Company Presentation ETW
Biogas-CHP + Biogas Treatment Systems

Company.

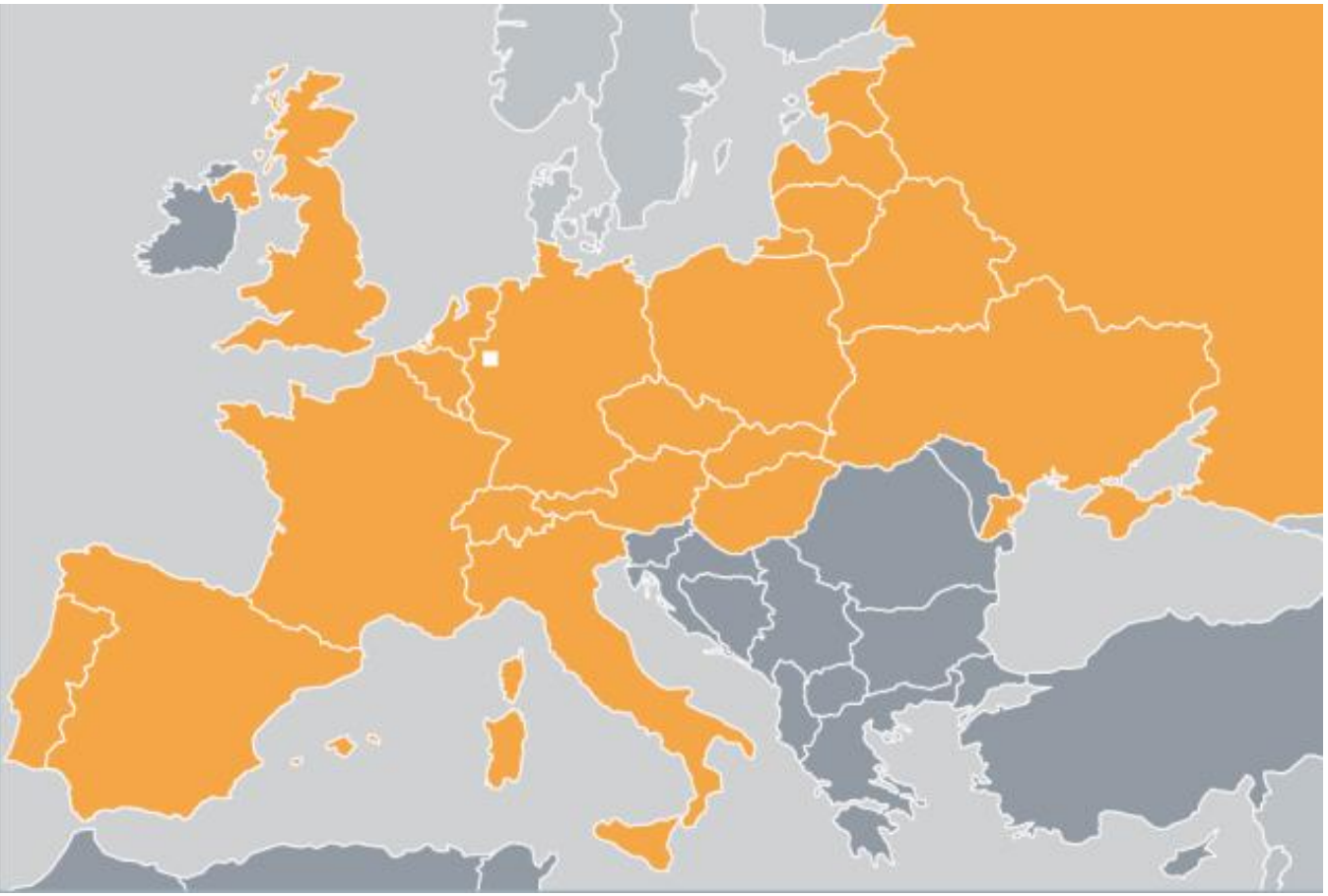
Competence in the private sector.

- More than 30 years experience with industrial scale CHP plant realization and service.
- CHP units for natural gas or other gaseous fueles (farm biogas, landfill gas, sewage gas, mine gas, a.s.o.)
- Power range 400kW – 2,5MW el. / Module

Company.

Company Formation:	1996
Implemented projects:	> 500
Installed Gas-CHP capacity:	> 288 MW
Total Turn-over 2018:	> 30 million €
International sales:	40%
Employees:	100
Engineering/Plant design:	15
Manufacturing:	25
Service:	50
Sales & Adminsitartion:	10

Location and Sales Region.



ETW Headquarter & Production

Moers, North Rhine-Westfalia,
Germany

The Ruhr region, a strategical location:

- Industrial area
- Population 12 mi
- Highly qualified labour
- Supply-chain
- 8 Int. Airports in 3h
- Research facilities

ETW Business areas.

Engineering & Plant Design	Manufacturing	Installation & Commissioning	Maintenance & Spare Parts

Biogas CHP

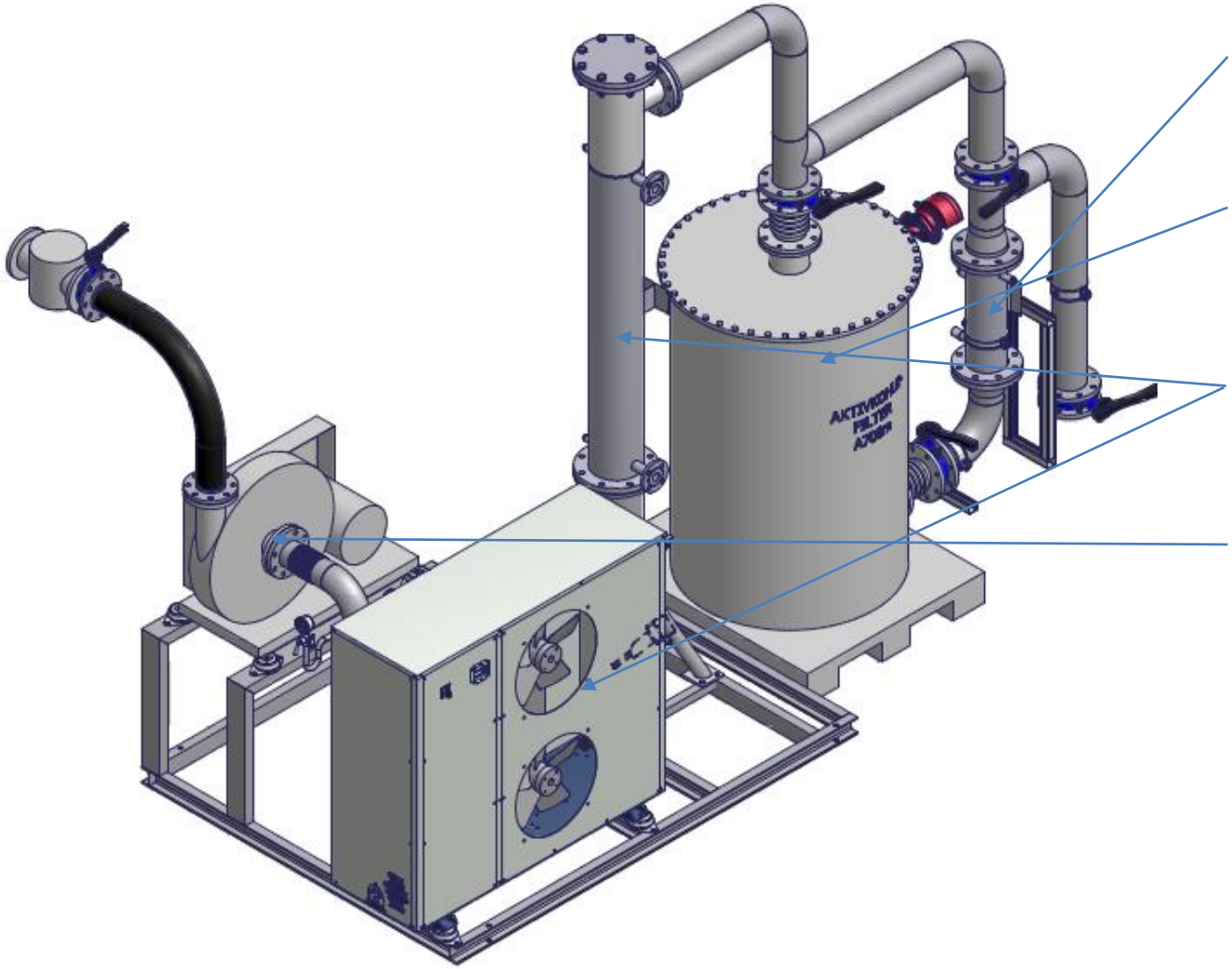
Natural gas CHP

Biomethane

Service

Biogas treatment system

Typical Scope of Supply of a biogas treatment system:



Biogas preheating

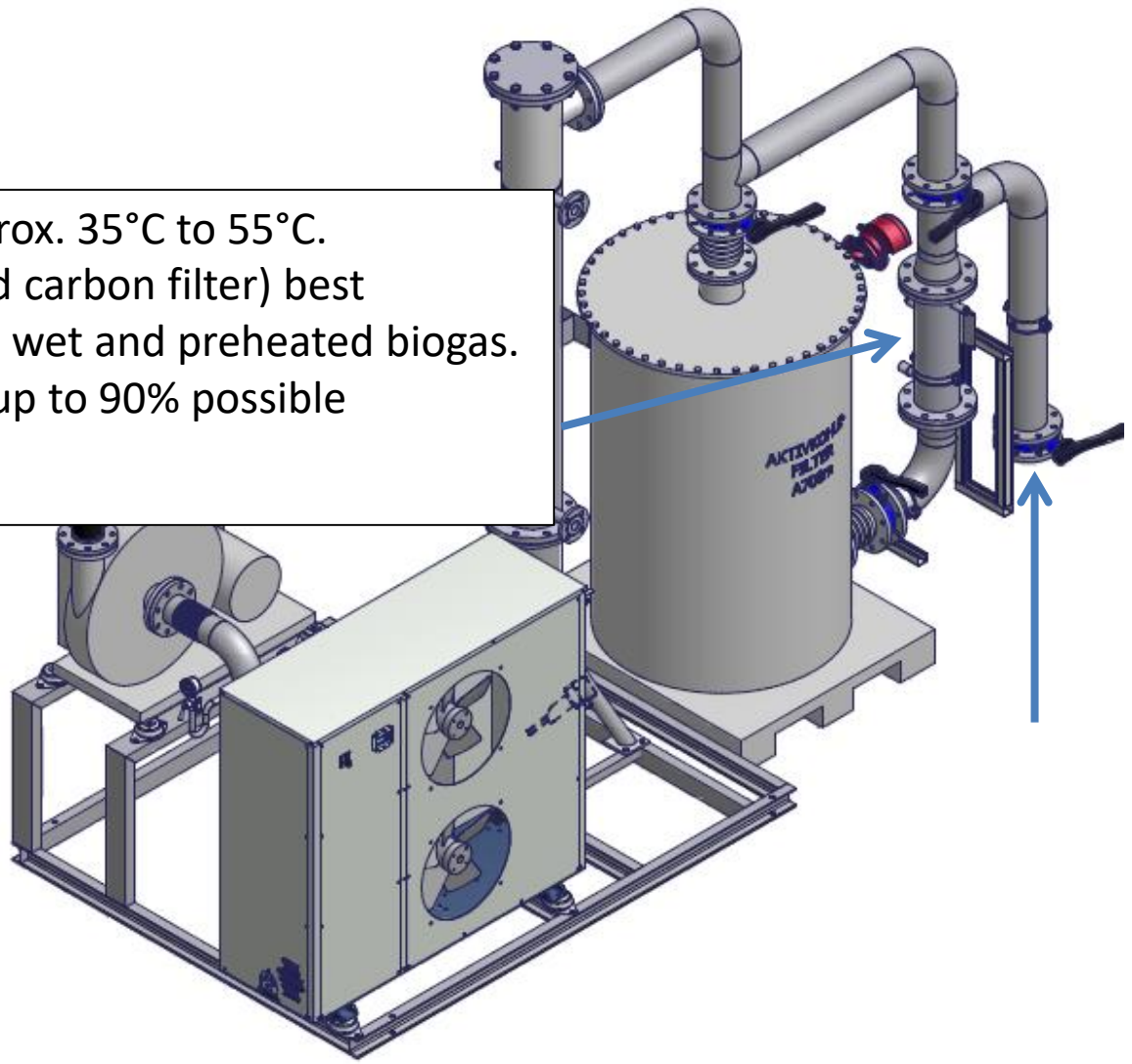
Activated carbon filter

Biogas cooling and drying

Biogas blower

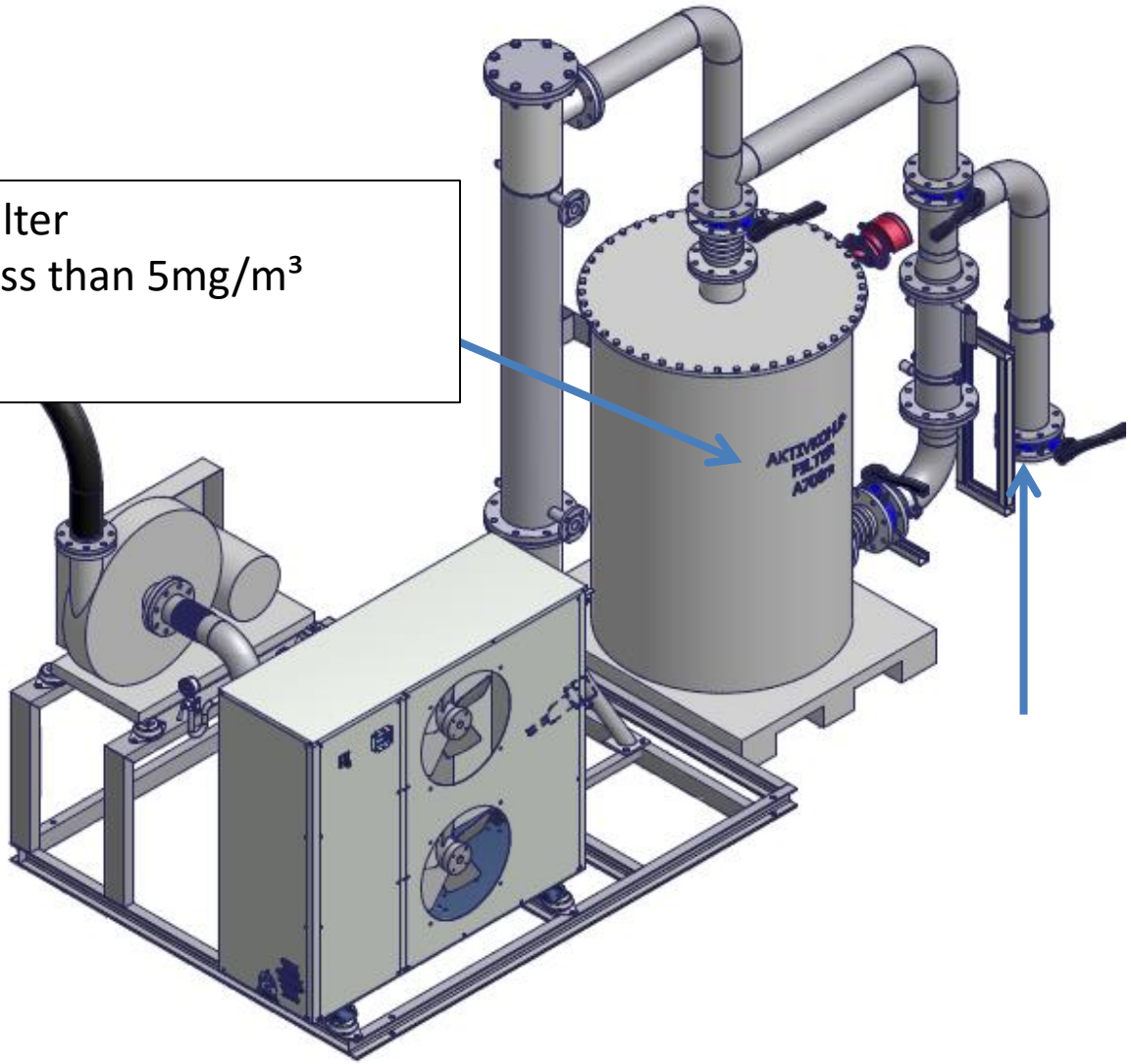
Biogas treatment system

1. Heat up from approx. 35°C to 55°C.
   The ACF (activated carbon filter) best performance with wet and preheated biogas.
   Loading capacity up to 90% possible



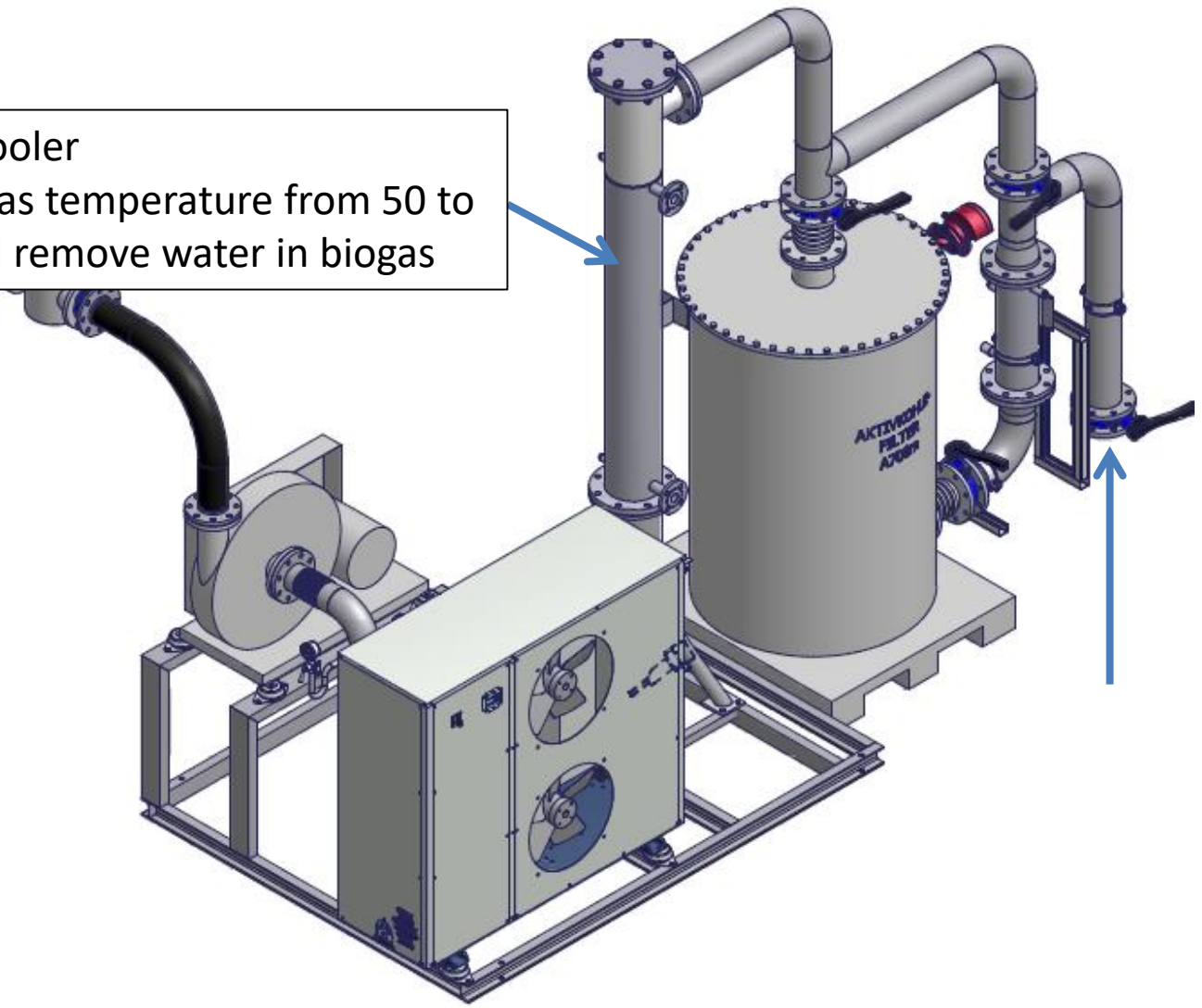
Biogas treatment system

2. Activated carbon filter
to reduce H_2S to less than 5mg/m³

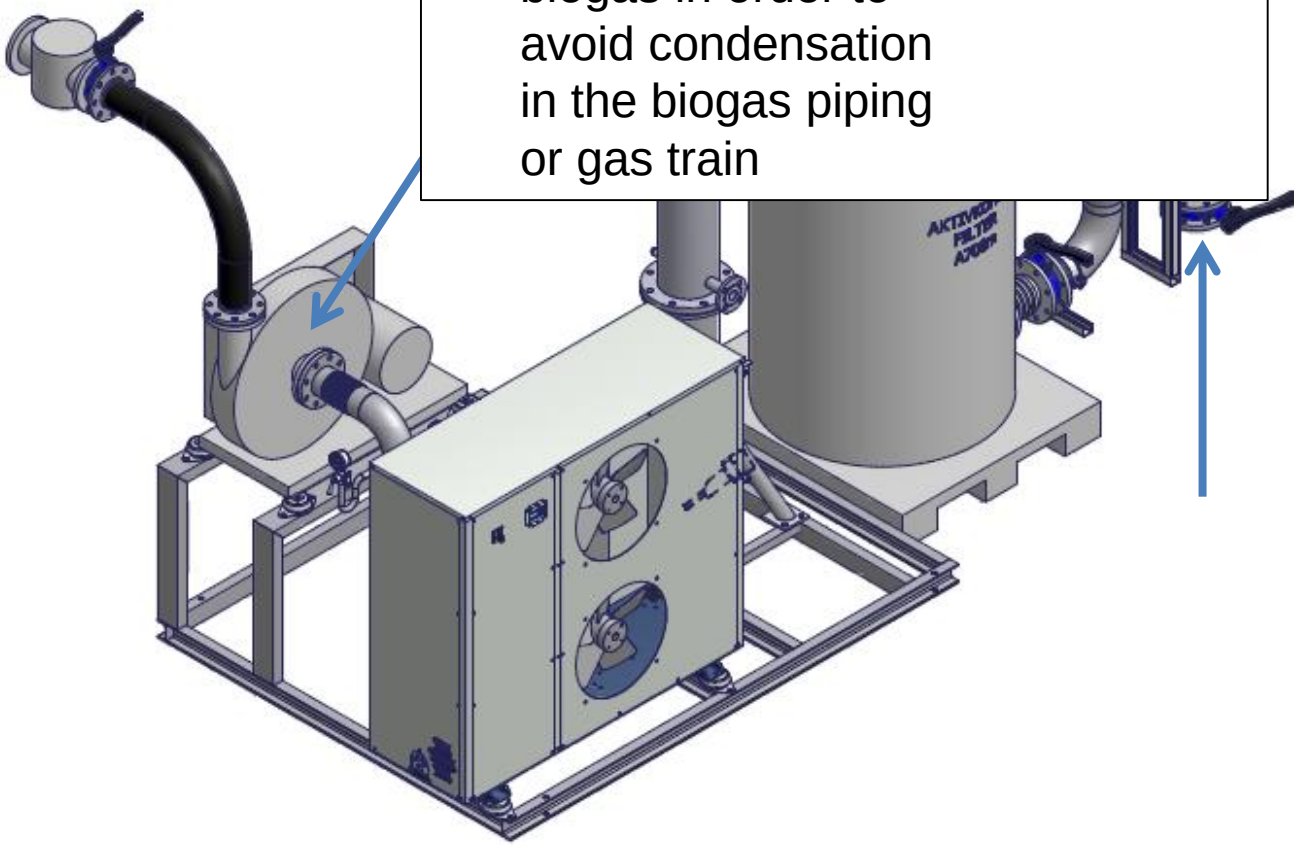


Biogas treatment system

3. biogas cooler
reduce gas temperature from 50 to 10°C and remove water in biogas



4. Gas Blower
Increase gas pressure from -10mbarü to +80 - 120 mbarü
Reheat of the biogas in order to avoid condensation in the biogas piping or gas train



Biogas treatment system

Activated carbon filter – important factor for the economic and smooth operation:

- Possible filter size of 1000 Liter – 6000 Liter (depending on the size of the gas engine + H_2S content of the biogas
- Design basis is the volume flow, flow speed and dwell time of the biogas
- Project related, a trace heating of the filter could be necessary
- Condensation of the biogas in the filter must be avoided
- Special type of activated carbon for reduction of H_2S or Siloxane available

Biogas treatment system

Example for 2x 6000 Liter activated carbon filter for a gas treamtment system of 2000 m3/h in Germany – CHP capacity of approx. 4400 kW el.

Biogas treatment system

Gas analysis – important factor for the smooth operation:

- Measuring of CH_4, H_2S and O_2 content in the biogas before gas engine
- Safety funtion + setting of the start adjustment of the gas engine

Experiences in the field.

Total loss of an exhaust gas heat exchanger due to wrong H_2S monitoring.
(in combination with an catalyst in the exhaust system – total loss within 2 weeks of operation.

Experiences in the field.

SiO_2 – residue on a piston of a gas engine, due to missing Siloxane treatment of the biogas

Result: Knocking of the gas engine – engine breakdown

*Picture from Shell Deutschland Oil GmbH

Experiences in the field.

H_2SO_4 – corrosion on a piston of a gas engine, due to missing H_2S treatment of the biogas

Result: Seizing of the piston

*Picture from Shell Deutschland Oil GmbH

Thanks for your kind attention.

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