EUROCITIES

Budapest zoo & garden: thermal heating

Heat energy from natural resources

Budapest's network of thermal baths attracts millions of visitors each year. Recognising the potential of its more than 100 natural springs and its bored well as a heating source, in 2010 Budapest Zoo & Botanical Garden (BZBG) launched a scheme to heat its buildings using waste heat energy from the spa water.

Making the most of resources

The BZBG used to consume more than 800,000m^3 of gas for heating, at a cost of nearly €360,000 a year. Given that the animals and plants need a constant heat supply throughout the year, BZBG was looking for a creative solution to save on energy costs and reduce carbon emissions. The nearby Széchenyi thermal bath held the key. The zoo implemented a system to transfer the heat from the geothermal well between the two locations, using it as a heating source for one (the zoo) and, at the same time, reducing electricity consumption for cooling for the other (the bath).

Straight from the well, at 75˚C the water is too hot for spa guests to enjoy safely, and must first be cooled. The idea was therefore to use the surplus hot water to heat the facilities at the zoo, using a heat exchanger installed at the bath. After the heat exchange, warm water (around 60˚C) transfers heat directly to the zoo through two pipes. The whole system is regulated using a computer system and 14 heat monitors.

Mutual benefits

The success of the project depends on collaboration between three partners: BZBG, Budapest Spas and Hot Springs Ltd, and the Budapest District Heating Company. This cooperation was simplified by the fact that all three are city-owned, and given that the project would provide benefits for all of them.

> Not only have our costs decreased, but we now have a reliable heating system to complement our older system. The initiative is also helping us to protect our environment: we have worked out that over just one year, we are saving the equivalent weight in carbon dioxide as 100 enormous African bull elephants.
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> ***Dr. Miklós Persányi, director general, BZBG***

cities in action
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where: Budapest, Hungary
what: environment
when: 2010+

For BZBG, this means a saving of up to €130,000 a year on its natural gas bill, and greater independence from its former gas-based heating system. However, a third of this saving does go towards operating the new system (two big circulation pumps together consume 100,000kWh of electricity annually).

The spa saved money by relying less on its cooling system, with an average reduction in annual energy consumption of around 25,000kWh. Meanwhile, the district heating company gained new partners and is now able to position itself as a sustainable energy supplier.

Room for improvement

The system has now been running successfully for two years. Nevertheless, greater energy efficiency could be achieved by renovating the current heating system in the buildings, and talks are ongoing about installing surface heating, replacing doors and windows, and better insulation. This presents a bit of a challenge, as the buildings are listed and therefore subject to strict rules when it comes to renovations.

The partners are also exploring ways to use more geothermal heat energy, for example an absorption cooling system for air conditioning and pool water conditioning.

Perfect location

The project in Budapest works so well because of the city's numerous hot springs and wells and the zoo's proximity to the Széchenyi bath.

Although this could make the project difficult to replicate in other cites, it should nevertheless serve as an inspiration for similar solutions using waste heat energy. What Budapest's project demonstrates is that energy efficiency and sustainability can be achieved not only with the latest technologies, but also by making better use of existing energy sources.

There was some limited financial help required from the city, but Budapest considers this a worthwhile investment as it now means that not only does it save money and energy overall, but the zoo is no longer totally dependent on one single energy source. In addition, by using clean energy instead of fossil fuels, CO_2 emissions in the city centre have decreased by more than 600 tonnes a year, meaning cleaner air for local residents.

The total budget was approximately €1.05m, of which 60% came from the European Regional Development Fund. The remainder was provided by the BZBG (30%, as a zero rate loan from the city council, and 10% from its own budget).

> Sustainability doesn't only mean using brand new technologies, but rather recognising opportunities to use existing resources. Using thermal water for clean and sustainable heat energy and making the most of waste thermal energy instead of using fossil fuels is a simple yet superb practice. This is what smart and green cities are all about.
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> ***Vince Zsigmond, acting project manager***

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