Substrate Treatment
Biogas Technology
Residual Material Storage
Gas Storage Facilities
Stainless Steel Membrane Cover

UNIQUE.WORLDWIDE

Agriculture

Biogas Plants
in modular construction

SUBSTRATE FLEXIBLE

LIPP MAGAZINE

Know-How
represented by more than 170 patents

Knowledge and experience
gained in more than 50 years in cooperation with our customers from various industries. Worldwide.

Awards
we received them repeatedly for groundbreaking inventions.

For the inventive talent

1982
Rudolf-Diesel-Medal
The Rudolf-Diesel-Medal is awarded to personalities whose entrepreneurial success is particularly based on inventions.

Paving the way for success: Duplex material Verinox

2005
Baden-Württemberg Innovation Award
This award, first established in 1984 by the former Baden-Württemberg Minister for Economics Rudolf Eberle, is presented to medium-sized companies for innovative developments.

2006
Steel Innovation Award
This prize is awarded every three years and is intended to promote and highlight applications and ideas around the material steel.

Commitment for the Future

A Swabian inventive spirit combines profession with know-how and with his innovative inventions creates the basis of a globally operating company: The success story of the LIPP Company is in character of the "Musterländle" (model state) Baden-Württemberg, but its development is far from being ordinary.

More than 50 years ago, Xaver Lipp founded the family-run enterprise LIPP GmbH. Thanks to his inventive talent and his keen sense of observation he obtained a knowledge that led to major inventions and patents in the field of metal processing – thus setting standards in tank and plant construction for more than 35 years now. The LIPP double-fold system, as the basis for tank construction, and the use of the patented duplex material Verinox for highest quality demands, are milestones that have notably shaped the company. Today, the LIPP GmbH is a technological leader in the field of tank and system solutions including the construction of biogas plants. LIPP has set standards and won several awards for the durable high quality of its products.

In 1992, Roland Lipp followed his father as managing director. In 2011, Manuel Lipp took over as managing director in the third generation. The company founder Xaver Lipp is still working, decisively pushing forward the technical developments.

First agricultural biogas plant in Europe in modular construction, 1972.

Xaver Lipp, Manuel Lipp, Karin Lipp-Mayer

UNIQUE

The System

As early as 1970, Xaver Lipp had the idea for the unique double-fold system, which signified a quantum leap in the field of tank technology and has stood the test in the construction of containers and tanks in innumerable plants to the present day.
The system involves steel bands being interlinked by folds giving the inside of the tank an edgeless and smooth surface. Additionally, the double-fold system guarantees maximum tightness and stability.
The LIPP System has already been successfully used in more than 80 countries.

flexible, stable and secure construction technology
+point

FLEXIBLE

The Assembly

The LIPP double-fold system is the fastest and easiest technique for the flexible construction of reliable containers and tanks at the customer's location.
Characteristic of the system are the transportable assembly devices, allowing the construction of tanks by steel bands with varying diameter and height. The mostly automated production process permits a continuous variable installation within a short time.
Prefabricated modules can be assembled subsequently.
Thus, we guarantee high quality for each project – worldwide.

efficient on-site assembly flexible sizes
+point

VARIABLE //

Our Materials

In order to meet the specific needs and requirements of our customers, LIPP covers a wide variety of materials. Depending on the substrate-specific requirements, the spectrum ranges from galvanised steel to high-alloyed stainless steels (e.g. 1.4301 [304] or 1.4571 [316i]).

A special material, Verinox, was developed by LIPP and won the Baden-Württemberg Innovation Award in 2005. It combines galvanised steel for the outside and stainless steel for the inside of the tank. After in-house production, the coiled material is delivered to the construction site. Verinox impresses with a favourable cost-benefit ratio and guarantees lasting reliability.

The material “Verinox“ is produced in-house

lower costs
superior quality
+point

VERSATILE MATERIALS //

Unlimited Possibilities

Modular Design from 40 kW to over 5 MW

LIPP manufactures both complete plants – from the substrate reception to the biogas utilisation – as well as individual components. The modular structure allows implementing all specific customer requirements, with all services coming from only one source.

Whether you need a small plant, processing liquid manure with 40 kW, or a large-scale plant, processing various substrates with over five MW – LIPP offers customized biogas plants that are optimally tailored to the wishes, spatial possibilities and individual substrate range of the customer. **The worldwide unique construction technology allows variable tank and digester sizes from 3 to more than 40 m diameter.**

Biogas Plants in modular construction

Intelligent Conception

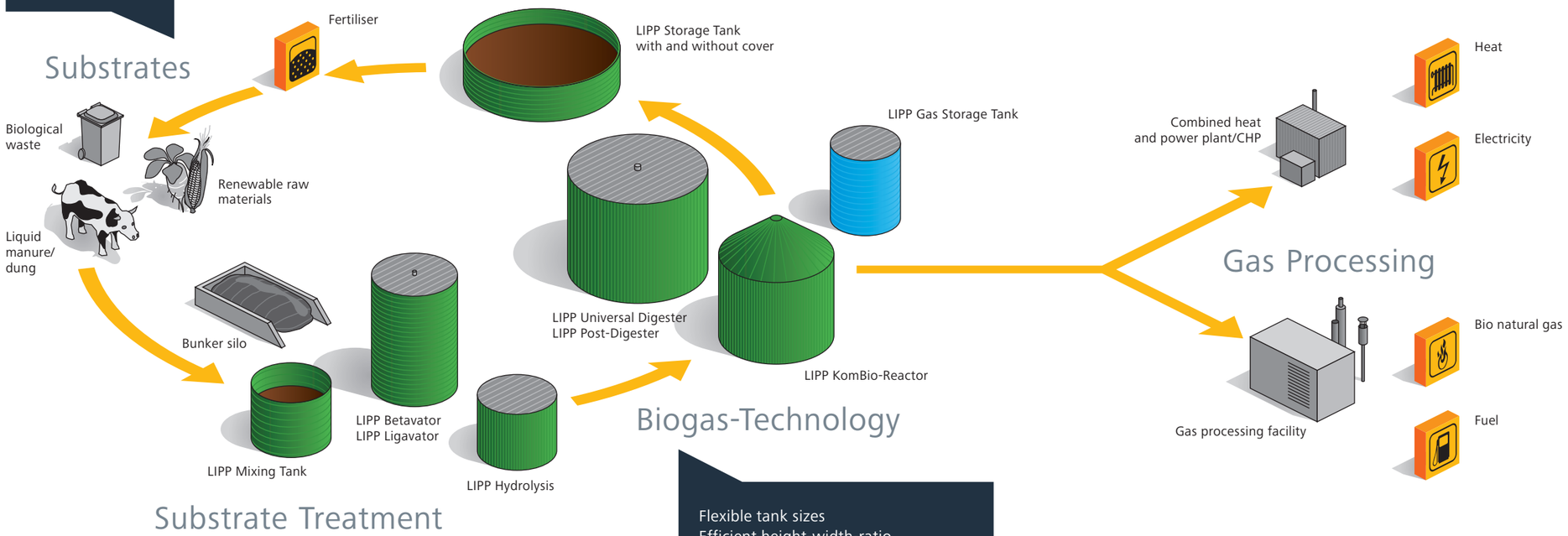
As a biogas plant manufacturer, LIPP is already looking back on more than 35 years of experience. From the very beginnings to the present day, the continually gained knowledge allowed LIPP to acquire an expertise that provides every client with the appropriate solution.

Groundbreaking inventions like the LIPP double-fold system or the composite material Verinox made LIPP a technology leader for complete biogas plants as well as individual components in modular construction. These are adapted individually and substrate flexible to the respective location in close coordination with the customer.

In order to achieve maximum energy yield, the different substrates require individually tailored processing techniques. Due to its longstanding experience, LIPP provides the right solution for each substrate, for example, the pretreatment using the hydrolysis process or various storage possibilities in specially developed tanks. Individually adapted stirring and mixing techniques optimally digest and utilize every substrate, ensuring the highest possible biogas yield at the end.

Flexible tank sizes
Wide range of covers

Operation analysis



Individually selectable processing techniques

Flexible tank sizes
Efficient height-width-ratio
Flexible stirring systems
External wall heating
Heat conducting stainless steel tanks
Smooth inner walls

Thermal use of biogas in greenhouses

Biogas pipe

"Tradition and innovation:
For us an obligation,
to seek new challenges
and to do the feasible."

Handled by Experts

Optimized biomass = reduced dwelling time in the digester

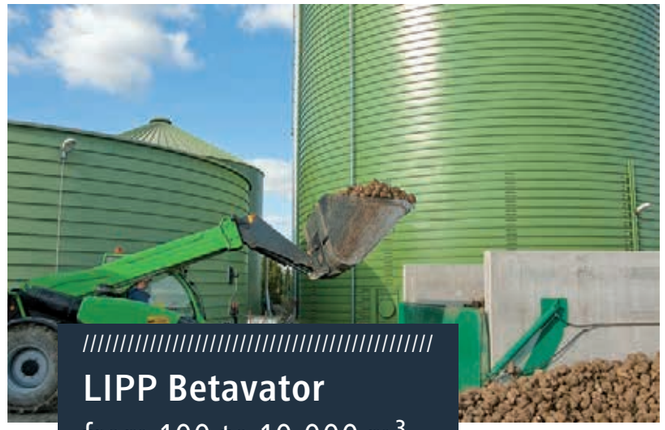
+point

The variety of substrates, which are used as raw material for biogas plants, requires strict observance with regard to the appropriate planning of a plant. A plant operator using liquid manure as substrate, needs different storage and processing possibilities than an operator who mainly uses sugar beets for energy production in his biogas plant. With more than 35 years of experience in the field of tank manufacturing, LIPP has developed specific storage tanks. They are tailor-made and relate to the characteristics of the respective substrate from the moment at which it is placed in storage or being pre-treated, always focusing on the greatest possible energy yield.

Open interim storage of substrates means energy loss. LIPP came up with airtight storage tanks for the conservation of suitable substrates, which can later be automatically pumped into the digester all year long. **This way the airtight tanks help to turn an energy loss into an energy yield, respectively a higher gas yield, and can additionally prevent unpleasant odour emissions.**

Liquid manure Maize Sugar beets Biological waste Grain Silage

Substrate Treatment



LIPP Betavator
from 100 to 10.000 m³

The LIPP Betavator is suitable for the ideal and all year round storage (silaging) of sugar beets and other root crops, which achieve high biogas yields per hectare of cultivated land.
After the sugar beets have been mashed, they are pumped directly into the airtight LIPP Betavator, where the high-quality silage is preserved.

"Significantly better substrate preparation in the LIPP Betavator results in high gas yields with shorter dwelling time in the digester."

LIPP Ligavator
from 100 to 10.000 m³

The LIPP Ligavator was especially developed for the liquid preservation of wet maize and grain. After the substrate has been mixed by passing the filling auger (Ligamix), it is subsequently pumped into the Ligavator. This saves the operator the troublesome and time-consuming feeding of the digester and the energy remains in the substrate until its transformation into biogas.

Feeding of the LIPP Ligavator

LIPP Hydrolysis
from 100 to 2.000 m³

The employment of the technically highly advanced LIPP hydrolysis process offers a special advantage. Here, the substrates are pre-treated at 30 to 50°C in a special hydrolysis tank which is installed upstream of the digester. The procedure results in the splitting up and pre-acidification of the long-chain carbohydrates, fat, and proteins.
This two-step process considerably shortens the dwelling time in the digester and achieves a higher methane yield in conjunction with high process reliability and flexibility regarding the use of substrates. Furthermore, the high substrate digestion reduces the necessary energy input needed for circulation in the digester.

LIPP Hydrolysis Tank

Hydrolysis as concrete construction

"A two-step fermentation-process with upstream hydrolysis allows high substrate digestion and process reliability."

Optimal Conditions for high Gas Yield

The principle of anaerobic fermentation forms the basis for every biogas plant. Depending on the accruing amount and availability of the substrate(s), the aim is to achieve the highest possible gas yield.
Type of substrate, the pH-value, temperature, and technical procedure of the fermentation affect the performance of the micro-organisms, which are responsible for the biomass decomposition and gas formation. It is LIPP's aim to establish the best possible conditions for the environmentally friendly processing, storage, and exploitation of substrates in a LIPP biogas plant – always considering the relevant factors in close coordination with the client.

A crucial factor for a high gas yield is the appropriate mixing technique for each substrate. LIPP succeeded in developing various substrate flexible horizontal and vertical stirring systems, always taking into account the nature of the individual substrate. The **smooth inner walls** made of stainless steel and an individual **efficient height-width-ratio** of the digester promote a satisfactory circulation and, thus, a constant fermentation process, also reducing internal energy consumption and preventing the formation of floating and sinking layers in the substrate.

All LIPP tanks combine the benefits of the patented material Verinox – a combination of galvanised steel on the outside and stainless steel on the inside. It not only provides for a long service life of the plant, but at the same time is also an excellent and consistent heat conductor for the energetically favourable wall heating, which is mounted on the outside and provides for the desired process temperature. The external fixation eliminates the need for interior constructions that would interfere with the mixing and stirring process. Insulation and outer cladding protect and insulate the digester.

"The horizontal and vertical stirring technique prevents the formation of sinking and floating layers."

high gas yield +point

Biogas Technology

Oxygen
Methane
Carbon dioxide
Hydrogen sulphide

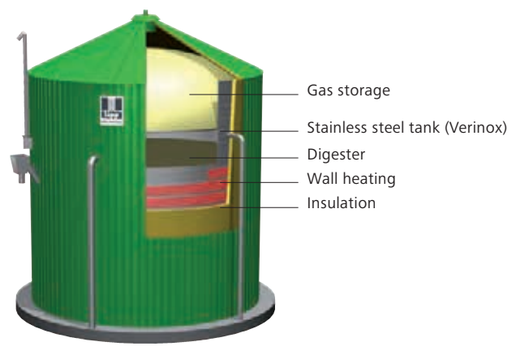
LIPP KomBio-Reactor
from 100 to 2.500 m³

The patented LIPP KomBio-Reactor, a digester with integrated gas storage, constitutes the centrepiece of the modular LIPP biogas plant. Owing to the efficient on-site production with the LIPP double-fold system, it is available in a variety of sizes and is working substrate flexible.

The integrated gas storage is situated above the digester. The surrounding steel shell additionally protects the gas accumulator from wind, UV-radiation, and bad weather conditions, while the roof decreases the required heat output during winter.

Assembly of wall heating, insulation, and outer cladding

"The exterior wall-heating provides for uniform heating treatment of the substrate and, thus, guarantees a constant fermentation process."



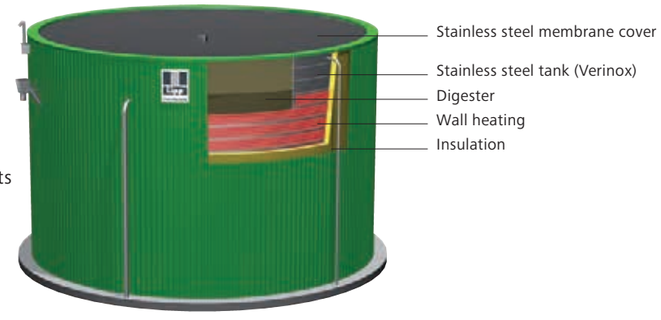
LIPP Universal Digester
from 200 to 5.000 m³

The LIPP universal digester is used for large-scale plants. Unlike the LIPP KomBio-Reactor, it does not have an integrated gas storage. The generated biogas is transferred either to a KomBio-Reactor, which is combined with the universal digester, or to a separate gas storage tank.

LIPP Post-Digester
from 200 to 5.000 m³

For the storage of liquid fermentation residue and the admittance of residual gases, LIPP offers special airtight tanks – the post-digesters. Here, the remaining residual gas potential of the substrate can be fully exploited which again helps to minimize energy losses.

flexible stirring solutions +point



Independent through Renewable Energies

"The biogas plant saves us 135.000 litres of heating oil a year."

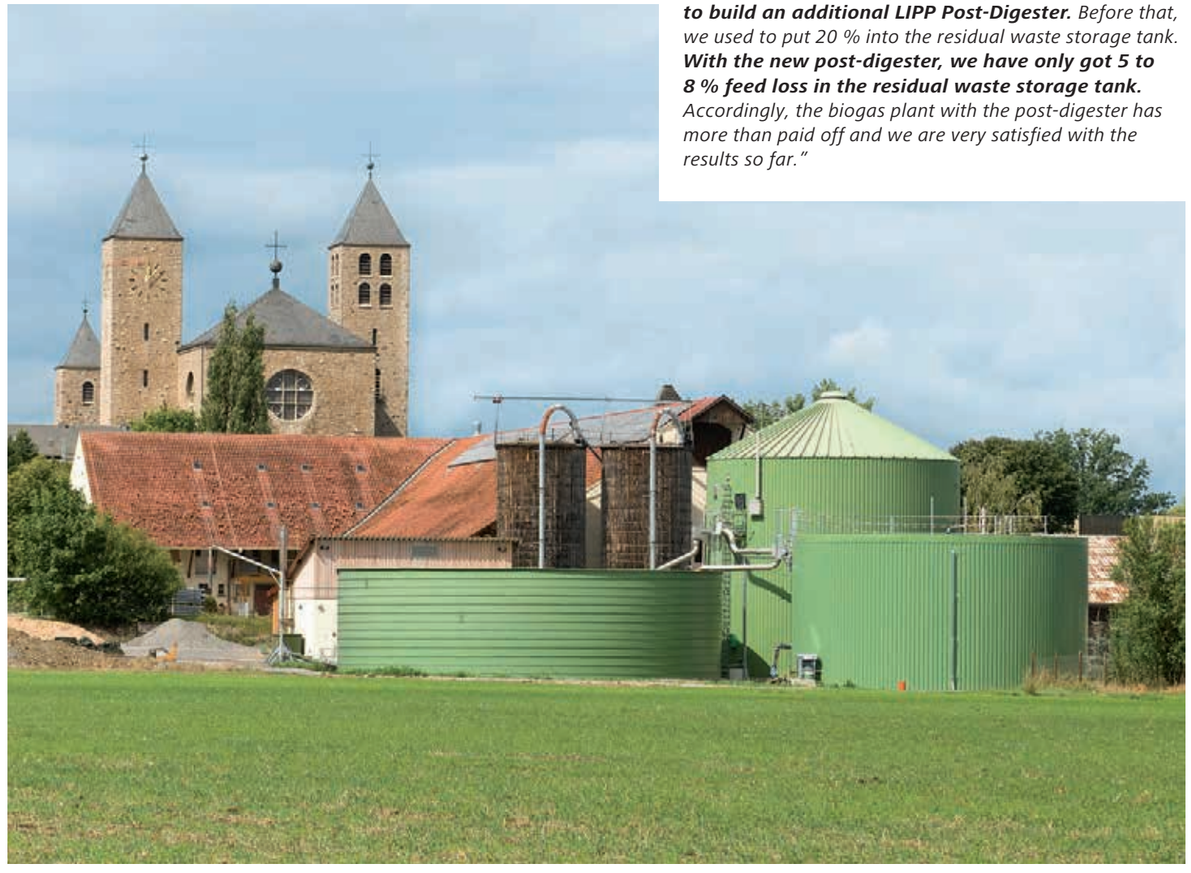
Klaus Burger and Bruder Edmar, Germany

ABBEY OF MÜNSTERSCHWARZACH

In 2000, Abbot Fidelis Rupert and Father Anselm Grün formulated an ambitious goal: Within ten years, the monastery was supposed to be supplied exclusively with renewable energies.
Just how ambitious this goal was, can be guessed by the size of the monastery. According to Brother Edmar, *"the monastery itself is home for 100 monks. Also belonging to the monastery is a secondary school with more than 900 pupils and a guesthouse with 80 beds. Another 200 persons are working in production plants and workshops belonging to the monastery."*

The plan worked out. Even more so. Thanks to the biogas plant made by LIPP, the monastery saves more than 135.000 litres heating oil every year. *"This, of course, is an enormous amount",* resumes the operating manager, Klaus Burger. *"The wood heating system is switched off during summer and we can cover the entire heating demand for process water with the biogas plant.*

The biogas plant is always supplied with 7 tons of maize, additionally grass silage, and 1,5 tons of grain. 95 % of the fodder is grown on own ground and the substrate is being returned to the fields, thus making the abbey independent from price fluctuations. ***The maize needs 56 days for processing in the digester, so we decided to build an additional LIPP Post-Digester.*** *Before that, we used to put 20 % into the residual waste storage tank.* ***With the new post-digester, we have only got 5 to 8 % feed loss in the residual waste storage tank.*** *Accordingly, the biogas plant with the post-digester has more than paid off and we are very satisfied with the results so far."*



HIGHLY CONCENTRATED

Waste Material = Reusable Material

The remaining fermentation residue can be stored in LIPP storage tanks until its use as environmentally sound fertiliser. All the major plant nutrients are preserved through the anaerobic digestion process. Depending on quality and the amount of the fermentation residue, LIPP's flexible double-fold production system provides the appropriate storage tank with or without cover in every conceivable size. **The high content of mineralized nitrogen and further nutrients in the organic fertiliser ensures a balanced carbon footprint when applied to the ground.**

Residual material storage with floating air roof

LIPP Storage Tank
from 100 to 10.000 m³

Whether you need textile or inflatable film covers, or a LIPP membrane cover – LIPP tanks allow constructions either with or without roofs.

Storage tank for fermented substrate with membrane cover

Slurry tank without roof

Residual Waste Storage

LIPP Stainless Steel Membrane Cover
up to 50 m in diameter

A free-span light membrane construction made of stainless steel allows spanning tanks with up to 50 m in diameter. Thus unsupported, the construction withstands extreme snow loads and heavy winds. The construction is non-corroding, impermeable to gas, and resistant to UV-rays.

Assembly of stainless steel membrane cover

Fertiliser

RELIABLE

Constant Energy

Due to fluctuations during the biogas production process and in order to bridge failure times of the CHP, the produced biogas needs to be stored intermediately. Depending on the type of installation, the produced biogas is transferred either to the integrated gas storage device of the LIPP KomBio-Reactor or to a separate LIPP gas storage tank.

In the CHP, the processed biogas is used for combined heat and power generation. The desulphurised and dried gas mixture arrives in a special gas engine. Here, a generator produces electricity, which is then fed into the electrical grid. A part of the produced heat can be used to heat the biogas plant. The excess thermal energy is suitable for heating surrounding buildings, stables, or greenhouses.

Especially for larger plants, another option for using biogas is to upgrade it in order to reach the quality of natural gas. During this process, the biogas is cleaned, desulphurised, and dried. With a methane content of about 97 %, the bio natural gas can then be fed into the gas grid or can be used as fuel for natural gas vehicles.

LIPP Gas Storage Tank
from 30 to 5.000 m³

LIPP developed a special system for depressurised dry gas storage for its separate gas storage tanks, characterized by high functional and operational reliability. The gas is stored with a maximum pressure of five mbar in a bubble-shaped balloon, hanging inside the tank. The higher pressure, which is necessary for the later use of the biogas, takes place after the storage by means of a side channel compressor. A highly dependable method that requires less maintenance and provides for a longer service life of the storage device.

Energy Storage System

Combined heat and power system (CHP)

Electricity
Heat
Fuel
Natural gas

Stable Value for the Next Generation

BIOENERGIE UND SERVICE GBR

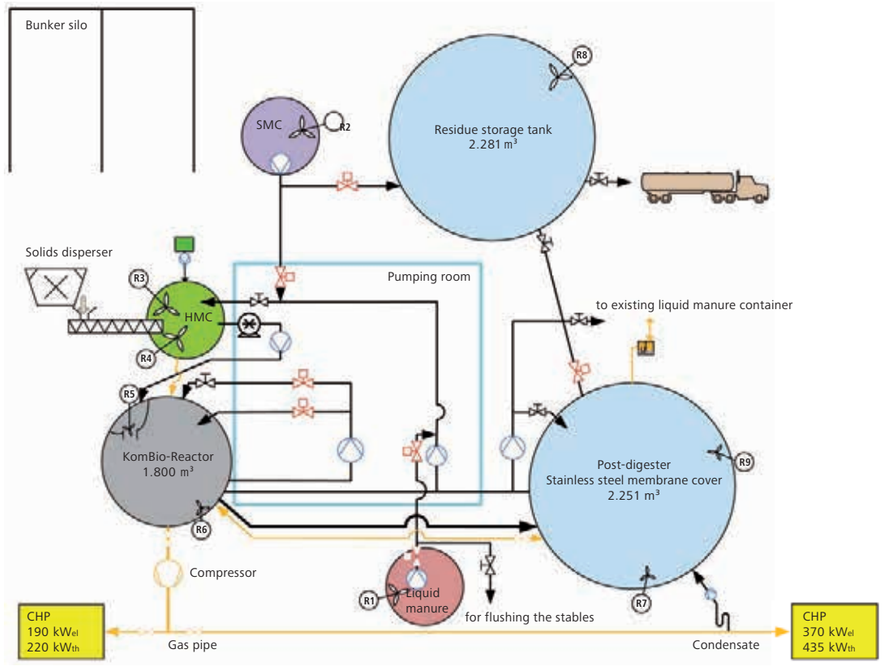
It was the imminent generation change that put Alois Bosch to the question: How will we go on? Together with his children, he decided to build a biogas plant in addition to the existing cattle and pig breeding. **High quality and lasting value determined their decision in favour of a LIPP biogas plant.**

Anton Abele, the plant operator, summarizes: ***"One major advantage of the LIPP biogas plant is the hydrolysis.*** *In contrast to the normal two-step procedure, it has the advantage that dwelling times can be reduced significantly."* For him, a further great advantage lies in the smooth inner walls of the digesters themselves. **Owing to the stainless steel surface, the substrate is stirred much more easily than in, for instance, a concrete tank.** *"The LIPP system enables us to stir with the pump. An external agitator, which is not in the medium, allows stirring large quantities with relatively little use of energy. The heating is not interfering with the substrate because it is mounted on the outside. Such being the case, the heat is transferred to the metal, which of course is an excellent heat conductor. Consequently we have a large surface area to heat the digester."*

"We only need small amounts of substrate for the gas production."

Alois Bosch and Anton Abele, Germany

Alois Bosch, too, is impressed by the efficiency of the plant: *"We only need very little amounts of substrate for the biogas production. Furthermore, it is the modular design of the LIPP plant that convinced us. It is simply a well developed concept and that is why we would always opt again for a LIPP biogas plant."*



HMC
Hydrolysis and mixing container

SMC
Silage effluent- and liquid manure container

Process scheme biogas plant

Assembly of solids disperser in front of hydrolysis- and mixing tank

The measurement and control technology is situated in the pumping room and allows fully automated operation

A catwalk, accessible via a stairway, connects the LIPP KomBio-Reactor with the LIPP Post-Digester

An Immediate Success

Giovanni Giardini is a farmer in Rovigo, Italy. He is running a cattle farm for meat production and cultivates grain and maize on arable land. Two years ago, he decided to set up a biogas plant in order to use the accruing waste materials more effectively and to tap an additional source of income for the farm.

Today Giardini draws a content balance: *"LIPP's solutions have convinced me, because they are reliable and efficient, especially in regard to the fermentation process.* ***That is why we decided to use liquid and cattle manure, and in particular maize, fruit and vegetable waste as substrates for the plant.***
The plant has been in operation for three months now and has an output of 835 kW. The start-up took place smoothly, quickly and effectively. LIPP's technicians supervised the initial process and the collaboration was splendid. I am very satisfied with the obtained results.
We are already thinking of expanding this plant and setting up a new one – together with LIPP."

"The start-up took place smoothly, quickly and effectively."

Giovanni Giardini, Italy

Around the Globe

It is due to the outstanding qualities of the LIPP biogas plants – the flexible construction technology employing the LIPP double-fold system and the high-quality materials, like Verinox – that allow the construction of modular LIPP biogas plants worldwide.
Static stability, functional reliability and a long operating life – within a short time, LIPP constructs high quality and consistent biogas plants, adapted to all climatic and geological conditions of the respective site.

consistent quality in all climatic zones +point

LIPP Worldwide

Austria
Belgium
Canada
China
Cyprus
Czech Republic
Denmark
Finland
France
Germany
Hungary
Japan
Korea
Malaysia
Netherlands
Peru
Poland
Romania
Russia
Spain
Switzerland
Syria
Taiwan
Ukraine

Biogas plant in Russia, capacity approx 100 kW_{el}
Total input p.a.: 36.755 t liquid cattle manure, cereal waste, silage maize

Biogas plant in Canada, capacity approx 3 MW
Total input p.a.: 143.840 t
sewage sludge, cheese whey, abattoir sludge, organic household waste, yoghurt waste, milk

Biogas plant in Japan, capacity approx 244 kW_{el}, 260 kW_{th}
Total input p.a.: 58.400 t food waste, and organic sludge

Biogas plant in Austria, capacity approx 1 MW_{el}
Total input p.a.: 21.900 t liquid manure, glycerine, silage maize, grain maize

"All I can say is... for me, it is a good and successful investment."

Giuseppe Traverso, Italy

Biogas plant in Italy,
capacity approx 999 kW_{el}, 1,100 kW_{th}
Total input p.a.: 5.680 m^3
fresh chicken manure, maize silage, grass silage, glycerine, molasses

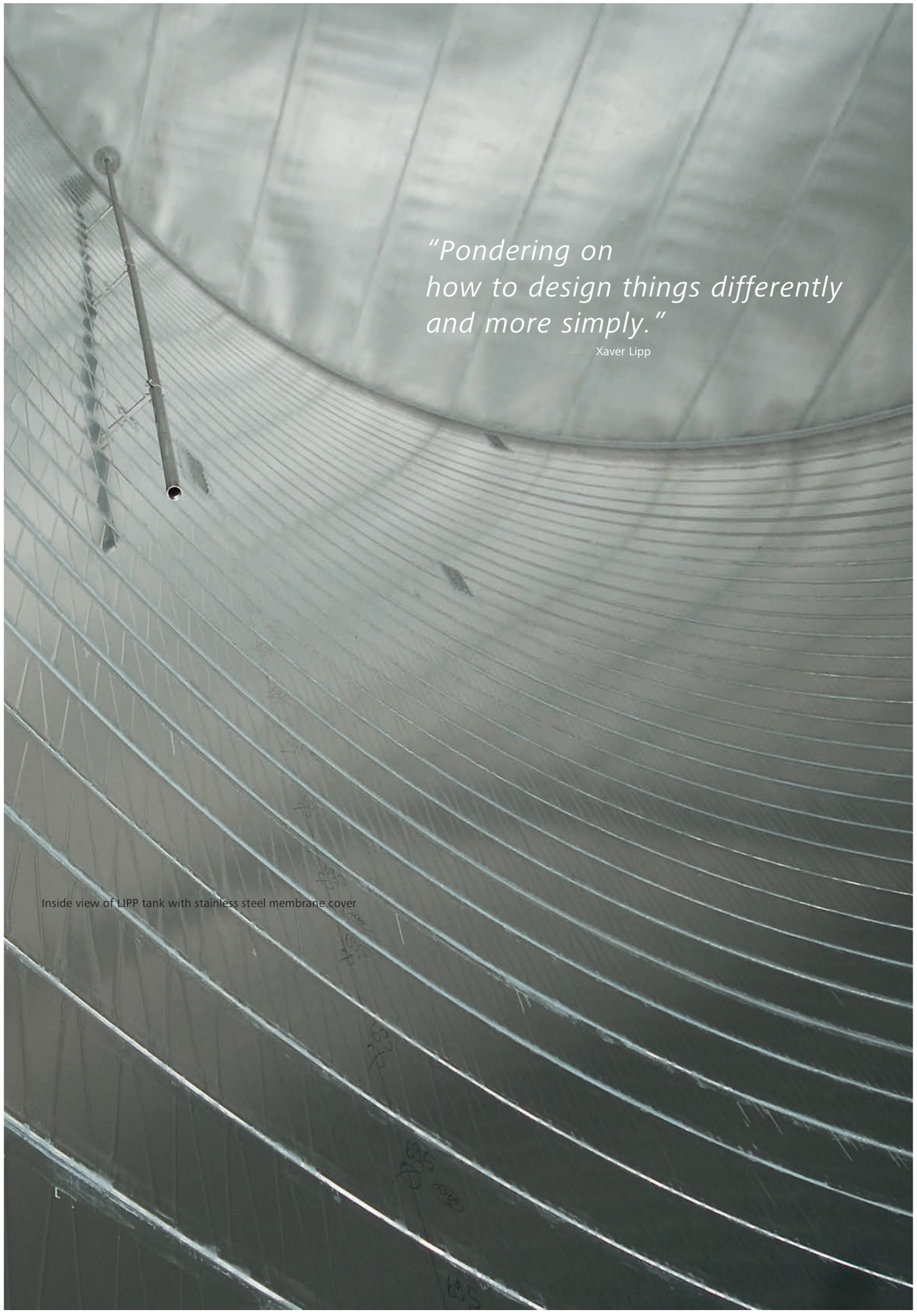
Regulation and Technical Service

From the conception to the engineering to the implementation – LIPP assists its customers in all issues as an experienced, competent, and reliant partner. Our aim is a biogas plant, which provides what we promise and a client, who can make the most efficient use of his plant. After the initial start-up procedure, our technical service ensures that everything is running smoothly.

. Operation analysis
. Profitability analysis
. Project planning and development
. Plant manufacturing
. Technical and biological start-up
. Biological support and laboratory analysis
. Technical service and maintenance
. Operator training
. Management with optimized measurement and control technology (MSR)

Effective control by measurement and control technology (MSR)

Technical service on site



Inside view of LIPP tank with stainless steel membrane cover

Flexible Building Technology
Efficient On-Site Assembly
Short Construction Period
Low Investment Costs
Maximum Tightness
Long Operating Life
High Quality
Little Assembly Space Requirement

UNIQUE.WORLDWIDE

Conception.
Planning.
Installation.
Service.

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