

Airport optimises energy use per passenger



The number of passengers passing through Auckland Airport this year is expected to be a sharp increase on the record 9.4 million of 2002. And unlikely as it sounds, that offers further opportunities for the facility's energy efficiency programme. ►

AUCKLAND INTERNATIONAL AIRPORT LTD
INFRASTRUCTURE SYSTEMS MANAGER

PHIL GRIEVE (LEFT) AND ENERGY MANAGER
ROLAND HILL.

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LIGHTING, HEATING AND AIR-CONDITIONING ARE CONTROLLED BY A BUILDING MANAGEMENT SYSTEM THAT INTERFACES WITH THE AIRPORT'S FLIGHT INFORMATION DISPLAY SYSTEM. CONTROLLERS ARE ABLE TO OVERRIDE ANY SETTING TO CATER FOR UNSCHEDULED FLIGHTS.



No one at Auckland International Airport Limited (AIAL) can predict how many people will use the facility this year – but management is working on a projected 30% increase in ‘seating capacity’.

That’s based on the number of flights that have been pre-booked. How many passengers will be on board is, of course, difficult to say.

Still, the tourism industry is buoyant, and everything points to a bumper year. While growth on this scale could create unabashed panic, AIAL believes it has everything under control. It is already well-advanced with plans to create additional apron space and appropriate services for the planes carrying the expected influx of

visitors. Longer term, its strategy also includes terminal building extensions. All good news.

The greater volume of traffic is particularly welcome news to the team managing AIAL’s energy use. More passengers, says services engineering officer and energy manager, Roland Hill, creates opportunities for greater energy efficiency. “We measure energy efficiency in terms of the cost-per-passenger, and the growing numbers have enabled us to improve performance significantly over the last few years.”

Between June 2000 and June 2003, electrical efficiency has nearly doubled (from just over 3 kWh per passenger to around 1.7 kWh). Similarly, water consumption has fallen from 3.4 litres per

passenger to 2.2 litres per passenger.

Overall energy use, including gas, has fallen from 3.7 to around 2.4 kWh per passenger. “While we have reduced energy use in some instances,” Hill stresses, “our drive is about handling more passengers with the same amount of energy and resources.”

“The international terminal’s large glass façade would have allowed a build-up of heat during summer – but the combination of external shade and low emissivity glazing minimises the impact of solar and thermal gain.” – Roland Hill, energy manager.





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The airport's annual energy use is around 23 MWh, with the international terminal accounting for most of that. And about 80% of its load is consumed by climate control technology – heating, cooling and air-conditioning – with lighting using the remainder. Managing the performance of those resources and maintaining efficiency levels is a multi-dimensional juggling act.

“The emphasis is on maintaining a bright, crisp, welcoming environment, with a comfortable ambient temperature,” says Hill, “and that’s a demanding task because flight schedules tend to be ‘dynamic’. Rescheduled flights are part of the travel game, and providing real time climate control requires constant reassessment of the projected and actual loads.”

A number of factors facilitate the team's ability to manage the variables. “We have a well-designed building in terms of natural light and thermal efficiency. We also have an automated building management system that gives control crews plenty of flexibility to override settings and cater for unscheduled flights. And we have more passengers. In recent years the airport has become something of a 24/7 gateway into and out of New Zealand. To some extent, the constant flow of passengers minimises the need for juggling the duty cycles of our equipment. Today, the gear is virtually running continuously.”

The building's inherent lighting and thermal properties have been vital features in the airport's energy efficiency programme. “The expansion and major renovations between 1995 and 1997

delivered a building that cleverly combines aesthetics, functionality and energy efficiency. So we've started from a reasonably high benchmark, and our programme is typically about small, incremental improvements. It's particularly evident in lighting and heating.”

Lighting

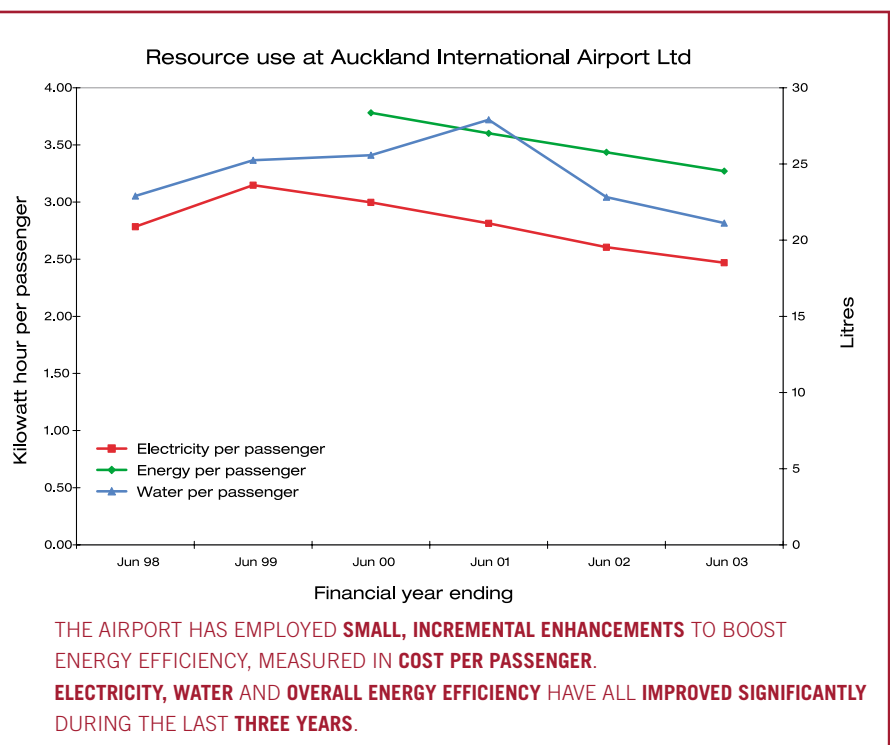
Most of the lights in the international terminal are metal halides and fluorescents. Their duty cycle varies considerably, because of daylight sensors.

“The main lobby area, for example, has a vast glass-panelled frontage. Depending on the time of

day and the amount of sunlight, the lights closest to the glass panels are switched on or off. And with many of the lights running at a kilowatt each, there are substantial savings when they're not being used.”

Other areas of the complex employ a mix of timer systems and motion detectors to minimise unnecessary light use. They are mostly in store rooms, service areas and plant enclosures, as well as in some of the public toilet blocks.

Heating too, has been fine-tuned for optimum performance. AIAL's facilities maintenance





► manager, Tom Watford, says most of the technology is gas-fired and is used predominantly for the international terminal. Four gas-fired boilers are the workhorses. “We have insulated enclosures around them, to ensure that the [combustion] air is, in effect, pre-heated. We also have modulating burners, which helps the boilers operate at the required, [most efficient] pre-set level, rather than running flat-out.”

Energy-saving technologies include the use of refrigerant-based, reverse-cycle heat pumps in the 24-hour operational electronics rooms. “They’re also run in conjunction with units in our main, chilled water systems, thereby providing a useful redundancy option.”

Large numbers of passengers, Watford points out, sometimes create a heat problem. “A 747 carries around 400 people, and when two or three arrive simultaneously, an awful lot of body heat is generated. That means we not only have to be able to cut back on the heating, but also introduce cooler air via the air-conditioning system. Of course, such scenarios need to be anticipated – it’s too late to make the change once everyone is already sweltering. Fortunately, our building management system aims to balance the two resources optimally.”

Building management system

As the major player in the AIAL’s energy efficiency programme, the Building Management System (BMS) is fully integrated with the airport’s Flight Information Display System (FIDS). “The building management system,” says Hill, “monitors real-time data from FIDS and then automatically configures the appropriate heating, air-conditioning and lighting settings for the different flight arrivals and departures.”

External environmental conditions (weather and daylight) are factored into the equation. When appropriate, weather conditions enable the building management system to reduce or boost the duty cycle of different pieces of equipment. “The real test of the system, however, is when a number of flights are delayed or cancelled. That’s when its decision-making abilities go into overdrive.”

To simplify the process, the international terminal is segmented into a variety of zones, enabling the building management system to develop and apply

1 THE AIRPORT HAS BEEN FITTED WITH CONVENTIONAL ENERGY-OPTIMISING TECHNOLOGY, SUCH AS VARIABLE SPEED DRIVES FOR MANAGING PUMPS.

2 FITTING MOTION SENSORS IN AREAS SUCH AS STORE ROOMS HAS ELIMINATED THE PROBLEM OF LIGHTS BEING LEFT ON UNNECESSARILY.

3 GAS-FIRED BOILERS ARE THE WORKHORSES FOR HEATING. THEIR ENCLOSURES ARE INSULATED, EFFECTIVELY PRE-HEATING THE AIR.

Airport electrical infrastructure

Vector supplies the AIAL complex with two 33 kV feeds direct from Mangere substation, but its responsibility ends at the boundary fence. The airport distributes the electricity at 11 kV, and is totally responsible for the infrastructure – the transformers, circuit breakers and the lines.

One of Vector’s 33 kV feeds is redundant, and immediately becomes available should the first fail for whatever reason. The airport also has a tertiary 11kV back-up (dating back to before the 33kV upgrade). The 33kV supply has proved trouble-free, unlike the 11kV system which often failed when a car hit a power pole in Mangere.

different energy load profiles for specific areas such as the office complex.

Increasing volumes of passengers, says Hill, will further simplify the configuring of energy load profiles, and usher in additional efficiency gains.

“More traffic will help to even out the peaks and troughs, and allow us to run the equipment more or less continuously, but at a lower level.” ■

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