PKS-THERMPIPE®

Geothermal and waste water warmth
Energy recovery from the ground and waste water: a practical circuit

With the aim of conserving the environment, it is our task to handle the resources available to us as economically and efficiently as possible. Thanks to modern thermal insulation and the targeted use of energy, it has been possible to reduce heating energy consumption, for example, in Germany’s residential sector by an average of 22% since 2002. But there is still an energy leak which has been given little attention to date: waste water. Originally a “waste product” of our society, this resource is disposed of by the cubic metre through the sewage system every day, whereby waste water harbours an enormous energy potential which should be no means be simply "thrown out with the bathwater": residual heat of 15 °C on average which can be used for cooling or heating buildings. The process of recovering waste water heat is quite simple: after all, waste water is always available wherever people live and work.

In addition to the waste water energy, the same system can also be used for the surrounding earth. Geothermal/Waste water warmth is simply drained off from the sewage pipe and harnessed via a heat pump, for example. The energy can then be utilised directly on site without incurring any high losses associated with transport. Enabling up to 50% of the primary energy to be saved. A highly-efficient process!
Waste Water and the Environment
Safe and durable

Our PKS sewage pipes made of polyethylene – the basis for energy recovery

PKS sewage pipes made of polyethylene (PE) offer maximum safety and durability. For more than 40 years, PE sewage pipes have proven their worth in the chemicals industry and in the municipal sector. And no wonder: after all, PE avails of the requisite properties which are indispensable for modern waste water systems: good chemical resistance as well as durability. Ideal for extreme loads: PE waste water systems are unbreakable and even capable of withstanding earthquakes. Thanks to the welding features displayed by PE, homogeneous waste water systems are possible from a single package principally dispensing with plug connections and sealing rings entirely. And root intrusions can be safely eliminated.

When compared to standard solid-wall pipes, the hollow, lightweight support pipes on the outside of the PKS sewage pipe ensure significant savings in terms of weight while guaranteeing easy handling during installation. PKS sewage pipes: the perfect basis for sustained energy recovery.
3-in-1 function

PKS sewage pipe + waste water heat + geothermics = PKS-THERMPIPE® system

The PKS sewage pipe forms the basis for the PKS-THERMPIPE® system. The system not only ensures safe waste water transport. As a "horizontal geothermal probe", the PKS-THERMPIPE® system has the additional task of deflecting thermal energy: waste water warmth and geothermal warmth. The advantage of utilising two heat sources at the same time is obvious. Apart from the sewage pipe, the waste water also heats up the surrounding earth which is repeatedly charged by the waste water energy along the same principle as a power pack. Otherwise lost within the earth, this energy is harnessed by the PKS-THERMPIPE® system. The conventional support pipe available on the outer pipe serves as a heat dissipater for both energy sources and through which a heat transfer medium flows. By additionally recovering the energy from the surrounding ground, the PKS-THERMPIPE® system is independent of diurnal lines or irregular waste water lines, thereby ensuring a constant supply of energy.
Advantages of PKS-THERMPIPE® pipes

- Constant energy supply
  Use of waste water warmth PLUS continually available geothermal warmth
- Easy installation:
  no installations required inside the conduit
- High degree of tightness:
  no weak spots caused by plug connections
- Efficient utilisation:
  low pressure losses thanks to tightly-welded thermal conduction circuit
- Durable material: service life of all pipe components > 50 years
- Variable range of application:
  current range of application from DN 300 to DN 1800
- Consistent deflection of energy: consistent feeding of the heat pump
- No transport losses:
  heat is extracted from the waste water and pipeline zone on site
- Maintenance-friendly:
  low formation of sewer film

How it works: geothermal probe with waste water turbocharger

The static and thermal design of the PKS-THERMPIPE® system depends on the project and is oriented towards the structural conditions on site, the available energy potential (waste water, geothermics) and the energy required by the units to be supplied. The system draws the lion’s share of energy available from the ground. The number of PKS-THERMPIPE® pipes to be integrated depends on the requisite energy volume and the extraction outputs to be realised by the sub-systems comprising “waste water heat” and “geothermal heat”. The PKS-THERMPIPE® pipes welded together are connected to the FRANK-PKS® distribution shaft using standard moulded parts and pipes made of PE-100 materials. The lines are directed from the shaft into the building, e.g. to a heat pump for energy realisation.

Reference values for extraction output by the PKS-THERMPIPE® system

<table>
<thead>
<tr>
<th>DN</th>
<th>Q [W/m]</th>
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<td>300</td>
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Planning with foresight for sustainable savings!

Plan the option of energy recovery when installing new sewage pipes and save up to 50% primary energy. Have you already opted for a PKS sewage pipe when installing a new sewage system? Then make the most of your advantage now and keep your options open for energy recovery if new extensions are pending. After all, the energy cost benefits of PKS-THERMPIPE® pipes are unbeatable when it comes to new installations! At little extra expense, PKS pipes can be converted in the factory to highly-efficient PKS-THERMPIPE® pipes. Larger buildings in the vicinity or still planned which reveal higher energy requirements can be heated or cooled using energy from waste water or geothermal heat in future. See for yourself: compare the extra financial expense associated with energy recovery with the costs of conventional PKS pipes in the chart provided.

<table>
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<th>DN [mm]</th>
<th>Costs [€/kW]</th>
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<td>1800</td>
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* Cost comparison: Additional costs compared to conventional PKS pipes

Higher energy efficiency thanks to variable installation

The individual 6-metre pipes are connected in parallel with the distribution shaft to achieve higher energy efficiency: low pressure losses are guaranteed; it is possible to connect and disconnect individual circuits.

Combinations of parallel and series switching are possible with small nominal widths: minimisation of installation costs owing to shorter mathematical constant and heat transfer pipelines.
Practical applications

Site report PKS-THERMPIPE®
Wimaria Stadion (Weimar)

Within the framework of a research project, a section (36 m) of an existing concrete duct was fitted with the PKS-THERMPIPE® pipe system in Weimar. The heat output comprises approx. 22 kW. The heat is used in a sports facility (for heating and warming service water). The existing gas heating system was extended to include the heat pump technology. The pipes are installed at a depth of approx. 4.5 metres and transport the waste water generated by approx. 5,000 inhabitants in Thuringia’s fourth-largest city. The waste water volume is approx. 14 l/s at temperatures of 15 to 20°C. Apart from the components already outlined which were installed in the ground, additional investments were also made in the area of the heating system. Along with an SWP 270 H high-temperature heat pump (heat output: 26.5 kW) and 2 multifunctional storage tanks (MFS 830 S) each with a capacity of 830 litres for drinking water supplies and a separating buffer storage tank of the same size, various measurement devices were also installed to document the efficiency of the plant.

Scope of supply

- 36 m PKS-THERMPIPE® DN 500 (6 pipes, 1 adapter incl. shaft connecting sleeve and wall collar)
- Electro-fusion coupler d 560 mm
- Type 1 distribution shaft with horizontal distribution trunk
- 300 m PE-100 pipe d 50 mm, SDR 11
- Electro-fusion moulded parts d 50 mm in SDR 11 for heat circuits

Services offered by FRANK

- Planning and design of the sewage pipe section
- Site support including training of installation personnel

External service

- Insulation design and optimisation of the system parameters by the Forschungsinstitut für Tief- und Rohrleitungsbau Weimar e. V. (FITR)
Responsibility and sustainability

How a "waste product" becomes an energy source

Global energy requirements are continually on the rise. Our modern society is no longer conceivable entirely without the free availability of energy - whether in private households, the commercial sector or industry. But the resources available are limited. For this reason, it is our task to utilise regenerative energies sustainably as well as the energy available to us in a more targeted fashion. Energy is often not fully used where it is applied. Resulting in unused residual energy. Or conversion into another form of energy demands energy losses which are too high. Larger buildings in particular such as residential and office complexes, hospitals, homes for the elderly, indoor swimming pools, sports facilities, commercial and industrial buildings could be heated and cooled using a particularly environmentally-friendly application of energy: geothermal heat and waste water energy. Geothermal heat is available everywhere and at all times. Waste water is always available wherever people live and work.

Using our PKS-THERMPIPE® system, we have succeeded in utilising energy where is is available: on site. Without any transport losses. And by dual utilisation of waste water AND geothermal heat, you are guaranteed constant and clean energy supplies.

At FRANK GmbH, we are delighted to be able to contribute towards conserving our environment in the form of our PKS-THERMPIPE® system.

Prerequisites for utilising waste water warmth

1. Dense residential buildings or industry with a correspondingly high supply of waste water (dry weather flow ≥ 15 l/s).
2. Consumers with correspondingly high heat requirements (≥ 50 - 200 kW). These can include schools, kindergartens, official authorities and shopping centres, hospitals, hotels, swimming pools, larger residential complexes etc.
3. Relatively short distances (approx. 100 m, max. 500 m) between the heating system and the sewage conduit.
4. The system temperatures for heat utilisation (return pipe) are max. 50 °C (the lower the better).
PKS-THERMPIPE® pipes

Within the framework of static calculation to ATV-DVWK A 127, pipe rigidity (SR24) is calculated in accordance with DIN 16961. The PKS-THERMPIPE pipe manufacturing process also enables the manufacture of other SR classes than those indicated here.

Project-related design and/or co-ordinated manufacturing guarantees the user a pipe system with economical dimensions and optimum rigidity.

- Standard length 6 m
- Special lengths on request
- Made of PE 100
- Form A: yellow interior with electro-fusion socket and spigot (DN 300 to DN 2400)
- Form B: yellow interior with extrusion-welding socket and spigot (DN 300 to DN 3500)

Prerequisites for PKS-THERMPIPE® pipes

1. Refurbishment / New installation
2. Collectors with no/few building connections (introductions poss. via shafts)
3. Waste water volume (15 l/s)
4. Bivalent heating system at consumer’s
PKS-THERMPIPE® distribution shafts

The connection lines for the individual THERMPIPE brine circuit sections are combined at one or more central points in distribution shafts. Fully prefabricated in the factory, the distribution shafts facilitate system connection and commissioning. All of the requisite shut-off and regulating valves are already pre-mounted. This facilitates flushing and ventilating as well as hydraulic adjustment of the system. High-quality balancing valves allow exact hydraulic adjustment at various lengths of the connection lines as well as ensuring optimum thermal utilisation of each pipe section.

The distribution shaft dimensions depend on the respective project. At increased static requirements - from pressing groundwater through to use by trucks - suitability is documented by verifiable statics. The adaptable designs of the distributions therefore mean that a suitable solution can be found for any plant size.

- Shaft shell and base made of PE
- Shaft dimensions from DN 300 mm to 2000 mm
- Overall length or height from 3 to 6 m
- Passable/Navigable variants can be supplied.

Connecting line at distribution shaft in horizontal design

Distribution components in the distribution shaft