Conference Report

7th International Conference on Indoor Air Quality and Climate (Indoor Air '96), July 21-26, 1996, Nagoya, Japan

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The international community working in the field of indoor air research gathers every three years to discuss the state-of-the-art. In Nagoya, Japan, some 900 scientists from more than 50 countries met. More than 600 papers were presented in the form of keynote lectures, plenary lectures, lectures in technical sessions and posters. Special issues were discussed in 16 workshops. The papers have been published in four proceeding volumes with almost 4000 pages.

Given the fact that people in developed countries spend most of their time (more than 90 %) in indoor environments, the subject of indoor air quality is important. As one of the leading persons in the indoor air research community, Prof. Ole FANGER from Denmark, pointed out in a plenary lecture (4 : 3-12)¹, it was until very recently that people were assumed to be the only pollution source in buildings. The building itself is, according to Fanger, now acknowledged as being an indoor air equally important source of indoor air pollution. Since the mid thirties, human comfort, in addition to health, was introduced by the American hygienist YAGLOU as a paradigm for ventilation. By that, the question of how to measure and regulate indoor air quality arose. FANGER offered a solution of this problem, when he introduced his olf/decipol²

concept at the Indoor Air '87 Conference in Berlin, Germany. A decisive feature of this technique is that a (-trained or untrained) panel rates the air quality from the first impression when entering a room. A major set back of this method, also reported at the conference in Nagoya by GROES et al. (4 : 237-242), PARINE and ORESZAZYN (1 : 429-434) and AIZLEWOOD et al. (2 : 895-900), is the observation that the perception of air quality by building occupants does not correlate with the ratings by a panel. Furthermore, LEI et al. (4 : 349-354) found a strong impact of temperature and humidity on the perceived air quality, whereas in another study (BLUYSEN et al., 3 : 619-624), no effect of temperature on perceived air quality was observed. This implies that the simple model³ provided by the olf/decipol approach has to be replaced by a more complicated one. At least it seems to be premature to base the European Prestandard (prENV 1752) on 'Ventilation for buildings - Design criteria for the indoor environment' on this concept. As smoking is a common human activity indoors, environmental tobacco smoke (ETS) has always been an

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² Definitions: 1 olf (source strength of pollution) = emission rate (of bioeffluents) of one sedentary person; 1 decipol (perceived level) = level of air pollution of a sedentary person at a ventilation rate of 10 l/s (= 0.1 olf/l/s); a smoker, on average emits 6 olfs.

³ The approach is to add up all sources of indoor pollution (in olf-units) and adjust the ventilation in order to obtain an acceptable decipol level.

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¹ The figures in parentheses refer to the volume number and the pages of the proceedings.

issue in the field of indoor air research and, of course, also at the Indoor Air Conferences. In the past 10 to 20 years, methods for measuring ETS constituents in indoor environments have been developed and suitable markers for the ETS gaseous phase (nicotine⁴ and its pyrolysis product 3-ethenylpyridine) as well as for the ETS particles (UV-PM⁵, F-PM⁶, solanesol) have been established. The tobacco industry and CORESTA⁷ have played an important role in this development. The establishment of specific ETS markers allows ETS apportionment of the exposure to wide-spread pollutants such as particles, volatile organic compounds (VOC) and polycyclic aromatic hydrocarbons (PAH). At the conference in Nagoya, BAEK et al. (1 : 483-488) reported that ETS contributes, on average, 20 % to the indoor exposure to respirable suspended particles (RSP), other sources being heating systems and outdoor air.

In a representative study with nonsmokers in 5 European cities (Barcelona, Turin, Paris, Bremen, Stockholm), PHILLIPS et al. (1 : 495-500) found a high variation by city in the exposure to RSP, nicotine and benzene, with Barcelona being the highest and Stockholm the lowest. This order was independent of whether the subjects had a smoking or nonsmoking workplace or lived in a smoking or nonsmoking household.

Another important aspect of ETS research is the improvement of air quality in indoor environments where smoking takes place. At the meeting in Nagoya, different approaches for the solution of this problem were presented, although real breakthroughs were not reported. NELSON et al. (4 : 21-26 and 4 : 27-32) reported data from a new cigarette which primarily heats tobacco showing a reduction of about 90 % for most of the ETS constituents compared to conventional cigarettes. ISHII et al. (2 : 151-156) developed a ventilation system for a new car in the Shinkansen bullet train, providing acceptable

air quality for both smokers and nonsmokers. OTANI (4 : 51-56) studied the removal of particulate and gaseous phase ETS components by corona discharge. While isoprene was successfully removed by this system, acetaldehyde could not be eliminated to a substantial degree, mainly because aldehyde is generated from ethanol and other tobacco smoke species under these conditions.

On the other hand, existing ventilation systems, when operated properly, obviously can provide acceptable air quality in smoking environments. BOHANON and co-workers (4 : 39-44) studied the concentrations of some ETS constituents and the air quality perception at three different ventilation rates in an office building with a 'tolerant smoking policy'. The ETS levels were low, even at the tested minimum ventilation rate of 0.22 air changes per hour (ACH). When the ventilation rate was increased to ASHRAE⁸ rates (0.42 ACH) and maximum rates (1.02 ACH), carbon dioxide, total VOC, formaldehyde and most of the ETS compounds tested decreased. However, evaluation of the environment, mood, odour and symptoms by the occupants demonstrated a consistently high degree of acceptance unaffected by changes in ventilation rates. For the foreseeable future, ETS will be an issue in the field of indoor air quality.

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⁴ PIADÉ et al. (4 : 33-38) gave an empirical description of the long known sorption phenomena of nicotine to indoor surfaces. According to that, nicotine, in contrast to 3-ethenylpyridine, has to be regarded as a poor marker for the ETS gas phase.

⁵ UV-PM: Ultraviolet light absorption of particulate matter, which is more specific for ETS particles than the gravimetric determination of total particle concentrations.

⁶ F-PM: Fluorescence of particulate matter, still somewhat more specific for ETS particles than UV-PM.

⁷ The CORESTA ETS Subgroup, apart from other activities, initiates collaborative studies for ETS constituents in order to develop CORESTA Recommended Methods and standard methods for ISO and for ASTM (American Society for Testing and Materials). A collaborative study on respirable suspended particles (RSP), UV-PM, F-PM, solanesol, nicotine and 3-ethenylpyridine is presently in the planning phase.

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⁸ ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers