

The Humidity Control Experience

Desiccant Humidity Control Van
Mobile Exhibit



a word about the experience

The Humidity Control Experience was designed and produced to support the U.S. Department of Energy's national energy conservation goals. The one-year effort combined the expertise of a Team that includes federal and private technical experts and designers. This mobile exhibit, entitled The Humidity Control Experience, showcases the use of desiccant-based dehumidifying technology in air conditioning.

The expandable, 102- x 53-foot tandem axle trailer van demonstrates the technology in

several ways. The most apparent promotion is for the audience to physically experience the contrast of conventional air conditioning in zone one with the humidity control air conditioning in zone two. The concept of this transition in comfort levels is integrated into the color choice of the illustrations. Warm colors (burnt orange) are on the doors and entry panels of the trailers, cooler colors in shades of green demonstrate the cool but moist comfort of conventional air conditioning. When visitors go through an air-locked channel into zone two, cool shades of blue are used

to compliment the idea of cool and dry air conditioning produced by the dehumidification technology.

The interior of the exhibit features 9 backlit posters and offers hands-on learning with plasma screen displays and tabletop exhibits. DVD-fed screens present more detailed information. The trailer is staffed by specially trained driver/facilitators. The exterior of the exhibit features more than 800 square feet of attention-getting graphics.



exterior graphics (800+ square feet)

The Team was responsible for the design, production and application of over 800 square feet of adhesive vinyl.



interior graphics

(9 lightboxes @30x37 and 4 plasma screen DVD presentations @ 2-10 minute duration)

The Team was responsible for the design, production and installation of nine 30-inch x 37-inch backlit posters as well as production of four DVD presentations to be shown at consecutive stops in the tour.



Over 100 Years of Progress

1842



In 1842, John Gorrie received the first patent for an air conditioning system. Gorrie was a doctor fighting malaria in Appalachicola, Florida, then a mosquito infested town in the state's panhandle. He hung buckets of ice to lower his house's temperature and cool his fever-stricken patients.

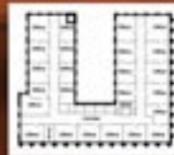
Historians argue whether Gorrie developed a full-blown air conditioning system with ducts and fans to circulate chilled air. But, he is considered the godfather of air conditioning.



In 1902, Willis Carrier designed a spray-type temperature and humidity control system for the Sackett & Williams printing plant in Brooklyn, New York.

1902

Before air conditioning, houses and office buildings were designed to enhance natural cooling by placement of windows and doors for natural light and ventilation.



1924



In the 1920s, air conditioned theaters, department stores and office buildings were becoming more and more commonplace.



1946

After World War II, the demand for room air conditioners begins to increase. Thirty thousand room air conditioners were produced in 1946 alone.

Air conditioning becomes a bargaining issue when textile workers in North Carolina strike in 1947 because of stressful heat and humidity in the workplace.



1952



Glass-walled skyscrapers such as the United Nations (1952) linked the development of modern architecture with the new technology. Mechanical cooling freed designers from conventional methods of siting office buildings in relation to the sun or ventilating them with operable windows, while making them dependent on air conditioning systems to function.



Since the energy crisis of the 1970s, interest turned to designing buildings to be virtually "air tight". This brought about the shift from natural ventilation to mechanical ventilation.

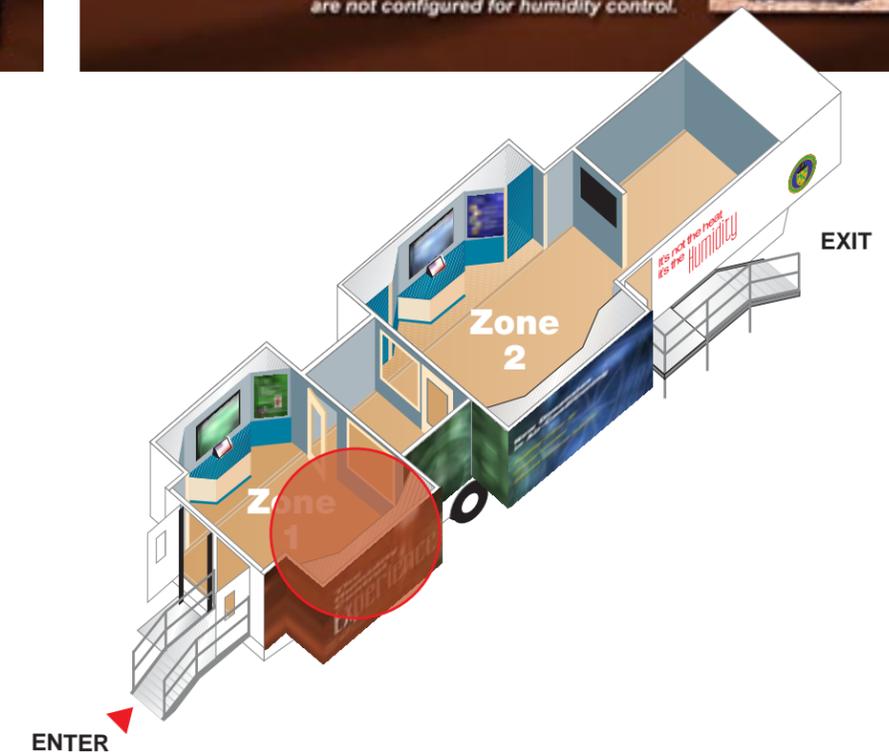
This "rooftop unit" is typical of the type of system used in low-rise commercial buildings which account for more than 90% of commercial construction in North America. Unfortunately, standard commercial rooftop units are not configured for humidity control.



Zone 1

lightboxes 1-3

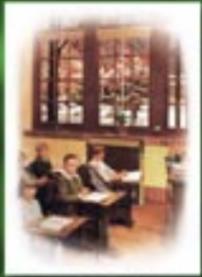
“Over 100 Years of Progress”
A brief history of air conditioning



Key Issues

- Modern buildings require ventilation air provided by air conditioning systems
- Ventilation air is heavily laden with moisture in non-arid climates
- Conventional air conditioning controls only temperature with a thermostat
- Unmet moisture loads pass into buildings raising humidity levels
- Some modern building materials and activities also introduce indoor air contaminants

Old classroom with radiator for heating and operable windows for ventilating and cooling



Modern classroom with closed environment reliant on air conditioning to provide heating, ventilating, and cooling while maintaining good indoor air quality (IAQ)



Overview of Building Impacts

Better humidity control:

- Provides higher ventilation rates and better indoor air quality for more productive learning environments in schools
- Reduces cost of refrigeration in supermarkets and ice arenas
- Improves comfort in theaters and restaurants
- Decreases costly moisture damage to building structures and furnishings in hotels
- Limits exposure to allergens, pathogens, and chemicals

42 inch Plasma Screen DVD presentation

Humidity Control Problems of Conventional Air Conditioning

Conventional Cooling

- Needs reheat for humidity control
- Oversized compressors, coils, and fans

Good

Enthalpy Exchange with Cooling

- Mitigates humidity only
- Requires building exhaust

Better

Desiccant Dehumidification with Heat Exchange and Cooling

- Controls humidity
- Building exhaust not required

Best

Zone 1

lightboxes 4-5 and DVD 1

“Key Issues”
Where air-conditioning is today and some of its inherent limitations




Origins of Humidity Control

- Willis Carrier, the inventor of conventional air conditioning, first used it to control humidity in a printing plant in the 1920s
- Conventional air conditioning, using coils, compressors, and refrigerants, has grown to dominate comfort cooling markets
- Desiccant dehumidification first used to preserve cargo in ships at sea in the 1930s
- Desiccant dehumidification has focused on niche uses in many moisture sensitive industrial process and storage markets
- Now many commercial and institutional buildings use desiccants for both dehumidification and energy recovery



42 inch Plasma Screen DVD presentation

Desiccant Dehumidification

Transitions from Industrial to Commercial and Institutional Applications

Food and beverage processing control TO Refrigerated warehouse environmental control TO Supermarket space conditioning

Pharmaceutical and medical device manufacturing control TO Hospital operating room environmental control TO Nursing home space conditioning

Zone 2

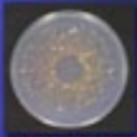
lightboxes 6-7 and DVD 2

“Origins of Humidity Control”
Where did desiccant based systems come from and why?



Proper Ventilation Equals Healthy IAQ

Desiccants eliminate common moisture problems in buildings

				
Deter Dust Mites	Minimize Bacteria	Discourage Fungus	Eradicate Mold Damage	Prevent Corrosion

It stands to reason that if you are comfortable you can be more productive than if you are not comfortable. Professor P. Ole Fanger, D.Sc. Director, International Centre for Indoor Environment and Energy at the Technical University of Denmark, is one of the world's leading experts on human interaction with indoor environments. Professor Fanger has recently published a series of experimental results linking comfort to productivity and ventilation air and humidity control to improved comfort.

Desiccant systems are widely used for energy recovery, to provide precision humidity control in industry and to control operating costs in today's supermarkets. Ongoing work at ORNL, at NREL, and within industry has yielded significant advances in performance, applications, and material cost reduction.

Desiccant humidity control is expected to become an essential engineering tool to manage moisture within the 21st century building.

Frequently Asked Questions About Desiccant Technology

Press Enter to return.

What applications benefit from desiccant technology?

- Schools
- Refrigerated Warehouses
- Ice Rinks
- Theaters
- Operating Rooms
- Restaurants
- Supermarkets

42 inch Plasma Screen DVD presentation

21st Century Indoor Air Quality

The future of IAQ depends on proper ventilation air and moisture management.

Pre-Treatment of outside air using desiccants eliminates a "dirty little secret" about rooftop O.A. louvers – they are usually shut by the users.

The only solution for moisture management is independent temperature and humidity control.



Actively regenerated desiccant systems are a viable solution for the growing requirement for standalone ventilation air systems.

"If the energy infrastructure of this country is inadequate or in some way excessively costly, it will undermine economic growth, and is therefore a major issue that must be addressed"
Alan Greenspan, January 28, 2001

Desiccant-based CHP systems are entering the market to meet this new demand!



Zone 2

lightboxes 8-9 and DVD 3

"21st Century Indoor Air Quality"
Why do we need desiccant based systems in our future?




**tabletop
exhibit**
(52in x 72 in)

The Team was responsible for the design and production of a tabletop exhibit to be used inside convention halls to inform and direct people to exhibit van outside.



**The
Humidity
Control
Experience**



mobile showcase

benefits

Indoor air quality is improved through higher ventilation and fresh air make-up rates. These systems also maintain lower humidity levels which help to:

- Deter dust mites
- Minimize bacteria
- Discourage fungus
- Eradicate mold damage
- Prevent Corosion

overview

Desiccant humidity control systems offer numerous advantages in many mainstream building applications.

This desiccant, advanced technology display/demonstration trailer has been constructed to reinforce the Indoor Air Quality (IAQ) benefit message associated with desiccant dehumidification and to allow building hvac designers and air conditioning customers a first hand experience of the *comfort* and *energy-saving* aspects of this technology.



poster (24in x 36 in)

The Team was responsible for the design and production of an informative poster to be placed outside the exhibit van when attending conferences.



The Humidity Control Experience

overview

Desiccant humidity control systems offer significant advantages in many current building applications. Incorporating these technologies into existing and future buildings can reduce energy costs, and result in better health, greater comfort and increased productivity for the building occupants.

The DHC Van has two primary purposes. The first is to create an awareness of the features and potential benefits of desiccant technologies. By educating the attendee regarding conventional air conditioning history, technologies and limitations and then explaining how the desiccant systems operate, why they are beneficial and how they can be (and are!) of benefit, the attendee can learn a significant amount in a brief time frame.

The second reason the DHC Van was created was to provide an actual experience of the difference that a desiccant system can make to the quality of the air. The design of the structure is divided into two zones, the first using conventional air conditioning technologies and the second using desiccant-based dehumidification. As the attendees move from Zone 1 to Zone 2, the difference in room temperatures and humidity levels is shown on a visual display for comparison purposes.

the tour



Zone 1

Zone 2

ENTER

EXIT

featured stops

Zone 1 - "Over 100 Years of Progress" A brief history of air-conditioning. "Key Issues" Where air-conditioning is today and some of it's inherent limitations.

Zone 2 - "Origins of Humidity Control" Where did desiccant based systems come from and why? "21st Century Indoor Air Quality" Why do we need desiccant based systems in our future?

sponsored by



United States Department of Energy

feel it

- Tours range from 15 minutes to one hour
- Please begin the tour in Zone 1 at the history section
- A facilitator will guide your tour through the showcase
- Please feel free to ask questions at the end of your tour

tri-fold brochure

The Team was responsible for the design and production of an informative tri-fold brochure to be used as a take-away for tour attendees.



removable ▶

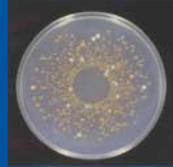
benefits

Indoor air quality is improved through higher ventilation and fresh air make-up rates. These systems also maintain lower humidity levels which help to:

deter dust mites



minimize bacteria



discourage fungus



eradicate mold damage



prevent corrosion



These IAQ features are only part of the broad benefits that help improve health and comfort, as well as reduce energy costs.

tours and workshops

Recognizing the wide range of attendees, the DHC Van offers:

- A 15-minute tour suitable for all visitors
- A 45-minute overview emphasizing the uses and benefits of advanced technologies for decision-makers
- One-hour to one-day workshops tailored to meet end users' needs.

contact

Scheduling and Program Information:

James R. Sand, Ph.D.
Research Engineer
Building Technology Center, Bldg. 3147
Oak Ridge National Laboratory
1000 Bethel Valley Road
Tel: 865-574-5819
Fax: 865-574-9338
E-mail: sandjr@ornl.gov

For more information visit:
www.ornl.gov/desiccantvan

The Humidity Control Experience



Desiccant Humidity Control Van

m o b i l e e x h i b i t

United States
Department of Energy



OVERVIEW

Desiccant humidity control systems offer significant advantages in many current building applications. Incorporating these technologies into existing and future buildings can reduce energy costs and result in better health, greater comfort, and increased productivity for the building occupants.

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the tour

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21st Century Indoor Air Quality

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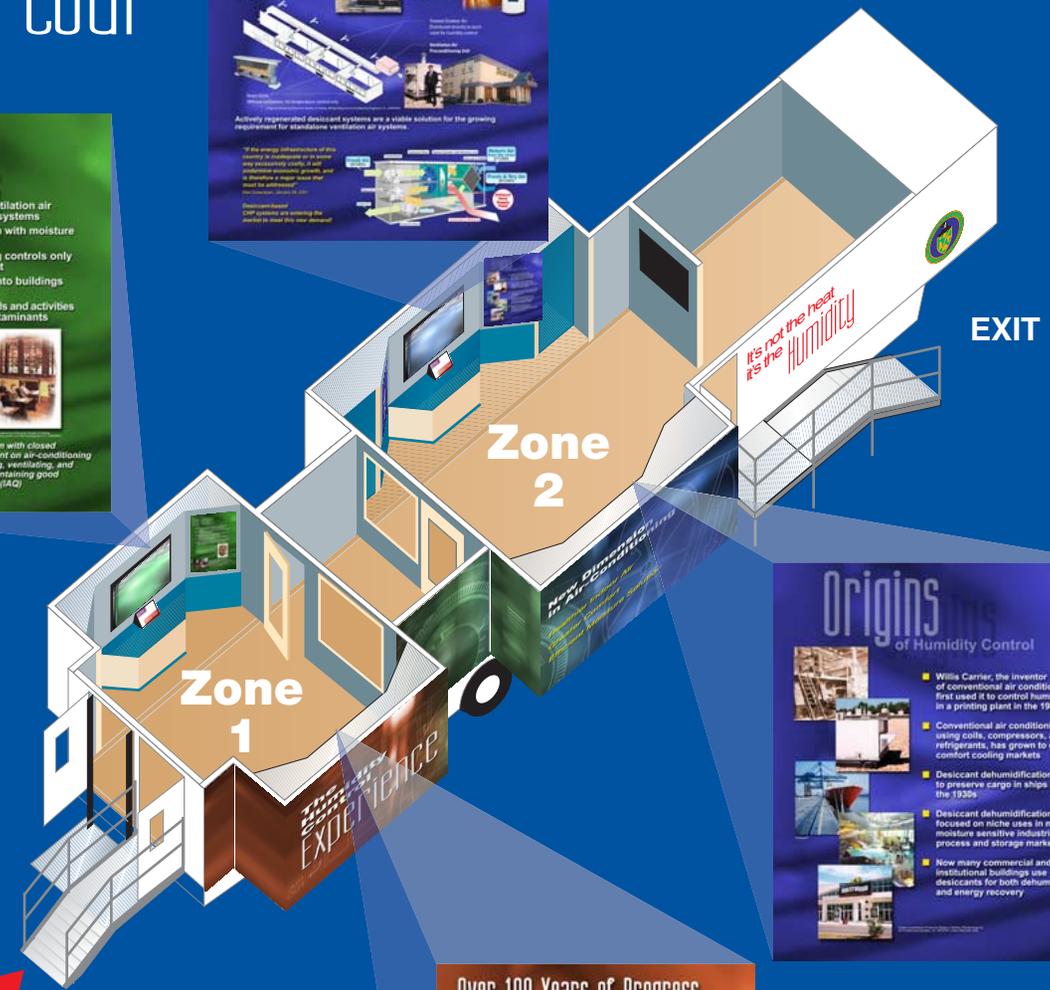
Pre-Treatment of outside air using desiccants eliminates a "dry film" effect about rooftop C.O. towers - they are usually shut by the users.

The only solution for moisture management is independent temperature and humidity control.

Actively regenerated desiccant systems are a viable solution for the growing requirement for standalone ventilation systems.

"If the energy performance of the system is improved, it will reduce the energy costs and provide a more sustainable building." - ASHRAE 55-2004

Desiccant-based C.O. towers are making the world a better place to live.



ENTER

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a brief thank you

The Team was responsible for the design and production of a short exit presentation thanking visitors for taking part in “The Experience” and urging them to learn more through the provided brochure and website address.

