

Library and Archive Management: Sustainable Air-Conditioning Technologies and Compliance with BS 5454

K. Dehigama¹, A.P.R. Dampelessa² and L. Rajapaksha²

¹Library, Faculty of Engineering, University of Peradeniya

²Department of Mechanical Engineering, Faculty of Engineering, University of Peradeniya

British Standard (BS) 5454 requires maintaining specific indoor conditions for libraries and archives. Under this, maintaining a specific moisture content and temperature is of importance with regard to providing conditions that minimise deterioration of stored materials in archives, and comfortable environments for users. The technology involved in providing and maintaining required indoor conditions, depending on the geographical location and local climate, could vary from simple passive ventilation to sophisticated air conditioning systems, where the passive systems consume hardly any energy in providing the required conditions. On the contrary, a conventional grid-connected air conditioning system incurs significant carbon emissions and running energy bills.

With increasing awareness on environmental pollution resulting from use of energy, technologies with lower levels of carbon emission and higher operating efficiencies could be considered for sustainable operation of libraries and archives. In place of conventional vapour compression refrigeration-based air-conditioning systems that use grid power, technologies such as absorption refrigeration, desiccant cooling ventilation systems and evaporative cooling systems stand among suitable candidates. However, these technologies have certain limitations when it comes to their applications under certain climatic conditions, selection and use of energy source, and efficiency of operations.

Absorption technology uses heat, instead of grid power, to produce the cooling effect, whereas evaporative cooling depends on the energy in the atmosphere to provide specific levels of moisture and temperature in delivered air, which, to some extent, depends on the moisture level and temperature of outdoor air. Desiccant technology, to some extent, enables controlling of conditions of delivered air through an evaporative system mainly focusing on varying moisture content using a heat source.

If waste heat from a process is available, an absorption system could deliver cooling and air conditioning with zero-carbon emissions. On the other hand, even with a fossil fuel based heat source, absorption systems could provide 2/3 reduction in carbon emission in comparison with a similar capacity grid-connected air conditioning and ventilation system. The reductions in carbon emissions in the use of evaporative and desiccant technologies are substantial as they use alternative energy sources and generally have very low levels of power consumptions in comparison with grid-connected air conditioning systems.

On the theme of a low carbon solution for archive and library management, this paper discusses a few selected air conditioning technologies; which are established and emerging in the light of their operational limitations in delivering specified indoor conditions, and qualitatively discusses their conformity with the indoor conditions specified in BS 5454 for libraries and archives.