



Commercial Case Study

Sydney Installs Geothermal Pond Loop

Sydney Harbour, in the Australian State of New South Wales, is something of a worldwide icon. Most travel brochures relating to Australia include a picture of its glittering waters, complete with the city's other famous features – the Opera House and the Harbour Bridge. As is the case with many such busy waterways, a specialist police presence is necessary.

The Sydney Water Police hold the distinction of being the first civilian form of policing established in NSW in 1830. It was merged, with all other Police units, into the NSW Police Department in 1862. Today, they are equipped with 11 sea going crafts and a number of smaller boats, all with electronic navigational aids. The Section employs 123 personnel, including divers and support staff.

In 2001, the New South Wales Department of Works and Services (now renamed the Department of Commerce) was charged with the task of designing a new headquarters for the Water Police and began

looking at options for air conditioning systems. According to the department engineers, long-term building investments were best served by systems that provided maximum owning and operating paybacks.

When researching a cooling system that afforded energy efficiency and the best return on investment, the Department of Commerce became interested in installing a geothermal cooling system. The geothermal technology offered a myriad of benefits, such as: increased comfort levels, improved indoor air quality, easy installation, zoning, flexibility, environmental sensitivity, energy and operating costs savings, reduced maintenance, and enhanced community relations (with the absence of noisy outdoor equipment). Consequently, the design went ahead on this basis. The alternative would have been a variable refrigerant volume (VRV) system.

A Niche Design

As the project advisors leaned toward a geothermal application, the facility design clearly had to incorporate a system of jetties and boat ramps for



Sydney Water Police Dock

the police vessels. In turn, this led the designers to consider a closed geothermal loop located in the harbour beneath these structures – the classic “pond loop” in one of the best known “ponds” in the world!

The design proceeded to the bid process. Although, the State Government bidding practices disallowed manufacturer’s names to be included in the documents, ClimateMaster’s Australian Distributor, Air Solutions International Pty Ltd, worked closely with the Department’s engineers in the process of selecting equipment.

When the bids were received, the Department found that it was facing the situation of a project that had exceeded the budget – largely caused by an over run in building works with the inclusion of a sea wall. Air Solutions and the manufacturer/installer of the harbour loop, LoopMaster Australasia, were requested to attend a meeting to discuss possible avenues for savings. Understandably, both parties held concerns for the viability of the geothermal design. Air Solutions representative, Paul Mascall, ventured to inquire whether any considerations were being made as to the use of air-cooled equipment. The Department of Commerce responded that under no circumstances would this be contemplated. The Department’s engineers advised that they were already encountering life-cycle problems

with outdoor equipment in environments far less aggressive than the salt-laden atmosphere prevalent on Sydney Harbour foreshores.

As part of post bid negotiations, the building air conditioning was reduced from 14 zones to 12 zones to take advantage of ClimateMaster’s range of larger capacity equipment. Air Solutions subsequently quoted to the new schedule and a prominent Sydney mechanical contractor was awarded the contract for the mechanical services – specifying the ClimateMaster units from Air Solutions.

A Flexible Cooling System

By mid 2003, the units had been delivered and installed. The flexibility of the water source heat pumps was demonstrated by the fact that certain units were later fitted with upgraded fan decks to overcome some unusually high external duct resistances. The final equipment schedule was five GS horizontal, six GS vertical, and one CL units. And, with all the equipment underground and inside, the equipment life cycle ranges from 15 to 20 years or more.

The ClimateMaster equipment serves the two-story, 16,150 square feet (1500 meters²) complex, providing pollution free, energy efficient air conditioning that makes best use of the site conditions. The total capacity of the plant is 43 tons (150 kW) and the design engineers anticipated an operating cost savings of 40 percent of that likely



Office complex with ocean loops

Sydney Water Police Station New South Wales, Australia



Sydney Water Police Station and Dock

with an equivalent VRV system. The expected maintenance savings are in the order of 50 percent of that of a VRV system. The heat exchanger in the harbour is comprised of three banks of six coils each – submerged in the harbour and connected by 3-inch (80 mm) diameter supply and return water lines to the building itself.

In addition, all the water source heat pumps were provided with ClimateMaster's "Ultra Quiet" Sound Attenuation package. The compressors are internally sprung and externally isolated using a dual vibration dampening system for extra quiet operation. The mounting system incorporates spring isolation between the compressor mounting tray and the compressor with rubber grommet isolation between the mounting tray and unit base. ClimateMaster also applies a high-density noise suppression material and $\frac{1}{2}$ inch (13 mm) fiberglass insulation to the base pan, all access panels and blower housing.

A Renewable Energy Source

When choosing the cooling system for the project, the NSW Department of Commerce made a decision with a "green conscience." Geothermal technology offers a clean and green renewable energy source. A geothermal heating and cooling system helps protect the ozone layer with trace CO₂ emissions. According to the United States Environmental Protection Agency, a typical 3-ton

(10.5kW) residential GHP system produces an average of about one pound (0.45 kg) less CO₂ per hour of use than a conventional system. If only 100,000 homes converted to GHPs, this would reduce annual CO₂ emissions by 125,000 tons (114,000 metric tons) per year.

"Geothermal technology offers municipalities a cost effective and environmentally responsible solution to building needs. The lower operating costs and minimum maintenance requirements provide a three to five year return on investment," said Paul Mascall, representative for Air Solutions International. "This is becoming increasingly important to city governments."

The Sydney Water Police Station was the first of many upcoming Sydney municipal projects with the intent of specifying geothermal systems. According to the Department of Commerce, the benefits of a geothermal system offer not only superior comfort, but also present solutions for energy efficiency and environmental safeguards.



Sydney Water Police Station
New South Wales, Australia

Square Footage:
16,150

Type of System:
Closed-Loop Surface Water System

Number of Units:
12

Total Capacity (HVAC Ton):
43

Loop Manufacturer/Installer:
Loopmaster Australasia

Australian Distributor:
Air Solutions International Pty Ltd

Owner/Occupants:
Sydney Department of Commerce

Manufacturer:
ClimateMaster, Inc.
www.climatemaster.com



ClimateMaster is the world's largest and most progressive manufacturer of geothermal heat pumps. The company is committed to innovation and dedicated to environmentally clean, economically sound and superbly comfortable home and business environments.

ClimateMaster has been designing and building equipment that enhances the environments we live and work in every day for more than 50 years. In addition to geothermal heat pumps, ClimateMaster offers the most extensive product line of water-source heat pumps for use in a wide variety of applications. ClimateMaster products are proudly built in the U.S.A.



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