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The Center for Energy Studies is a multidisciplinary research center, the central liaison for energy research, education, and public service at The University of Texas at Austin. Dr. Herbert H. Woodson is director.

Editor: Jennifer Evans

Large-Scale HVAC Test System Begins Operation

A dual-air-loop test system, a facility for large-scale tests of heating, ventilating, and air-conditioning (HVAC) equipment, has started operation at the center.

Conservation and Solar Energy researchers are developing a research program on advanced air conditioning and air cleaning that will use the new dual-air-loop system (see photograph), according to Bruce Hunn, head of the Conservation and Solar Energy Program.

Firms manufacturing nonconventional air-conditioning and air-cleaning equipment are invited to participate as sponsors of dual-air-loop research, both proprietary and nonproprietary.

Tests with the dual-air-loop system can accommodate HVAC equipment of up to 20 tons' capacity, about what a 10,000-square-foot office building would require.

The facility is suitable for testing:

- ☐ Evaporative air conditioners
- ☐ Air scrubbing, sorbing, and filtration equipment
- ☐ Sensible heat exchangers (air-to-air)
- ☐ Direct-contact heat exchangers (liquid-to-air)
- ☐ Solid and liquid desiccant air conditioners
- ☐ Absorption air conditioners
- ☐ Ice storage equipment

The two air loops are 26-inch-diameter round ducts, 80 and 50 feet long. Air flow to 5,000 cubic feet per minute can be achieved through the loops.

How components interact. "I see the facility as a testing ground. It can be used to develop experimental procedures for rating the performance of innovative cooling systems," said John L. Peterson, the Conservation and Solar Energy researcher who supervises the operation of the dual-air-loop facility.

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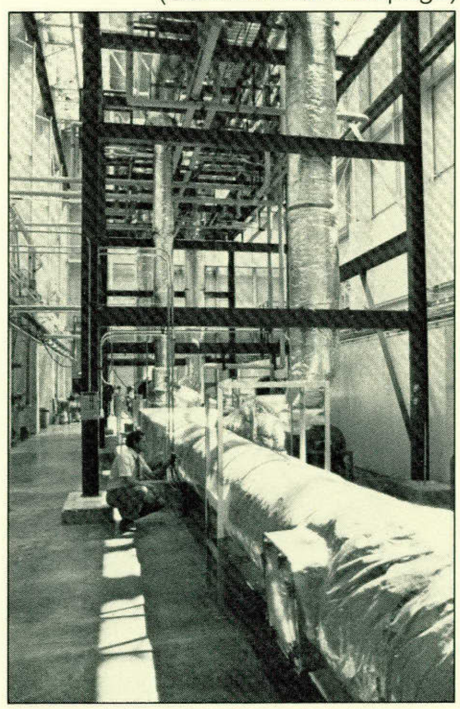
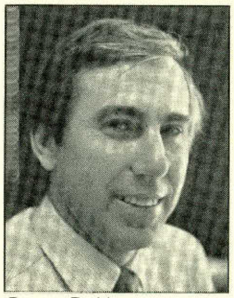
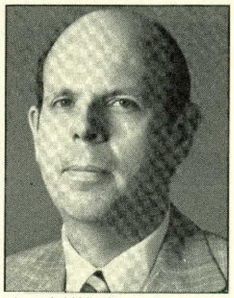
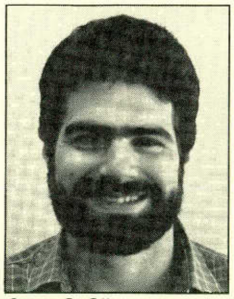


Firms are being solicited to participate in research with the dual-air-loop test system. Nonconventional air-conditioning and air-cleaning equipment will be studied with the unit, designed to test HVAC systems to 20 tons' capacity.


Bruce D. Hunn


Jerold W. Jones


John L. Peterson


Scott C. Silver

"The system not only will test a component, but also will test it as it interacts in an HVAC system. We hope to serve as a resource for developing test procedures for rating this type of equipment."

Constructed by Scientific Development Engineers of Austin, Texas, the dual-air-loop system is instrumented for continuous, automated, or manual control and measurement. Three conditions can be varied: air flow rate, air temperature, and relative humidity. The instrumentation measures six variables for air, water, and steam processes:

- ☐ Flow rate (at 9 points)
- ☐ Temperature (at 26 points)
- ☐ Relative humidity (at 4 points)
- ☐ Absolute pressure (at 10 points)
- ☐ Differential pressure (at 5 points)
- ☐ Fan speed (at 2 points)

Researchers can use the system's microcomputer to program and perform adjustment sequences during an experiment. For example, a 24-hour cycle of summer air temperatures and humidity can be simulated.

Four air zones. When testing an HVAC system, parts of the air loops can be used to simulate different air zones: the outside air supply, air circulating inside the building, recirculated air, and exhaust air.

The test system is insulated and is located inside the center's experimental bay, which is air conditioned. Thus the heat, cold, or humidity outdoors has little effect on operating conditions for the system, Mr. Peterson said.

Evaporative cooling has become the first target area for the dual-air-loop research because concerns about indoor air pollution will most likely create an entirely new market for evaporative and cooling equipment, Mr. Peterson said. The proposed revision of the ASHRAE Standard "Ventilation for Acceptable Indoor Air Quality" has made the technology attractive in even the most humid areas of the United States. ASHRAE is the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

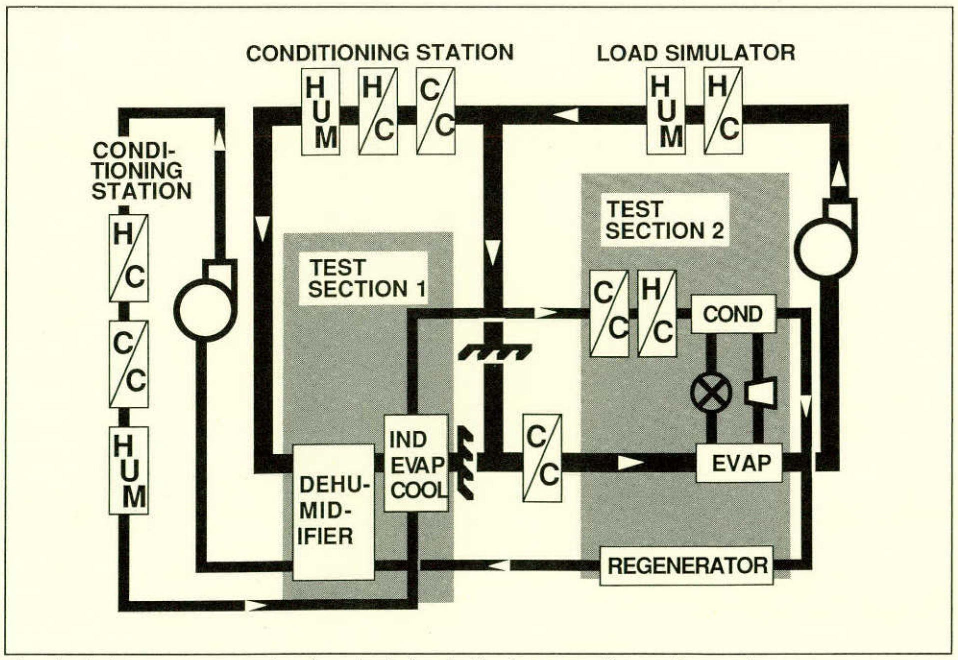
Indirect evaporative cooling systems can exhaust internally generated pollutants and odors that in other systems are normally recirculated within the building, he said. Because they are indirect rather than direct, the systems add no humidity to the cooled air.

Indirect evaporative cooling frequently saves 30 to 40 percent of the energy used by conventional air conditioning. Peak demands on the local utility are reduced as well. Another environmental advantage is the absence of fluorocarbons, which deplete ozone in the earth's atmosphere.

The first test. Norsaire Systems of Englewood, Colorado, has donated an advanced indirect evaporative air conditioner that will be tested in the dual-air-loop facility this summer. The research will measure how well the equipment performs under different weather conditions.

No standard exists for rating evaporative cooling equipment. The industry needs a rating system directly comparable to the EER (energy efficiency rating) of conventional vapor-compression equipment, said Mr. Peterson.

A technical committee of ASHRAE has just begun work on a rating system for direct evaporative cooling, he said, but indirect evaporative cooling, the more commercially promising of the two, is not yet being addressed. ■



The dual-air-loop system set up for a test of an indirect evaporative cooling system.

To find out more about the dual-air-loop research, contact Mr. John L. Peterson, Conservation and Solar Energy Program, Center for Energy Studies, The University of Texas at Austin, 10100 Burnet Road, Austin, Texas 78758 (512/471-7792).

Dual-Air-Loop Researchers

Dr. Bruce D. Hunn
Head, Conservation and Solar Energy Program

Mr. John L. Peterson
Research Associate and Supervisor, Dual-Air-Loop Test Facility

Dr. Jerold Jones
Professor of Mechanical Engineering

Mr. Scott Silver
Research Engineering Associate

CES Update

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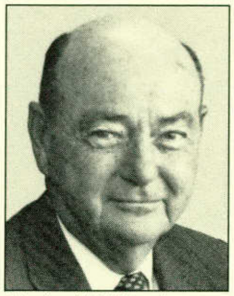

Herbert H. Woodson

UT President William H. Cunningham has appointed **Herbert H. Woodson** acting dean of the UT College of Engineering beginning September 1.

Earnest F. Gloyna, who has served as dean of engineering since 1970, will remain associated with the college, carrying out research and special projects.

Dr. Woodson, who directs the Center for Energy Studies, is a tenured electrical engineering professor and has taught at UT since 1971. He is ad interim director of the Center for Fusion Engineering and serves on the Advisory Council of the Electric Power Research Institute.

Among many awards and honor, Dr. Woodson received the Nikola Tesla Award in 1984 by the Institute of Electrical and Electronics Engineers.

■

Dale E. Klein, deputy director of the center, has been inducted into Phi Kappa Phi, an academic honor society. He won the Outstanding Service Award of the Travis Chapter of the Texas Society of Professional Engineers. Dr. Klein is serving as 1986-87 president of the chapter.

■

Jerry Taborek has been invited to teach at the NATO Advanced Study Institute on **Thermal-Hydraulic Fundamentals** and Design of Two-Phase Flow Heat Exchangers July 6-17 in Povoa de Varzim, Portugal. Dr. Taborek is a research engineer at the center, developing a heat transfer research program. The institute is an international forum held primarily for scientists, engineers, and academicians of NATO countries.

Conservation and Solar Energy

John R. Howell has been honored with the 1987 Ralph Coats Roe Award given by the Mechanical Engineering Division of the American Society for Engineering Education. Dr. Howell, a former deputy director of the center, is a Conservation and Solar researcher, E.C.H. Bantel Professor for Professional Practice, and chairman of the UT Department of Mechanical Engineering.

Nuclear Studies

A computer analysis of **shipping casks used for nuclear wastes** is being conducted by Nuclear Studies researchers.

The two-year study is the third major one performed by the center for Sandia National Laboratories, said Dale Klein, who is leading the project. He is deputy director of the center, director of the Nuclear Engineering Teaching Laboratory, and a UT associate professor of mechanical engineering. Mechanical engineering graduate students Randall Manteufel and Mohammad Ally and undergraduate Krista Dewart are participants.

The goal in the study is to modify an existing computer code to analyze the performance of the shipping casks under normal conditions and during accidents, such as flooding of the casks.

The results will help the federal government certify new shipping cask designs more quickly, said Dr. Klein.

Process Energetics

Two researchers have joined the Process Energetics Program: Peishi Chen, a post-doctoral researcher who will develop computer simulations of industrial drying, and D'Arlene Berensmann, an information specialist who will compile and manage data bases for the program.

A graduating engineering student who has worked in the Process Energetics Program, Tim Bielek, has won a fellowship for graduate study in the program from Texas Instruments. Another May graduate, David Pearce, has been awarded a graduate fellowship to Stanford University.

Separations Research Program

Separations researchers at the center have begun a study of ways to separate mixed liquids by using **microscopically porous membranes of ceramic.**

Ceramic (or inorganic) membranes are used in the food, pharmaceutical, and petroleum industries to separate fat from milk, purify water, dehydrate juices, sterilize drug components, and remove water from oil-water emulsions.

Typically alumina, an inorganic salt,

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Top minority high school students from throughout Texas visit the Center for Energy Studies June 17 as part of UT's MITE Program (Minority Introduction to Engineering).

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Center for Energy Studies
Balcones Research Center
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Austin, Texas 78758

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is formed into a hollow ceramic tube, or into a solid tube of alumina with several small, hollow tubes running its length. The skin on the surface of the alumina is highly and finely porous. Its pores are only a few microns (millionths of a meter) in diameter. The interior pores are much coarser.

When the liquid mixture flows through the tube under pressure, the micropores of the membrane allow only droplets or particles of a specific size to pass through. To prevent saturation, a ceramic membrane can be flushed with reverse pressure or chemically cleaned and thus may be reused many times.

Separations researchers William J. Koros, Jose Luis Bravo, James R. Fair, Duane Moosberg, and Cheri Wooten will test and measure a ceramic system to characterize how it performs under ranges of conditions. They will study ways to combine ceramic membranes with other membrane materials and with liquid-liquid extraction techniques.

The study is funded by Alcoa separate from other program research. ■

UT Austin Energy

New Technology Center Offers UT Ideas to Industry

A technology transfer center at a university generally focuses on telling the outside world about professors' new ideas. The new UT Center for Technology Development and Transfer has a different role. It locates private firms and actually make deals with them to commercialize the professors' ideas.

According to the director of the new center, Stephen A. Szygenda, the UT center can even form a company or set up a joint venture to commercialize the product or process. The center's coordinator is Meg Wilson.

Anyone from the university staff, faculty, or student body or from a private firm interested in finding new products and services can approach the Center for Technology Development and Transfer.

Half a dozen venture capitalists have visited the center since it was started in July 1986, said Dr. Szygenda. Eighteen projects are in various stages of being developed, evaluated, and negotiated. Two examples he mentioned are a heart pump and a fluidized-bed combustion method.

The Texas Legislature created the center. It serves not just The University of Texas at Austin but all Texas universities, public and private.

Hundreds of companies have spun off from UT research projects over the years, said Dr. Szygenda. The largest of these is Tracor.

In the past the university's commercialization of research ideas occurred primarily through patents and licensing. Frequently researchers with promising ideas left the university to develop them on their own.

One policy change has happened that might make future academic inventors reconsider. The UT policy on intellectual property was changed in 1985 to direct that 50 percent of the university's income from an invention or licensed concept go directly into the pockets of the research team members. Previously a sliding scale was followed, and usually researchers received less than 50 percent.

Besides the monetary incentive change, Dr. Szygenda said, the Center for Technology Development and Transfer now encourages and explores a greater, more flexible range of commercialization paths: patents, royalties, and licensing, but also grants, joint ventures, new corporations, and—the most valuable option—equity sharing.

Equity sharing is an arrangement in which the company wishing to commercialize an infant research concept pays the university for it with shares in the company. If even a scant few successful companies are developed every year from university research results, a large income potential is possible over the long term.

"Equity in a company can be worth far more than patent royalties," said Dr. Szygenda.

"The center provides us with an opportunity to put together a deal the way it is done in the business world. . . . It's structured as a win-win situation for everyone concerned," he said.

The United States' efforts at technology transfer have been notoriously slow. Dr. Szygenda said if successful, the center will stimulate the Texas economy and serve as a model for other states. ■