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## Challenge of the Decade

# Seek air quality answers

**Experts in all facets of indoor air quality discuss the current status of the problem and some of potential steps in bringing about solutions**

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**C**HARACTERIZING it as "one of the most serious public health challenges facing business and health care professionals in the next decade," experts from both the public and private sector, including ASHRAE President Donald R. Bahnfleth, recently gathered in Golden Valley, Minnesota, to address "The Character and Control of Indoor Air Pollution."

A growing concern since the OPEC oil embargo forced new solutions to energy conservation problems such as "tight buildings", indoor air pollution is gaining attention from both within and without the heating, ventilating and air conditioning industry.

The one-day seminar was co-sponsored by the American Lung Association and Honeywell, Inc.

According to an American Lung Association briefing paper, "Experts agree that indoor air pollution has increased in recent years as a result of the nationwide drive to save energy costs by weatherizing homes: tight doors, glazed windows, full insulation and rubber gaskets all help keep weather out but pollutants in by curtailing ventilation - the single most important mechanism for clearing the indoors of accumulated emissions. These 'common sense' economies have been promoted in recent years by federal and local conservation appeals, the spread by utilities of energy audits, and tax benefits for homeowners making energy related improvements.

The combination of higher indoor emissions, partly from tighter homes, with

a growing body of knowledge about pollutants and their properties has given a new sense of urgency to the concern about indoor air quality."

### Panel of experts

It is because of this concern and the need to raise public awareness that the sponsors brought together a panel of experts to discuss the status of the indoor air pollution problem and possible solutions.

A characterization of the problem from a health perspective was given by the session's keynote speaker Dr. Michael Blumenthal, M.D., director of the Section of Allergy for the University of Minnesota. According to Dr. Blumenthal, indoor air pollution is not a new problem. "Indoor air pollution has been around as long as there has been indoor air," said Dr. Blumenthal. However, he noted that the scientific community and Congress have become increasingly aware of the problem.

The principal pollutants include carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>) and hydrocarbons from stoves and burning appliances; formaldehyde from paneling and insulation products; radon from uranium bearing rock and soil; asbestos, principally from construction materials; and toxins from a wide range of household products.

According to the American Lung Association briefing paper, "The pollutants in question are either known or suspected to cause symptoms and ailments ranging from mild nasal irritation to cancer. But while many of the health effects are well established, some are not, and most studies pertain primarily to outdoor exposure levels, controlled experiments, and

special workplace conditions like mines. Though relevant studies go back decades, residential interiors are a relatively new area for inquiry and pose difficult questions about duration and exposure as well as the minimum levels at which particular pollutants begin to be harmful."

Dr. Blumenthal noted that as methodology increases, there will be continued reporting of adverse effects of indoor air pollution. He broadly defined an adverse reaction to air pollution as "any undesirable effect caused by an air pollutant."

Environmental factors controlling indoor air pollution include the number and type of pollutants as well as their concentration and the duration of exposure. Atmospheric effects on indoor air pollution include temperature, humidity and the amount of ventilation.

The degree to which a person is affected by indoor air pollution, according to Dr. Blumenthal, depends on the subject's genetics, health, age, sex and other pharmacologic agents. "The effects of air pollution on the body are very poorly understood," said Dr. Blumenthal.

"There are many hidden sources of indoor air pollution," said Dr. Blumenthal. Clinical allergies are caused by aeroallergens. Some of the common indoor aeroallergens noted by Dr. Blumenthal are dust mites, epidermals, fungi and other biologicals. Common indoor molds include aspergillus, penicillium and cladosporium.

Dr. Blumenthal explained that the criteria for the clinical evaluation of adverse reactions from air pollutants include: clinical characterization of the adverse reaction, identification of the pollutant, demonstration of a caused relationship

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between the air pollutant with the clinical picture and identification of the mechanism involved in the adverse reaction.

Three methods for prevention of adverse health problems from indoor air pollutants described by Dr. Blumenthal include: decreased production of pollutants, preventing contact of the air pollutant with the subject and preventing contact of the subject with the air pollutants.

An overview of indoor air pollution control strategies was delivered by James E. Woods, Ph.D., P.E., Technical Director, Indoor Air Quality Diagnostics Program, Honeywell. Woods noted that indoor air quality has become a major focal point within the last decade due to at least four factors: 1) energy conservation has led to reduced infiltration and ventilation in occupied spaces; 2) synthetic materials have been used more extensively; 3) effluents from indoor sources, such as tobacco smoke, copy machines and aerosols have become more ubiquitous; and 4) methods of detecting indoor pollutants at concentrations below those found in industrial facilities have become available.

Indoor air quality, according to Woods, is an indication of how well the air satisfies thermal requirements, respiratory requirements and contaminant control. He went on to describe some of the basic control strategies such as source control, dilution, removal and ventilation, noting that ventilation efficiency was the key to controlling indoor air pollution and stressing the bottom line that the removal rate of pollution must be greater than the generation rate.

### Distinguished panel

A panel presentation followed on control policy issues giving the federal perspective, state perspective, industry perspective and the public building management perspective. David Mudarri, Ph.D., Special Initiatives Officer, United States Environmental Protection Agency, Office of Air and Radiation, stated, "The focus of our attention should be on 'exposure' as to whether this is a public policy issue. Is there sufficient exposure to generate a response by the EPA?"

We have more tools to deal with the indoor environment than we do with the outdoor environment. We can treat products, treat air and educate people. What is done in the outdoor environment cannot be applied 'carte blanche' to the indoor environment", said Mudarri.

He stated that the problems of indoor air pollution may be better solved by working with such organizations as the American Lung Association, rather than imposing federal regulations. "If the EPA is going to deal with the issue, it must do it not only in a way that addresses the issue, it must also address the U.S. Con-

stitution. For this reason, it may be dealt with better on the state and local level," said Mudarri.

"Public policy can only be set when all areas of investigation are shared," stated Marsha Keller, Assistant Commissioner of the Minnesota Department of Energy and Economic Development. "We must decide who regulates, on what level, what should be regulated and who pays," said Keller.

"There needs to be a collaborative effort on deciding who should shape strategy," stated Keller. "The question of who is in charge will have to be dealt with in a highly participatory way."

Donald R. Bahnfleth, P.E., president of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, noted the need to avoid knee-jerk reactions. He cited ASHRAE's continuing work in indoor air quality and stated that the magnitude of work yet to be done requires that both the public and private sector work closely together.

"The voluntary consensus procedure provides benefits to all," stated Bahnfleth. "Energy conservation and indoor air quality must be attacked together." He noted that in 1975, ASHRAE reduced its standard for minimum ventilation in response to energy conservation pressures. Two years ago, the Society revised the figures upward. Bahnfleth also cited new designs in HVAC materials which allow new innovations in source control.

"Indoor air quality in a public building is much more complex than it is in office buildings," stated John Eberhard, Director of the Building Research Board, National Research Council. "Modifying design criteria for public buildings is extremely complex," he said. "Indoor air quality is not a big problem to those who operate public buildings," said Eberhard. He stated that most people who are concerned with indoor air quality are concerned with "their air" and that the design of public buildings will not be affected until indoor air quality becomes a *public health* issue.

### Technical solutions

The technical solutions to indoor air pollution including source control, dilution, removal and ventilation were addressed by a panel of experts. Demetrios Moschandreas, Ph.D., Director of Research Chemistry and Chemical Engineering, Illinois Institute of Technology, explained that source controls include source elimination, source improvement, source effluent direction, source sealants, and a change in source use patterns.

Charles Lane, a research scientist with the Energy Division, Minnesota Department of Energy and Economic Development, stated that in dilution, how and where circulation devices are placed

needs to be addressed. "The rules of thumb in ventilation are oversimplified," said Lane. "We need design guidelines."

The removal of indoor air pollution can be accomplished through the filtration of gases and particulates, according to Brian Krafthefer, a principal research scientist from Honeywell Physical Sciences Center. The method of filtration can be either mechanical, electronic or a combination of both, he said. He noted that at present "there isn't a good understanding of how removal devices work together."

Ventilation, one of the key points in the control of indoor air pollution, was addressed by John Carlton-Foss, Ph.D., president of Human-Technical Systems, Inc. Carlton-Foss stated that where ventilation systems were placed, who should perform the measurements and where the measurements should be made are central questions in the ventilation process. "If the designer doesn't put the vents and returns at the proper spots, you don't get the ventilation you desire," said Carlton-Foss.

Various operational solutions in both the residential and office/commercial environment were also addressed by a knowledgeable panel. John Spears, an architect with the National Association of Home Builders Research Foundation, Inc. in Gaithersburg, Maryland, submitted a statement saying the NAHB is looking into indoor air quality and the effect of radon and working with the Environmental Protection Agency on field studies.

"Indoor air pollution has made it into the big times," reported David Swankin, of Swankin and Turner, a consultant to the Consumer Federation of America. He said that the attention level, as far as indoor air pollution is concerned, has gone up. "Consumers need reliable information as far as indoor air quality is concerned," said Swankin. He also called for a credentialing system in the near future for those that test indoor air quality.

Douglas Greenaway, an architect with the Building Owners and Managers Association, reported that BOMA is still on a "learning curve." "BOMA's policy is still an evolving one. We are in an educating mode," said Greenaway.

He noted that some building owners are only now becoming aware of the problems with indoor air quality. "We advise our members to take complaints seriously and correct them. BOMA encourages members to work closely with tenants on indoor air pollution problems," stated Greenaway.

Philip R. Morey, Ph.D., a senior environmental hygienist with the Indoor Air Quality Diagnostics Program at Honeywell, showed a variety of slides on design errors and "sick" buildings throughout the United States. ■