**METROPOLITAN NY CHAPTER**

# Refrigeration Service Engineers Society

*Continuing Education for the HVAC/R Industry*

**"Better Service Through Knowledge"**

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***February 2015***

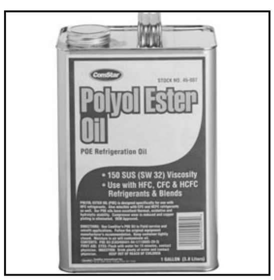
***WWW.METRONYRSES.ORG***

## Working with POE Oils

Refrigeration systems which contain Polyol Ester (POE) oil present technicians with additional concerns that are not normally an issue with systems using either mineral based or alkylbenzene oils. Refrigeration technicians need to be aware of these issues while servicing and installing these systems; otherwise additional system problems can easily develop.

One major concern when working with POE oils is that they are hygroscopic. If they remain in contact with air, they have the ability to readily absorb moisture. For a technician this means when a repair requires opening a system, it should be left exposed to the atmosphere only as long as necessary to complete the repair. For example, when replacing a compressor with POE oil do not remove the compressor's stub cap until ready to braze it into the piping. Also, if the system is left open for an extended period (such as overnight) then it should be capped off to prevent the oil from absorbing moisture.

Also, when adding POE oil to a system be sure to tightly seal the container of the unused oil so that it does not take on moisture. It is normally better to use several smaller containers of POE oil for a particular job rather than one larger container for several jobs and have to store the oil between jobs. If unused oil does need to be stored, it should be stored in its original metal container, rather than a plastic container. POE oil can absorb moisture through the walls of traditional plastic containers – this is why manufacturers ship new POE oil in metal containers.




Another concern for technicians is the ability of POE oils to be effective detergents. These oils can effectively clean the inner surface of a system and can release debris which might be present. When converting an existing mineral oil system to use POE oil, it is a good practice to install a suction line filter/drier into the system. This will help filter out the debris released by the POE oil which may clog metering devices or lead to a premature compressor failure.
While brazing copper tubing; it has always been recommended that the tubing be purged with nitrogen to prevent the formation of oxide scale on the inside of the copper tubing. This is even more important when installing and servicing systems containing POE oil. If brazed without the use of nitrogen, the oxide scale formed on the inner tubing can be scrubbed from the walls by the POE oil and travel throughout the system.

Another concern while servicing systems with POE oil is the difficulty to remove moisture from POE oils. It will stay dissolved in the oil and cannot be readily removed by applying a vacuum. Moisture can only be removed from POE oil with the use of a desiccant. Again, normal servicing practices always recommend replacing the liquid line filter/drier when a system is opened for service. Now it is more important with systems using POE oils.

## Refrigerant Classifications

Refrigerants used in our industry are classified by their toxicity and flammability rating.

The toxicity rating is based on the level to which an individual can be exposed over his/her working life without ill effects. This is defined as the Threshold Limit Value (TLV) and the Time-Weighted Average (TWA).

- Class A - toxicity has not been identified at concentrations at or below 400 PPM
- Class B - toxicity has been identified at concentrations at or below 400 PPM

Flammability characteristics are divided into three number groups:

- Class 1 - refrigerants which do not show flame propagation when tested in air at 14.7 psia and 65°F
- Class 2 - refrigerants which have a lower flammability limit (LFL) of more than 0.00625lb/ft3 at 70°F and 14.7 psia, and a heat of combustion of less than 8,174 Btu/lb.
- Class 3 - refrigerants which are highly flammable as defined by an LFL of less than or equal to 0.00625lb/ft3 at 70°F and 14.7 psia, or a heat of combustion at or above 8,174 Btu/lb.

## Evaporator Superheat

Generally the term "superheat" is used to describe the state of a refrigerant. Refrigerant in its vapor state is said to be superheated because it is at a temperature above its saturation (boiling point) temperature. The degree at which a refrigerant is superheated is the temperature difference between its actual temperature and its saturation temperature. For example, if the saturation temperature of a refrigerant is 20ºF and its actual temperature is 30ºF, then the refrigerant is said to be superheated by 10º. This could be also stated as "the refrigerant has 10º of superheat."
In a properly operating system the refrigerant will be in a superheated state from the last section of the evaporator to the first section of the condenser. Technicians can measure the superheat condition anywhere along this path. One common location is at the outlet of the evaporator. This is typically referred to as the “evaporator’s superheat”.

Measuring the evaporator’s superheat value is an important part of analyzing a system’s performance. If a lower than normal value is measured, too much refrigerant is entering the evaporator for the heat load. Many technicians refer to this as a "flooded evaporator." If a higher than normal value is measured, too little refrigerant is entering the evaporator for the heat load. Technicians generally refer to this as a "starved evaporator."

Part of effectively troubleshooting a refrigeration system should always include looking at the performance of the evaporator. This means measuring the evaporator’s superheat value. If this is overlooked, the true system problem can be misdiagnosed. For example, a system with a lower than normal suction pressure can be the result of several problems, two of which are a low refrigerant charge and a lack of airflow across the evaporator. The difference between these two problems can be seen by looking at the evaporator’s superheat. A low refrigerant charge will have a higher than normal evaporator superheat value; and lack of airflow across the evaporator will cause the evaporator’s superheat to be lower than normal.
Below is a procedure for calculating an evaporator’s superheat value:

First, measure the pressure of the refrigerant at the outlet of the evaporator. If this is not possible measure the pressure at the next closest location (usually at the inlet of the compressor) and then estimate the pressure at the outlet of the evaporator by estimating the pressure drop from the measured location to the outlet of the evaporator. For many systems a 2 psig pressure drop can be assumed from the outlet of the evaporator to the inlet of the compressor.
Next, convert the measured pressure to its saturation temperature, using a P/T chart.

Then, measure the temperature of the refrigerant at the outlet of the evaporator. This is done by measuring the refrigerant line temperature, which is assumed to be the same as the refrigerant passing thorough.
Finally, subtract the measured refrigerant temperature from the converted saturation temperature. The difference is the superheat value of the refrigerant.

For example, let’s calculate the evaporator superheat for a walk-in cooler using HFC134a refrigerant.
First, we measured a pressure of 18 psig at the inlet of the compressor (there are no valves at the outlet for the evaporator). Assuming a 2 psig pressure drop across the suction line, we have a 20 psig pressure at the outlet of the evaporator.

Next, using a P/T chart we determine the saturation temperature to be 22°F.

Then, we measure a line temperature of 30°F.

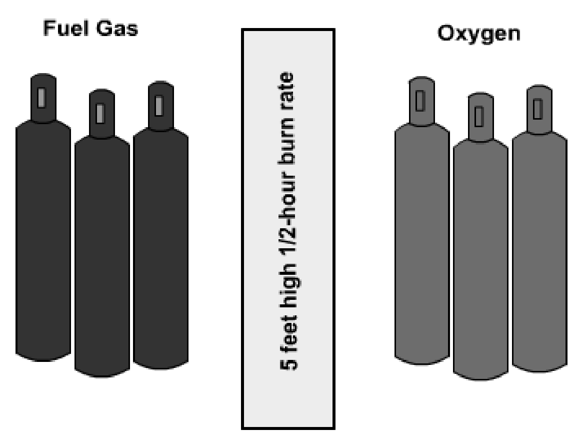
Finally, we subtract 30°F from 22°F, for a superheat value of 8°F.

What is the correct superheat value of the refrigerant leaving an evaporator? It is based on the system’s application and the manufacturer’s design. As a rule of thumb medium temperature systems will generally have a superheat of 8°F to 10°F and low temperature applications 4°F to 6°F. But again, always check with the system’s manufacturer for the recommended values.

Technicians should include measuring the evaporator superheat when diagnosing a system problem. Failing to include this measurement can lead to misdiagnosing the true system problem.

## Storing Cylinders

The proper storage of the cylinders used in our industry is a safety concern for technicians and their companies. Many of these cylinders contain flammable gases which can cause serious injury if mishandled. All stored cylinders need be supported so they will not fall over. Also any fuel gases, such as acetylene, need to be separated from any flammable material.




The safe minimum distance between stored fuel gas cylinders and any flammable material is 20 feet or separated by 5 -foot wall with a 1/2 hour burn rating.

# COMING TOPICS

***What's up With New Refrigerants***

***High Velocity Air Conditioning***

***Low Temp Radiant Heat***

***System Capacity – A Comparison of Different Modulating and Staging Controls***

**If you have any suggestions or requests for Future programs, please let us know!**

# METROPOLITAN NEW YORK CHAPTER, RSES

**For Information Call: Stan Hollander, CMS (718) 232-6679**

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***RSES Mission Statement***

To provide opportunities for enhanced technical competence by offering comprehensive, cutting-edge education and certification to our members and the HVAC/R industry.
To advance the professionalism and proficiency of our industry through alliances with other HVAC/R associations.

***In the unlikely event of cancellations, announcements will be posted on our web site***

# Wednesday February 11th, 2015 at 7:30pm

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## *A/C Capacity Control Down to 10% of Rated System Capacity*

By

Jerry Kelman—Rawal Devices, Inc.

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**EDUCATIONAL PROGRAM**
**Wednesday February 11th, 2015**
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