Book Review

Advanced Building Technologies for Sustainability

Asif Sayed, Wiley, 2012, ISBN 987-0-470-54603-1, 256p, AUD 105.00 NZD 120.00, GBP 57.50, Euro 68.00, USD 85.00. E-book version AUD 84.99, NZD 99.99, GBP 47.99, Euro 54.99, USD 69.99.

This book is a timely presentation of new technologies being promoted to achieve energy efficient buildings insofar as this is a first attempt to deliver a book bundling these technologies together into a coherent whole. It is certainly not a design guide, but a good primer for architects and engineers.

The author has structured chapters suggesting how the equipment can be used for specific building types, e.g. hospitals, educational buildings etc. Consequently I am aware of a fair bit or repetition, and I am conscious of encountering paragraphs that I have met several times previously.

Infuriatingly, it is intended for a US audience, and the Australian/European reader has to concern themselves with changing degrees Farenheit to Celcius, Btu and Therms to KiloWatts and Joules.

The book gives us insights into the principles behind the operation of these systems: it is not so much as the equipment is new, but the alternative way the components are placed. It is implicit that whatever system is involved, if it relies on thermal mass and/or low velocity deliveries of conditioned air, that a thorough digital computer simulation (with all the caveats that this exercise includes) is carried out by experts. The potential for getting it wrong (or not entirely right) is high given our Australian experience with our high performance green buildings to date.

The technologies covered include firstly the technologies of radiant cooling, underfloor delivery and displacement delivery of chilled air and ventilation: Secondly the best use of the building envelope as a climatic modifier: and thirdly, low energy systems.

Radiant Cooling and Displacement Systems

My suspicion of radiant cooling stems from first, the weakness of air flow when relying on thermal buoyancy compared to the thrust generated by an electrically driven fan. Secondly the directionality of radiation. Finally the hidden trade-off between its energy savings and the cost of installing, operating and maintaining the control systems that keep the systems in balance.

Comfort in warm climates is measures by the Environmental Temperate (*EnvT*) which is 2/3 Mean Radiant Temperature (*MRT*) plus 1/3 Dry Bulb Temperature (*DBT*). This means that whichever part of the body is exposed to the radiator (or absorber) would be experiencing a different temperature to those parts experiencing the air temperature. This asymmetry could cause discomfort.

The Building envelope as a Climatic Modifier.

Trying to teach Sustainable Design of buildings without recourse to computer simulations has resulted in buildings based on some rather optimistic assertions by their designers. There is no generic model of an optimised working energy efficient building. We can talk about thermal mass, control of glazing and insulation, but until we see the CFD models and the numbers, green buildings have become a design *style* rather than a *performance specification*. For example, a common furphy is for designers to argue that air conditioning

and cooling are not required simply because the building has opening windows and is therefore naturally ventilated.

Low Energy Systems
These chapters (9 to 11) I found useful and informative. To discuss co- and tri-gen without describing absorption chillers to some detail strikes me as an omission. The section of geothermal energy was very useful.

Stand-alone systems will only work if either they are endowed with a massive redundancy of equipment, or building users are prepared to tailor their energy usage to that of supply. Until then, sell-back to the grid will be the only economic option unless some miraculous new battery technology comes to the fore.

Building Control Systems
At the end of the day all building environmental systems will depend on their electronic controls. Opening windows, individually controlled induction units, the difficulties of controlling the leaching and charging of heat once thermal mass is primed, require complex building management systems involving multitudes of sensors, logic units, actuators, and heuristic algorithms. These components need regular calibration and maintenance, and I suspect that they require greater cost than the energy saved. However, if we are concerned with carbon reduction rather than cost, then this is a necessary overhead.

Summary
I am now of an age where I am sceptical of the introduction of new technologies in the Australian HVAC sector, particularly the haste to install chilled beams as the great panacea. However, Mr Sayed's book is forcing me to review my predilections. At the end of my read I suggest that the title of this book should be more exactly *Advanced Air Conditioning Technologies for Sustainability*.

I commend this book to students of architecture and construction management.

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