

Fitness First Rockdale – Air Change Rooftop Unit



Training indoors in clean, fresh air

One of the nation's leading health club brands, **Fitness First**, recently commissioned Air Change and IAQ Consulting to complete a project that included the design and installation of an economical and efficient indoor air quality system. *CCN* editor Derek Royal reports.

All of us face a variety of risks to our health as we go about our day-to-day lives. Driving in cars, flying in planes, engaging in recreational activities, and being exposed to environmental pollutants all pose varying degrees of risk. Some risks are simply unavoidable. Some we choose to accept because to do otherwise would restrict our ability to lead our lives the way we want. And some are risks we might decide to avoid if we had the opportunity to make informed choices. Indoor air pollution is one risk that you can do something about.

Indoor levels of air pollutants can be two-to-five times higher, and occasionally 100 times higher than outdoor levels, according to the EPA. The latest research shows that the vast majority of people in offices want to work in clean, fresh, pure air.

It is a well established fact that indoor air contains many Volatile Organic Compounds (VOCs) that can pose a significant health risk. VOCs such as formaldehyde, from wall paneling and furniture, and Xylene and Tolyene, from paints and carpets, are but a few of the VOCs identified in indoor air. Many of these VOCs are



Case Study

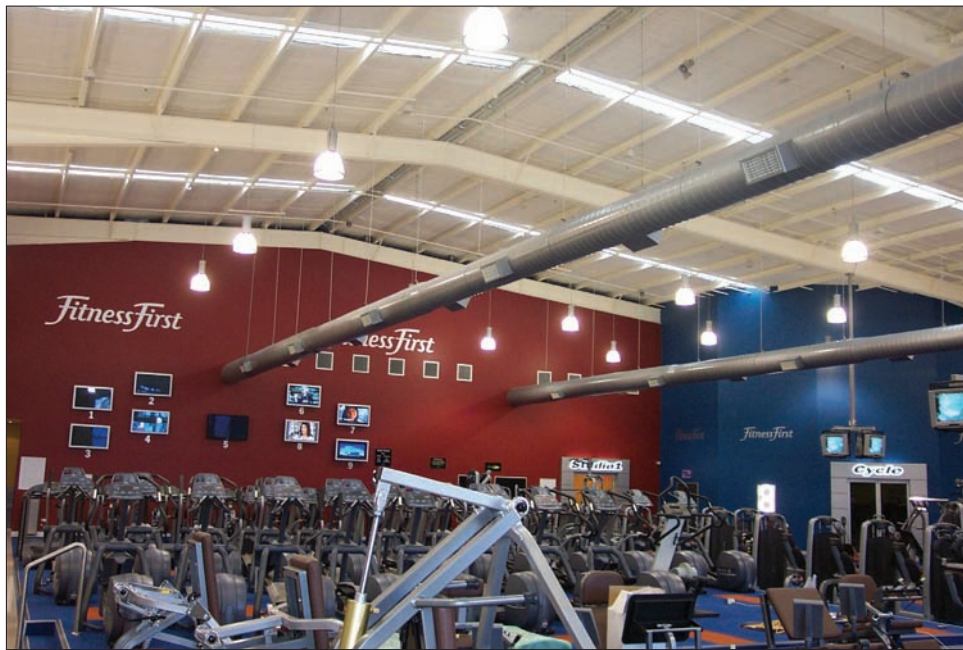
known carcinogens and together they contribute toward a health problem called "Sick Building Syndrome", the symptoms of which can include headaches, nausea, fatigue and eye nose and skin irritations.

VOCs include a variety of chemicals, some of which may have short and long-term adverse health effects. In recent years, a growing body of scientific evidence has indicated that the air within homes and other buildings can be more seriously polluted than the outdoor air in even the largest and most industrialised cities. Other research indicates that people spend approximately 90 per cent of their time indoors. Thus, for many

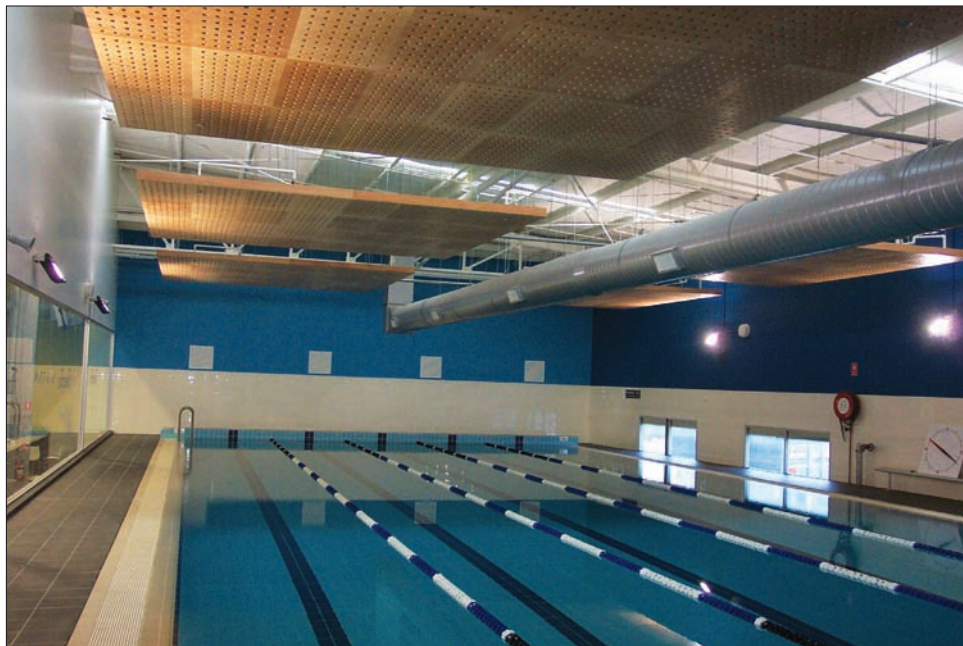
people, there is a greater risk to health from exposure to air pollution indoors.

If too little outdoor air enters a building, pollutants can accumulate to levels that can pose health and comfort problems. Advanced building designs that are tightly sealed are starting to feature mechanical systems that bring increased quantities of outdoor air into a building. Some of these designs include energy-efficient heat recovery ventilators (also known as air-to-air heat exchangers). These systems can offer a greater quantity of outdoor air, using less energy.

Fitness First is a popular health club brand in Australia with over 70 clubs nationwide.



FiFitness First Rockdale – gym area



Fitness First Rockdale – pool area



**Lindsay Pelser,
IAQ Consulting**

The organisation provides state-of-the-art facilities and a wide range of products and services for its members. With most clubs containing new furnishings and equipment, and also due to the high occupancy rates, it is essential to manage Indoor Air Quality (IAQ) and energy efficiency.

Various sized Air Change rooftop package units ranging from 20kW to 96kW have been supplied to Fitness First Clubs, all with heat reclaim, free reheat, Return Air bypass with CO₂ sensors, economy cycle and de-super heaters for free hot water.

On average, all of the air in a Fitness First club is completely replaced with healthy outdoor air every six to eight minutes. An example is Fitness First Rockdale, with a gym, indoor pool, cycle room and studio area. The Air Change mechanical system using 100 per cent fresh air has been designed to manage IAQ, energy efficiency and also to capture waste heat from the air conditioners to provide hot water heating for the indoor pool and showers. The Fitness First Rockdale installation was designed and installed by Lindsay Pelser, of IAQ Consulting.



**Air Change MD
John Urch**

"This was a very interesting project to design," Pelser tells *CCN*.

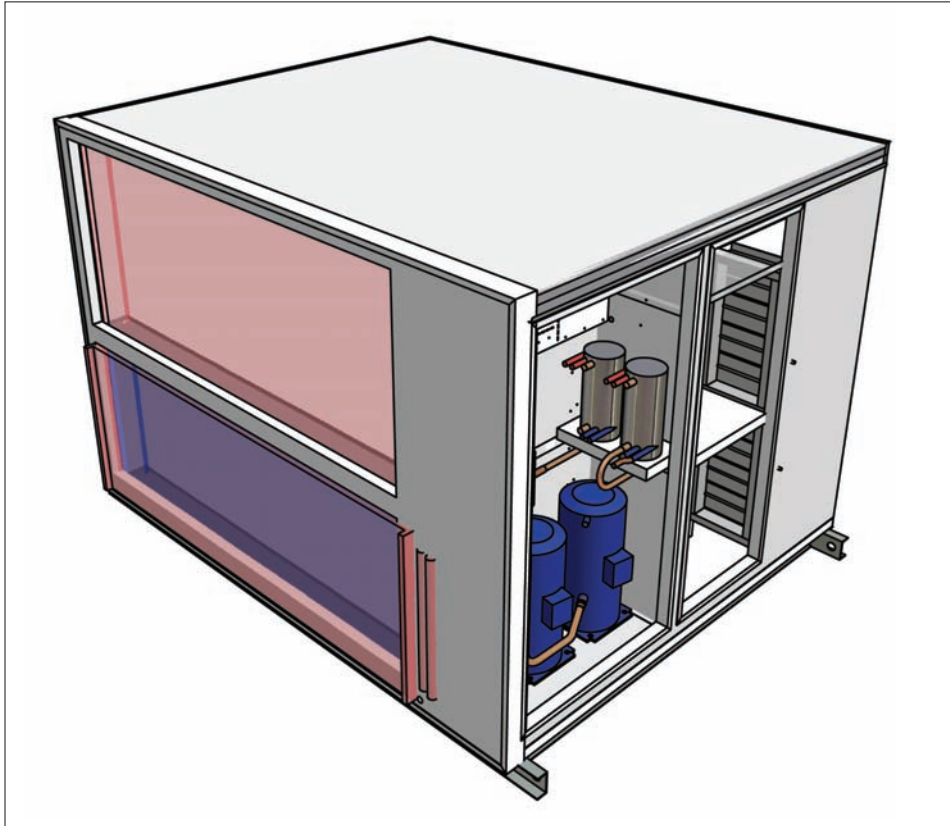
"The building was an ex Bunnings Warehouse with a high ceiling void.

"At the time of the project, Fitness First clubs had lots of wall and ceiling fans to create air movement, and air conditioning systems that recycled the indoor air and wasted lots of energy without maintaining both temperature and good indoor air quality. So it was decided that we would use the Air Change Systems that are the most energy efficient units in the marketplace that use 100 per cent fresh air and 100 per cent exhaust air using an air-to-air heat exchange unit."

Pelser spoke to Air Change about fitting de-super heaters to recover waste heat from the compressors and to use this for heating the water supply for use in the indoor swimming pool. This was fitted by Air Change.



Case Study



Rooftop unit, complete box

"What made this club different to the rest was that I designed the club to air changes per hour," Lindsay Pelsler says. "This was different for each part of the club with the cycle room having more air changes than the main weights area. Air was moved at a higher velocity to create good air movement thereby eliminating the need for all the wall and ceiling fans found in other clubs."

The swimming pool was designed using an Air Change pool pack unit and the area's temperature is maintained at 29°C while the club is maintained at 22°C. Because there are full ceiling-to-floor glass windows between the pool and gym it was critical to have the correct airflow pattern to prevent condensate on the glass.

"The pool room temperature is maintained at 2°C higher than the water temperature," Pelsler says. "All condensate from the air conditioning units is recovered and used for the pool and toilets. The steam room which requires air to be exhausted to comply to standards has all the moisture removed by means of a steam trap. As there are no steam traps fitted to steam rooms and one could not be purchased, I had to design a system to remove the moisture before it went to the exhaust duct. This has been a problem in the industry as all steam from steam rooms is normally connected to the exhaust duct, resulting in the steam condensing and the water dripping through the duct work on to the ceilings and rusting the duct."

In the change room, Pelsler's team started the trend of fitting exhaust grills to each toilet, urinal, shower and basin, which gives better exhaust at the source rather than having the

normal four or so exhaust grills found in the ceiling and dragging the odour across the room to the outlet.

"With a proper supply and exhaust system fitted in the change rooms it is not necessary to fit air-fresheners to disguise odour," Pelsler says. "This overall was an interesting design with air quality and energy being the main design factors. The lighting energy use can be reduced considerably by using LED Lighting. This would make this the ultimate energy efficient building with good indoor air quality."

Air Change managing director John Urch says the principle behind any heat recovery system is essentially to reuse energy that would otherwise be wasted.

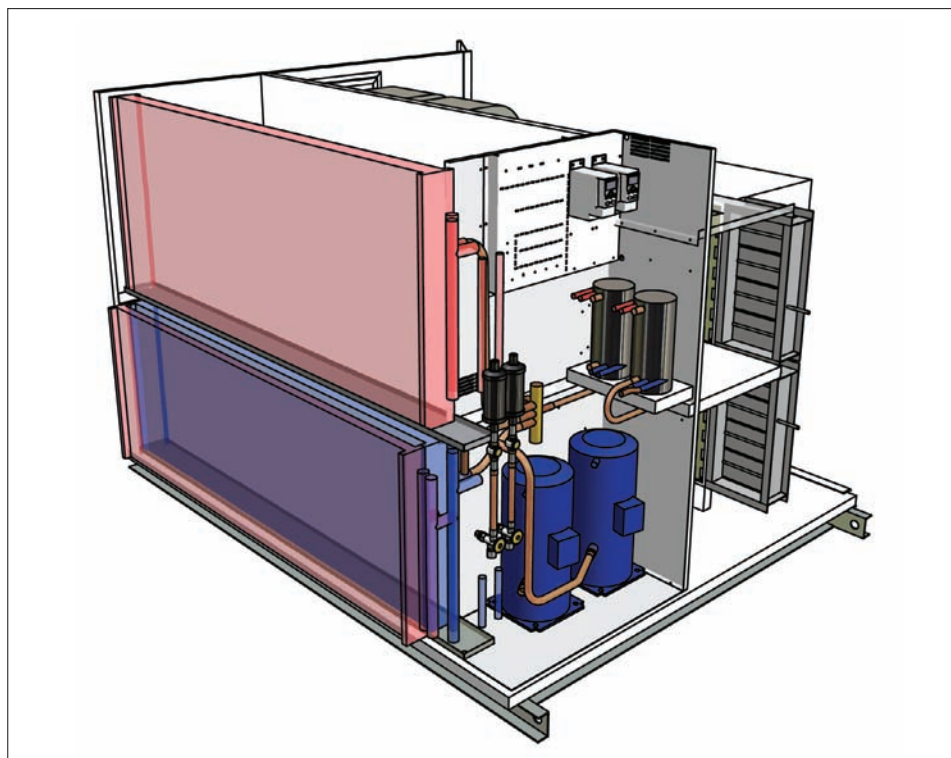
"The Air Change system utilises a patented counter flow plate heat exchanger which uses the cooler spill air (summer) or warmer spill air (winter) to pre-cool or pre-heat the incoming outside air," Urch tells *CCN*. "There is no cross contamination of air paths, and due to the unique design, very high transfer efficiencies are achieved."

There are three modes of operation the Air Change Rooftop Packaged unit can incorporate to maintain the required level for IAQ and still offer energy savings over a conventional unit.

1. Standard Mode – The RTP unit operates in its standard "heat reclaim" mode using 100 per cent outside air. The outside air is first pre-cooled and dehumidified by the heat exchanger, using the cooler exhaust air. This pre-conditioned outside air is then cooled via the evaporator coil to a nominal 13°C.

The return air stream leaves the space absorbing 75 per cent of the temperature and humidity from the outside air stream, through

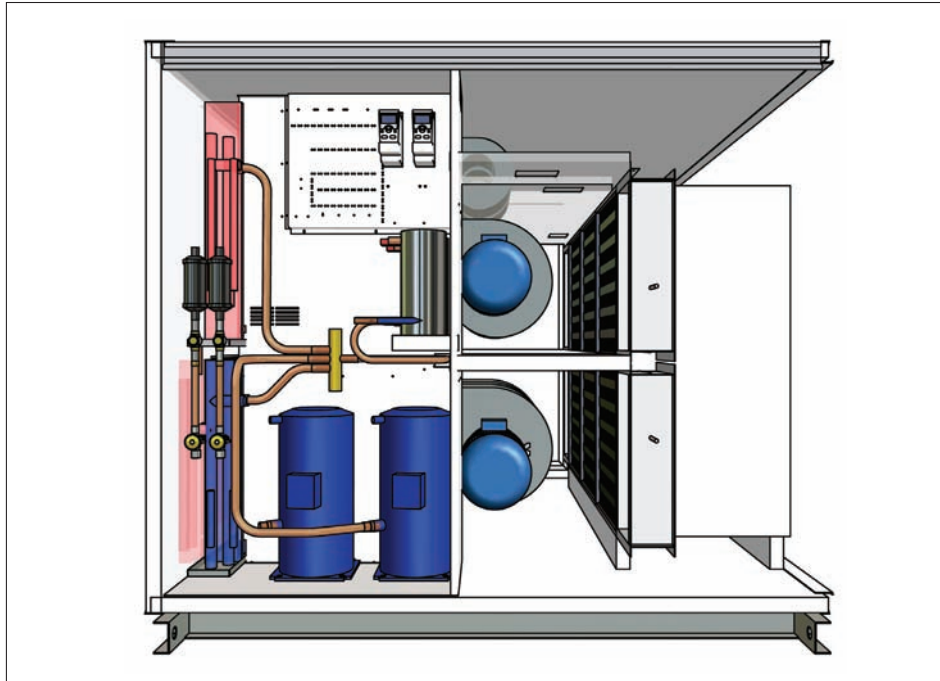
>> | "What made this club different to the rest was that I designed the club to air changes per hour," Lindsay Pelsler says. | <<<



Rooftop Unit, front left view



Case Study



Rooftop Unit, left-hand-side view

the heat exchanger. Once leaving the heat exchanger air is then fed over the condenser coil and exhausted to the atmosphere.

2. CO₂ Sensing Mode – An important aspect of an HVAC system that is often overlooked is controlling IAQ. The Air Change RTP unit can incorporate a CO₂ sensor which will modulate outside air according to occupancy levels.

When CO₂ levels inside a space are low, the RTP unit will introduce minimal outside air thereby saving on the energy required to cool or heat. As more people enter a space and CO₂ levels rise, a greater amount of outside air is introduced, which is still being pre-conditioned

>>| “For a typical gymnasium example, a conventional unit will be required to be sized for peak outside air quantities. In comparison the Air Change units with return air bypass and economy cycle modes, will be running in cooling mode less frequently and also saving fan power.” |<<

by the heat exchanger. Traditionally, conventional systems waste energy by only operating at a peak outside air rate, regardless of the internal occupancy.

In addition, the CO₂ sensor is also linked to Variable Speed Drives (VSD's) which control fan speed for both supply and exhaust. This ensures the correct airflow as fan speeds adjust, according to the CO₂ sensors operation.

This mode will operate when occupancy levels are low, yet outside air temperatures are warm. Typically at Fitness First, this will be during day time hours. The Rooftop Package Units will conserve energy by providing minimum outside air according to CO₂ levels monitored in the space.

3. Economy Cycle Mode – When occupancy levels are higher and the ambient temperatures

are within certain set-points, the Air Change RTP can also operate in 'Economy Cycle' mode, which can provide free cooling. This takes advantage of lower ambient temperatures to cool the space, generally without the need for compressor based cooling.

For a typical gymnasium example, a conventional unit will be required to be sized for peak outside air quantities. In comparison the Air Change units with return air bypass and economy cycle modes, will be running in cooling mode less frequently and also saving fan power.

Further energy is recovered as the RTP Units can be equipped with de-superheaters for free hot water. The system is designed to capture waste heat from the air conditioners to provide water heating for the indoor pool and showers. At Fitness First Rockdale two packaged air conditioners now supply 70 to 80 per cent of all hot water heating, with the standard water heating system initiated only if required.

“At Fitness First we manage a large portfolio of facilities,” says Roy McDowall, Fitness First's general manager, property and construction. “These buildings demand careful selection of equipment, focusing on energy efficiency, the occupant's health and comfort and providing an acceptable return on investment.” ✨

Fast Facts

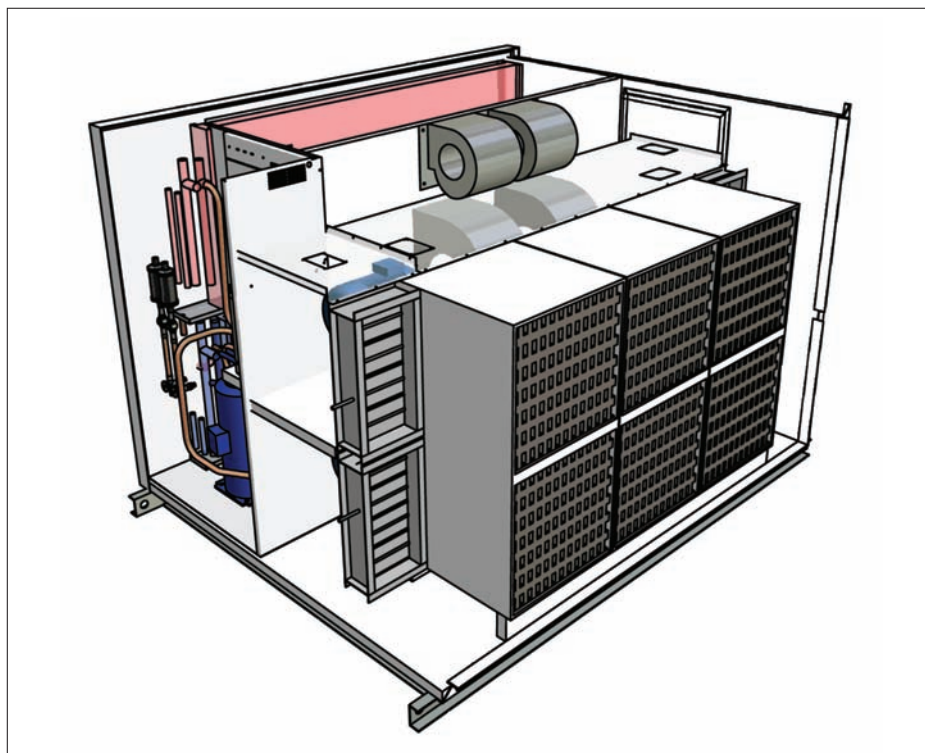
Client: Fitness First Rockdale (NSW)

Design engineer: Lindsay Pelsler, IAQ Consulting

Site engineer: Innes Bruveris

Installation: Stacy Cumming

Unit Supplier: Air Change



Rooftop Unit, rear left view