



# Technical Training

2018



## Training Agenda

- **Introductions**
- **EcoCOOL® Composition**
- **Compatibility**
- **Installation Volumes**
- **Installation Tools**
- **EcoCOOL® Blends**
- **HVAC and Refrigeration Systems**
- **Compressor Systems**
- **Prospect Development Process**



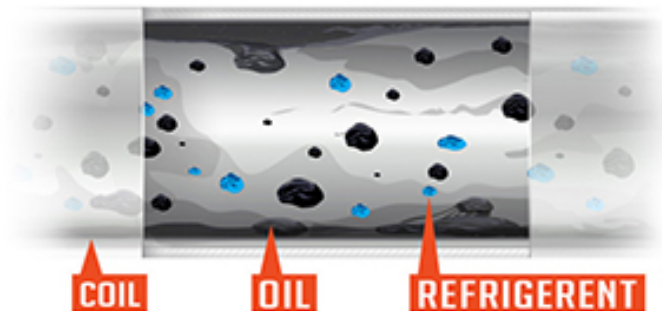
### EcoCOOL® Composition

EcoCOOL® is a trade secret. It has been tested by two independent laboratories and neither could identify any components that make up EcoCOOL®. Even if the components of EcoCOOL® were identifiable, the blending and baking process of the product cannot be duplicated.

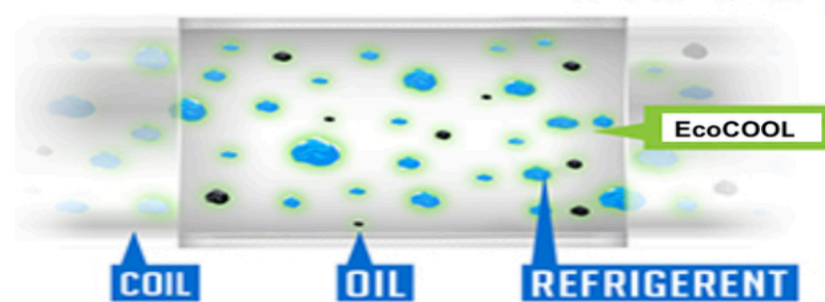
### American Society of Heating Refrigeration and Air Conditioning Engineers

ASHRAE states that .5 to 8% of the compressor oil circulates through the coils of an air conditioning or refrigeration system and the oil will form a film of Oil Fouling, which is about 2% of the diameter of the tubing.

## OIL FOULING BEFORE TREATMENT



## AFTER TREATMENT





### **EcoCOOL® Catalyst #1 – Removes Oil Fouling**

When EcoCOOL® is added to the cooling system's compressor oil, catalyst #1 removes the oil fouling by breaking and eliminating the surface tension on the walls of the copper tubing. The result is improved heat exchange and increased BTU's. Return air blown over the coils is cooled more efficiently and provides cooler supply air to the space being cooled. A space that is cooled faster will satisfy thermostat settings faster and reduce compressor run times. ASHRAE states that lost energy efficiencies caused by Oil Fouling begin immediately and can be as high as 7% in the first year and 5% in the second year; reaching 30% inefficiency and higher, during the life of equipment.

### **EcoCOOL® Catalyst #2 – Makes the Refrigerant Extract Heat More Efficiently**

The #2 catalyst attaches to the hydrocarbon molecule in the refrigerant as it passes through the Direct Expansion Valve. This reaction increases its surface area, and allows for greater heat transfer. The increased heat transfer causes the refrigerant to evaporate more efficiently, reducing work for the compressor.

### **EcoCOOL® Component #3 – Lubricity Compound**

The lubricity compound increases the lubricity of the compressor oil by 54% enabling the the equipment's moving parts to operate with less vibration, reduced noise levels, lower operating temperatures, and reduce friction. These findings have been conducted in an independent laboratory test by Intertek, using SAE protocols.

While we know that EcoCOOL® improves mechanical efficiency, it isn't possible to determine an exact period of extended equipment life. However, improved lubricity can be shown to reduce electricity consumption by 1% to 3%.



## **EcoCOOL® Compatibility & Applications**

### **Compatibility with Refrigerants and Compressor Oils**

Based on independent Intertek Laboratory reports, using SAE protocols, EcoCOOL® is completely compatible with all modern compressor oils including; traditional mineral oils, and synthetics such as polyolester (POE) and polyalkylene glycol oils (PAG). Test results in Intertek Laboratory's have confirmed compatibility with all compressor components including gaskets, seals, and metals.

Independent Intertek Laboratory reports also confirm that EcoCOOL® is compatible with all modern refrigerants, including:

[R22](#) | [R502](#) | [R12](#) | [R134a](#) | [R404a](#) | [R407c](#) | [R410a](#) | [R717 Ammonia](#)

R11 and R123 systems have less oil fouling; therefore, EcoCOOL® will not be as effective and is not used in these systems.

R11 has no new production and can only be sourced in recycled refrigerant.

R123 will have no new equipment developed from 2020 and no new production for service after 2030.



## EcoCOOL® Installation Volumes

### Rule #1

It is recommended that rule #1 be used only on reciprocating chiller systems and commercial packaged units. Compressor manufacturer specifications can be found online. A search using the compressor make, model number, serial number and specifications will usually provide access to a user manual that will list the manufacturer's original compressor oil charge. The necessary information for an online search is found on the label of the compressor.

Multiply the oil fill (oil charge) quantity by 10%.

For example, if a chiller has eight gallons of oil:

8 gallons (multiplied by 128 oz. per gallon) = 1024 ounces

10% of 1,024 ounces = 102 units of EcoCOOL®

### Rule #2

Multiply the tonnage by one ounce. This is the acceptable rule for smaller residential DX systems. A 3.5 ton split system will require 3.5 ounces of EcoCOOL®. Any system that is less than 2 tons (PTAC units or Aircons) will always require a minimum of 2 units of EcoCOOL®.



## EcoCOOL® Installation Volumes

### Rule #3

When installing EcoCOOL® in centrifugal compressors, EcoCOOL® Catalyst 1 is installed separately into the refrigerant circuit at a ratio of .3 ounces per ton. We then install EcoCOOL® L (lubricity agent) separately into the oil sump at a ratio of 2% of the manufacturers stated oil charge.

### Rule #4

When installing EcoCOOL® in ammonia reciprocating compressors, a pre-blended combination of EcoCOOL® Catalyst 1 and EcoCOOL® L is used, and installed at a ratio of 5% of the manufacturers stated oil charge. EcoCOOL® is NOT installed in ammonia screw compressors, due to the presence of a coalescing oil separator.





## EcoCOOL® Installation Tools

### Bright Solutions Yellow Pump

This pump is used for non chiller DX systems and automobile installations. Currently, the pump needs to be modified for long term use by replacing the rubber "O" rings with silicone "O" rings.

This pump is recommended for residential installations and light commercial installs of less than 16 units. 6-8 full strokes is equal to one unit.



### The Yellow Jacket Bicycle Pump

This pump is recommended for large chiller installations. The pump will produce 3.5 units per stroke.



### Pump Care and Maintenance

After each day's use, all pumps must be flushed to maintain purity and avoid Product contamination.

Pumps must be flushed with 91% alcohol.

Pumps will last longer if silicone "O" rings are installed and they are flushed after each day's use.





## Refrigerants and EcoCOOL® Blends

EcoCOOL® standard blend is used in 90% of all applications. There are special blends that are used in certain types of refrigerants and compressors that are noted in the chart below.

Model Number	Description
<b>EcoCOOL® Standard</b> R22/134/410	Original EcoCOOL® synthetic refrigerant catalyst and lubricity agent. Designed for DX systems – reciprocating, screw and scroll compressors.
<b>EcoCOOL®</b> Catalyst #1 & #2 only	EcoCOOL® synthetic refrigerant catalyst #1 and #2 with no lubricity compound. Designed for centrifugal type compressors with DX valve and separate oil circuit.
<b>EcoCOOL®</b> Catalyst #1 & L (Separately)	EcoCOOL® synthetic refrigerant catalyst #1 only. Designed for centrifugal compressors with no DX valve. L (Lubricity Compound) is installed separately, in the oil sump.
<b>EcoCOOL®</b> Catalyst #1 & L (Combined)	EcoCOOL® synthetic refrigerant catalyst #1 and L (Lubricity Compound) combined, is pre-blended for use in Ammonia reciprocating compressors and is installed at 5% of the compressor oil charge.
<b>EcoCOOL®</b> Catalyst #2	EcoCOOL® synthetic refrigerant catalyst #2 for specialty installations only.
<b>EcoCOOL®</b> Lubricity compound L, only	EcoCOOL® lubricity compound. Used only for specialty installations, oil tanks, gear boxes, and refrigeration systems with separate oil circuit.



## HVAC and Refrigeration Systems

### Chillers

A chiller is a system where water (or glycol or salt water brine) is cooled, not the air. Unlike air cooling, water is used as the heat conductor. Water (brine) or Glycol (antifreeze) is circulated, instead of air, to cool a space or object. Water is cooled in a “barrel” with the evaporator refrigeration coils running through it.

The cooled or chilled water is pumped to a heat exchanger or “radiator” in the space to be cooled. A fan blows over the radiator, containing the chilled water, which cools the air. The chiller system is more efficient than an air system since water carries more heat per unit space, than air. The water is cooled to 42 - 48 degrees F and then returned from the radiator to the chiller barrel for re-cooling. It is returned to the radiator again and again to cool the designated space.

Chillers can have reciprocating, screw, or centrifugal compressors. For all chiller applications it is critical to confirm the compressor type, refrigerant type, and oil separator type to determine the blend and quantity of EcoCOOL® that should be used.





## Compressor Systems

Centrifugal Compressors can contain a separate oil circuit and no DX valve. In this case we add EcoCOOL®1 to the refrigerant circuit at .3 ounces per ton. We separately add the lubricity agent, EcoCOOL®L, to the oil circuit at 2% of the manufacturers stated oil charge. It is an industry known fact that oil fouling occurs from oil intruding into the refrigerant circuit over time through leaky seals. This makes Catalyst 1 effective in removing oil fouling. Catalyst 2 reacts as it passes through the DX valve which is non existent in these systems.



The original EcoCOOL® Blend is compatible with Rotary (screw) compressors provided that there is not a Coalescing Oil Separator. Coalescing Oil Separators are generally a horizontally mounted cylinder. On Rotary (screw) compressors that do not have a coalescing oil separator, Original EcoCOOL® Blend is added to the refrigeration circuit at 10% of the manufacturers stated oil charge.





## Compressor Systems

Reciprocating Compressors, that use traditional refrigerants, install original blend EcoCOOL® at a ratio of 10% of the manufacturers stated oil charge.

Semi-Hermetic compressors are housed with the motor in the same housing but the casing is a bolted type and can be repaired easily. The oil level is monitored by a sight gauge and an equal amount of oil should be removed for the amount of EcoCOOL® being installed.



**EcoCOOL® SYNTHETIC CATALYST TECHNOLOGY FOR AMMONIA IS FOR AMMONIA DX SYSTEMS ONLY WITH PISTON TYPE COMPRESSORS. EcoCOOL has not been approved for use in non DX, or screw, or centrifugal ammonia compressor systems. EcoCOOL® Ammonia Blend is installed at 5% of the manufacturers stated oil charge. It is recommended to remove 5% of the existing oil charge before the EcoCOOL® installation.**





## HVAC and Refrigeration Systems

### Refrigerated Trailer Units (RTU)

Refrigerated Trailer Units are attached to trailers or box trucks that are designed to transport refrigerated products.

Usually, the unit uses R134a refrigerant and the compressor is powered by a small diesel engine.

The installation volume of EcoCOOL® for different sized RTUs:

2.5 ton RTU	= 8 units of EcoCOOL®
5 ton RTU	= 12 units of EcoCOOL®
Rail Car RTU	= 16 units of EcoCOOL®





## HVAC and Refrigeration Systems

### Roof Top Units Scroll Compressors

Roof Top Units (Packaged Units) and most walk-in coolers and freezers will be driven by a reciprocating or scroll compressor.

It is critical to obtain equipment specifications from the compressor label, not the label of the outside of the Packaged Unit. Some packaged units have multiple compressors, which can vary in size.



Typically, the compressor oil charge will be stamped on the compressor label.



## HVAC and Refrigeration Systems

### Packaged Terminal Air Conditioner (PTAC)

A PTAC is a self-contained heating and air conditioning system found in hotels, motels, hospitals, apartment buildings, and sunrooms. PTACs are often fitted on an external wall, with vents and heat sinks, both inside and outside of the building. Installing EcoCOOL® in PTACs is a unique process because these units do not have a service port. A bullet piercing Schrader valve must be soldered onto the refrigerant tubing to enable EcoCOOL® to be installed.

Most PTAC units are .75 to 1.5 tons, but both sizes will require a minimum of 2 units of EcoCOOL®.

### Residential Split System and Heat Pumps

Residential Split Systems have a condensing unit outside the building and a heat exchanger located inside the building. To determine the correct volume of EcoCOOL® to be installed, find the model number on the manufacturer's label attached to the outside condenser unit. The model numbers sequence will vary depending on the manufacturer, but the model number will always contain the BTU's. 12,000 BTU's is equal to one ton. EcoCOOL® is installed in residential split systems at a ratio of one unit per ton.

For example: Bryant a/c unit Model # 113ANA042000CHA is a 42,000 BTU unit. This equals 3.5 tons and would require 3.5 units of EcoCOOL®.







## Compressor Systems

### HERMETICALLY SEALED SCROLL COMPRESSOR

Original Blend EcoCOOL® is installed in the low pressure service port (Schrader valve). We install EcoCOOL® in scroll type compressors at a ratio of 10% of the manufacturers stated oil charge.

Hermetic type compressors have a completely sealed housing with its motor also sealed in the same housing. It is leak proof but cannot be repaired. We do not remove any oil when installing EcoCOOL®.





## Prospect Development Process

### Proof of Performance

The following example is a of proof of performance protocol, used by an independent test and balance engineering firm that specializes in third party data collection and analysis.

### Testing Protocol for EcoCOOL®

This testing protocol is provided for the purpose of establishing

1. A baseline test for a DX cooling unit to determine the performance of the unit prior to injection of the EcoCOOL® product.
2. Performing the same test to determine the performance on the same unit after the addition of the EcoCOOL® product. The protocol is as follows:

### Baseline Testing (Pre EcoCOOL® Installation)

Measure total airflow being produced by the unit to establish the volume of airflow moving across the DX coil, when possible.

Attach data loggers to measure the following metrics and collect data at one minute intervals for a minimum period of 2 weeks. The objective is to establish a range of data that will be used to determine the baseline performance for the unit:

- Discharge Air Temperature
- Supply Air Temperature
- Outdoor Air Temperature
- Compressor Motor Amperage (Amperes)
- Humidity (optional)



## Prospect Development Process (Continued)

### EcoCOOL® Reaction Period

Because EcoCOOL® is a synthetic catalyst, following installation, a period of time must be allowed for the catalyst to react with the system. The time allowed for reaction is dependent on the size of the system being treated. For the purpose of this example, the reaction period is two weeks.

### Post EcoCOOL® Installation Measurement

After the EcoCOOL® product has been installed, the data logging of all points will continue, for a minimum period of 2-4 weeks.

On completion of the post installation measurement phase, all data will be downloaded from the loggers and submitted to an independent third party, qualified to analyze and prepare reports on the energy efficiency of HVACR systems. Reports will utilize the collected data to compare the results of the test unit's baseline performance, with the unit's performance following the installation of EcoCOOL®.

### Measurement Protocols For Chilled Water Systems

For chilled water applications, protocols and timing would be similar, with data collected as follows:

- Entering water temperature(°F)
- Leaving water temperature(°F)
- Compressor Motor Amperage (Amperes)
- Chilled water flow through the chiller(GPM)
- Outdoor Air Temperature(°F)

The same type of data analysis and results reporting would apply, to chilled water applications.



## **Prospect Development Process (Continued)**

### **Distributor & Dealer Support**

EcoCOOL® Technology can provide technical support in all key areas of Prospect Development, including, but not limited to:

**Selecting equipment for proof of performance**

**Establishing objectives and metrics for a proof of performance test**

**Launching data loggers and downloading test data**

**Planning installation options**

**Project management oversight**

**Independent energy expert to analyze test data and prepare a report on performance results**



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