

WASTEWATER ENERGY RECOVERY SYSTEMS: Technology Overview

	HUBER Technology	SHARC Energy	UHRIG Group
Website	HUBER Technology: www.huber-technology.com 	SHARC Energy: https://www.sharcenergy.com/ 	UHRIG Group: https://energie.uhrig-group.com/en/ 
Company Location	Headquartered and manufactured in Denver, NC, USA	Headquartered in Port Coquitlam, BC, Canada – Offices in NY	Headquartered in Geisingen, Germany – Offices in NY
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Summary	HUBER's ThermWin® platform combines proven screening and RoWin® heat exchanger technology to deliver reliable, continuous operation under real sewer conditions—including high solids and variable flows. ThermWin® is a direct wastewater energy recovery systems that extracts thermal energy from wastewater for space heating, cooling, and domestic hot water production. From in-building ThermWin Core® systems to large-scale sewer-connected installations, HUBER solutions are	SHARC Energy manufactures three complementary Wastewater Energy Transfer (WET) product lines — PIRANHA™, SHARC™, and SHARC BFO™ — covering the spectrum from mid-size multi-family residential buildings to large district energy systems. All three solutions are completely sealed, odor free and can be installed within the building envelope, offering unmatched flexibility in how and where the WET systems can be sited. SHARC Energy is wastewater agnostic and heat exchanger agnostic, working across	The THERM-LINER system is a modular sewer heat exchanger system that can be installed in new sewers and existing sewers to provide energy savings and reduce carbon emissions from individual buildings, entire neighborhoods or district heating and cooling networks. The system is installed directly inside the sewer. It is removable and extendable. Installation is carried out through existing manholes. No excavation or street opening is required. Only temporary

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modular and scalable across a wide range of load profiles—from single buildings to multi-megawatt district energy systems. Systems integrate seamlessly with heat pumps and can serve as the primary thermal source for building and campus energy networks.

ThermWin® transforms both building sanitary lines, municipal sewers and combined sewers into high-capacity thermal infrastructure, enabling significant energy savings, carbon reduction, and flexible deployment across retrofit and new construction applications.

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sanitary and non-sanitary effluent and influent streams – offering both plate-and-frame and shell-and-tube heat exchanger configurations to suit project requirements.

PIRANHA™ is an active wastewater-source heat pump optimized for smaller-scale applications — from buildings as small as 35 residential units up to ~350 units — as well as commercial applications including hotels, laundries, breweries, hospitals, senior living, and corrections facilities. It requires no pre-filtration, produces potable domestic hot water up to 140°F, and delivers average year-round efficiency up to 600% (COP 6.0). The PIRANHA is compact and designed for retrofit applications, making it one of the most accessible entry points to wastewater energy recovery available

SHARC™ is a passive, high-volume wastewater energy transfer system built for larger-scale applications — from 350+ residential units to large commercial, industrial, campus, and district energy systems. Just like PIRANHA, SHARC units can be installed in parallel to scale to virtually any project size. Operating as

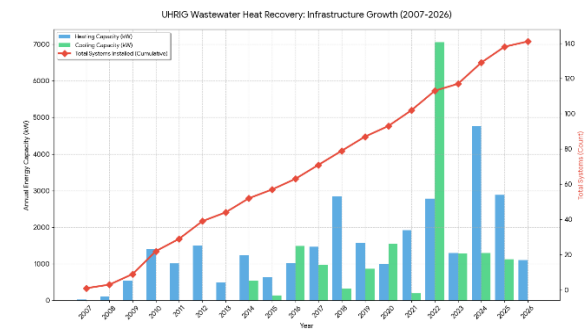
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wastewater management is needed during installation.

The modules are self-cleaning: increased flow during rainfall events flushes the heat exchanger surface. Biofilm re-establishes afterwards and reaches a stable equilibrium. This is accounted for in the system design.

Continuous monitoring identifies deviations in performance without requiring physical inspection.

Across 140+ installations and 18+ years of operation, no THERM-LINER has required cleaning. No system has been removed due to clogging or solids accumulation.



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		both heat source and heat sink, SHARC supports heating, cooling, and DHW production, and pairs beautifully with geothermal systems – reducing bore field requirements by up to 40% (CapEx savings) and providing ground loop conditioning for OpEx savings. SHARC BFO™ is a passive plate-and-frame heat exchanger system targeting non-sanitary effluent streams with minimal solids — including WWTP tail water, data center cooling loops, food and beverage process discharge, and high/medium-temperature geothermal or hydronic loops. The BFO expands SHARC Energy’s addressable market beyond the sanitary line into any facility where clean, warm effluent is being discharged without its thermal energy being recovered. Scalable from single building to ATL/TEN/district level systems.		
Product Components	The ThermWin® platform is a modular system built around HUBER’s core wastewater screening and the completely sealed and self-cleaning RoWin® heat exchanger. ThermWin® is configurable for in-building, in-channel, or wet well applications:	PIRANHA™ Self-contained, sealed wastewater-source heat pump that produces	SHARC™ Comprised of a high-volume filtration system, customized heat exchanger and controls, on a	THERM-LINER A: https://energie.uhrig-group.com/en/gravity-pipeline-type-a/ THERM-LINER B: https://energie.uhrig-group.com/en/gravity-pipeline-type-b/

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ThermWin Core® (In-Building Systems) Compact, fully integrated units designed for behind-the-meter installations. Combines integrated screening and RoWin® heat exchanger within the building, connecting directly to sanitary lines—ideal for retrofits, urban sites, and space-constrained applications. Channel-Mounted RoWin® heat exchanger is installed directly in the wastewater flow. Well-suited for installation in wastewater treatment plant effluent channels. Classic ThermWin® Systems, Wet Well / Centralized Installations utilizing sewer lines for energy recovery source or sink. This combines HUBER screening with the RoWin® heat exchanger As a leader in wastewater treatment technology, HUBER can integrate additional upstream and downstream equipment to address site-specific requirements and ensure reliable operation under real sewer conditions.	domestic hot water and provides space cooling from a single packaged unit. PIRANHA™ has been approved by the MA Board of State Examiners of Plumbers and Gas Fitters. It recovers thermal energy directly from a building's wastewater; no pre-filtration is required – delivering up to 140°F with average combined COP up to 7.0 Available in three sizes — T5 HC, T10 HC, and T15	compact, fully sealed skid assembly. The heat exchanger is available in plate-and-frame and shell-and-tube configurations. Systems are sized based on flow rates (100–2,500 GPM) and can be installed in parallel Touch screen interface, remote monitoring, and flow/temperature/BT U metering are included as standard. SHARC BFO™ The BFO is a plate-and-frame heat exchanger with specialty piping, valving, and custom controls, designed specifically for effluent streams with THERM-LINER C: https://energie.uhrig-group.com/en/bypass-type-c/ THERM-LINER Stack: https://energie.uhrig-group.com/en/therm-liner-stack/

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			HC — with design heat outputs of 60, 120, and 180 MBH respectively, and cooling capacities of 48, 96, and 144 MBH. Multiple units can be paralleled to scale output to any project.	minimal solids content and no macerator or filtration required.		
Application	Individual Building Scale <i>Small – Medium:</i> - Multi-family residential (e.g., 50-350 unit apartments / condos; student housing, community housing) - Commercial (hotels, laundries, etc.)	Multiple Building Scale: <i>Medium – Large:</i> - District and Campus Energy - Multi-family residential - commercial - heavy industrial (petrochemical, pulp & paper, auto manufacturing) - university campuses - hospital and health network campuses	Individual Building Scale <i>Small – Medium:</i> - Multi-family Residential (35 units up to 350 units) – apartments / condos; dormitories, senior& assisted living, community housing, corrections - Commercial – Hospitality,	Large Building / Campus & District Energy Scale: - Multi-family Residential (350+units) – apartments / condos, affordable housing. Geothermal loop offset & conditioning. - Commercial – Data Centers, large hospitality / casino, healthcare campuses,	Individual Building Scale: <i>Small – Medium:</i> Heating and cooling with energy from wastewater are possible in any building with a power requirement of around 200 kW or more (around 25 residential units, apartments, condos, student	Multiple Building Scale: District and Campus Energy: <i>Medium – Large:</i> multi-family residential, commercial, and industrial use up to 5 MW.

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	• Institutional schools, recreational centres, etc.) • Light industrial (breweries, distilleries, food processing, etc.) • Specialized applications (sterilization condensate heat reclaim, hot springs heat recovery)	• Wastewater treatment plant • Geothermal bore field offset	water parks, hospitals, commercial laundry, community centers, and car washes • Light Industrial – Manufacturing , food & beverage, micro-breweries/distilleries, thermal storage • Institutional – University campuses, laboratories, military & federal facilities	commercial office & mixed-use, university & college central utilities, military & federal installations • Industrial – Pharmaceutical, manufacturing, food & beverage plants, breweries/distilleries, thermal storage • Municipal – Wastewater treatment plants, lift stations, subways, sewer mains.	housing, senior assisted living community housing • commercial buildings: (hospitals, micro-breweries and distilleries, hospitality, commercial laundry, community activity center and industrial).

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Useful Links to Projects	Three smaller scale sample projects in Switzerland District Heating with ThermWin in Wittenberge Munich Daycare uses Thermwin Bremen innovation complex uses HUBER ThermWin for heating and cooling	The Toronto Western Hospital WET™ Project 6 HUBER Heat Exchanger RoWin 14 for the new La Saulaie district in Lyon World's largest wastewater energy transfer project at Markham District Energy (Ontario, Canada) THM, a university of applied science, uses HUBER ThermWin for heating and cooling with wastewater	• Building Seven35, North Vancouver, BC • Lake Louise Inn, Banff, AB • 3200 Bluff, Boulder, CO • Amalgamated Housing Corporation, Bronx, NY • EPRI & Incubatenergy® Labs Challenge	• District of Columbia Water Headquarters • Ilelém Village Vancouver, BC • National Western Center, Denver, CA • Alafia Development, Vital Brooklyn, NY • False Creek Neighborhood Energy Utility, Vancouver, BC	THERM-LINER references: https://energie.uhrig-group.com/en/references/ 140+ THERM-LINER systems are installed in Europe. The oldest system is in operation for 18+ years. THERM-LINER is one of two technologies selected by New York City DEP for its Sewer Heat Recovery System Development Demonstration Project, currently in design, with construction targeted for 2027. We can arrange a direct conversation between a Massachusetts applicant or sewer operator and a European sewer network operator running a THERM-LINER system on cleaning, maintenance and day-to-day operation. Operators in Berlin and Paris have done this before, without us in the room.
	Source of Wastewater Flow (min / avg. GPM or GPH)	Variable wastewater source based on application. Batch or cascading flows allow for lower minimum flows without wastewater holding tanks	Variable based on application. Wastewater holding tank acts as thermal	Variable based on application, 100 GPM minimum flow rate. Wastewater holding tank acts as thermal battery and buffer.	Minimum quantity required: 317 GPM = 20 l/s

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		battery and buffer.		
Depth to Sewer (feet)	HUBER's ThermWin® system can be used to access wastewater at any sewer depth. Variable based on application. ThermWin CORE® equipment is completely located within the building as a sealed system. Channel mounted RoWin® heat exchanger is at surface level for extraction at wastewater plant effluent channels.	PIRANHA™ equipment is sited inside or (in a container) adjacent to the building it serves. The sanitary and non-sanitary source pipes are typically just below grade and readily accessible. PIRANHA is fully sealed and odor free during operation.	SHARC™ equipment is sited inside or (in a container) adjacent to the system it serves. It accesses the building's sanitary line, a nearby sewer main, or other wastewater sources at any depth. The SHARC is fully sealed and odor free during operation.	No limitation

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Sewer Diameter (inches)	Due to the straightforward design and installation process, the ThermWin® system is able to access wastewater from all sizes of sewer; there are no minimum or maximum diameter requirements. Screening able to work with sanitary or combined sewers regardless of solids content or size.	PIRANHA™ connects to any building sanitary system, process drain, or hydronic loop — the size of the pipe is immaterial. Source connections include sanitary drain stacks, greywater lines, laundry and commercial kitchen discharge, car wash recirculation loops, food and beverage process drains, ejector pits, interceptors, and any other warm-water hydronic source within the building envelope.	SHARC™ scales from building to municipal level sanitary and non-sanitary systems. It can accommodate any sewer pipe diameter – connecting directly to force mains, gravity mains, wet wells, and individual building drains. SHARC also interfaces directly with wastewater treatment plant infrastructure on both the influent and effluent streams prior to discharge. The SHARC BFO™ extends this reach further still, interfacing with data center cooling circuits, chilled water return lines, condenser and process loops, deionized water circuits, and any hydronic loop where suspended solids do not exceed 2.5mm.	47 inches and larger
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Distance from Sewer to Building(s) (feet)	RoWin® heat exchanger is installed in building with no limitation on the distance from the sewer		PIRANHA™ equipment is typically sited inside the building mechanical space and connects to sanitary and non-sanitary pipes before they leave the building envelope. Minimizing the distance from pipe to PIRANHA.	SHARC™ equipment can be sited wherever it makes the most sense for the project. The closer the system is to the hydronic source the better – to minimize mechanical and pumping costs.	The greater the amount of energy that is brought from the sewer to the building or district heating network, the less important the distance is as a cost factor. We have implemented projects where the sewers were a few meters to 500 meters (1,640 ft) away.
Energy Recovery: (min & max ranges: kW for heating and cooling)	Minimum energy recovery of 100 kW is possible with maximum energy recovery only limited by the availability and flow of wastewater.	Maximum energy recovery is only limited by wastewater flow and temperature. Multiple units can be run in parallel. Current installations of 20+ MW are in operation in North America	PIRANHA™ T5, T10, T15: Heating capacities: 17.5 kW, 35 kW, 52.5 kW Cooling capacities [HC]: 14 kW, 28 kW, 42 kW	Each SHARC™ provides .13–3.3 MW _{th} of thermal transfer based on a 10°F ΔT and 5°F approach. Multiple units can be run in parallel.	Min: 200 kW Max: 5 MW In some cases, solutions that fall above or below these guidelines may be feasible and cost-effective.

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Preliminary Assessment (for customers)	HUBER begins with a targeted screening of key project parameters (building type, location, and heating/cooling demand) to quickly determine wastewater energy recovery viability. We then perform a structured technical evaluation using project-specific inputs, including: • Building thermal loads • Utility rates and cost structure • Existing HVAC systems • Wastewater conditions (temperature, flow, and accessibility) This work is led by HUBER's engineering team and is a standard part of our project development approach—not a separate or optional service. The result is a clear, data-driven feasibility assessment and conceptual system approach grounded in real equipment performance.	No charge for preliminary project analysis and report. Includes on-site visit by SHARC representative and F.W. Webb, our rep for New England. SHARC Energy has developed an acronym for assessing retrofit opportunities: W.A.S.H. • Wastewater source – Can a connection be made to the hydronic source pipe w/o negatively impacting normal operation? • Ample electrical capacity – Does the property have enough electrical service to support the new hardware? • Space – Is there space for the hardware, tanks, piping, and service clearances? Is there a clear pathway from the street to the mechanical space? • Hot water plant – How far from the SHARC/PIRANHA is the process loop?	Based on sewer data (dimensions, wastewater flow and temperatures), we determine the sewer potential and specify the costs for tapping this potential. The scope refers to the wastewater heat recovery system. We then advise the customer on how to proceed if the cost analysis is convincing. We offer this initial assessment free of charge.
Energy Solution Options (for customers)	HUBER is a global OEM and equipment supplier specializing in wastewater energy recovery, providing	SHARC Energy is an OEM that works across a broad range of project design and financing structures — private ownership, energy performance	We plan, build, and install our systems - turnkey, all from a single source.

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screening systems for reliable solids removal and system protection and RoWin® heat exchangers engineered specifically for wastewater applications We work closely with engineers, owners, and utilities to ensure proper system sizing, constructability, and long-term performance—reducing operational risk and avoiding the maintenance and reliability challenges. HUBER provides full controls for all ThermWin® solutions along with ancillary equipment for a fully integrated solution. All HUBER equipment includes Installation Support, Start-up Support, Training and US based Service as standard in HUBER scope of supply.	contracts, energy as a service, public-private partnerships, stand-alone utility and utility-owned models. In Massachusetts, SHARC Energy is represented by F.W. Webb, the largest plumbing, heating, and HVAC distributor in the Northeast, with dedicated hydronic design, process controls, and water works divisions. SHARC Energy and F.W. Webb's hands-on involvement spans the full project lifecycle — from preliminary assessment and system design through installation, commissioning, and ongoing operations & maintenance (O&M) support. Our no-charge preliminary analysis details the anticipated thermal transfer, flowrate & ΔT. SHARC Energy includes factory start-up for all installations and offers additional O&M training. The SHARC™ controls package captures flow, temperature, pressure differential and BTU data.	The plants are then usually taken over by third parties who own or operate the system. In addition, we offer online monitoring of the systems.

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Estimated Energy Results (based on size of product option installed: estimated energy / cost savings, MMBtu of energy transferred / day etc.).	The Toronto Western Hospital Wastewater Energy Transfer™ (WET™) system is currently the world's largest raw wastewater energy project. With a combined total of over 19MW of thermal capacity, including over 33,000 MBTU of heating capacity and over 2,400 of cooling capacity), the project will supply 90% of the campus's heating and cooling needs, reduce annual greenhouse gas emissions by around 8,400 metric tonnes, and save the hospital over \$500,000 per year in utility and operating costs.	Depending on the wastewater source flow/temp and project load profile, PIRANHA™ can cover up to 100% of DHW production for a typical multi-family building. Multiple PIRANHA can be operated in parallel to provide up to ~15 MMBTU per day. PIRANHA™ can also provide supplementary heating, cooling, and geothermal field optimization.	Based on wastewater source flow/temp and project load profile SHARC™ can provide 45 – 130 MMBTU per day, with multiple units operated in parallel to scale to any project size. When connected to a geothermal loop, SHARC™ can reduce the bore field size by up to 40%. Additionally, by keeping the ground loop tempered year-round, SHARC maximizes the efficiency and capacity of the heat pumps served by the loop, delivering meaningful OpEx savings over the life of the system.	Depends on the variables of the project.