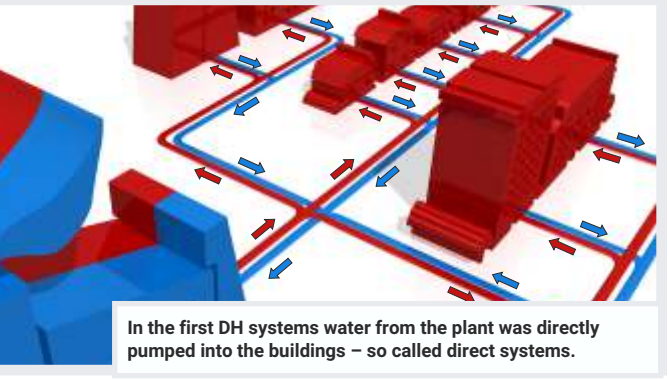
DISTRICT ENERGY SYSTEMS

CHALLENGE_EFFICIENCY

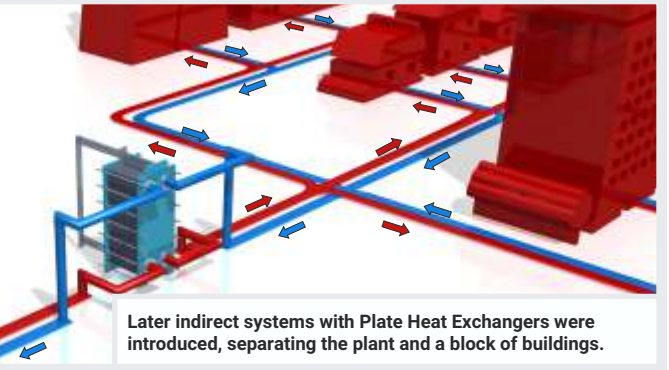
SWEP
A DOVER COMPANY

INTRODUCTION TO DISTRICT ENERGY SYSTEMS

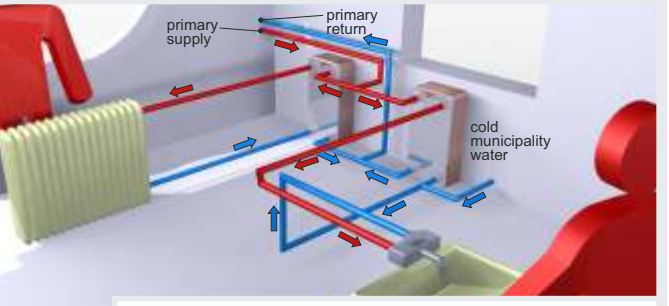
Rapid economic growth brings with it both advantages and disadvantages. Development in science and industry benefit many people, but also requires a vast amount of energy and causes a subsequent impact on the environment. District Energy is an efficient solution to support a sustainable development.



In the first DH systems water from the plant was directly pumped into the buildings – so called direct systems.



Later indirect systems with Plate Heat Exchangers were introduced, separating the plant and a block of buildings.



A typical modern building level substation provides both space heating and tap water heating.

Necessary modernization

The design of District Heating (DH) systems in many countries is to a large extent based on old standards. Combined with maintenance neglect and insufficient modernization of the fixed assets, operational losses have increased through the years. To improve energy efficiency and performance in a rapid yet sustainable way, the currently outdated DH systems must be replaced. All of this can be achieved without compromising living conditions and modernization. According to Arto Nourkivi, Ph.D. at the University of Helsinki and a consultant to the World Bank, district heating has managed to become an economically, financially and environmentally preferred heat product, displayed in numerous projects on the free energy markets of the northern EU.

District Heating

A District Heating (DH) system consists of four main parts: A central heat plant where the heat is produced, a piping distribution network, substations (DHS), which exchange energy from the primary to the secondary system, and, finally, a secondary system which heats the buildings. A substation is the main link between the heating source and the actual people who benefit from the heating or cooling, and an effective design of this part can save a great deal of money.

District Cooling

District Cooling (DC) works according to the same principle as District Heating, but its production and distribution of cooling energy is centralized. Chilled water is delivered via an underground insulated pipeline to cool the indoor air of the buildings within a district, for example offices and industrial and residential buildings. Specially designed units called Energy Transfer Stations (which is the same set up as a District Heating Station) are installed in each building. They use the water to lower the temperature of the air passing through the building's air conditioning system. District cooling can be used instead of a chiller-based system and is advantageous when larger buildings or areas need to be covered. The result is improved performance and reliability, as well as lower maintenance costs.

THE SWEP DISTRICT ENERGY CONCEPT

SWEP, a world-leading supplier of brazed plate heat exchangers (BPHEs), can provide a complete District Heating Station concept, including tap water modules and/or District Cooling Stations. The engineers of the Swedish-based company know what they are talking about. Developed for the harsh weather conditions of northern Europe, the BHPE technology combines high efficiency with outstanding environmental performance. About 95% of the material is used to transfer heat. There is no "dead zone" outside the gaskets, because there are no gaskets. With a BPHE you get up to 25% better capacity utilization compared with a plate-and-frame heat exchanger with rubber gaskets. Additionally, the all brazed-design offers a more compact scale-resistant solution, significantly reducing life cycle costs.

District Heating Station and Tap Water Station

Our District Heating Station concept provides you with state-of-the-art equipment that includes SWEP BPHE technology. We offer correctly-dimensioned products to achieve an efficient solution to your specific problem. The water from the district heating network is heated by the water running through the radiator by means of a circulation pump. The hot water flow depends on the given relationship between the radiator supply temperature and the outdoor temperature involving regulator and valve. The District Heating station can be equipped with a tap water module, which offers instantaneous tap water for the building. It is also possible to separate the Tap Water Station from the District Heating station. SWEP offers a dedicated range of BPHEs developed only for efficient tap water production.

District Cooling Station

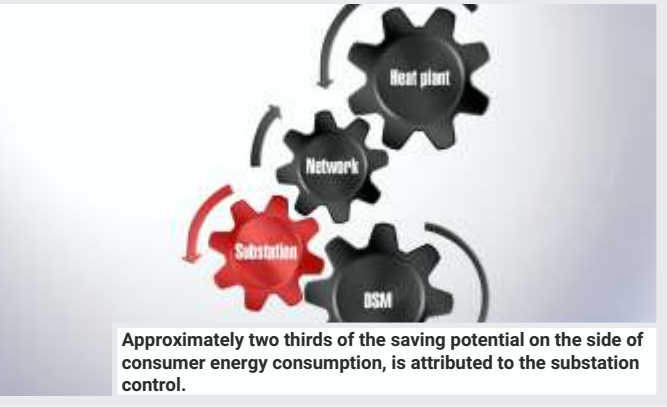
We can also offer an Energy Transfer Station for District Cooling. In the District Cooling applications, tight temperature approach is needed between the media. With a similar build-up as a District Heating station, the main difference is the size of the heat exchanger used. When equipped with the SWEP XXL range of BPHEs, i.e. our B649 units, the station will be more efficient compared to a station equipped with a standard PHE, while simultaneously lowering maintenance costs, as well as your carbon footprint.

Proven, cost-effective and demand-driven

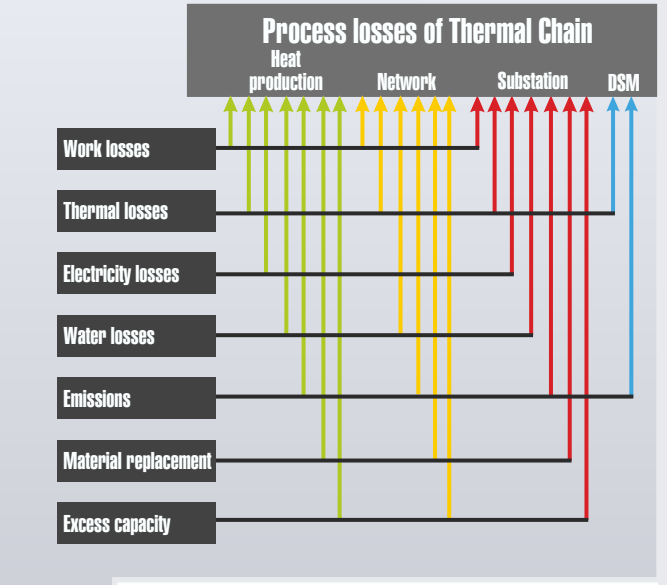
SWEP has vast experience from installations world-wide, covering small flat stations and substations, as well as large DC installations. During the past decade alone, SWEP has installed more than 1 million BPHEs in the world's District Energy networks. The system components in a correctly dimensioned system are optimized for the particular premises, bringing more stable control, better cooling and less risk of fouling. There is less wear on the system's components, and the running and maintenance costs are minimized. As opposed to production-driven DH systems, where there usually is an imbalance between the heat production and the actual need for heating, the demand-driven DH system of a SWEP solution allows for automatic adjustments, taking into account the outdoor temperature and the building's specific heating needs. The substation takes as much heat from the network as is necessary, no more and no less.

PERFECTLY DIMENSIONED WITH THE ISAC SOFTWARE

Precisely dimensioned systems bring more efficient stations and better return on investment. SWEP's experience in this field has resulted in the market's most complete substation program. Our unique ISAC software, a tool for dynamic dimensioning, simulation and analysis, allows our engineers to accurately calculate the most efficient system in a particular operating situation.



Approximately two thirds of the saving potential on the side of consumer energy consumption, is attributed to the substation control.



An efficient building level substation has a positive impact on most losses. Life Cycle savings of 25% on operating cost can be expected by modernizing networks with high-tech substations.

Integrated

The concept is based on a total undertaking – we ensure that the highest possible standards are applied to ensure the performance and service life of its components, while offering good accessibility for future maintenance and service. The system is developed in accordance with current rules and regulations.

Certified

The system's main components are supplied by manufac-turers certified by SWEP. Detailed information about the components' characteristics makes it possible to simulate them in ISAC.

Tried and tested

All components are factory-assembled and their function is tested before delivery. Manufacturing, assembly and function testing are carried out under SWEP's close supervision.

Correctly installed

The system is installed and commissioned in cooperation with installation engineers of your choosing. Delivered with comprehensive documentation, the system is delivered factory-assembled, which saves time and money on the installation.

Easily operated and maintained

A complete package of supplementary services simplifies operation and maintenance. For example, the system can be monitored remotely and control parameters adjusted via the Internet.

Complete solution with performance guarantee

SWEP is continuously working on the development of individual components to optimize system performance. The goal of this cooperation between component suppliers, energy companies and real estate agencies is to offer the most reliable, efficient and technologically complete substations. As a result of our research, the previously expensive command and control functions can now be offered as standard solutions, saving energy as well as cost.

KEY COMPONENTS

Below you will find an example of a SWEP District Heating Station, with all the important components.

Controller
With software developed specially for the application, an advanced data substation (DUC) controls and monitors the substation. The controller is as standard available with an integrated web server and a port for TCP/IP communication. The ideal web solution for small to mid-sized systems, it enables control, supervision and follow-up of status, events, trends and alarms via the Internet, local networks or integrated SCADA systems.

Pump
VFD-equipped pumps ensure that the flow and pressure is adjusted to the actual demand. The premium pumps used in SWEP-branded substations ensure significantly reduced power consumption.

BPHE
The substation uses the most efficient heat exchanger on the market. More than 95% of the material is used for heat transfer, which gives a solution that is unbeatable on price, performance and space requirements.

SWEP substations can be equipped with a module for instantenious domestic hot water production.

Dirt separator
Aside from filters, SWEP substations are also offered with state-of-the-art dirt separators, removing even the smallest dirt particles, reducing maintenance needs and further oosting performance.

De-gasser
Experience has shown that many District Heating systems suffer from high oxygen and air content in the networks. The de-gassers installed in SWEP substations remove dissolved gasses from the secondary circuit, reducing the corrosion risk while – even more importantly – bringing a more energy-efficient system.

REFERENCES

SWEP is a world leading supplier of brazed plate heat exchangers. Annually, we install close to 3.5 million units worldwide in various applications. Here are some of our success stories.

Stockholm, Sweden

The design and construction of the hospital Nya Karolinska Solna (NKS) started in 2010, and the first phases were equipped with traditional plate heat exchangers (PHEs). During the course of the project, SWEP launched the world's largest BPHE, the B649. This model meant that BPHE technology became a viable option for structures on the scale of NKS, and SWEP was chosen to supply the remaining heat exchangers. The operational dependability and low life cycle cost were determining factors in NKS's decision to choose SWEP BHPEs.

Degerfors, Sweden

Outokumpu – a world-leading company in custom-made products in coarse, special stainless steel (quarto) – has invested heavily in its rolling mill in Degerfors, Sweden. To cool the rolling mill's machine shop, Outokumpu's energy-saving solution allows the company to use either outdoor air or industrial water from a nearby river to cool the air through existing cooling coils and a SWEP B649 BPHE. In November 2012, the heat exchanger only needed to use one fifth of its dimensioned effect. When the highest seasonal temperatures are reached, the BPHE helps to remove 1.2 MWh of excess heat.

Jubai, Saudi Arabia

Apart from producing BPHEs, SWEP also provides highly efficient pre-fabricated energy transfer stations (ETS, also called substations). To cool a steel plant in Saudi Arabia, SWEP provided two pre-fabricated ETS built into standard 20- and 40-foot containers. The solution has to withstand temperatures of up to 50°C, while providing superior performance and operational dependability. In 2013 another two B649 units were ordered for an extension of the plant.

Sofia, Bulgaria

District heating accounts for 25% of the total energy consumption in Bulgaria's major cities. SWEP was involved in the rehabilitation of Sofia's outdated DH networks as early as 2002, when almost 3,000 BPHEs were supplied. In 2010, the European Bank for Reconstruction and Development funded another round of the rehabilitation work. SWEP BPHEs were chosen in two of the five phases of the project for delivery to Brunata, a substation manufacturer. There are now more than 6,000 SWEP BPHEs in Sofia's district heating network.

Nottingham, UK

By incinerating domestic and commercial waste, EnviroEnergy generates steam, which is distributed across the city of Nottingham as electricity and hot water. EnviroEnergy recently added a spur to its network to supply hot water to the new E.ON office building and 1 MW used for an absorption chiller. The interface with the heating network is a SWEP B649 BPHE, chosen for its compactness and ability to work across a wide duty range throughout the year.

Changtu, China

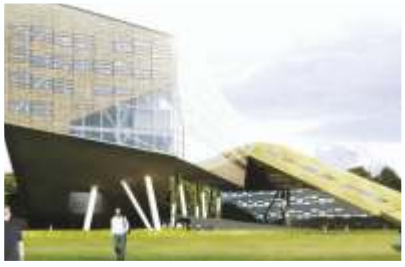
Changtu County is strategically located at the heart of northeast China, and has been selected for industrialization in the field of heat exchange. The first project in the gradual transition to a modern substation design comprises part of the city's network, supplying space heating for 300,000 m². Changtu chose to cooperate with SWEP for system consulting and the supply of modern BPHEs.

Dresden, Germany

Dresden, with a population of more than 0.5 million, has a long history of district heating. In 2013, it was decided to connect the central district heating network with the external sub-network at Dresden Klotzsche. A total heat capacity of 46 MW is transferred to the sub-network through six SWEP B649 BPHEs. The high temperatures made BPHEs a natural choice for the utility company, which wanted to ensure high operational dependability.

Reading, UK

The objective of the new European Centre for Medium-Range Weather Forecasts, in Reading, UK, is the development and operation of global models and data assimilation for the preparation of weather forecasts. SWEP has supplied four B649 BPHEs as glycol/water breaker units in the Centre's air conditioning system, transferring 4.8 MW of heat.



Groningen, Holland

The University of Groningen is a renowned European research university in the fields of ecology and material sciences. In 2010, a revolutionary climate system was commissioned that reduced the energy used for heating and cooling by 60%. Eco-Prefab floors with integrated cooling and heating pipes are connected to a heat pump, which generates and stores the required energy using underground geothermal aquifers. Twenty SWEP BPHEs of various sizes were supplied to handle the system's heat exchange requirements.

Paris, France

With its subsidiaries, the ADP group (Aéroports de Paris) has assisted in the construction and servicing of airports in over 55 countries. When ADP wanted to switch from superheated to low-pressure district heating at the Orly airport, the company turned to SWEP for the installation of compact BPHEs. ADP also used SWEP BPHEs at Le Bourget Airport. Elsewhere in France, SWEP has installed more than 2,500 BPHEs in the district energy segment in the last three years alone.

Anting, China

Anting New Town is part of Shanghai's One City, Nine Towns plan. Designed to accommodate a population of 50,000, the system covers 250 buildings. Each building has a substation employing three BPHEs. Anting's system makes the town unique in China, with district heating and cooling plus domestic hot water supplied via combined building-level substations. Compactness and reliable year-round operation to cope with the region's climatic extremes of heat and cold were determining factors in the choice of SWEP as the BPHE supplier.

Gothenburg, Sweden

In 2010, SWEP won the contract to supply complete district heating and cooling substations (DHS and DCS) for the rehabilitation of the city's ETS installation, as well as the expansion of the new district energy networks in Gothenburg. About 500 ETS installations annually are expected to be replaced by pre-fabricated substations. In this project, SWEP will also be responsible for the installation and commissioning of the DHS/DCS.

SWEP is the world's leading supplier of compact brazed plate heat exchangers (BPHEs). These products are used where heat needs to be transferred efficiently in air conditioning, refrigeration, heating, and industrial applications. SWEP is close to its customers, with representation in more than 50 countries and its own dedicated sales force in more than 20 countries. Highly efficient production units in Sweden, Switzerland, the USA, Malaysia, Slovakia, and China enable SWEP to serve customers all over the world. SWEP is part of the global Dover Corporation, which is a multi-billion-dollar, NYSE-traded, diversified manufacturer of a wide range of proprietary products and components for industrial and commercial use.

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