

Indoor Air Quality

Authors: Alex Ledbrooke & Jo Barnes

On January 24th 2007 the Institution of Environmental Sciences and the Institute of Air Quality Management held a conference at the Building Research Establishment, Watford, entitled “Personal Choice or National Responsibility for Indoor Air Quality?” Around 60 delegates were present for the nine presentations on offer.

Derrick Crump (BRE) opened proceedings by emphasising the potential health effects of indoor air pollution. Pollutants such as VOCs, allergens, and fibres can be sourced from indoors (e.g. furnishings, cooking, smoking) and outdoors (ambient air); and the concentrations of such pollutants indoors is intimately connected to building heating, cooling and ventilation systems. He was followed by Tadj Oreszczyn (Bartlett School of Graduate Studies, UCL) who talked about the use of ‘Building Physics Models’ to examine the balance of energy use and ventilation in terms of pollutant concentrations indoors – and the vital need for such models to be grounded with field data. He illustrated the importance of occupant behaviour by reference to conservatories – originally a retro-fit energy reduction intervention but now (depending on the way the conservatory is heated, whether it can be isolated and whether it is used in winter) the situation is uncertain. Ben Croxford (UCL) focused on the risk associated with indoor gas appliances. His project examined 597 households in east London and of these 23% had some kind of problem appliance – 3% had a very high risk of carbon monoxide poisoning (there was also a 5% high risk and 9% medium risk). In the final presentation of the first session Jo Barnes (Air Quality Unit, Cornwall College) discussed recent measurements of arsenic concentrations in ambient air in Cornwall and their implications for health. In particular, evidence was presented that for residents in historic mining areas in Cornwall indoor arsenic exposure should be monitored. The case was also made for indoor baseline monitoring of other metals/metalloids in all areas where there was an exposure risk.

After lunch Dudley Shallcross (Bristol) talked about the complexities of the relationship between urban outdoor air pollution and its indoor penetration and circulation. Vian Kukadia (BRE) continued this theme and described how the BRE was attempting to raise awareness of indoor air quality issues and was undertaking extensive monitoring “. . . to provide industry with guidance and solutions”. Nicola Carslaw (York) used the set of master equations currently in use for tropospheric chemistry modelling to examine indoor air pollution. Three features of the indoor system stand out. First, although photolysis is minimised indoors hydroxyl radical concentrations are still significant – 40x less than outdoor summer concentrations but similar to outdoor night-time and winter concentrations. Second, there are much larger surface areas indoors than outdoors ($0.02 \text{ cm}^2/\text{cm}^3$ indoors and $1 \times 10^{-5} \text{ cm}^2/\text{cm}^3$ outdoors). Third, terpenes and limonoids (often from air fresheners and similar) are important indoor sources of hydrocarbons to drive the indoor air chemistry. The final presentation (Mike Ashmore, York) dealt with the use of (total) personal exposure modelling as a tool for policy assessment. He emphasised that knowledge of the frequency distributions of exposure in a population (Population Exposure Frequency Distribution) based on the way individuals divide time between indoors and outdoors, roadside and elsewhere, work and home etc. and their

activity patterns (e.g. groups such as bus drivers, schoolchildren office workers) was essential in evaluating risk and in designing intervention strategies. Exposure to HGVs seemed to be a particular hazard.

In summary, indoor air pollution has great significance for individual health and its links to building design, occupant behaviour, outdoor pollution and geographical location are complex and under-researched.