister:	**4300-09 (flushes 3-4 tons)**
“2+1” Display Pack:	**4300-10 (flushes 14 tons)**
2 lb. Canister:	**4300-11 (flushes 5-7 tons)**
13 lb. Cylinder:	**4300-15 (flushes up to 50 tons)**
26 lb. Cylinder:	**4300-26 (flushes over 50 tons)**
19.5 oz. Liquid:	**4300-30**
Liquid Starter Kit:	**4300-38**
Flushing Tool:	**4300-50**
Rx11-flush Gun:	**4300-51**
Rx11-flush Hose (24″):	**4300-52**
Injection Valve:	**4300-89**

ADVANTAGES

- Safe, nontoxic and nonflammable
- Used the same way as R-11
- Low boiling point enhances complete evaporation
- Cleaning is fast, efficient and verifiable
- Can be used for new system cleaning or retrofits
- Modern packaging minimized solvent exposure to hands, eyes and lungs
- The solvent is approved as part of the U.S. EPA’s Significant New Alternatives Program (SNAP)

APPLICATION

Based on new and patented HFC solvents developed by Dupont, Rx11-flush is ozone-safe, non-toxic, nonflammable and compatible with most materials in a refrigeration system. The cleaner itself has excellent solvency characteristics, and it is packaged in a convenient pressurized container, sufficient to purge a moderately contaminated five to seven ton air conditioning or refrigeration system.

Rx11-Flush is a totally new chemical formulation based on new HFC technologies. It is a powerful cleaner, stronger than R-11 ever was, and it is the best prescription to effectively scrub the inside of the refrigeration system. It dries quickly, has a low boiling point, has no aroma, will not attack components, offers great worker safety ratings and is affordably priced. Rx11-Flush is the industry’s best answer for major system overhauls.

3 Neutralization of possible acid contamination is good insurance against future problems

Acid in refrigeration systems can be the result of either simple moisture ingress or one of the after effects of a burnout. When moisture enters the system, it can form highly corrosive acids that are ultimately absorbed by the oil. In addition, burnouts can result in the same organic acids, hydrochloric and hydrofluoric, if the refrigerant breaks down.

These acids can attack metal, and they can even go after the welded connections embedded in glass. Hydrofluoric acid is the most aggressive on glass. The acids can also react with the oil and system metals, causing metal salts or oxides; they can also degrade motor insulation.

Rx-Acid Scavenger™ was developed to specifically "scavenge" and neutralize such acids. Based upon newer carbidimide chemistry, it allows for use with all oils; mineral, alkylbenzenes and POE. Less is required per gallon of system oil as compared to current market competitors.

4301-02 4301-05 4301-06

Universal Treatment Injector
4779-0

ADVANTAGES

- Easy-to-use snip spout
- Use Rx-Acid Scavenger after burnouts or for system maintenance
- Use with all oil; mineral, alkylbenzene or POE
- Use one 2 fl. oz. bottle per gallon of system oil, the lowest treatment requirement of all industry neutralizers
- Eliminate acid build-up
- Protect against future acid contamination
- Prevent compressor burnout
- Protect reclaim equipment

APPLICATION

Formulated as a hydrolytic stabilizer or "acid scavenger" for lubricants. It is considered a more stable and compatible acid reactant. As formulated, Rx-Acid Scavenger can bind and neutralize both organic and inorganic acids, although organic acids are the most typical for refrigeration systems.

The two most prominent benefits are its ability to be used with all three industry lubricants and its "low treat" feature that requires only 2 fl. oz. of product per gallon of oil. Because it can be used with all oils, only one neutralizer product is needed for all applications, one product on the shelf, one product in the truck and one in the tool box. Because of its "low treat" feature, less matter must be added to a system in neutralizing acid. There is up to 50% less than used by all industry competitors. This becomes significant on rack systems and other large system applications.

Total System Protection

Before installing this new compressor, it is recommended that the system be....

- ✔ Flushed and cleaned with Rx11-flush
- ✔ Acid-checked with the Phase III Refrigeration Oil Acid Test Kit
- ✔ Protected with Rx-Acid Scavenger

Use the Total System Protection sticker for notification on equipment and applications where these products should be used.

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