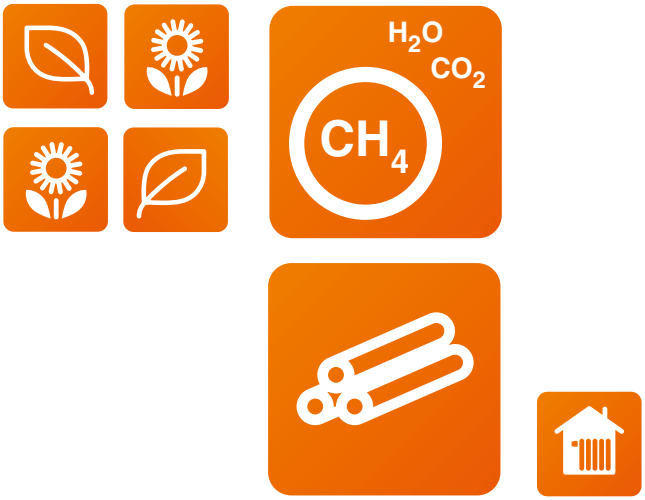
MT | BioMethan®

Gas upgrading technology

Biomethane – New Perspectives for Energy Supply


MT BioMethan

What is Biogas Upgrading?



Biogas is becoming more important as basic and peak load energy from renewable energy throughout Europe.

The upgrading of biogas to biomethane (bio natural gas) holds special potential with versatile application possibilities. The raw biogas is dried, desulphurised and refined to natural gas quality through a carbon dioxide separation process.

It can be injected in the national grid and transported to any suitable location using the existing infrastructure. The possible applications are as flexible as those of fossil fuels.

In the context of global climate protection objectives biogas production and upgrading technologies are supported in several ways. They form a cornerstone of future energy supply.


Methan

Why Biomethane?

Climate, environment and health protection - the use of fossil fuels and nuclear energy is to be specifically reduced. At the same time the energy demand of the modern 21st century society continues to increase. The energy generated from regenerative energies presents a solution for this discrepancy.

No other energy source is as flexible in its application as biomethane. In addition, it can be produced predictably and safely - an ideal supplement in addition to energy from wind and solar power.

In March 2011 the Government announced details of the Renewable Heat Incentive (RHI). The RHI offer incentives for renewable heat generation and usage. It includes long-term tariff support for biomethane gas to grid injection.

The Utilisation Paths

Industry.
Municipalities.
Private households.

Biomethane can be used for power and heat generation in decentralised combined heat and power plants and in larger central plants with cogeneration, for heat generation in highly efficient gas-fired condensing heating system or as a regenerative fuel in natural gas vehicles.

Biomethane injected into the natural gas grid can be efficiently transported to the nearest most suitable location. This flexibility is beneficial for both municipalities and large industries prospects for the generation of control energy, an economic heat supply and an improved carbon footprint.

Due to the high gas quality, biomethane is perfectly compatible with technical facilities within private households. The mixture of natural gas and biomethane comes in the usual quality out of the existing facilities within private dwellings.

Furthermore, it can be used as a regenerative fuel in natural gas vehicles - an important aspect for vehicle fleets used within energy self-sufficient communities and energy-efficient industrial enterprises.

Full of Energy for the Future

Economical.
Ecological.
Environmentally conscious.

Biogas production is a relatively new business area that provides extra income. In combination with gas upgrading interesting long term opportunities arise.

Moreover, the use of biogas technology strengthens the regional increase in value.

Biomethane supports the energy mix and reasonably supplements proven technologies for energy generation. It reduces the dependency on natural gas imports as well as consumption. Beyond that, biogas technology alongside gas upgrading contributes to the reduction of climate damaging carbon dioxide emissions.

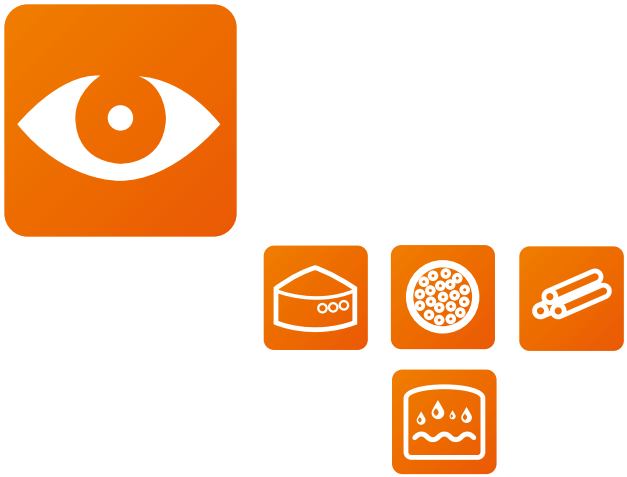
Why MT-BioMethan?

Turnkey Biogas Technology

MT-BioMethan GmbH is a specialist for highly efficient biogas upgrading and biomethane injection plants. We have the technology, experience and knowledge to unite individual components of this process into an economical concept.

In association with the parent company, MT-Energie, we offer worldwide turnkey biogas technology and products. Our know-how concerning the fermentation line up to the injection station also results an ideal interface compatibility with project partners.

Our professional service teams are operating all over Europe offering quick response times and 24/7 hotline – the MT-Group has achieved an unbeatable reputation for high standards of customer service.



Source: Evonik

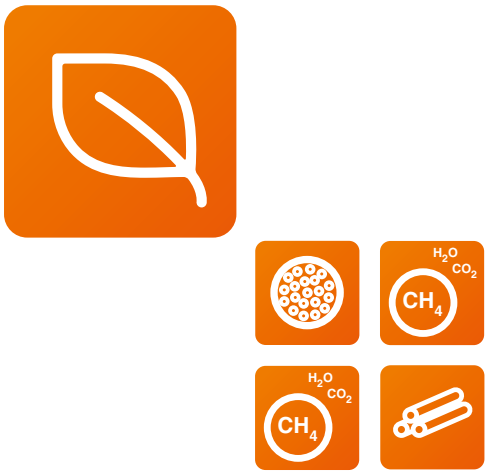
Gas Upgrading

with Hollow Fibre Membranes

MT-BioMethan offers an electricity-operated biogas upgrading process and demand-driven performance classes. By means of membrane-based gas permeation, the raw biogas is dried efficiently using minimum primary energy, it is desulphurised and the low-calorific carbon dioxide is then subsequently separated.

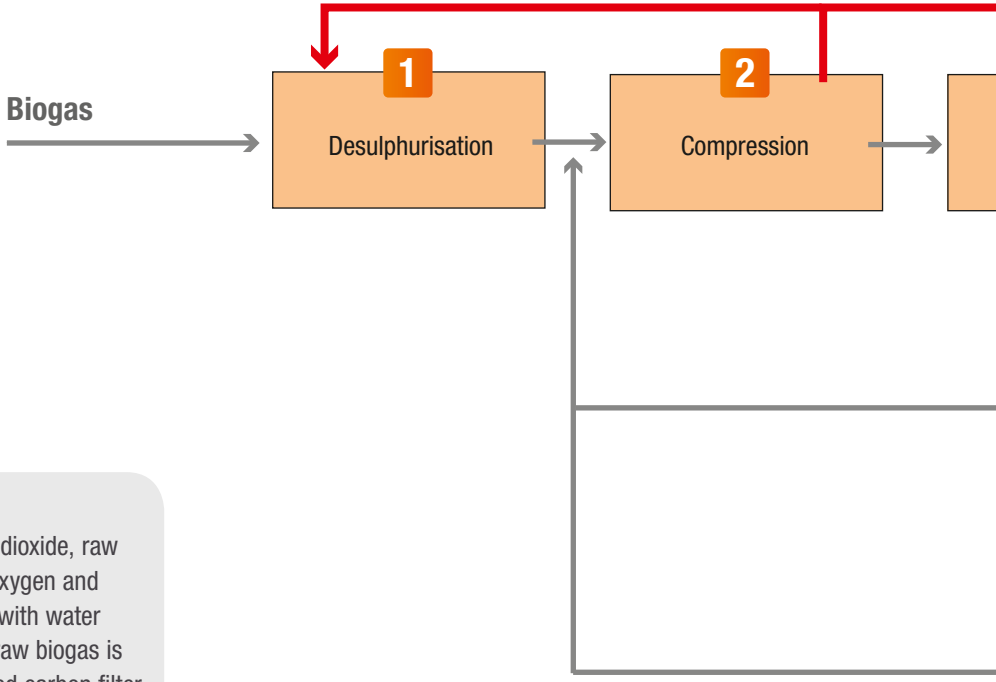
To achieve this, SEPURAN® Green membrane modules by Evonik are used. These consist of several thousand extremely fine hollow fibres the ends of which are embedded in resin and bundled in stainless steel pipes.

The membranes are characterised by high pressure and temperature resistance, pressure stability and different gas permeabilities. The above-average carbon dioxide and methane selectivity allows for a methane purity of 97% and a methane slip of below 0.8%.



Process description

MT-Membrane Technology



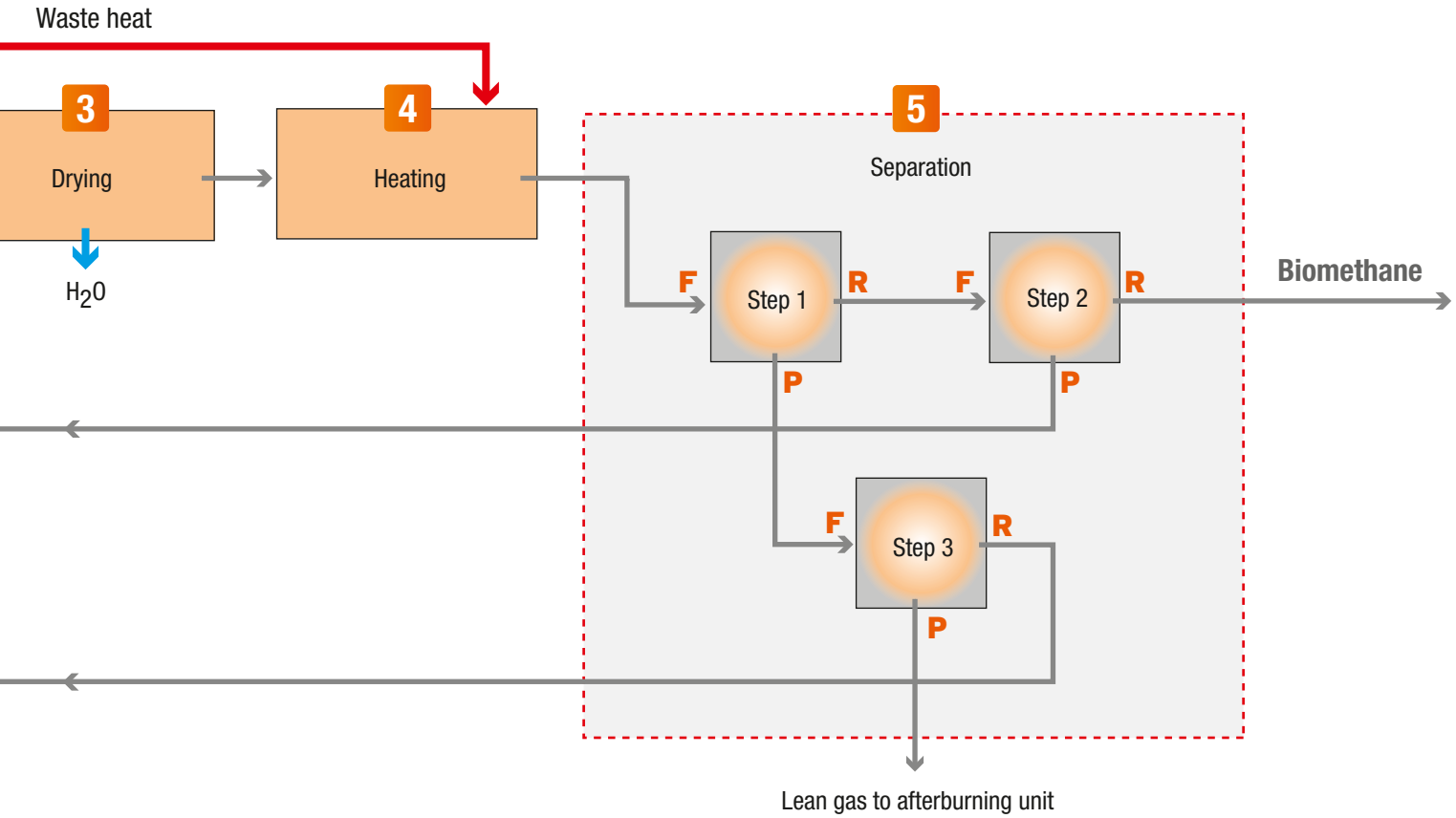
1 Pre-cleaning
Next to its main components, methane and carbon dioxide, raw biogas also contains hydrogen sulphide, nitrogen, oxygen and hydrogen. In addition, the gas mixture is saturated with water vapour. During the course of the pre-cleaning, the raw biogas is first pre-dried and then desulphurised in an activated carbon filter.

2 Compression
In the next step, the pre-cleaned gas is compressed to an operating pressure of 16 bar(g) in a screw compressor. To achieve the highest possible plant efficiency, part of the heat energy arising from the compression process is used in a later stage of the process, the gas heating.

3 Gas drying
Further heat is removed from the gas mixture to lower the dew points of the water vapour and other condensible gases to avoid condensation within the modules. This is achieved with a tube bundle heat exchanger, which cools the gas with cold water provided by a chiller. The condensate from the gas is removed from the process by a light materials separator, which also separates accumulated oil from the screw compressor.

F = Feed
R = Retentat
P = Permeat

4 Gas heating
To optimise the separation properties of the membranes, the gas is heated to the membranes' operating temperature of approx. 35°C. The required heat is extracted from the oil cooling circuit of the screw compressor. Since deposits on the membrane (fouling) would influence the permeability, the gas undergoes a three-stage precision cleaning before feeding into the modules: first, a micro filter removes oil aerosols and larger solid particles from the gas. Secondly, an activated carbon filter (adsorption filter) cleans the gas of remaining oil particles and other materials. Finally, further aerosols and particles are retained in a superfine micro filter.



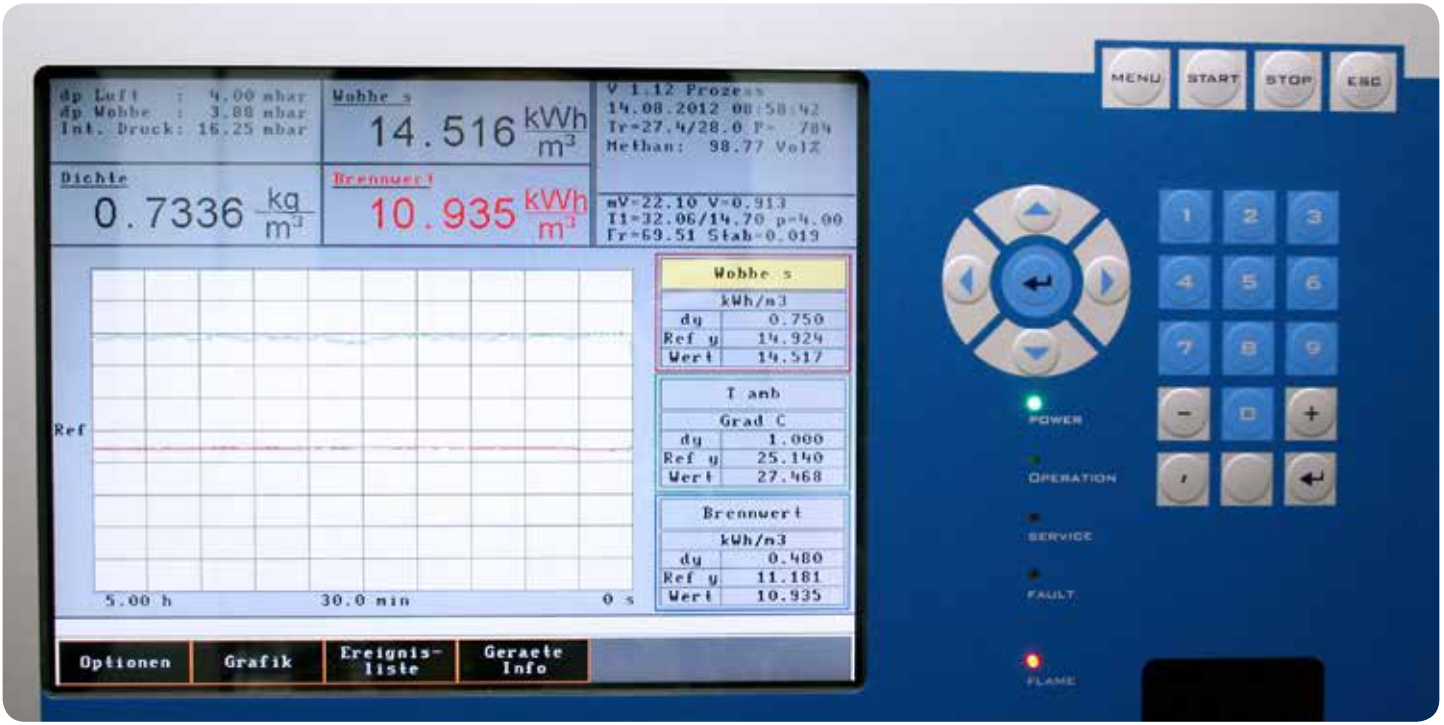
5 Separation

The number and interconnection of the modules generally depends on the degree of separation and the desired purity of the methane. By default, the MT-Membrane Technology is equipped with a three-stage separator:

The hollow fibre membrane modules of the first stage separate the feed stream of pre-cleaned raw biogas into the methane-enriched retentate and the permeate, containing carbon dioxide.

In the second stage, precision separation of the gas components is carried out. The retentate of the first stage undergoes the separation process a second time. This results in the desired biomethane purity. This retentate, the product gas flow, is fed into the injection plant. The permeate is returned to the compression stage of the process.

The third stage, also a fine separation, is charged on the feed side with the permeate from stage 1. The methane-containing retentate, is also conducted back to the compression stage and, mixed with the permeate from the second stage, undergoes the process anew. Due to its low methane content of approx. 0.5 per cent, the carbon dioxide permeate of stage 3, on the other hand, is fed to post-combustion as a lean gas.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dp Wobbe : 3.88 mbar
Int. Druck: 16.25 mbar
Wobbe s
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Dichte
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STOP
ESC
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OPERATION
SERVICE
FAULT
FLAME

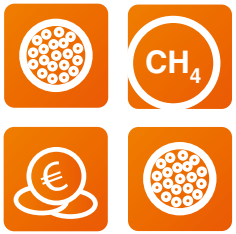
Technology with More Value

Advantages which pay off

The high module selectivity and capacity results in a reduced recycle stream which is fed back to the upgrading process. This reduces significantly the electrical energy demand: the electricity consumption was reduced by 17% compared to the conventional membrane upgrading system.

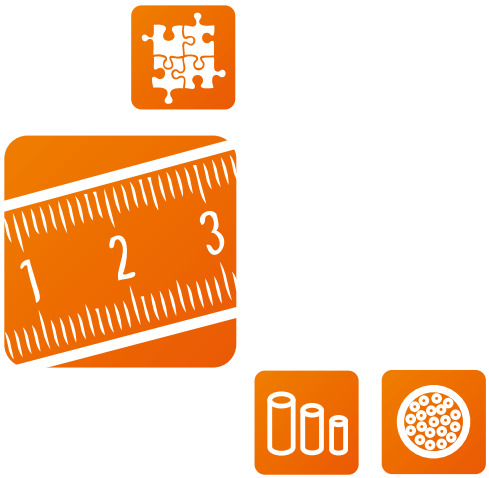
Moreover, it is easily adjusted to changing volume streams and gas compositions.

In addition, the high methane purity results in savings in conditioning to injection quality. Apart from this the economic loss was minimised by the low methane slip.




MT | BioMethan®

Made-to-measure Production



The components of the individual process stages are installed in enclosed containers. With the proven modular construction, each plant can be configured to the operator's individual requirements.

For this purpose, any number of modules can be serially connected.

Number and interconnection of the modules generally depend on the degree of separation and the desired purity of the methane. In order to achieve optimum separation results with minimal methane losses, the MT-Membrane Technology is equipped as standard with a three-stage separation.

At the moment MT-BioMethan is realising membrane upgrading systems in five performance classes 250, 500, 750, 1,000 and 1,400 Nm³/h raw biogas.

Gas Upgrading

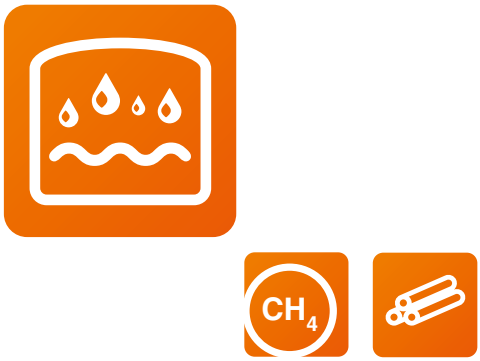
with Amine Scrubbing

MT-BioMethan also offers a gas upgrading system with a heat-led amine scrubbing process in performance classes of 185 up to 2,000 Nm³/h raw biogas.

This technology is preferred when the exhaust gas heat from the CHP motor of the gas upgrading plant can be made available as process heat.

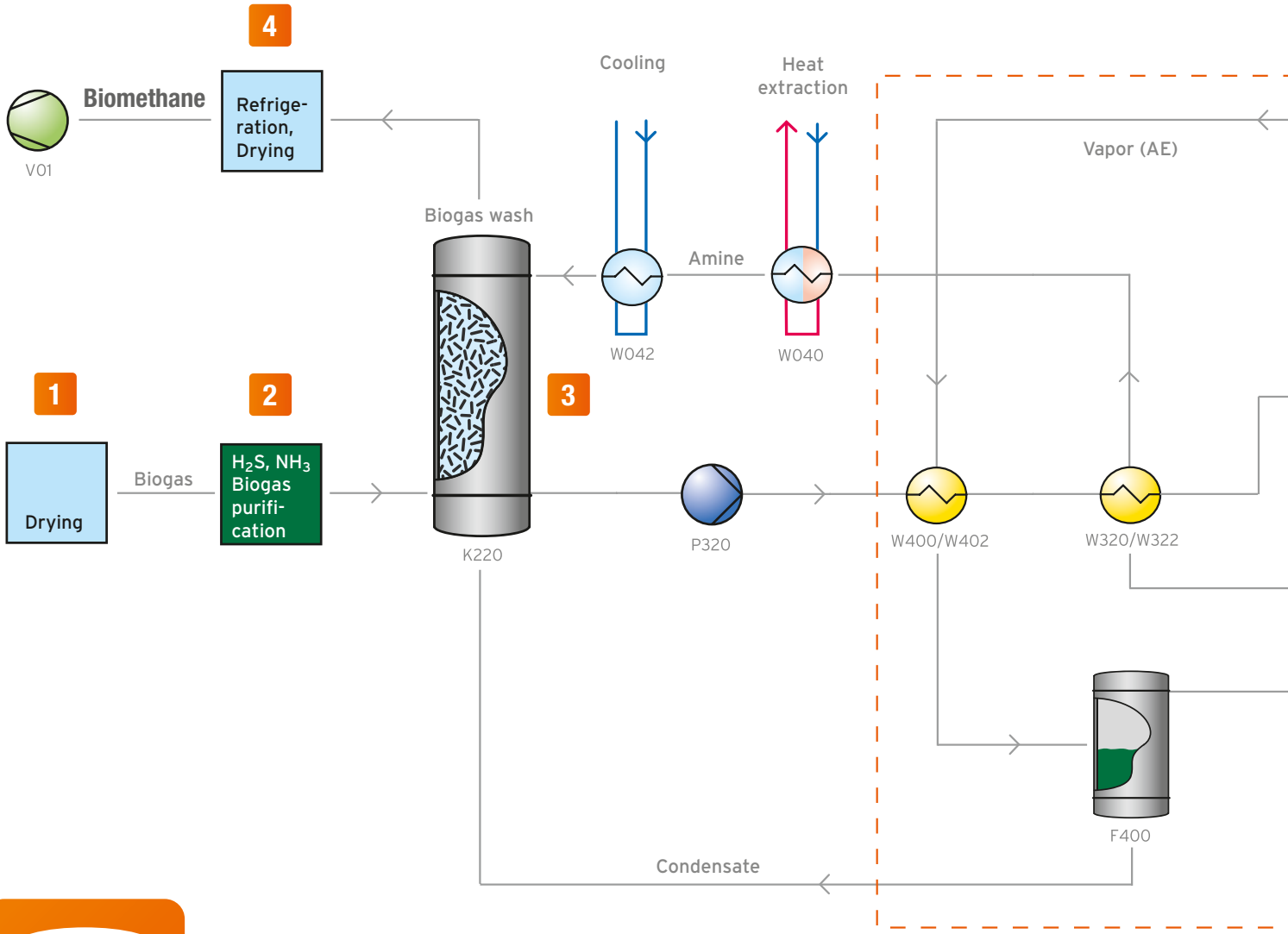
With a methane purity of up to 99.5% and a methane slip of 0.1%, MT-BioMethan offers in this segment highly efficient, economic process technology with a high availability.

The choice of the corresponding process and the respective performance class can be optimally tailored to the frame conditions of each project. Above all we can deliver to you the appropriate gas injection plant as required.

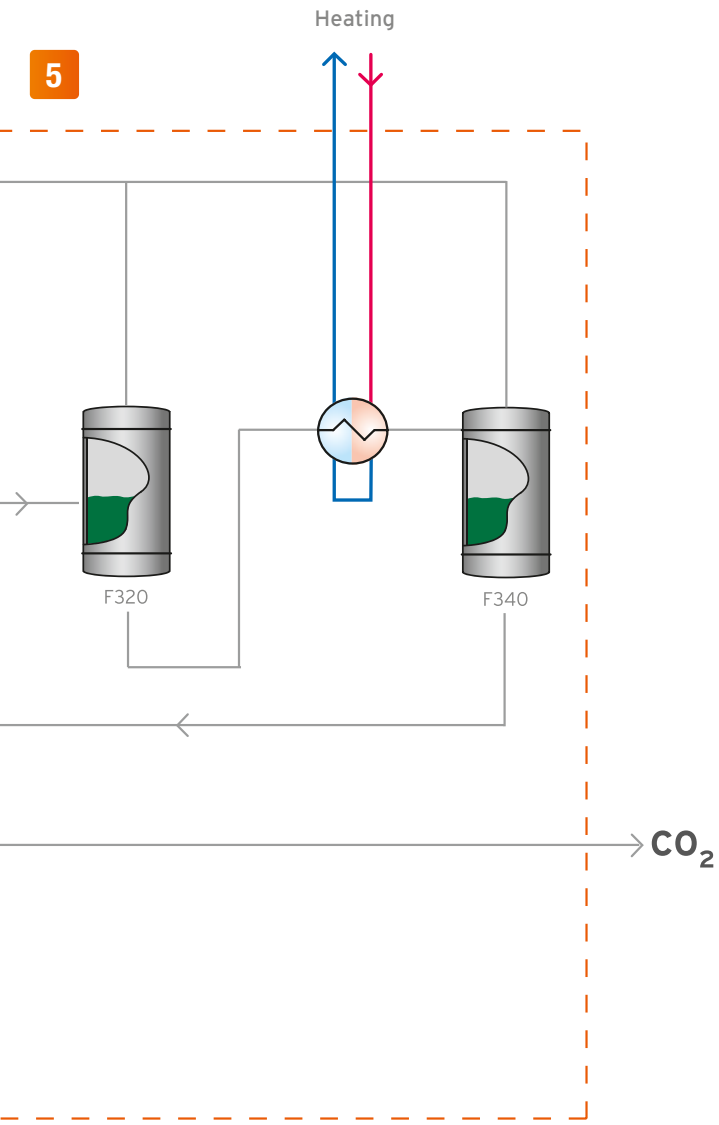


Process description

Amine Scrubbing



W = Heat exchanger
P = Pump
F = Separator/Reactor
K = Washing column
V = Compressor



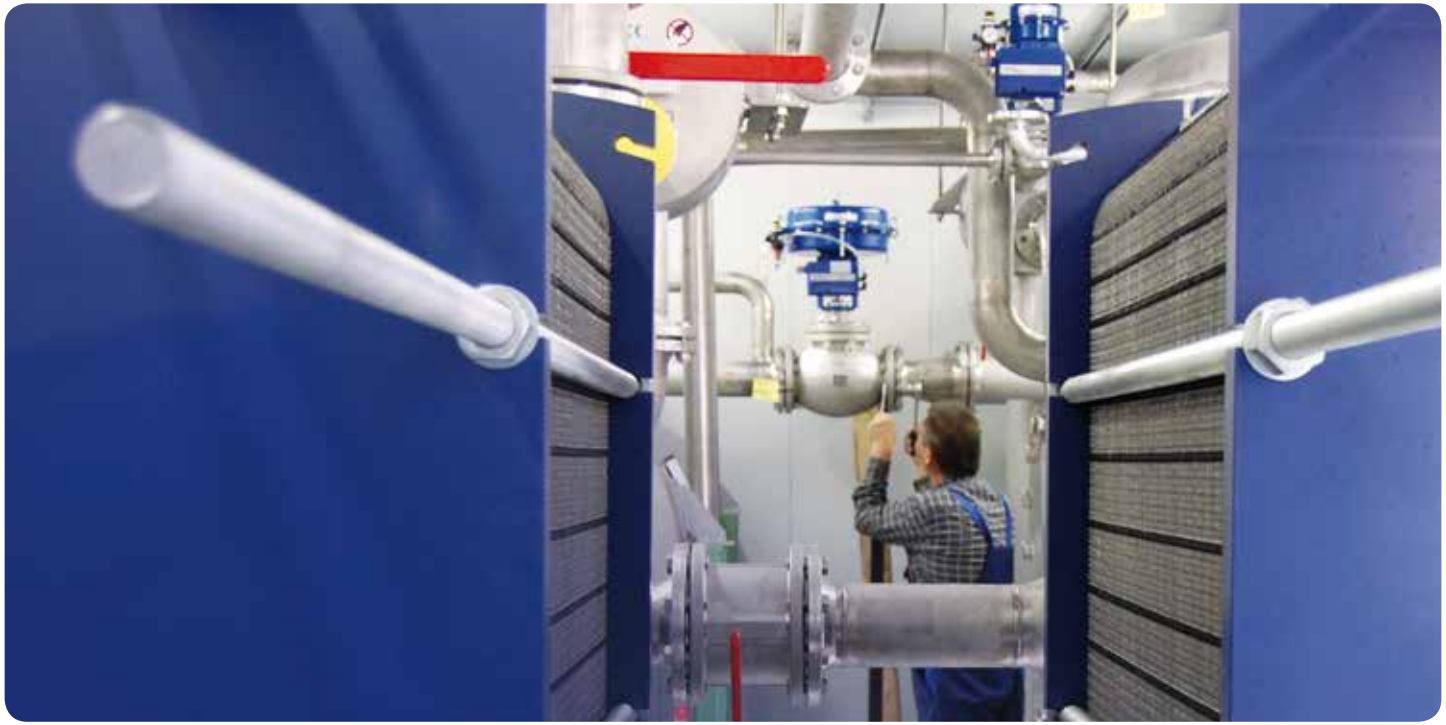
1 Drying
In the first stage the raw biogas saturated with water vapour is dried. This drying is necessary so the concentration ratio in the amine scrubbing solution makes no changes.

2 Desulphurisation
Any residual sulphur in the crude biogas needs to be removed before the actual amine scrubbing. The biogas flows through an active carbon filter system with a special coating; the system has a very high capacity for hydrogen sulphide, which is converted into elemental sulphur and held there within the system.

3 Separation of the carbon dioxide from the biogas
During the pressureless amine scrubbing the previously dried and desulphurised biogas flows through a packed scrubber column. The scrubbing solution is a watery amine solution. This flows from top to bottom, i.e. countercurrent to the gas. The scrubbing process is carried out at a temperature of 40°C. The packing material in the column increases the surface significantly, so that an intensive mass transfer between gas and liquidity phase takes place. Due to its chemical characteristics, the amine solution can absorb the carbon dioxide contained within the biogas very well. Contrarily, the methane does not react with the scrubbing solution, thus it can be removed as highly purified biomethane at the top of the column. The selectivity of the scrubbing solution results in a minimum methane loss of less than 0.1%.

4 Biomethane cooling and drying
After its purification, the biomethane has to be cooled and dried again. For this purpose, it is lead through a heat exchanger. There, the gas, which still contains water and amine vapour, condenses at the cooling surface before it is led back into the scrubbing cycle. The biomethane is handed over to an injection station.

5 Regeneration of the scrubbing solution
The used scrubbing solution loaded with carbon dioxide is removed at the bottom of the column and led into a regeneration process. The aim is to separate the absorbed carbon dioxide from the scrubbing solution under heat influence. This process step recovers the absorption capacity of the scrubbing solution for carbon dioxide. The regenerated scrubbing solution can be used again.



Our Competences

Professional Planning

MT-BioMethan specialises in the small batch production of standardised plants.

The gas upgrading plant integrated into a 12 m plant container is prefabricated at the company location in Zeven, Lower Saxony, Germany.

The complete electrical installations, sensor wiring and process control installation are already carried out in the production hall. The work is completed with the automation testing and visualisation of the project.

The plant is delivered with a tested plant control system and is checked for firmness and tightness. This enables a smooth and timely on site commissioning.

Our Qualifications

Production

MT-BioMethan performs internal production controls according to the following procedures:

- Testing process according to EN 473 MT (Magnetic Testing)
- PT (Penetrant Testing)
- VT (Visual Testing)
- Compression testing of pipelines
- External quality surveillance by RT (Radioactive Testing)

The production of plants from a single source is a prerequisite for a hiward.

Certification

- DIN EN ISO 9001
- Certified welding company according to DIN EN ISO 3834-3
- Pressure Equipment Directive 97/23/EC Module H
- German Technical and Scientific Association for Gas and Water G 493-1
- Approved company of the German Chamber of Handicrafts
- Registered professional electrician in the electrician directory of EWE NETZ GmbH

MT-BioMethan GmbH

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