

Using Heat Pumps to Supply Thermal Energy – Bielsko-Biala, Poland

Keywords	Renewable Energy Sources, Heat Pumps, WWTP, Swimming/Fitness Centre
Objectives	To reduce both overall cost and negative environmental impacts due to heating activity.
Description	<p>Heat pumps systems have been installed at Komorowice Wastewater Treatment Plant and Aqua Centre of Recreation (swimming pool & fitness).</p> <p>Heat pumps at the Komorowice WWTP were installed in 2005. The system installed consists of three pumps of 14kW each. The system is connected to an electric boiler of a capacity of 24kW which supplies energy in times of peak demand. At Komorowice WWTP, waste water is used as the bottom heat source, characterised by a minimum temperature (winter) above 6 to 8°C. The water flows through the sand trap system, with eight coils made of polyethylene pipes of the diameter of 40mm and of the length of 300 running meters each. The collector system, being the heat sink for the bottom source, is filled with a blend of glycol and water in a proportion of 1:3. The heat pumps produce a top source of heat of 45°C to 55°C. Heating fluid circulates within a closed system and supplies radiators, convectors, as well as heaters.</p> <p>The installation has been executed in a way enabling for separate and independent feeding of:</p> <ul style="list-style-type: none"> - Administration / office building for the treatment plant personnel, - Administration / workshop building for the maintenance department personnel, - Screens grids' building. <p>In total a volume of over 6,000m³ room space, all sanitary water for about 80 employees as well as four digestion chambers of a total capacity of 8,000m³ are heated.</p> <p>The use of waste water within the heat pump system as a source of energy is in the case of a WWTP the best possible solution. Recovering of energy from waste water, of which temperature throughout the year does not drop below 6°C, allows for a better heat recovery compared to the use of flowing surface water or ground heat.</p> <p>Heat pumps of a capacity of 350 kW were also installed in the City's new indoor swimming pool and Aqua Fitness Club (opened in 2006). The pumps use the heat contained in piped water supplied to the residents of Bielsko-Biala and the heat from swimming pool ventilation in order to heat and air condition the building in the summer season. The system is backed up by a gas-fired boiler during periods of maximum energy need.</p>
Results / Achievements	<p>Heat Pumps at Komorowice Water Treatment Plant</p> <ul style="list-style-type: none"> - Bottom heat source: untreated wastewater (min. temperature: 6°C) - Temperature achieved at the top heat source – 45°C to 55°C - Application: room heating of 6,000m³, sanitary water heating(storage tank of 700l), heating of four digestion chambers (of 8,000m³) - Working efficiency: 4.44 - Benefits – 600 kWh of electric power instead of 250 m³ of gas per day - Payback period of installation instead of traditional gas installation equals 5 years <p>Heat pump at Aqua Recreation Centre</p> <ul style="list-style-type: none"> - Bottom heat source: drinking water supplying the City - Heat recovery from ventilation system - Application: heating of water in indoor swimming pool (max 31.5°C), heating and air-conditioning of swimming pool and fitness centre space (total volume of 15,000 m³) - Payback period: about 2 years
Friendly advice for replication	<p>Heat pumps, even though they have been known and available for over ten years, are yet to gain popularity as an alternative source of energy. The installations presented above are characterised by a very high power efficiency and financial effectiveness. Also, full automation has practically eliminated the need for providing extra service with respect to heating installations.</p> <p>Heat pumps can be easily used in commune companies which have access to water and sewage. Also experience shows that respective installations are economically profitable.</p>
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