

# Energy Engineering

*Dr. Wayne C. Turner, Editor-in-Chief*

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# Test Results of Energy Saving and Humidity Control Devices

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## ABSTRACT

The Appliance Laboratory at FSEC/UCF conducts testing of products and HVAC concepts claimed to save energy. This article provides the results of three test projects: (1) Tests of a spray-on coating for AC condensers sold under the brand name Adsil, and claimed to save energy by increasing heat exchange of the condenser; (2) Tests of a compressor oil additive sold under the brand name PolarShield and claimed to save energy by increasing compressor lubricity and improving refrigerant side evaporator and condenser heat exchange; and (3) Tests of a unique desiccant/HVAC combination (Cromer cycle) claimed to increase humidity control in humid environments while saving energy over other dehumidification strategies. The third test is on a concept that is being developed for commercialization.

The Adsil product showed statistically significant improvement of the EER of the air conditioner units after it was applied. The improvement ranged from zero improvement when added to a new unit, up to 11.9 percent savings on a degraded condenser estimated at 85 percent of its useful life. The Polarshield product showed no improvement in EER or energy savings in the three before/after tests. The third test showed a statistically significant reduction in performance and more energy use after the Polarshield was added. The Cromer cycle showed a doubling of the moisture removed by the test air conditioner and a reduction of the relative humidity in the space without a reduction in EER of the equipment. The results are promising and thus further effort toward commercialization is warranted.

## TEST OF ADSIL COATING

Adsil, a company in Palm Coast Florida, has developed a chemical and a system to deposit this chemical onto a substrate such as the fins and coil of AC evaporators and condensers. The chemical contains a high proportion of silica and the coating is thus referred to as a "glass" or "pre-ceramic." In addition to corrosion protection, the company claims that the coating provides an extremely thin layer (5 microns) that is strongly bonded and provides a 1 percent to 2 percent heat transfer improvement by wicking into sub-micron crevices and joints, where other coatings typically cause a 4 to 5 percent reduction in heat transfer. Because this coating may reduce HVAC related demand and consumption, especially units exposed to degradation of the condenser, and it may prevent an increase in demand over time caused by corrosion and degradation of HVAC coil surfaces, it was of interest to determine under controlled tests if a demand or energy use savings is provided by the product.

## ADSIL TEST SET-UP

This research project to test the Adsil product included five separate tests of air conditioning equipment conducted within the controlled environmental chambers of the Appliance Laboratory at the Florida Solar Energy Center, University of Central Florida. Two additional tests were conducted on units outside the Appliance Laboratory. All tests included a determination of baseline of operational performance for each test unit after being washed with a hose. Then the Adsil cleaning and application was performed per company standard AD1115-01 dated Nov. 15, 2000, and the operational performance was again determined to quantify the potential improvement due to the Adsil cleaning and application process. In addition, the two outside units, one without the Adsil treatment (control) and one with the treatment, were exposed to an acidic salt spray to produce accelerated aging and degradation of the condenser coils while performance was measured.

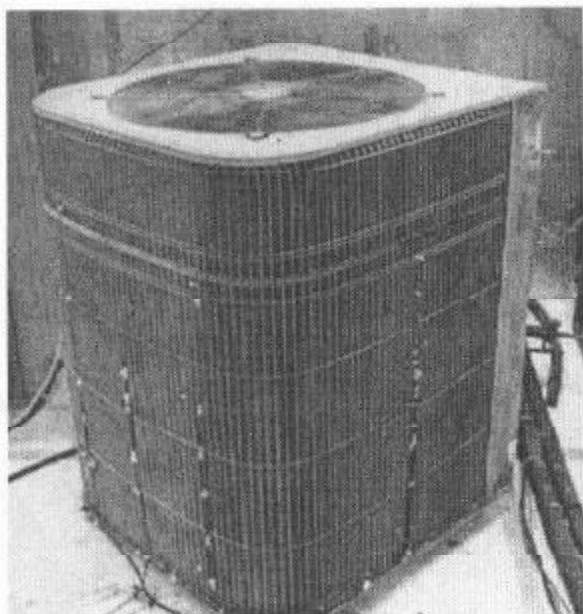


Figure 1. Test Unit #5 Under Test "Before" Adsil Application.

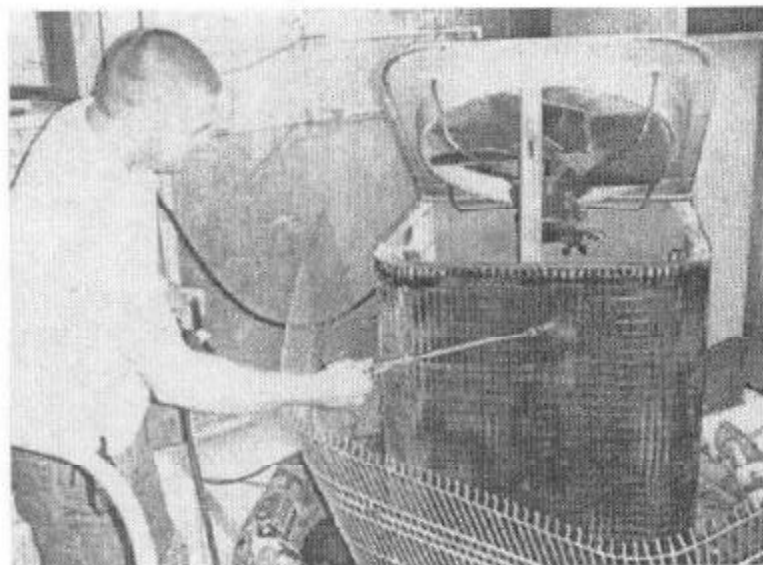
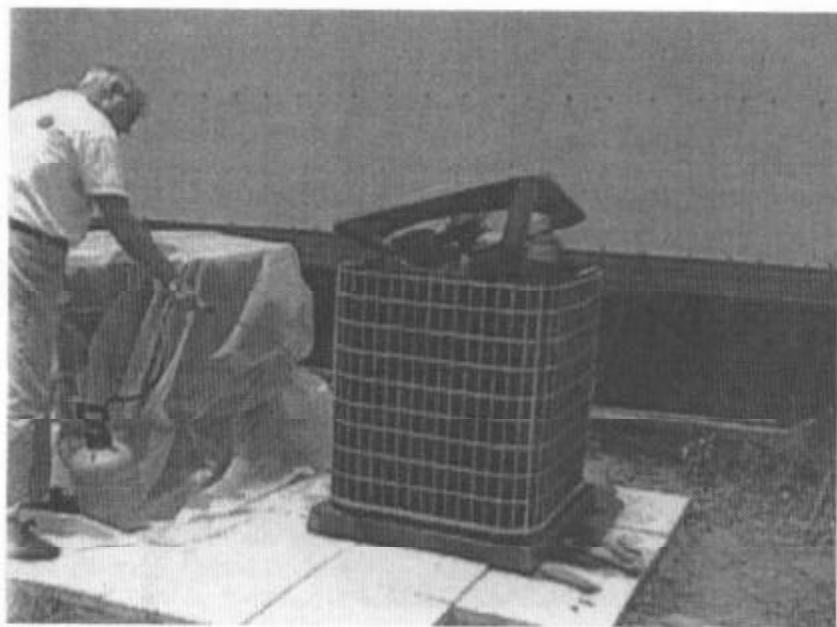
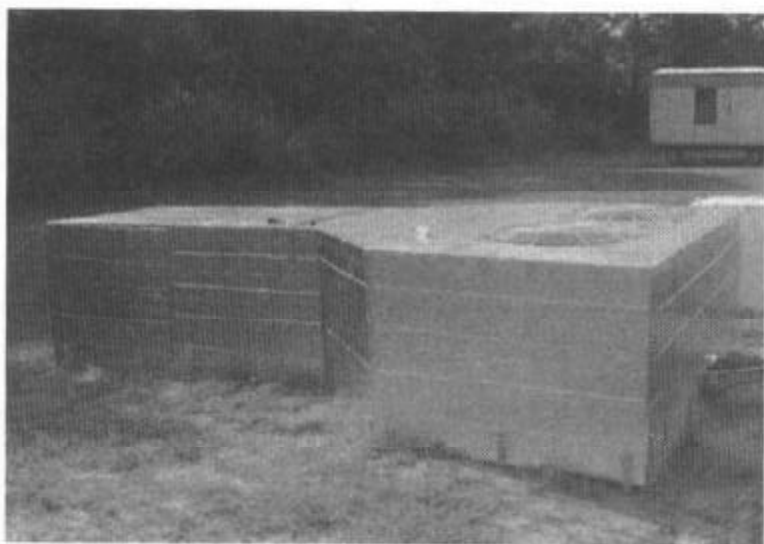


Figure 2. Application of Adsil on Test Unit 5.



**Figure 3. Adslit Applied to Outside Unit.**



**Figure 4. Salt Spray Enclosure for Side by Side Test Units.**

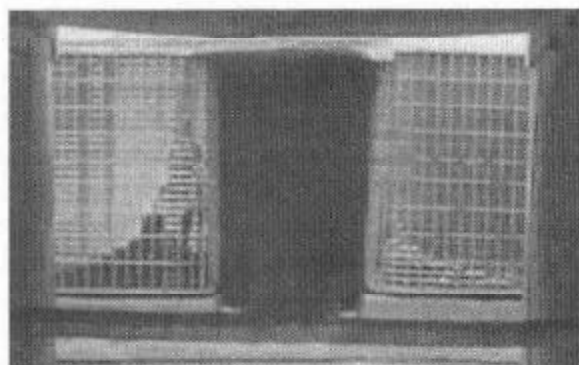


Figure 5. Side-by-Side Units at End of Test (View from Inside of Duct) - Adsil Unit on Right.

#### ADSIL TEST RESULTS

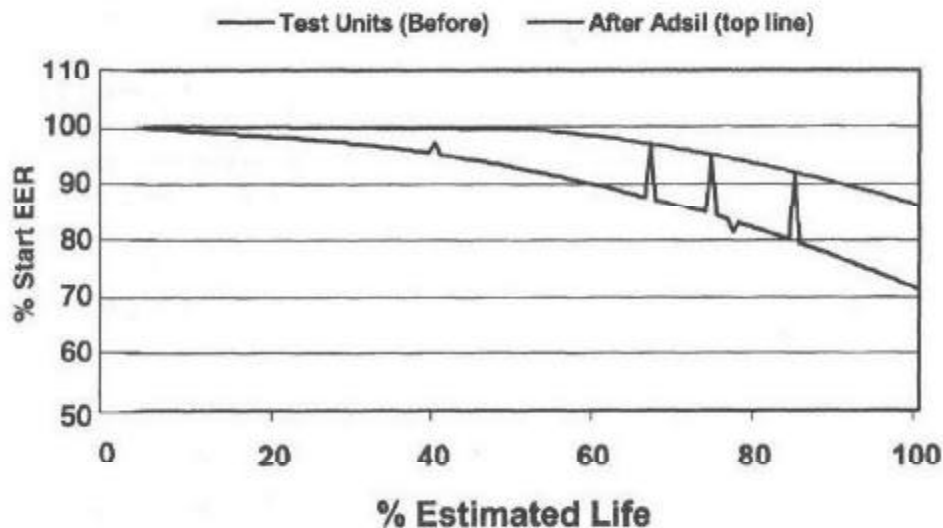


Figure 6. Measured EER Performance over Time with Before-After Test Results.

## ADSIL TEST CONCLUSIONS

Both the control unit and the Adsil unit showed degraded performance EER in a slow, linear fashion during the first part of their percent life. The control unit demonstrated this linear drop for about 0 to 30 percent of its life, while the Adsil coated unit degraded more slowly for the 0 to 50 percent portion of life. At about 30 percent and 50 percent life for the control and Adsil respectively, both units showed a more rapid degradation over time that became worse as time went on. The difference in measured performance for the outside units ranged from no change in performance when they were new to an 11 percent improvement in performance at an estimated 77 percent of useful life. The percent improvements found in the before-after tests showed that EER improved after treatment with Adsil and this improvement was significant at the 95 percent confidence level. This measured improvement increased with the estimated life of the unit at treatment. The difference in measured performance on the before/after tests ranged from no change on the new unit to 11.9 percent improvement on the unit estimated at 85 percent of its useful life.