Environmental Assessment for Improved Collection Conservation

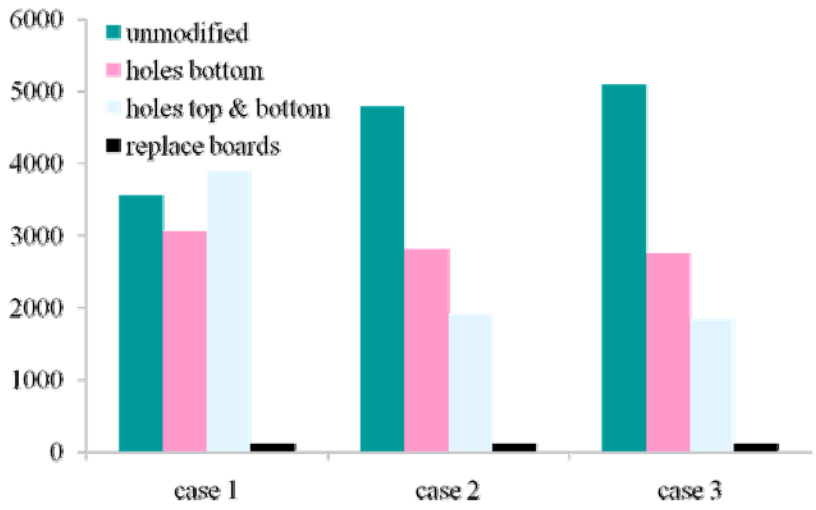
D. Thickett

[1]English Heritage, 1 Waterhouse Square, 138 Holborn, London, EC1N 2ST

david.thickett@english-heritage.org.uk http://www.english-heritage.org.uk)

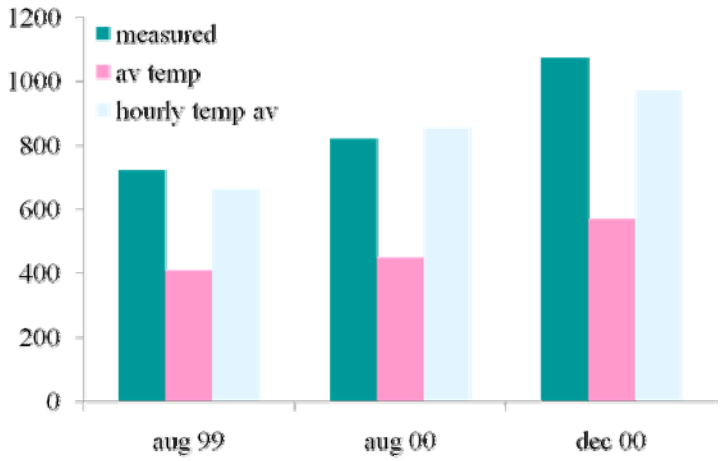
Many tools are increasingly available for assessing environments for preservation. A large number of gas species can be monitored, with increasing accuracy and at lower concentrations. Beyond initial scoping studies, this information is only useful when combined with other environmental data, predominantly RH or time of wetness and placed in the context of deterioration studies of either model or real artefacts. For example, the figure below shows carboxyllic acid concentrations in three showcases during a series of modifications to stop corrosion of lead/tin solder in jewellery. Two modifications reduced the acid concentrations by 50 and then almost 75%.

Figure 1: Acid concentration ($\mu g\ m^{-3}$)



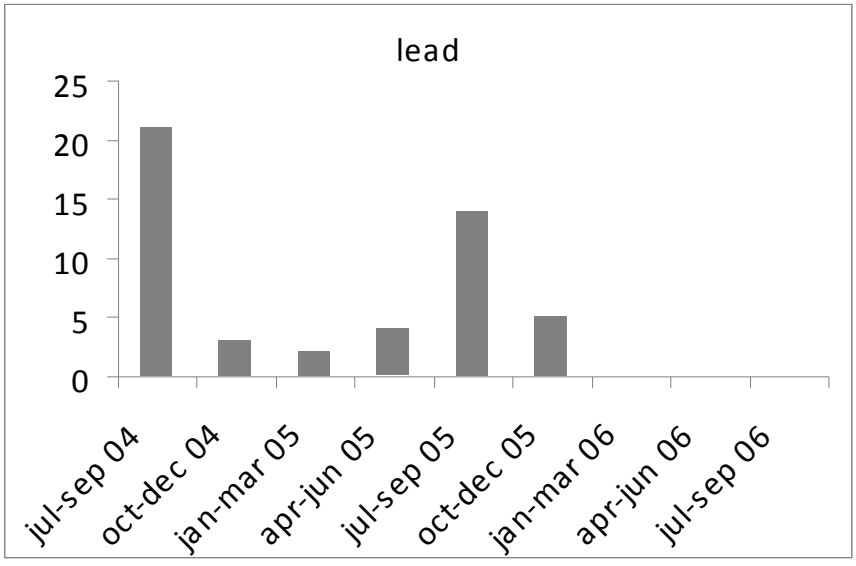
However to interpret this data a great of information about susceptibility at different acid concentrations and RHs is required. Dealing with temperature and RH data, which is often highly variable in naturally ventilated buildings is often a challenge. Average values are most commonly used, but the offgassing of many materials is not a linear function of either temperature or RH. Many formaldehyde based glues in wood boards double their rate of formaldehyde emission every approximately 7˚C and full emission and adsorption data as a function of temperature, RH and ventilation rate is available for several board types through the Versar program developed by EPA. The program models internal formaldehyde concentrations from this data. The concentrations of formaldehyde have been measured and modelled for storage cases containing vulnerable weeping glass. Results are shown in below

Figure 2: Formaldehyde concentration (µg m^{-3})



The green bars are the measured value, the pink the values from the model calculated using average temperatures and the grey bars those calculated using hourly temperatures and then averaging the formaldehyde concentration. As can be seen using average temperatures significantly underestimates the formaldehyde concentration.

A number of dosimeters have been developed to assess the overall environmental impact on general or specific collections. Again these require careful calibration, with laboratory and field studies such as have been undertaken with the MIMIC, SENSORG and MASTER projects. The figure below shows the amount of corrosion on lead coupons exposed in the cases from the first example. It can be clearly seen that although the corrosion rate drops with the refits, it is still significant and only replacing the boards cures the problem



Monitoring in the historic environment has a number of potential pitfalls. Many gases have a strong seasonal distribution and buildings often behave very differently under changing heating and ventilation regimes. Microclimates are common and can have complex

distributions. Additionally the strong aesthetic aspects of display, particularly with historic interiors can severely limit the placement of sensors. Much work has been undertaken in this field and several projects are presently yielding large amounts of useful information to assess such measurements. However the limits of publication often mean only a small proportion of this information reaches the public domain and often with some delay. COST D42 provides a mechanism to disseminate the information within a peer network and develop expertise and knowledge within the field.