1.8 SWEDEN: CASE STUDY 2. WASTE WATER HEAT PUMP, VILHELMINA MUNICIPALITY

JOKKMOKKS KOMMUN
JÅHKÅMÅHKE KOMMUVNNA
JÅHKÅMÅHKI SUOHKAN

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

Case study report for Sweden: Community owned energy project from initiation to completion
Waste Water Heat Pump, Vilhelmina municipality

1 Introduction

Vilhelmina is the largest municipality in Västerbotten County when it comes to the area (8795 km2). The number of inhabitants is about 6,800. More than half of the population lives in or near the main community Vilhelmina and the other half lives across a very large geographic area in many small and medium sized villages. Ensuring a cost-efficient and reliable municipal service even in the smaller communities is important.

2 Description of community

The western part of Vilhelmina municipality consists of a mountain range with various valleys. One of them is called Kittelfjäll, which has outstanding on- and off-piste skiing opportunities in a beautiful nature. The small village itself is becoming more and more attractive to people who want to have a holiday home there. The current detailed land use plan comprises an approximately 100 hectare area in which a maximum of 350 residential properties can be built. The rising number of inhabitants made it necessary to build a new sewage plant, as the old one is designed for only 900 pe. The new one is able to deal with up to 4000 pe and should be highly flexible due to the high share of part-time inhabitants.

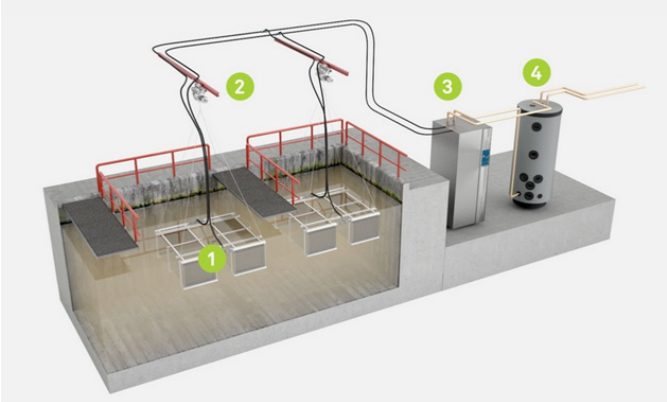
3 Energy efficiency and renewable project

Like a refrigerator or air conditioner, a heat pump forces the transfer of heat energy from the ground, water or air to the application. Using motive power to run the heat pump's process effects the transfer of several times as much energy to the application, be it heating, hot water or even cooling. In theory, heat can be extracted from any source, no matter how cold, but a warmer source allows higher efficiency. The relationship between how much power we use versus how much energy is delivered is known as a COP or Coefficient of Operating Performance. If a heat pump uses 3kW of power and delivers 12kW of energy then its COP is 4 (=12 /3).

There are specific challenges when it comes to make use of the heat of wastewater. One major issue is the harsh environment as the wastewater due to its nature fret at the heat collector. Fats, oils and grease floats on water surface and can encrust on pipe walls and mechanical equipment. Service for and cleaning of the appliance need to be easy as the process of wastewater treatment cannot be stopped for too long.

The standard design for the wastewater treatment plan would be direct electric heating. Instead, a heat pump has been installed (23 kW), which is tested with good results in similar plants. It will deliver about 57 000 kWh per year and use about 12 000 kWh electricity, which gives a COP of 4.75.

The collectors use a polymeric special material to maximize the area to take up the heat from the water, which makes them more effective than standard ones. They are also compact, easy to install and to clean. An important environmental advantage is is that these collectors use very little cooling liquid compared to standard solutions.



Waste Water Heat Pump System (Evertech), design chosen for Kittelfjäll pilot site

1: Heat Collector, to be placed in the waste water
2: Possibility for hanging collectors in the water to avoid problems with operation
3: Heat Pump
4: Heat Boiler

4 Ownership structure and financial model used

The waste water plant is built and owned by the municipality of Vilhelmina. The use of the waste water heat makes the operational costs of the plant significant lower:
Total investment: 47 250 Euro
Electricity price: 0.15 Euro / kWh
Saved electricity per year: 45.000 kWh = 6 750 Euro
Pay-Off: 7 years.
The investment is economic by given lifetime of heat pump of ca 15 years.

5 Implementation Process

Vilhelmina municipality has used this technology in an earlier project and has been convinced by its advantages. Therefore, the use of heat pump technology has been part of the planning from the beginning.

6 Project results: Lessons learnt & post- project benefits

Energy efficiency projects are considered as most attractive projects for the municipalities because of their short payback period and economic, environmental and social benefits. However, it is important to consider operational or life-time-costs already in the planning stage and not only on possibly lower investment costs for standard technology. It is also essential that decision makers have the chance to see new efficient technology in place and to learn from best practice examples.

Contact: Silva Herrmann, Climate and Energy Expert, Jokkmokk Municipality.
Silva.Herrmann@jokkmokk.se

LECo

Local Energy Communities

Project Partners

Centria University of Applied Sciences (Finland),
Western Development Commission (Ireland), Luleå University of Technology (Sweden),
Renewable Energies Agency (Germany)*, Jokkmokk municipality (Sweden),
The Gaeltacht Authority (Ireland), Lohtaja Energy Cooperative (Finland),
UiT – the Arctic University of Norway (Norway)

*Outside the NPA Programme area