REHAU PIPE SYSTEMS FOR BIOGAS PLANTS
COMPLETE SOLUTIONS FROM A SINGLE SOURCE
Energy resources are becoming increasingly scarce. It is for this reason that the significance of renewable energy sources is growing. Worldwide, bio-energy is currently becoming an important economic factor. For decades REHAU has been a driving force in the development of resource-saving technologies and environmentally friendly materials. The company’s expertise – proved over decades – in the areas of building and civil engineering, of industrial plants construction and in special industrial applications form the basis for practically oriented, economical and future-safe solutions. REHAU is the partner for professional biomass plant construction. In more than 100 facilities REHAU’s bio-energy know how is already used successfully.

Given plant operating lives of 20 years or longer, the processed components must be particularly durable. They must be able to withstand high temperatures and be resistant to corrosion, abrasion and aging. REHAU know-how in the areas of materials and joining technique stands for proven quality, guaranteed safety and durability.

In order for facilities to operate as efficiently as possible, all components must be optimally matched. This is why REHAU offers the total piping technology for biogas plants as complete systems in which everything fits together – from the RAUBIO fermenter heating across the RAUBIO FIX mounting concept and right up to the RAUTHERMEX system for local and district heating.

REHAU’s offerings for biogas plant construction are rounded out by the AWADUKT PP non-pressurized heavy duty substrate pipe system, pressurized pipe systems made of PE and PE-RC as well as biogas transport solutions.

The highest level of material quality, operational safety and easy installation are all hallmarks of REHAU systems which are winning over more and more agriculturalists, plant designers and builders and energy suppliers.
Energy generation from biomass is becoming increasingly important. This trend can be observed in countries throughout the world. It is the declared goal of all EU nations to increase the share of renewable energy used to generate electricity to 21 percent and the share involved in generating the overall energy supply to 12 percent by 2010. For 2020, a binding target figure of 20 percent has been agreed upon.

You also can profit from this development and exploit the international potential of bio-energy!

The utilization of energy from biomass sources is supported by a variety of subsidy programs in the various nations. While the German renewable energies law (Erneuerbare-Energien-Gesetz = EEG) establishes particularly favorable conditions for investors, nations such as Great Britain, Poland and Sweden are supporting the market for renewable energy by means of a quota system using CO2 certificates which can be traded.

You will find a collection of and information on the most important legal sources on the systems of promotion of electricity generated from renewable energy sources and its access to the grid within the EU 25 under: http://res-legal.eu

Germany, Spain and Slovakia are working together in the International Feed-In Cooperation to clarify questions regarding feeding renewable energies into existing power grids and compensation. Detailed information on these subjects is available at www.feed-in-cooperation.org

Current data regarding the development of the worldwide energy market and the share of renewable energies can be obtained from the International Energy Agency (IEA) at www.iea.org
For the increasingly standardized systems found in biogas facilities REHAU offers ideal, practical solutions or develops customized packages for its clients.

With regard to the selection of raw materials, REHAU calls upon decades of experience. Here too, the same rule that has always applied to all our products holds true: quality without compromises.
1. RAUBIO fermenter heating system
2. RAUTHERMEX local/district heating system
3. RAUBIO Gas Condensate Collecting Shaft
4. RAU-PE 100 RC pressure pipe system
5. AWADUKT PP SN 10 biomass transportation system
6. RAUPROTECT biogas transportation system
With an intelligent securing concept, the RAUBIO FIX mounting system represents an upgrade: connecting a special injection grout system with accreditation using highly stable PE-Xa retainer rails.

Planning support: Using a software program specially developed by REHAU, the heater circuits required in the fermenter can be dimensioned to meet every application.

You can rely on the RAUBIO fermenter heating system: Already successfully used in numerous facilities, the system includes not only the pipelines but all the required fittings as well: from the wall seal flange, across the stainless steel distributor and up to the heat transfer medium – the ideal solution for modern, standardized fermenter design.

When the heater is not integrated into the fermenter wall but is set on the wall, the heater pipes for the fermenter heating require a reliable retention system which can withstand the extreme loads even of a high dry matter content. The RAUBIO FIX fermenter retainer meets these requirements. Together with the proven RAUBIO fermenter heating pipe this creates a complete system with retainer and heating pipe made of high quality, high-pressure crosslinked polyethylene (PE-Xa).
Crosslinked Polyethylene – An Indestructible Material
High-pressure crosslinked polyethylene (PE-Xa) is characterized by its enormous durability: resistant to chemicals, stable at temperatures up to +95 °C and significantly more abrasion resistant than conventional PE and PE-RT. PE-Xa pipes are not susceptible to external damage such as scoring or stress cracks.

Safe Operational Control
Even under dynamic loads, RAUBIO FIX PE-Xa provides the highest level of stability throughout the entire heating system — a fact which has been proven impressively through testing where extraction forces of more than 4 kN were applied to each mounting point. Safe operational control is assured, even where the dry matter content exceeds 10 percent.

Heating Circuit Layout in the Fermenter – Versatile Installation Technique
RAUBIO pipes are very flexible and are simply drawn into the fermenter retainer without any additional connecting techniques. They therefore automatically adjust themselves to the given fermenter geometry — without any elaborate welded joints or pressed connections. Up to 26 heater rings can be comfortably laid out on a 2-m fermenter rail. The advantages: rapid installation and a long service life with maintenance-free operation.

Overview of the REHAU Fermenter heating system
- Exceptional chemical resistance
- Very low roughness: e = 0.007 mm at 60 °C
- Temperature resistant up to 95 °C
- Long-term temperature resistance at 60 °C and 6.0 bar: 50 years
- Retention system security: > 4 kN/mounting point
- Diffusion barrier: reduces the entry of NH3 and hydrocarbons
- Jacket: outstanding protection for the functional barrier layer
RAUTHERMEX
THE ECOLOGICAL AND ECONOMICAL FORM
OF HEAT PROVISION

Modern industrial and domestic construction without a heat supply from efficient energy generation facilities using RAUTHERMEX local and district heating pipes would be practically unthinkable. District heating plants using condensing boiler technology, biomass, biogas or cogeneration technologies also result in significant reductions in CO₂. The future-oriented and pre-insulated RAUTHERMEX pipe system from REHAU is ideally suited for heat distribution.

RAUTHERMEX district heating lines are made of coextruded components which are bonded together so as to be longitudinally watertight and longitudinally stable. Insulation is provided by a closed-cell polyurethane foam.

Unique advantages guarantee the safe and efficient usage of RAUTHERMEX pipes:

- Optimal thermal insulation even if the outer jacket is damaged thanks to the longitudinal water tightness
- Longitudinally force-locked pipe connections: In underground pipelines this prevents length changes due to temperature fluctuations during use
- Flexible pipe system allows easy laying while the corrugated outer jacket permits narrow bend radii
- High level of operational safety since RAUTHERMEX pipes are made from corrosion resistant material
- No expansion cushions or compensation fittings required
- System components for all application situations
- Ideal for local and district heating supply.

Up to DN 160, RAUTHERMEX is available with a complete line of fittings and accessories.

REHAU Service
Special REHAU software permits complete local and district heating networks to be planned for any application, in fact. This allows the economic feasibility of a potential connection to be examined prior to the actual connection being made.
Pipe Components
RAUTHERMEX district heating pipes are manufactured in UNO and DUO versions with one or two PE-Xa pipes. During production, the used coextrusion process ensures an optimal bond. Thanks to their corrugated outer jacket, RAUTHERMEX pipes laid without lots of fittings are extremely bendable.

Installation Methods
Normally, RAUTHERMEX pipes are passed in trenches. However, the high quality of the pipes also allows them to be laid using the jet drilling process or their subsequent insertion into empty pipes. The compound construction of RAUTHERMEX pipes permits long draw-in lengths and, with coil lengths of up to 760 m, flexible installation with few joints.

Accessories
The RAUTHERMEX T-sleeve set II with a comprehensive line of accessories for RAUTHERMEX pipes both simplifies and speeds up safe insulation of T-joints. The two half-shells of the RAUTHERMEX T-sleeve are locked together according to the toggle lever principle with tension clamps.

Operational Control
REHAU components for pipe and jointing technique have proven their worth in decades of use – without corrosion or incrustations. Thanks to the pipes' longitudinal stability there are no changes in length due to temperature fluctuations. With a temperature resistance up to 95 °C, RAUTHERMEX is the ideal solution for modern low temperature systems.
The requirements for the operating safety of biogas plants have become increasingly stringent in recent years. In particular in the area of biogas networks, there has previously been no adequate industrial solution for condensate separation. With the DN 1000 compliant RAUBIO gas condensate collecting shaft based on the AWASCHACHT shaft system authorised by the Deutsches Institut für Bautechnik (German institute for construction engineering), REHAU is offering an industry-specific solution for the first time. The high safety standard is guaranteed in particular by a defined surge tank and the pre-assembled, elevated pump base. The integrated, removable separation of condensate from the PE 100 gas pipe with optimum cut-off function make rinsing and pressure testing many times easier. The integration of an additional inspection shaft in the gas network can therefore be omitted. With the modern material polypropylene and a sophisticated safety sealing system with load decoupled seals, leaks in the shaft are a thing of the past. The shaft system is supplied ready for installation. Connection to the internal gas network uses standard electrofusion couplers.

The advantages of the new gas condensate collecting shaft at a glance:
- Integrated condensate separation with optional cut-off function for pressure testing of the gas line in the modern material PE 100
- Corrosion and chemical resistance of the shaft as a result of the use of the modern material polypropylene
- No shaft leaks thanks to the safety sealing system with load decoupled seals
- Simple connection to new and existing gas pipes using electrofusion couplers
- Easy construction site handling with no lifting gear thanks to modular system
- Easy to inspect and safe due to GRP corrosion resistant steps and the light colour of the shaft
- Bounce secure and firmly anchored in the ground with external ribs.
- Minimum of 100 years shaft life expectancy – according to the assessment of LGA Nuremberg
- Shaft system with general technical approval of the Deutsches Institut für Bautechnik (DIBt): Z-42.1-400
- Withstands heavy loads up to SLW 60 (10 ton wheel load)
ACCESSORY PROGRAMS
GREATER OPERATIONAL SAFETY THANKS TO COMPREHENSIVE TOTAL SOLUTIONS

RAUPROTECT PE 100-RC biogas pipe
Biogas pipes can be optimally produced with the REHAU RAUPROTECT pipeline system. Fitted with special point load protection, the pipe system can be installed in the ground with no sand bed, e.g. in the plough burial process. Thus, cost-intensive soil replacement is eliminated and direct contact with the topsoil allows better passive gas cooling. The system is available as a coil or in rods up to d225.

AWADUKT PP SN10 transport system
AWADUKT PP SN10 is especially suited to transporting substrate or draining silage effluents. The polypropylene pipe material used guarantees an absolute seal, is wear resistant, and is even resistant to aggressive substances. The special internal layer allows high-pressure rinsability up to 340 bar. An extensive range of mouldings and shafts makes AWADUKT PP SN10 suitable for the broadest range of applications.

RAUSIKKO BOX seepage system
With RAUSIKKO BOX, REHAU offers the flexible solution for the central and decentral drainage of clean precipital water from your yard and horizontal silo areas. The storage coefficient of 95% provides a large storage/seepage volume even in the tightest spaces. With the integrated cleaning channel, subsequent connection to existing inspection shafts/drainage systems is also possible.

RAUCLEAN small sewage treatment plants
RAUCLEAN is the fully biological small sewage treatment plant for the (pre)cleaning of contaminated wastewater, e.g. sewage from the abattoir business. In the bioreactor, the individual cleaning stages take place simultaneously and continuously, which results in excellent wastewater treatment. Here, cleaning results well below the current limit values of drainage class D are achieved. The all-in-one concept and ready-to-use control allow quick installation.
REHAU does not merely supply plastic components. Instead, we provide tailor-made, environmentally friendly and future-safe total solutions together with the corresponding service. Plant builders value the advantages of REHAU complete packages and are ever more frequently putting their trust in the correct and practical solutions for increasingly standardized biogas plants.

**Complete Systems**

A complex plant operates best if each individual component is perfectly matched with the others. This is why REHAU offers you the full spectrum of pipe systems for your biogas plants — from the fermenter heater through to the district heating network:

- RAUBIO fermenter heater;
- REHAU insulated pipe systems;
- REHAU transport pipe systems;
- REHAU drainage systems.

**Consultation and Service**

REHAU is by your side with assistance and service throughout the entire product service life. We provide the know-how and the planning support you require for network planning and heater layout. Regardless of where you set it up, REHAU is close by and can assist you in the optimal design of your biogas plant.

**Proven Quality - Guaranteed**

REHAU pipe and heating systems have been construction-site-tested and have proved it’s worth over more than 30 years of use. We process only tested materials which are continuously subjected to both internal as well as external inspection. Your advantage: high product quality throughout the entire plant service life.

**Technical Innovation Driver**

Central, specialized teams at REHAU create innovative and practical solutions involving pipe and heating systems for biogas facilities.
PROJECT QUESTIONNAIRE

IN ORDER TO ENSURE YOU GET COMPREHENSIVE AND INDIVIDUAL ADVICE, WE INVITE YOU TO FILL OUT THE QUESTIONNAIRE OVERLEAF.
**PROJECT QUESTIONNAIRE**

**BIOGAS PIPE TECHNOLOGY**

**REHAU AG + Co**

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**Project:**

- Electrical output of the biogas facility: __________ kW

**Fermenter**

**Dimensioning fermenter heating**

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<thead>
<tr>
<th>1.</th>
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<tbody>
<tr>
<td>Round fermenter (d)</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Square fermenter (L x B)</td>
<td>m</td>
<td>m</td>
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<tr>
<td>Height of fermenter (h)</td>
<td>m</td>
<td>m</td>
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<tr>
<td>Fermenter in soil</td>
<td>m</td>
<td>m</td>
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<tr>
<td>Fermenter in groundwater (yes = ☐)</td>
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**Structure of fermenter wall**

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<tr>
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<tr>
<td></td>
<td>Lightweight concrete</td>
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<td></td>
<td>Steel</td>
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- Thickness of fermenter wall: __________ cm __________ cm __________ cm

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<th>Material heat insulation</th>
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- Thickness of heat insulation: __________ cm __________ cm __________ cm

**Structure of cover**

- **a) Foil roof**
  - 1. Foil accumulator without insulation
    - Height: m m m
  - 2. Membrane accumulator
    - Height: m m m
  - 3. Gas storage with insulation
    - a) Foil height
      - Height: m m m
    - b) Thickness of insulation
      - Height: cm cm cm
    - c) Heat conductivity
      - W/mK W/mK W/mK

- **b) Fixed fermenter cover**
  - Material of fermenter cover: Standard concrete | ☐ | ☐ | ☐ |
  - Lightweight concrete | ☐ | ☐ | ☐ |
  - Steel | ☐ | ☐ | ☐ |

- Thickness of fermenter cover: __________ cm __________ cm __________ cm

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</table>

- Thickness of heat insulation: __________ cm __________ cm __________ cm

**Fermenter heating**

- Minimum fresh biomass temperature: __________ °C __________ °C __________ °C
- Maximum fermentation temperature: __________ °C __________ °C __________ °C
- Maximum dry solids content in %: __________ % __________ % __________ %
- Maximum fresh substrate quantity: __________ m³/h __________ m³/h __________ m³/h
- Heating directly adjacent to fermenter wall: ☐ / ___ mm ☐ / ___ mm ☐ / ___ mm
- Heating integrated in fermenter wall/concrete cover: ☐ / ___ mm ☐ / ___ mm ☐ / ___ mm
Successful renovation of the largest biogas plants in Austria
REHAU scores points with its corrosion resistant system!
The largest biogas plants in Austria were constructed in the Lower Austrian towns of Retz and Ziersdorf in 2006. The respective three biogas plants per location have each been generating 1.5 Megawatts electrical power and around 1.6 Megawatts of thermal power since mid 2007 and supplying heat to around 200 households. Per plant and year, 30,000 tonnes of fresh mass for example of maize or grass silage are fermented, yielding 17,000 cubic metres of biogas per day. However, even after one year in operation, the total of six biogas plants urgently required renovation, as the steel heating systems installed in all twelve fermenters had disintegrated due to corrosion and were therefore completely ruined. In the renovation, the builder therefore turned to the RAUBIO corrosion-resistant fermenter heating system from REHAU.

Krippehna biogas plant
Agriculturally sustainable and operated collectively

The agricultural co-operative of Krippehna with its 500 kW biogas plant generates power and now also heat from biomass, such as maize silage from its own production, liquid manure from its animals, and cut grass. Power is fed into the public network, which – in addition to stables and operating buildings – currently heats 20 households on a local heating network in the town of Krippehna. The local heating connection of highly insulated RAUTHERMEX pipes was installed later. The financing came from the households benefiting. In exchange, they will receive their heat for free for the next 20 years. There are also benefits for the agricultural co-operative: it also earns the power-heat coupling bonus. With the current annual heat consumption quantity of 500,000 kWh, this comes to 10,000 Euro. Furthermore, there is a saving of around 55,000 litres of heating oil per year.
Geothermal energy – heating and cooling with energy from the ground

With the innovative system technology of REHAU geothermal energy, the Earth’s inexhaustible and environmentally sound energy supplies can be utilised at any time and in any weather. With tried and tested technology from REHAU, ground-air heat consumers can take up to 75% of their heat economically from the ground.

Solar thermal energy – heat from the sun

With the REHAU SOLECT thermal solar systems, a considerable proportion of the energy consumption for heating and hot water can be saved. This contributes significantly to the reduction of CO₂ emissions and saves money. For the use of solar energy, REHAU has perfectly harmonised components at its disposal, such as collectors and accumulators for new constructions and modernisation projects. The reliable, low-maintenance systems from REHAU guarantee a high solar yield over a number of years.

Sub-surface heating/cooling – environmentally sound, energy-saving concepts for thermal comfort

High-performance, efficient solutions for sub-surface heating/cooling systems are environment-oriented to reduce energy requirements and provide luxurious comfort. As a complete system provider, REHAU offers sophisticated solutions for any application: for floors and walls, for heating and cooling, for wet and dry construction.