

Air base flies high with energy efficiency

CASE STUDY

06/04



Energy Efficiency and Conservation Authority
Te Tari Tiaki Pūngao



Woodbourne Air Base has cut energy costs by reducing peak electricity loads, carrying out a long-term energy savings programme and maintaining a passion for energy efficiency.

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Woodbourne Air Base

The Royal New Zealand Air Force's Woodbourne air base, 8 km west of Blenheim, is the Air Force's only remaining support base. It's responsible for training recruits, officers, trades and command personnel.

Its heavy maintenance facility for repairing aircraft airframes, engines and avionics systems was commercialised in 1998 and is managed by Safe Air Ltd.

It usually holds around 1250 people – 700 service personnel, 100 civilians and 450 contract staff.



Woodbourne Air Base's secret ingredient is John White, an energy enthusiast who joined the team as a works officer in 1995.

White has a background in electrical engineering and worked for a local electricity lines company before joining the base.

He has the backing of the facilities management staff, whose passion for energy efficiency arose from rising electricity costs and a high lines charge, and flourished with White's enthusiasm.

Good foundation

In 1994 the base had installed a Novar Power Management System to reduce peak loads.

This set up a platform on which to base energy efficiency projects.

When White began, he advised Woodbourne that although it had achieved cost savings by reducing peak loads, an energy audit and ongoing commitment by facilities staff would help it find more savings and increase staff involvement.

His first challenge was to get Novar working to its full capabilities.

He drew on his electrical experience to enhance it and use it more actively.

More ideas

In 1996, a number of new energy-saving strategies were implemented under White's direction.

One strategy was to adjust the settings of the space heaters in all office and administration areas and the heating

elements in electroplating process baths.

Using Novar, the heaters were re-programmed so they switched on before staff arrived at the base in the mornings, instead of waiting till they got to work.

The heaters were then programmed to switch off as soon as the rooms and baths were up to temperature.

This enabled other commercial loads at Woodbourne to switch on, and the staggered approach reduced the overall peaks.

Staff were pleased to arrive to warm rooms instead of having to wait for them to heat up.

The Novar peak load management system

Installing and commissioning a Novar peak load management system in 1994 has been Woodbourne's largest single energy cost-saving project.

Novar took only six months to repay its cost of \$60,000.

It is a control system that uses power lines to carry communications signals. Its executive processor is operated with DOS-based PC software.

It controls loads automatically by shedding them, according to actual demand and pre-programmed targets.

Peak electricity loads, which accounted for around 60% of Woodbourne's electricity cost, declined from 3.5 MW to 1.95 MW.

In one year alone, savings on electricity costs totalled \$150,000.

This was made up of a 1.55 MW reduction in peak load demand, saving \$120,000 a year, and \$30,000 of savings from using 380,000 kWh less of energy.

Energy management programme

White now works with energy managers from NZDF's other bases and camps.

They meet regularly to share news of energy efficiency opportunities, and to report on their achievements.

After introducing new energy-saving strategies with the use of Novar, White hosted an energy brainstorm session with naval energy personnel and wrote a step-by-step energy policy and procedures manual.

After this policy was introduced to NZDF managers, it was quickly adopted by other bases.

The manual outlines the key principles of an energy-management process, which include:

- making long-term plans
- monitoring energy
- identifying savings projects
- involving staff in energy management
- formulating an action plan to implement improvements.

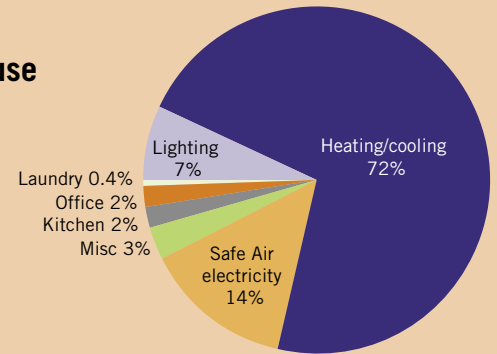
Novar remains an essential part of Woodbourne's energy management scheme.

Because many of the personnel stay at Woodbourne for only a short time, it's important to automate the technology as much as possible instead of relying on staff to switch items off.

Annual energy use (MWh) at Woodbourne	
Electricity	4,660
Coal	6,218
Diesel	2,657
Total	13,536

RNZAF Woodbourne - breakdown of energy use (excluding transport)

THE 2004 ENERGY AUDIT SHOWED THE AREA OF GREATEST NON-TRANSPORT ENERGY CONSUMPTION WAS HEATING AND COOLING.



Expected annual savings from the 2004 energy audit			
Opportunities	Savings	MWh	Payback
“Housekeeping” changes	\$5,400	59	7-8 months
Higher investment changes	\$88,500	1617	2 years
Total annual predicted savings	\$93,900	1676	



ELECTRICITY METERS, WHICH ASSIST IN MONITORING PEAK LOADS

However, an ongoing training and education programme also encourages staff to adopt good energy efficiency habits.

Monitoring energy use

Woodbourne has two tenants – Safe Air and Blenheim Airport – and the catering contractor, who are important energy users.

Woodbourne supplies them with energy and energy-intensive services such as compressed air, water and heat.

They are included in the base’s energy management programme.

Software has been installed to profile Safe Air’s electricity consumption patterns and overall amount.

White says the VaeWin (Visual Analysis Environment for Windows) software, from Utility Technology Ltd in Hamilton, is great for monitoring and analysing electricity use and peak loads.

Time of Use (TOU) electricity data is obtained from the retailer’s meters and Woodbourne’s own electricity check meters.

RIGHT: HEATING AND COOLING ACCOUNT FOR MOST OF WOODBOURNE’S ENERGY CONSUMPTION. JOHN WHITE POINTS OUT TEMPERATURE AND FLOW METERS FOR KEEPING TRACK OF BOILER OPERATION.

BELOW RIGHT: COMPUTER DISPLAY OF BOILER WATER TEMPERATURES, USEFUL FOR MONITORING ENERGY EFFICIENCY.

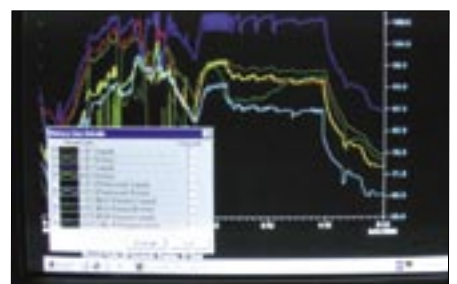
Boiler operation

The boilers are operated with a SCADA (Supervisory Control and Data Acquisition) system. This is also useful for recording and measuring the energy efficiency of the boilers by comparing fuel use with the amount of hot water produced.

The hot water temperature sensors and water flow meters were installed and supplied by Intech.

Energy audits and technical evaluations

Woodbourne first commissioned an energy audit in 1997, but White found it proved unsatisfactory and not completely relevant to the site.





Environmental defence

John White displays the New Zealand Defence Force's environmental policy:

"NZDF is committed to the efficient, effective and environmentally responsible use of energy throughout its nation-wide operations. NZDF will promote energy efficiency by implementing cost-effective programmes that will maintain or improve the quality of the work environment, optimise service reliability, increase productivity and enhance the safety of our workplace."

Consultant Glenn Johnston of Smart Power carried out an updated audit in 2004, using a \$9000 EECA energy audit grant.

EECA and NZDF's energy coordinator Tom Adson helped specify the audit's requirements.

Woodbourne implemented some of the recommendations identified in the audit, including:

- activating Energy Star on PCs
- improving swimming pool controls for temperature and humidity
- replacing incandescent lights with compact fluorescent energy-saving lamps
- passing on energy costs to tenants.

Some other useful energy and cost-saving opportunities identified in the audit are being evaluated to find out how much they would cost to carry out, and what would be involved. They include:

- buying higher-efficiency electric motors at the time of replacement
- upgrading lighting to more efficient types
- improving the power factor for the entire site
- using variable-speed drives on pumps, boilers, and swimming pool fans
- improving pool humidity controls and using a pool cover
- adjusting chilled water condensing temperatures seasonally
- increasing insulation in accommodation blocks
- improving the control of space heating systems.

Technical evaluations were carried out on some of Woodbourne's large energy-using equipment, such as boilers.

They found coal boilers are much more cost-effective than diesel at present prices. A capital project to replace diesel heating systems with coal is currently being developed.

The technical evaluations included assessing opportunities for power factor correction.

Recently, Woodbourne identified more cost saving opportunities. It installed time-switch controls on electric heaters in one block and reduced the daily fixed lines charge at one satellite site.

When the projects are put forward for funding, they compete against other operational and development projects within NZDF for priority.

Energy management challenges

When the Wigram air base closed in 1995, new buildings were constructed to keep up with growth at Woodbourne. This increased the demand for energy.

It also meant comparing Woodbourne's absolute energy consumption from year to year would be meaningless.

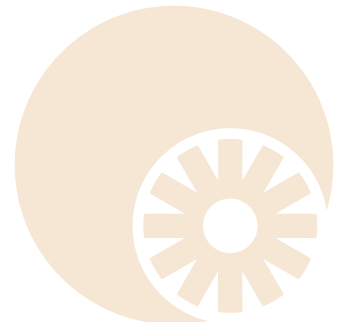
It is more valuable to use parameters such as energy use per square metre of floor area or numbers of personnel.

Carrying out energy management projects can be frustrating. Even the best energy-saving projects compete for funds with NZDF's other needs, such as aircraft and operational objectives.

The demand of energy management on staff time is also an issue.

According to the 2004 energy audit, a facility the size of Woodbourne should employ an energy manager who works on energy management at least 50% of the time.

Despite these challenges, Woodbourne has made big savings in energy costs, and will strive to keep the energy management programme running.



CREDITS

Client

Royal New Zealand Air Force Base, Woodbourne

Suppliers

Novar power management system (www.novarcontrols.com): Power Management Systems, Christchurch

VaeWin electricity profiling software: Utility Technology Ltd, www.utl.co.nz

Boiler meters for measuring flow and temperature: Intech Instruments

Case study

Text and photos:

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