

Complesso della Torre, Italy

A sea-centered project

The project is focused on the use of latent heat with two ice storages and heat pumps in combination with unglazed solar collectors and a PV system. It is designed as a pilot project for local heat supply.

Key facts

Buildings

Location	<i>Savona, Italy</i>
Construction	<i>2007</i>
Heat distribution	<i>underfloor heating</i>
Heated space	<i>69.000 m³</i>
Structure	<i>1 hotel (96 rooms + conference center) 103 flats, 20 offices, 31 shops</i>

Level of insulation *very good*

Heat pump and source

Number of	<i>6 (hotel) 150 (commercial and residential units)</i>
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Operation mode *Monoenergetic*
Heat source *(sea) water, air*

Heating system

Heat demand	<i>7,4 MW (7400kW)</i>
Heating temperature	<i>35 and 55°C</i>

Domestic hot water

Type of system	<i>mix</i>
Max. temperature	<i>55 °C</i>

Other information

Coefficient of Performance	<i>Up to 6.4</i>
Refrigerant	<i>R410A</i>

Lessons learned

- Use of innovative heat source – the sea is an unlimited renewable opportunity, with stable and favorable temperature conditions year-round
- Heat Pumps are extremely flexible: the whole district is served by this technology in a variety of combinations and applications



In Savona in north-west Italy, the Spanish architect Ricardo Bofill was commissioned to design a new residential and commercial district. The idea was to revamp the dock area of the town and give it a new lease of life, as planned by investors and local authorities.

The space, known as the ‘Complesso della Torre’, was to include a 19-story apartment block, a courtyard and a commercial space with a hotel, 31 shop units and 20 office units.

Inspired by the complex’s portside location, Bofill designed the two buildings to reflect the town’s historic links to the sea.

The sea’s presence in the new complex would be more than simply symbolic. It would also have a crucial technical role: providing the energy for the air conditioning and domestic hot water of the entire project via a heat pump system.

This could work because sea water has a fairly consistent temperature – from 14°C in winter to 24°C in summer – and because the complex is situated right by the sea

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Complesso della Torre – Titanium steel ocean-thermal exchangers and a high efficiency water-to-water heat pump serving a flat

Description of the technical concept

Sea water is drawn up through a concrete duct, protected by an intake grill and a shut-off damper, into a 60 m³ settling tank, which isolates dust from the water and stabilises the water level. It then flows to strainers and three exchangers made from titanium steel, which resists salt water corrosion. Water is then returned to the sea with a difference in temperature which is kept to 3°C in order to respect marine life.

The load side of the heat exchangers is the water loop, with a reverse return design, that feeds the water-to-water heat pumps.

In the hotel, two central heat pumps, 400 kW each, provide cold and hot water and domestic hot water at 55°C. These are connected to 190 terminal units. Ventilation is provided by four air-to-air stand-alone heat pumps complete with thermodynamic heat recovery and four additional air handling units.

Flats, offices and shops are served by 150 local water-to-water heat pumps, connected to more than 680 duct type terminal units.

The Results:

Each user has independent heating or cooling throughout the year, with immediate accounting on its own electricity meter.

The use of heat pumps for domestic hot water avoided the construction of heating plants with the associated bureaucracy and costs of installing gas pipes.

Thanks to the use of sea water, design analysis over a one year period highlighted an average saving of 70% when compared to a traditional system based on gas boilers.

Environmental impact too has been drastically reduced as direct CO₂ emissions have been thoroughly eliminated and indirect emissions have been practically halved.