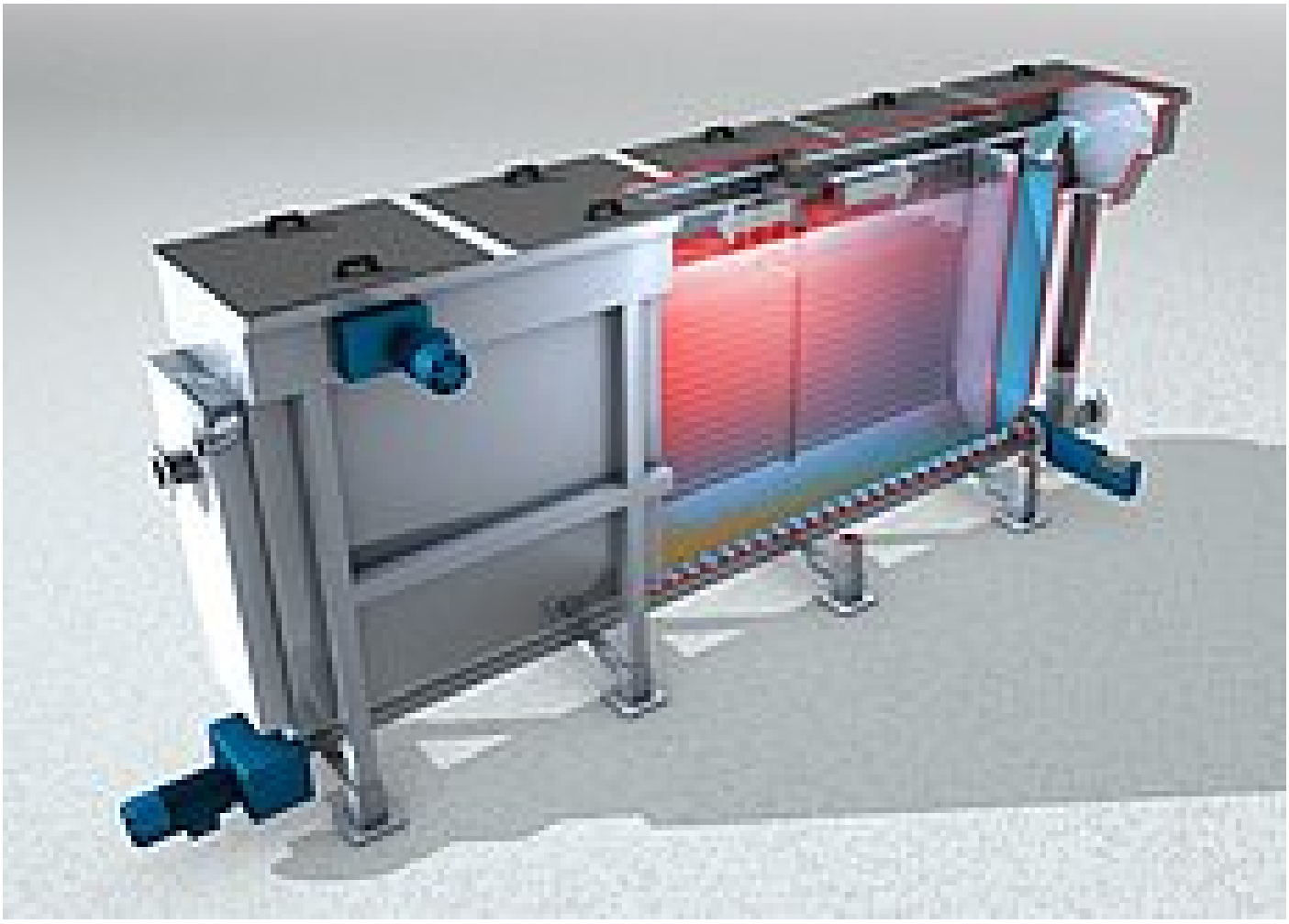
How To Heat And Cool Buildings With Wastewater



HUBER Heat Exchanger RoWin, developed especially to be used with wastewater and sludge

Most companies and agencies today operate with the concept of business sustainability. This is a holistic way of managing a business that includes environmental, social, and financial responsibilities. To meet this triple bottom line, companies must find ways to be cost-efficient, socially responsible, and eco-friendly at the same time.

Heating and cooling facilities uses large amounts of energy, and accounts for much of a company's operating costs. With new technologies, companies can reduce reliance on fossil fuels while saving money.

HUBER Technology is an innovator in the field of water and wastewater process engineering. For over 175 years, HUBER has focused on the development of new solutions to conserve one of our most valuable resources: water.

Water Online spoke with Steven E. Macomber, Regional Sales Director for HUBER, to learn about recovering thermal energy from wastewater.

Q: There's been an increasing push for both sustainability and cost savings when it comes to heating and cooling large buildings and facilities. How can wastewater from the sewer system be used for these purposes?

A: Underground sewer networks are a hidden source of energy. Domestic wastewater maintains a temperature between 50 and 68 °F (10 and 20 °C), even in the winter. This stable temperature range makes wastewater an excellent energy source for operating a heat pump. With its low temperature during the summer, wastewater is also a heat sink, and can be used for cooling buildings.

Q: How does such a system basically work?

A: An intake structure is connected to a sewer main, and a portion of the flow is pumped to an above-ground heat exchanger. A heat exchanger extracts heat energy from the wastewater. In the heat exchanger, heat energy is transferred to water or another clean carrier medium. The carrier medium transports the energy to a heat pump, which is used for maintaining proper temperature in the building. The cooled or heated wastewater then flows back to the sewer.

First "net-zero" office building in Washington, D.C.: AGU headquarters (rendering) with a HUBER ThermWin system as as the heart of its heating and cooling plant

Q: What are the advantages of using a wastewater heat exchanger versus conventional heating and cooling?

A: Recycling heat energy from wastewater saves costs. Energy costs for heating and cooling can be reduced by up to 80 percent when compared with conventional methods.

Sewer heat exchangers improve sustainability and are eco-friendly. Using a wastewater heat exchanger reduces the use of fossil fuels. This improves the environment by reducing emissions and lowering a building's carbon footprint. These systems also save water that would otherwise evaporate in cooling towers, and no cooling tower cleaning chemicals are polluting the environment.

Sewer heat exchangers can be space-saving, giving customers more latitude with their building design. Installation is quick and and easy.

The supply of wastewater is virtually unlimited. Wastewater is a free, local, and decentralized heat source. There is little interference to the existing sewer system, and minimal construction required to access the wastewater.

Q: Do grit, rags, and debris in the wastewater affect the operation of the system?

The wastewater is prescreened prior to being pumped to the heat exchanger. This prevents debris from affecting system operation. Screenings are returned to the wastewater stream.

Q: Does the raw sewage come into contact with the cooling water?

A: The cooling water does not contact the raw wastewater. The heat exchanger is constructed of welded stainless steel. Horizontal carrier medium pipe modules are arranged in parallel. The pipe modules are made of stainless steel to achieve maximum heat transfer efficiency. The pre-screened wastewater flows through the heat exchanger and, via the compactly arranged pipes, gives off its thermal energy to the cooling water.

Q: Are there negative effects from the wastewater as it flows through the heat exchanger, such as a buildup of sediment or biofilm on the pipes?

A: Due to the chemical and biological properties of wastewater, a biofilm builds up on the heat transfer surfaces. This can impair heat transfer. To prevent negative effects, an automatic solids removal mechanism provides preventive cleaning of the heat exchanger surfaces. Solids settle on the tank floor, are removed by a screw conveyor, and are returned to the sewer along with the wastewater.

Q: Is there a minimum sewage supply and temperature needed for this type of system?

A: A continuous wastewater flow of at least 1.3 gallons per second (5 liters per second) is required to ensure efficient heat recovery. The wastewater temperature should not fall below 50 °F (10 °C).

Q: What is the minimum system size (in kW) that such a system would be used for?

A: For economic heat recovery, the minimum output of useful heat is about 20 kW.

Q: How close must the facility be to the wastewater pipeline to remain economical?

A: The distance from the facility will be unique to the project. However, the distance from the sewer system to the heat station and building should be as short as possible to minimize capital and operating costs.

Q:Can other waste liquids be used for heating and cooling, such as industrial wastewater or wastewater treatment plant effluents?

A: Commercial and industrial facilities may have warm water discharges. On-site wastewater treatment can often be combined with heat recycling technology for cost savings and environmental sustainability. These solutions would be site-specific.

Treated wastewater effluent heat recovery provides several advantages: Considerable heat potentials are available due to the huge water volumes. Effluent cooling has no negative effects on the receiving water.

HUBER Technology has a compact, self-cleaning RoWin Heat Exchanger that can be installed directly in the effluent channel.

Sewage treatment plants often have a high demand for heat. In addition to heating and cooling buildings, recovered heat can be used to enhance sludge drying in HUBER's Solar Dryer.

Filtrate from wastewater dewatering is also ideal for producing heat energy that can be used for heating digesters, for drying sludge, or heating and cooling buildings.

Q: What type of projects are in place that use this technology?

A: Due to the many advantages discussed, the use of wastewater as a heating and cooling source is catching on. HUBER has a variety of installations, including a system for the Museum of Bavarian History, a new ministry building in Stuttgart, Germany, and a 28-story high-rise in Switzerland.

HUBER is also proud to have its ThermWin® system supply heating and cooling for the first "net-zero" building in Washington, D.C. A net-zero building generates all the energy it needs for itself. The American Geophysical Union (AGU), a non-profit organization of over 58,000 geophysicists, is building their new headquarters with net-zero technology. The 5-story building will include LED lights, vertically planted green walls, a greywater reuse system, and coolable ceiling structures. HUBER's ThermWin system will use wastewater from the sewer system to provide 500 kW cooling capacity and 220 kW heat output for the building.

The AGU project team visiting HUBER. Left to right: Saul Kinter (DC Water), Greta Perry (MGAC), Samantha Patke (Interface Engineering), Matthew Boyd (AGU), Virgil Brown (AGU), Panda Aumpansub (HAVTECH), Steve Macomber (HUBER US), Darrick Sallers (Skanska), Norman Long (HAVTECH)

Tour of the pathbreaking heat recovery plant at Wintower in Winterthur, Switzerland

Related Products:

- HUBER Heat Exchanger RoWin

Related Solutions:

- Wastewater Heat recovery: HUBER Solutions for Local and Short Loops
- HUBER Solution for Heat Recovery from Sewers (ThermWin)

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