



## **Compatibility with Rubber & Plastic**

It's quite important in practice application whether the refrigerant reacts to other materials in the refrigerating circuit. Refrigerant will contact the copper, steel, refrigeration oil, spacer and the insulating layer of the electric motor, so it should be carefully confirmed the compatibility of these materials with refrigerant. Additionally, foreign materials should also be taken into consideration, such as moisture.

One of the key advantages of CFC refrigerant is that it's stable and not easy to react, which could reduce the compatibility with other materials. Unfortunately, its inherent stability and long atmospheric lifetime is the reasons why it's eliminated. Usually requirements for the materials' compatibility will increase when environmental refrigerants are used.

### **1. Compatibility with Machine Winding**

Closed-type electric motor is used in many compressors, directly contacting the refrigerant which is used for cooling effect. Refrigerant and the insulating layer interact each other for the refrigerant can extract polymers from the insulating layer or the latter can absorb the former. The insulating layer will embrittle, layer and degenerate in other aspects when the polymers are extracted. Then the electric motor will stop working because of those above changes. Additionally, the extracted polymer will deposit in other places of the refrigerating system and make the flow sticky or cause block.

The dielectric strength and physical behavior will weaken if the refrigerant is absorbed by the insulating layer. When the machine winding gets hot, the rapid release of refrigerant will lead the insulating layer to blister, and then the winding will stop working untimely.

We should carefully consider the insulation of the electric motor based on the refrigerant; besides, special attention should be paid on the compatibility of the insulating materials and new refrigerant when refrigerant is changed.

### **2. Compatibility with Rubber & Plastic**

Spacer and O-ring might be made by rubber. Refrigerant, refrigeration oil or the mixture of the two materials could extract the rubber constituent, resulting in some adverse changes in the rubber properties. The shrink or swell of the rubber will make the spacer cease to be effective. Some neoprene rubbers will shrink in the HFC refrigerant while the nitrile rubber will swell when it contacts R-123. The influence of refrigerant to plastic will decrease with the fluorine contained in the refrigerant reducing.

### **3. Compatibility with Metal**

Hydrocarbon refrigerants are usually stable when they contact metals. However, refrigerant

will react to metals under some extreme conditions, such as extremely hot condition. ANSI/ASHRAE standard 97 provides a kind of material compatibility accelerated life test method via improving the temperature. Test is conducted for R-12, R-500, R-123, R-134a and copper, steel, aluminum as well as SUNISO 4GS in Imagination Resources Inc., according to the standard 97, and it turns out that only R-123 shows signs of incompatibility. Halogenated hydrocarbon refrigerant will form acidic material if it contains water, which will corrode the metal. Mixture of halogenated hydrocarbon refrigerant with oil can dissolve copper, deposit in the high-temperature steel parts and form a layer of copper film, which is called copper plating.