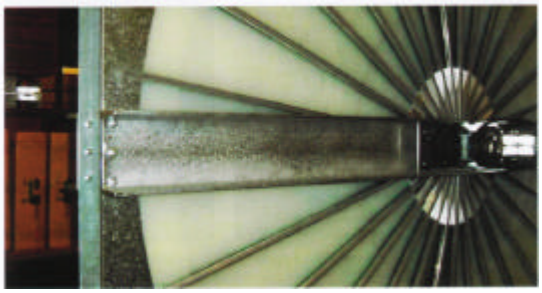
Rotary heat exchangers going swimmingly well

A State-of-the-art, Australian-designed rotary heat exchanger system that incorporates a number of clever and green features has been installed in an aquatic centre in suburban Melbourne. CCN splashed down to check it out.



Detail of one of the Mylar rotary beat exchangers at Nunawading Pool.

A major part of the refurbishment of Nunawading Pool in Whitehorse was the installation of a rotary heat exchanger system which incorporates a waste-heat recovery/indirect evaporative cooling and ventilation assembly in the design.

The project uses two Mylar rotary heat exchangers designed, developed and manufactured by Rotary Heat Exchangers Pty Ltd, a wholly Australian-owned company which, together with CSIRO and Monash University, pioneered the system in the 1970's.

Initially, a refrigerated heat pump system was to be installed in the pool, but the heat exchangers found favour because the technology offers a number of advantages over heat pumps, according to Bill Ellul, manager of Rotary Heat Exchangers and Ecopower.

Those features include:

- Significantly lower capital, installation and ongoing maintenance costs;
- Significantly lower energy-usage costs both in heating and cooling modes;
- The ability to include an efficient ventilation mode of operation when outside conditions are preferable to inside conditions by simply turning the heat wheels off.
- Substantial reduction in greenhouse gas emissions;
- Elimination of Ozone-depleting refrigerant gases; A 10-year warranty from corrosion or deterioration of the Mylar heat transfer material, which constitutes the bulk of the heat wheels;
- A proven track record spanning 35 years of operation of the Mylar heat wheels in aquatic environments involving hundreds of wheels.

The Mylar heat wheels work by allowing heated air to flow through a matrix of smooth passages only 100mm wide. The wheels rotate between the high moisture and chlorine contaminated exhaust air from the pool and the 100 per cent fresh air flowing
in from outside. The Mylar in the wheels, which rotate between fresh and exhaust air, heats the fresh air.

Mylar is a DuPont product very common in sailing. It consists of an extremely strong yet thin (1mm in thickness and 100mm in width) plastic film that absorbs heat from the exhausted air, from which it warms the incoming fresh air as it rotates around the wheel.

The heat wheels in operation at the Nunwading Aquatic Centre use more than 10km of Mylar film. Because it is so efficient, the Mylar system enables Rotary Heat Exchangers to do their work in a volume of air smaller than any other heat exchanger in the world, meaning big savings on plant size, Ellul says.

The Mylar heat wheel is highly corrosion-resistant making it suitable for both the chlorine environment of swimming pool halls and seaside locations, and is virtually self-cleaning due to the smooth nature of the Mylar and short passage for air-flow, Ellul says.

The system offered the benefits of large savings in energy consumption and greenhouse gas emissions compared to refrigerated air conditioning systems, he says.

The heat wheels employ a simple economy cycle, which allows fresh air to enter the building when conditions outside are more favourable than inside, by simply stopping the wheel from rotating.

"This simplicity is not available from conventional air conditioning systems and flat plate heat exchangers, which is why it is so often neglected."

When summer air temperatures exceed 30^{o}C, the heat wheels take on a cooling function by indirectly cooling the fresh air to the building via an evaporative cooler on the exhaust side of the wheels. This indirect cooling ensures that the humidified air passing through the evaporative cooler transfers only its cool effect to the fresh air thus maintaining its drying or dehumidifying qualities.

On days when outside conditions are more favourable than inside conditions, the heat wheels are simply stopped from rotating, while allowing fresh air to enter the building and exhaust air to escape the building.

"In this way an economy cycle is achieved simply," Ellul says.

As well as aquatic centres, Mylar heat wheels have been installed in hospitals, commercial buildings and schools around Australia and overseas.

More recently projects include Western Port Aquatic, Alfred Hospital research buildings, Melbourne University Beaurepare pool, Swinburne University BA building, and Broadmeadows Pools.

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