Heat is on air-conditioning

The Sydney Morning Herald
May 6, 2008

As our summers get warmer, the race is on to design more efficient buildings and cooling systems, writes Helen Meredith.

Air-conditioners in office buildings could collapse under increased heat loads as climate change takes hold and temperatures rise, according to a study carried out at Queensland University of Technology's School of Engineering Systems.

Lisa Guan says her computer model of indoor thermal environments and the cooling load imposed on air-conditioners in office buildings shows that most units would not cope under the more extreme circumstances. External and internal heat would have to be reduced and new buildings designed to take better account of the potential impact of higher temperatures.

The results of Dr Guan's study were released as recent heatwaves in southern Australia sent sales of air-conditioners skyrocketing.

The extreme temperatures experienced in Adelaide, Melbourne and other urban centres during March have provided a glimpse of what could become more commonplace in the future.

Already concern at climate change and the environmental impact of chlorofluorocarbon and other similar refrigerants on the ozone layer has stimulated interest in developing "environmentally friendly" air-conditioning systems.

Dr Guan warns that when temperatures rise it will take more than conventional air-conditioners to cope with the heat.

She says systems will collapse: "If the outdoor temperature increases by two degrees, the risk of overheating in an air-conditioned office building will increase significantly.

"The cooling load on air-conditioners will increase by up to 47% in some Australian cities, based on CSIRO projections of the potential increase in temperature due to climate change."

Designing air-conditioning systems to cope with this would need to take account of heat generated inside buildings, as well as heat from the sun.

The number of people in office buildings, lighting and machines all produced a lot of heat for air-conditioners to deal with, Dr Guan says.

"An adult male generates 140 watts of heat, and a woman 85% of that. Heat generated from lights, computers, printers and copiers all contribute to the internal load."

Cutting that internal load would be as important as shielding buildings externally from the sun. "If we do nothing, the cooling capacity of air-conditioners will need to increase by up to 59%," says Dr Guan. Operating larger-capacity units would cost much more.

"Obviously this is not feasible. We need to find ways to reduce both the amount of sun falling on our buildings and the heat generated within them."

She is looking at how cope with higher temperatures in buildings, including automatic control of outdoor air intake for free cooling, systems to turn off unnecessary lights and innovative ways to improve how natural light is used to improve energy efficiency.

Other researchers within the Faculty of Built Environment and Engineering at QUT have been working on a solar-powered cooling system. It uses a closed cycle adsorption process as an alternative to conventional air-conditioning systems that use vapour compression.

Its big advantage is that it runs on low-grade thermal energy instead of high-grade electricity.

The liquid desiccant solar air-conditioner removes moisture from the air and provides 100% fresh air without the application of CFC.

This makes it possible to control humidity levels independently, leaving conventional systems to deal with temperature.

Senior lecturer Dr Kame Khouzam says work has more recently been concentrated on the application of the technology to crop drying where humidity control is critical.

That also extends to environments in which seed has to be stored for some time and the need for temperature control is also an issue.

Dr Khouzam says this doesn't mean the technology could not still answer the call for smarter air-conditioning in commercial buildings.

This story was found at: ***http://www.smh.com.au/articles/2008/05/05/1209839551700.html***