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How to Avoid Mixing Recovered Refrigerants

As the number and diversity of refrigerant products on the market continues to grow, the occurrence of refrigerant mixing or contamination becomes more likely. When more mixed refrigerant is returned to reclaimers, there is an increased burden of removing impurities or separating mixtures that can add to the cost of refrigerant reclaiming operations. In many cases, the contamination of recovered refrigerant is avoidable if a few best practices are followed during service and recovery.

RECOVERED REFRIGERANT THAT IS DETERMINED TO BE OUT OF SPECIFICATION GENERALLY FALLS INTO ONE OF TWO CATEGORIES:

1. Intentional mixing of 2 or more different refrigerants that are not supposed to be mixed together, resulting in a product that is not close to specification.
2. Predominantly one refrigerant that is contaminated with some amount of another refrigerant that makes it slightly out of specification.

Case 1: An obvious suggestion is to avoid mixing different types of refrigerant in the same recovery cylinder. Unintentional mixing can certainly occur when systems or previously filled recovery cylinders are not labeled correctly. It is practically impossible to identify a single component refrigerant or refrigerant blend by pressure alone, even though a check of the pressure of a refrigerant against the PT chart will give some clue to its possible identity. For example, a container may have a pressure similar to R-22, but there are several retrofit blends that may also have a similar pressure. The exception might be R-410A, which should actually be pretty easy to identify based on the fact that its pressure is significantly higher than other refrigerants.

If you are not sure of the identity of a refrigerant — put it into a clean, empty recovery cylinder. Do not combine an unknown refrigerant with previously recovered refrigerant that you know is not out of specification. If a system is not labeled or reliable service records are not available to positively identify the refrigerant in question, then a sample of the refrigerant must be analyzed by a certified laboratory. Federal regulations require that containers of hazardous materials be labeled with their chemical name and CAS number. In addition, TC prohibits the transportation of hazardous materials without proper identification of the contents of the cylinder as well as a green nonflammable gas label. Finally, since equipment owners are required to maintain records related to service or disposal of their HVAC/R equipment, and technicians or service companies are the source for this documentation, proper identification of cylinder contents are the key to compliance with these record keeping requirements.

Case 2: Cross contamination between types of refrigerants you encounter every day can be enough to throw a recovery tank out of spec. While it would be ideal to have refrigerant-specific dedicated hoses, gauges and recovery equipment for each of the products you handle, it may not be practical. This makes it very important to properly purge, clean, or evacuate refrigerant tools every time they are used for a different product.

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Ask the Expert

Questions & Answers regarding refrigerants, lubricants, chemicals, or regulations.

How can I check in the field if I have a problem with the purity of my refrigerant?

As far as moisture and acidity are concerned, there are a few products that are designed to tell if the refrigerant is "good" or "bad." Sight glass moisture indicators are one example of a tool that can be used to tell if the refrigerant is relatively dry. Sight glasses are calibrated typically around 35 ppm moisture, so it will not tell you exactly how much you have if it is higher than that, but it will certainly tell you that you shouldn't have a problem if the indicator stays green. There are also several acid indicators that are designed to change color when a small amount of acidic refrigerant is vented through them. If there is no color change, there shouldn't be any acid, but a color change does not necessarily tell you how much acid is present.

There is no reliable way to field check for refrigerant purity or correct composition of a blend. Although there are some small refrigerant analyzers on the market, they are somewhat expensive and will not tell you the exact composition of an unknown mixture of refrigerants. They are pretty good, however, at telling if your known refrigerant is relatively pure. However, the results are not absolute and the analyzer must be used properly, maintained, and calibrated to be reliable.

The most accurate way to tell the condition of refrigerant is to take a sample and send it in to a laboratory for analysis. An AHRI certified lab can report the exact values for moisture, acidity, non-condensables, residual oil, and composition/purity. You will have to consider the cost of the test compared to the amount of refrigerant you are testing, and the potential cost for disposal of the refrigerant if the analysis indicates there is a problem with the refrigerant that a reclaimer cannot resolve at an economical price. For example, it might not make much sense to send in a 1 lb sample to determine the purity of a 5 lb air conditioner charge. It would make a lot of sense, however, to test a 1 lb sample from 2500 lbs of refrigerant recovered from a refrigeration system or chiller. Keep in mind that even if you are sending the recovered refrigerant to a certified reclaimer, the reclaimer will rely on their own testing of the recovered refrigerant when determining acceptance or possible handling or disposal fees.

Mixing refrigerants is not good practice because there are no Pressure-Temperature charts for mixed refrigerants. This can make it difficult to check proper system operation or set expansion valve superheat. Sometimes the best solution is to replace the refrigerant charge to make sure you have the right product in the system.

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To put the problem in perspective, **Table 1** shows how much of a different refrigerant it would take to throw the composition of an AHRI700 pure refrigerant below 98% purity.

Consider another example of how easy it is to contaminate refrigerant: an air conditioner that is charged with 6 lbs of R-22 only needs 2 ounces of another refrigerant to be swept out of a contaminated hose to put it below 98%. It is entirely possible that a hose or gauge set could contain this much refrigerant if not purged properly after an R-410A job or a refrigeration service call that used another refrigerant.

TABLE 1: **How much contamination makes a cylinder out-of-spec?**

AMOUNT OF AHRI700 PURE REFRIGERANT IN CYLINDER	AMOUNT OF DIFFERENT TYPE REFRIGERANT ADDED
10 lb	2.4 oz
20 lb	4.8 oz
30 lb	7.2 oz
40 lb	9.6 oz
50 lb	12 oz (3/4 lb)

Best Recovery & Service Practices:

- **Use dedicated recovery equipment** that is separate from normal service or charging equipment.
- **Purge or evacuate hoses and gauges prior to using them with a different refrigerant.** Use the purge cycle on recovery machines to remove residual refrigerant contained in the machine components. Hoses with low loss fittings or valves can contain a considerable amount of liquid refrigerant. Make sure they are safely emptied.
- **Evacuate all recovery cylinders to 29" Hg prior to recovering refrigerant into them.** Immediately label cylinders with the type of recovered refrigerant and only use the cylinders for the labeled refrigerant.
- **Use a filter/drier on the inlet to the recovery machine** to reduce the moisture in the refrigerant and to keep contaminants from damaging the machine.

Paying attention to best recovery and service practices that are designed to avoid contamination can save you and your customer the hassle and expense of dealing with out-of-spec refrigerant after it has been returned to a certified reclaimer. ■

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