

SMAC proving its worth in SA

The Shaw Method of Air Conditioning (SMAC) is gradually proving itself as technological advances catch up to the control sensor technology required to make it effective. CCN examines the results and potential of what appears to be a cost-effective, realistic solution to retrofitting buildings to the highest sustainability standards.

Air Con Serve was recently named the National Electrical and Communications Association (NECA) Environment and Energy Efficiency winner for addressing the issue of humidity control and long-term energy savings.

The focus of the award was a recent air conditioning upgrade at the Art Gallery of South Australia.

Strict international standards now require art galleries to have closed temperature and humidity control.

These standards impose substantial energy demands on conventional air conditioning plants. The introduction of the SA government's energy efficient action plan meant Arts SA was eager to reduce air conditioning energy but without any sacrifice to climate control quality.

Air Con Serve was chosen to provide the design, engineering and installation services for the implementation of SMAC into the West Wing of the Art Gallery of SA during July and August 2004.

Independent auditors Connell Mott MacDonald reported direct savings from the installation of the Shaw Method in October 2005.

Reports showed the maximum energy demand reduced by 14 per cent, with the cooling refrigeration loads showing a 58 per cent cooling energy reduction.

Gas reductions attributed to Shaw technologies were also calculated at 75 per cent.

Air Con Serve general manager Wayne Ryan said the award was just reward.

"We were successful in achieving reduced air conditioning energy by 50 per cent nominally," he said.

"Significant improvements were recorded to indoor air quality (temperature and humidity control), reduced greenhouse emissions, water and chemical usage."

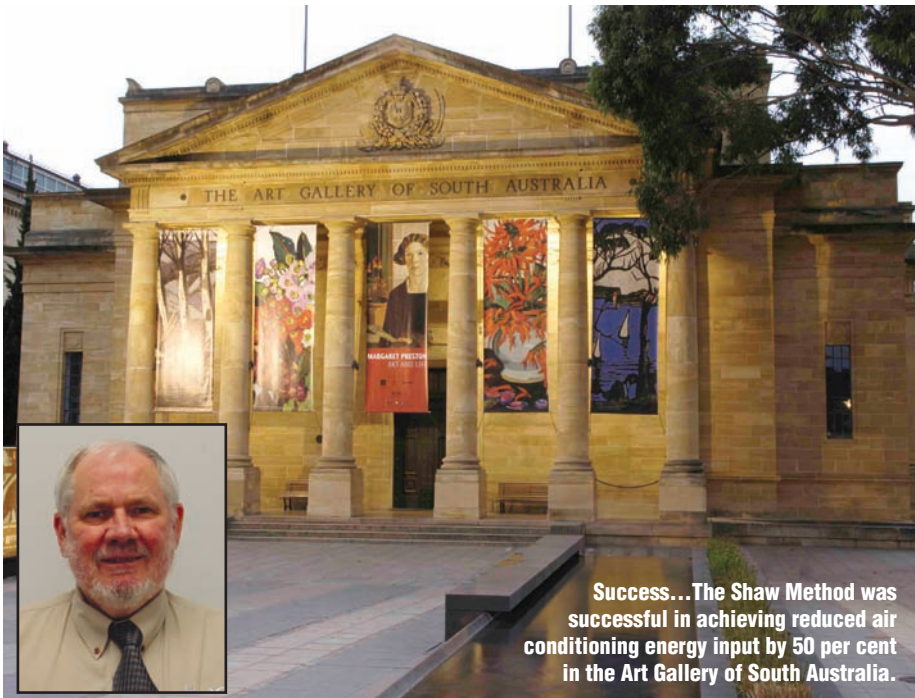
The project was the world's first installation of SMAC in an art gallery, and only the third world-wide joining those in Barmera Hospital, South Australia and the Siam Cement Headquarter Building in Bangkok, Thailand.

Despite the technology having its detractors, Ryan anticipated widespread use of SMAC.

"This new method of air conditioning employs a design based on known separate engineering principles, integrated into a single solution.

"This optimises energy and comfort performance of the entire air conditioning plant."

He anticipated growing international attention as the technology was "of world significance in the reduction of greenhouse emissions".



Success...The Shaw Method was successful in achieving reduced air conditioning energy input by 50 per cent in the Art Gallery of South Australia.

So what is the Shaw method?

The Shaw method is based on integrating three control variables.

The process works by multiple feedback from three control loops complementing each other to control humidity, air temperature and the chilled water velocity.

While the idea has been around for years and was discussed by the late Allan Shaw in many papers, it wasn't practical until the advent of microprocessors enabled the control sensor technology to become sensitive and reliable enough.

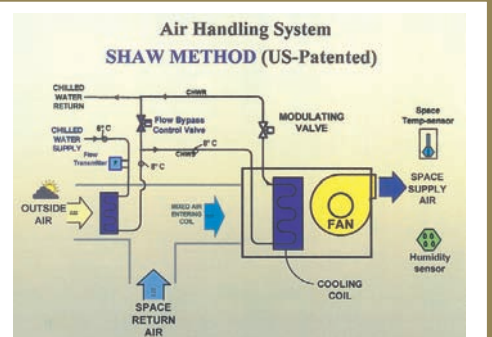
The main features of Shaw's control logic are:

- The leaving water temperature of the chiller can be reset by either the space relative humidity or the coil water velocity via the high signal selector.
- The control set points are programmed so both the humidity controller and the water velocity controller will lower the leaving water setpoint from 15°C to 7°C as either the humidity rises above 60 per cent or the chilled water velocity increases above a nominal 2m/s for all coils in any one zone of a multi-zone air handling unit.

- The temperature controller directly modulates the first stage of the AHU coil, with the water velocity controller only permitting the second stage control valves to modulate whenever the velocity in any coil is above 0.2m/s, ensuring turbulent flow in the coil(s). This is dependent on the space temperature controller modulating the chilled water valves as the zone temperature increases above the setpoint, nominally 24°C.
- The leaving water temperature is not reset downwards by the water velocity controller until the entire coil valves are fully open.

The control of the three variables is from individual P+I algorithms, which are tuned to prevent instability. Ryan said experience showed this tuning was no more time consuming than for a conventional system.

SMAC is suitable for both new and retrofit systems, and provides control of both sensible and latent loads in an energy-efficient manner, by the dehumidification of outdoor air at a separate coil.



Simple...No more difficult than conventional air conditioning.

Reheating the air is unnecessary. It is suitable for a wide range of ambient conditions and for full to part loads, with all system components readily available.

"The engineering is no more difficult than for a conventional system," Ryan says.

