

**Cool Worx™** is a transformative graphene-powered coating for HVAC/R, process cooling, and precision cooling coils. Cool Worx, a patent-pending coating, uniquely expedites heat transfer and provides superior corrosion resistance to the coil.

Cool Worx provides the following benefits:

- Energy Savings
- Superior Heat Transfer
- Improved System Performance
- Corrosion Protection
- Extended Equipment Life
- Lower Peak Demand

## Description

Cool Worx is an air-dry water-based coating powered by GMG Graphene, specifically optimized for its use as a unique two-in-one coating. Cool Worx provides a novel way of increasing heat transfer of air-cooled coils used in HVAC/R, industrial process cooling, and precision cooling applications. In addition, Cool Worx provides best-in-class corrosion resistance where independent testing demonstrated corrosion resistance to 30,000 hours per ASTM B117. Cool Worx uniquely expedites heat transfer from new or in service coils while protecting them from corrosive environments to optimize their performance and longevity.

The coating is specifically developed for air-cooled round tube plate fin (RTPF) and microchannel heat exchangers made of copper/aluminum or all, aluminum construction; but also heat exchangers of stainless steel or ferrous alloys. Cool Worx can be used on previously coated and non-coated coils after the coil is properly prepared for its application. Cool Worx can be applied on equipment panels when properly cleaned and dried.

## Benefits of Graphene

There are many properties of GMG's Graphene that are beneficial for a particular application. For its use in Cool Worx, the following qualities of high-purity graphene are utilized:

### • High surface area

Approximately 0.04 wt. ounces (one gram) has a micro surface area up to 3200 sq. feet within the thin coating layer. With the application of Cool Worx, it provides added surface area of the HVAC/R, process coiling, or thermal management coils to help reject heat.

### • High Thermal Conductivity

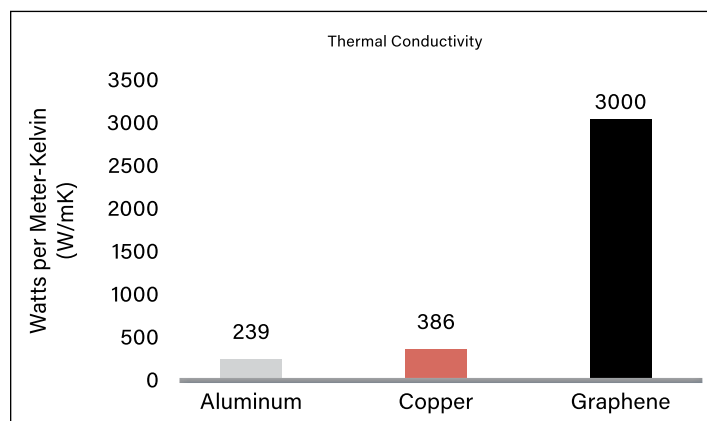
Graphene has a reported thermal conductivity of approximately 3000 Watts per Meter-Kelvin (W/mK), making it 12 times more conductive than aluminum and 7 times more than copper! An integrated high conductor in the coating aids in rejecting heat from the metal constructed coil.

### • Impermeability

Even the smallest atom, helium, cannot pass through a sheet of graphene. This impervious layer prevents oxygen from reaching metal surfaces, making it exceptional in eliminating metal corrosion. Graphene has hydrophobic (water repelling) properties when applied in a coating that aids in reducing corrosion.

## Specialty Products

### Cool Worx



Application:

Cool Worx is specifically formulated for use in the HVAC/R, process cooling, and precision cooling applications:

- Office Buildings
  - Schools
  - Data Centers
- Restaurants
  - Retail Outlets
  - Medical Facilities
- Hospitals
  - Supermarkets
  - Food Storage
- Transport Cooling
  - Industrial
  - Energy Production
- Other

The best investment opportunities for Cool Worx are in the commercial market where measurable gains in performance and corrosion protection are desired where energy of these systems is commonly monitored. This is especially true in markets where systems are operating at or above average running time and energy costs. Cool Worx provides an opportunity for the service provider to provide a solution to address business owners’ ongoing OPEX concerns, while better protecting the existing assets to prolong CAPEX discussions.

Additional Cool Worx opportunities include coastal or other corrosive applications whether in the commercial, industrial, or residential markets. Cool Worx prevents further coil degradation, restores some lost heat exchanger capability to prolong CAPEX in system replacement.

In addition to outdoor coils, Cool Worx has shown benefit when applied to evaporators. Third party testing has shown Cool Worx to have antimicrobial properties, which is another benefit for the indoor coil. Application of Cool Worx for the evaporator is best done before the system is commissioned to allow proper coating cure.

Packaging

1 Quart                      4158-20

**Note: Larger package sizes are planned based on market demand.**

Specifications:

| PROPERTIES                                                | RESULT                   | TEST METHOD         |
|-----------------------------------------------------------|--------------------------|---------------------|
| Salt Spray                                                | 30,000 Hours             | ASTM 8117           |
| Salt Spray, Acidic                                        | 3,000 Hours              | ASTM G85 A1         |
| Sal/Sulfur Dioxide Spray                                  | 720 Hours                | ASTM G85-09: A4     |
| Water Immersion                                           | 500 Hours                | ASTM D870           |
| Cross Hatch                                               | Level 0 European 5B, B-A | ASTM D3359-88 53151 |
| UV Resistance                                             | Exceeds 1000 Hours       | ASRM D4587          |
| Flexibility                                               | PASS                     | ASTM D522M          |
| Thermal Conductivity                                      | 15 W/mK                  | ASTM E1225          |
| C5 Condensation                                           | PASS                     | ISO 6270            |
| C5 Chemical Resistance                                    | PASS                     | ISO 7523            |
| Viscosity (Krebs, KU)                                     | 93-98                    |                     |
| Viscosity (Centipoise, cP)                                | 1300-1500                |                     |
| Solids % by volume/wt.                                    | 30-50%                   |                     |
| Density                                                   | 1.016 Kg/L               |                     |
| pH                                                        | 8-10                     |                     |
| Gloss at 20°/60°                                          | 65/92                    |                     |
| VOC                                                       | 165 grams/liter          |                     |
| Flash Point                                               | Water-born/non-flammable |                     |
| Dry Film Thickness                                        | 15 microns               |                     |
| Ambient Temperature Recommendation for Cool Worx Spraying | 45°F to 100°F            |                     |

**Coating:** Water-based graphene-powered coating, black colored. Air curing formulation.

Cool Worx cures after 24 hours room temperature with relative humidity below 80%. Curing times can be quicker or slower depending on ambient temperature and humidity. Never coat a coil when the outdoor ambient is below 45°F or relative humidity is above 80%.

**Application Method:** Spray formulation. One-time application with proper surface preparation and post-coating care is maintained.

**Estimated Coverage:** 20 sq. ft coil surface area using the three light coat method

**Mixing:** Cool Worx requires mixing before use, see directions for use.

**Thinning:** Do not dilute Cool Worx. Thinning may result in a change in coating performance.

**Maintenance:** To maintain peak coil performance, on-going maintenance of the coil with specified cleaners is required. See Cool Worx Applicator Guide (26-C87) for additional information.

**Transportation:** Cool Worx is not classified as a Dangerous Good by US Department of Transportation (DOT), Transportation of Dangerous Goods (TDG), IATA (air transport) or IMDG (marine transport). No special transport conditions are necessary unless required by other regulations. Please consult Nu-Calgon's Cool Worx Safety Data Sheet (SDS) for further details.

**Storage:** Store Cool Worx in its original container in a conditioned environment (50°F to 85°F climate) and away from direct sunlight. The shelf-life of Cool Worx is five plus years when stored in its original unopened container. Once opened, the partially used Cool Worx contents have an anticipated shelf-life of one year. Cool Worx must be thoroughly mixed prior to each use.

## Directions:

**General:** Cool Worx is to be applied by Nu-Calgon trained professionals only. Consult Cool Worx and applicable Nu-Calgon coil cleaner safety data sheet (SDS) before use. Nu-Calgon requires applicator training and acknowledgment on its proper use and handling before sale. This process is required for any warranty consideration.

**For full details on Cool Worx, including applicable set-up criteria, supplies required during use and clean-up, consult the applicator guide (26-C87) that can be found at [www.coolworxhvacr.com](http://www.coolworxhvacr.com).**

## Process:



**Procedure:** Cool Worx application is recommended over a two-day period to allow the condenser coil to thoroughly dry before applying Cool Worx. If necessary, Cool Worx can be applied in one day if a power blower (optional) is used along with turning on the system to help facilitate drying the coil. **It's necessary for the coil to be bone-dry for proper Cool Worx adhesion to the coil.**

For this reason, the two-day method is preferred to allow overnight drying during system operation – especially if line-up of systems will be coated at a jobsite. For days when applying Cool Worx on outdoor units, apply when the outdoor temperature is between 50°F - 100°F when there is no immediate rain in the forecast. Lower humidity days are preferred if circumstances dictate. Cool Worx can be applied in higher humidity situations, such as coastal regions, it simply will take longer for the coating to fully cure to provide max benefit.

## DAY ONE

1. Take inventory of tools/supplies to ensure proper items are ready at the job site.
2. Review the condition of the outdoor coil for Cool Worx application that requires cleaning preparation. Cool Worx can be applied on coated or non-coated aluminum and/or copper constructed precision cooling coil or coils of stainless steel of ferrous construction. (Cool Worx can be applied on other surfaces with proper preparation for Cool Worx adhesion– see Nu-Calgon for details.)
  - a. For new coils or coils in good condition where dust/grime simply need to be removed, use Nu-Calgon's Tri-Pow'r HD per label instructions at a 4:1 dilution ('B' setting on the Nu-Calgon Coil Gun) followed by a thorough rinse with fresh water.
  - b. For corroded coils or previously coated coils where the coating is starting to separate from the coil, Nu-Calgon's Nu-Brite is required to aggressively clean and etch the previous coating on the coil for best adhesion. (Note: if the coil is too severely corroded, this is not a Cool Worx opportunity.) Use Nu-Brite at a 10:1 dilution ('E' setting on the Nu-Calgon Coil Gun) followed by a thorough rinse with fresh water.
3. **OPTIONAL:** If Cool Worx is to be applied to the coil on the same day, a power blower is required to help facilitate drying of the coil surface. It is also recommended to turn the system on (air conditioning mode if heat pump) to ensure the coil surface is bone-dry before Cool Worx application.
4. Documentation - take photos before and after Cool Worx application.

**NOTE:** It's imperative any rust surfaces are previously addressed with a mechanical brush and rust converter to ensure proper Cool Worx adhesion.

## DAY TWO

5. **Ensure it is a favorable day for painting – not windy and above a 50°F outdoor temperature.** Tape off equipment panels with rough surface painter's tape to protect them from overspray. Lay down paint drop cloths and prepare necessary tools/supplies for applying Cool Worx. Ensure PPE is present including nitrile gloves; disposable APF-10 disposable mask, APF-1000 respirator when spraying Cool Worx with a HVLP sprayer. Nu-Calgon recommends the 3M Powerflow Face Mounted PAPR; 3M product number 6900PF, an APF-1000 rated respirator, plus dermal protection.

6. For small/medium size jobs, Nu-Calgon recommends the Graco TrueCoat 360 for its spraying versatility from any angle to provide as much coil coverage as possible. For repetitive larger applications, Titan CapSpray 115 (6 stage HVLP) or Graco Triton Air-Assisted Airless Spray Systems is recommended.

7. **Turn off system.** Proceed to shake each bottle of Cool Worx vigorously for one minute to ensure paint contents are properly mixed. Fill the sprayer bottle with Cool Worx, toggle the paint coverage setting on the sprayer to a light setting and confirm nozzle orientation. Test spray pattern on a piece of cardboard before spraying coil.

8. **Spray method:** Nu-Calgon guidelines for applying Cool Worx to refrigerant coils requires three light coatings. At a minimum, the air intake side requires this three-coat method to assist in energy savings. It's advantageous to cover as much of the backside of the coil as reasonable, if easy to access, to improve the benefits of Cool Worx. Use the three light coat method as follows:

a. **First Coating:** Have the sprayer tip positioned **90 degrees (straight-on) to the coil**, with the sprayer tip 2 to 3 inches away from the coil surface. Starting at the top left corner of the coil, coat in continuous sweeping motions of the coil surface. This coating provides coverage to the interior of the coil, roughly four-inch paint penetration into the coil - including the first coating pass of the tube bundle (for RTPF coils) or parallel tube bundles (microchannel coil designs). Proceed with providing the first coating to the entire coil surface.

**FIRST COAT:** Position sprayer 90° to coil, 2-3 inches away. Make sweeping left to right motions to paint inside coil. Coating provides minimum four-inch depth coverage into coil. See figure 1.

b. **Second Coating:** Rotate the sprayer position **45 degrees LEFT to the coil** with the sprayer tip 2 to 3 inches away from the coil surface. This sprayer orientation angle in relation to the coil will coat on **left side** of the aluminum fin panels of the coil. Starting at the top left corner of the coil, coat in continuous sweeping motions, left to right – depress the trigger after each sweep and repeat sweeping left to right paint coverage as you progress down the coil. Apply the second coating immediately after the first coating - no need to wait.

**SECOND COAT:** Tilt sprayer 45° LEFT of the coil, 2-3 inches away. Make sweeping motions to paint coil. Coating step paints one side of each fin. See figure 2.

c. **Third Coating:** Rotate the sprayer position **45 degrees RIGHT to the coil** with the sprayer tip 2 to 3 inches away from the coil surface. This sprayer orientation angle in relation to the coil will coat **right side** of the aluminum fin panels of the coil. Starting at the top left corner of the coil, coat in continuous sweeping motions, left to right – depress the trigger after each sweep and repeat sweeping left to right paint coverage as you progress down the coil. Apply the third coating immediately after the second coating- no need to wait.

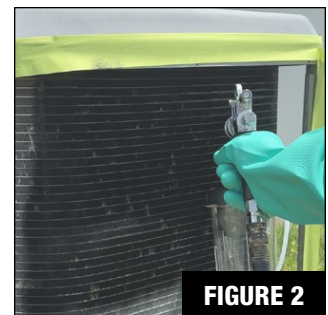
**THIRD COAT:** Tilt sprayer 45° RIGHT of the coil, 2-3 inches away. Make sweeping motions to paint coil. Coating step paints opposite side of each fin. See figure 3

9. After painting is complete, document Cool Worx application with pictures and reassemble necessary equipment panel(s) and start removing overspray tape from the unit. Allow 10 minutes before turning on the system so that Cool Worx is touch dry. As the system operates, it expedites the curing of Cool Worx.

**Drying Time:** As with any coating, the drying time varies with jobsite temperature and humidity. At 75°F, with a relative humidity of 50%, Cool Worx is touch dry in five minutes, surface can be handled in one hour and it fully cures in 24 hours. Lower ambient temperatures and higher humidity level will extend a full cure up to a few days.

10. Pour any unused Cool Worx back into its original container. Refer to the Cool Worx applicator guide for further instructions with job site clean-up.

11. **Apply supplied Cool Worx decal to equipment panel. Record application date.**



*For more information, consult [www.coolworxhvacr.com](http://www.coolworxhvacr.com).*