

Energy Generation from Biogenic Waste and Residues



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Biogas Monitoring – „Why and How?“



Company Structure



Binder Group AG

Finance Holding



Binder Engineering & Instrumentation

Sales & Service Companies in Germany, The Netherlands, Belgium, Italy, Switzerland, China & Singapore

Manufacturing Companies



BINDER GmbH

Gas Flow Meter, Gas Analyzer and Control Systems - with following product lines:
COMBIMASS® / VACOMASS® / CAMASS®



INSTRUM AG

Stainless Steel Pressure Regulators and Valves



BETA B.V.

Pressure and Temperature Switches

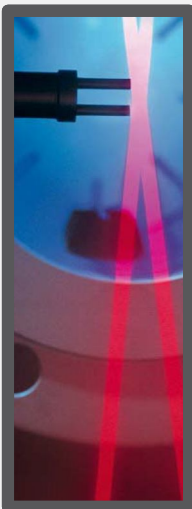
BINDER's business

- BINDER's main business is biogas flow metering and gas analysis, air flow metering and aeration control in WWTPs

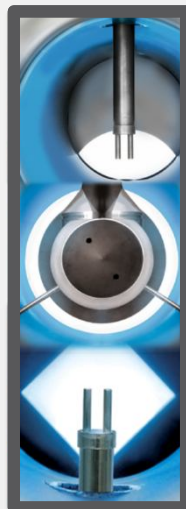
Gas Flow Metering



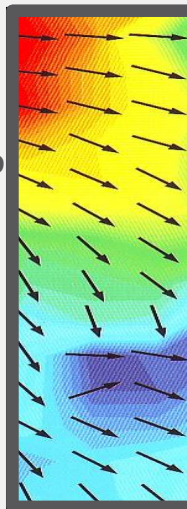
Real Gas Flow Calibration



Gas Flow Control



CFD Flow Simulation & Flow Conditioning



Hardware & Software



Gas Analysis



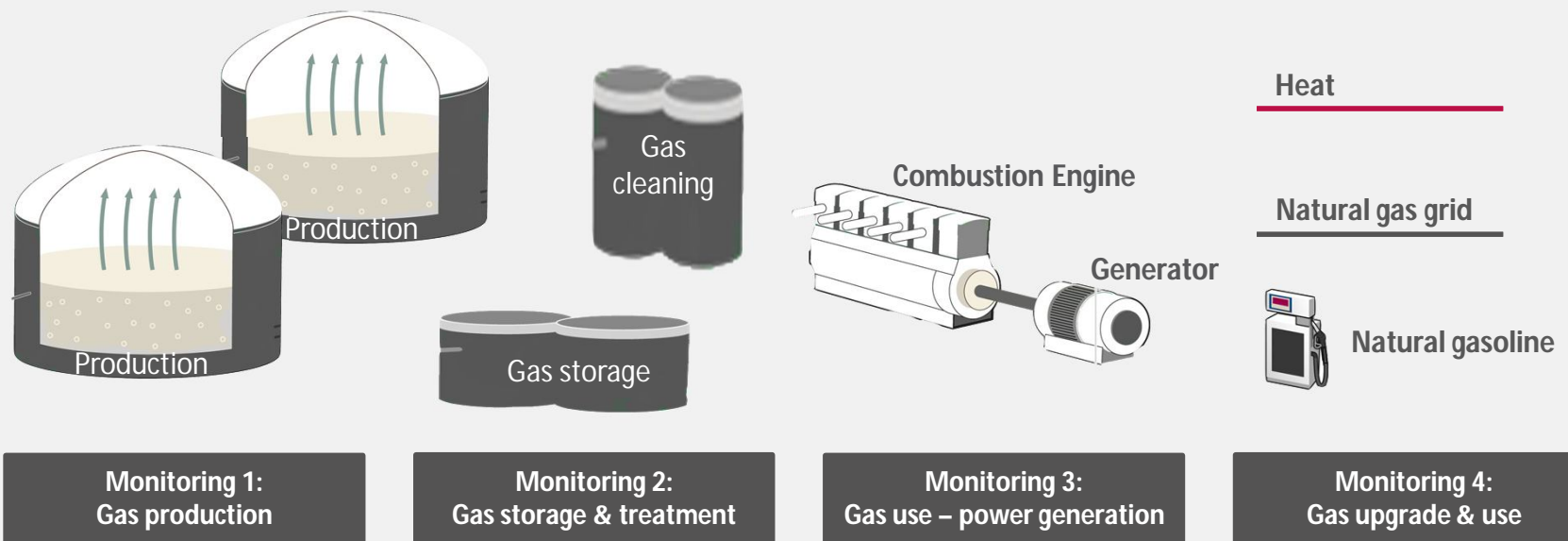
Where does biogas comes from?

- Sewage treatment plants
- Agricultural anaerobic digester plants
- Solid waste (composting) plants
- Landfill plants
- Biogas upgrade plants
- Anaerobic pre-treatment of industrial sewage coming from food production





Scheme of a biogas plant





Where monitoring of biogas becomes essential?

- Performance of the digester:
monitoring amount of feedstock vs. production of biogas
- Performance of H₂S -scrubber/biofilter:
monitoring cleaning performance to protect CHP units
- Control and adjustment of CHP units:
adjust engine settings on CH₄-concentration
- Grid injection or other further use:
monitoring of gas quality and quantity, calculation of energy contents



Why is process monitoring necessary?

All plant components are sophisticated and rather expensive.
Monitoring of plant equipment becomes an important issue for protection and for reliable long-term operation

- Supervision of individual components, e.g. digester, H₂S scrubber
- Protection of sensitive equipment, e.g. CHP-engine biogas engine (CHP unit)
- Preventive alarm settings to react timely on process fluctuations
- Improve feeding cycles and reduce raw material usage
- Comply to legal requirements, e.g. evidence of biogas production volumes and gas-quality

→ **Result:** Increase of safety, efficiency and profitability



Cost - CHP engine repair vs. use of gas analyzer

CHP breakdown	Gas Analyzer
CHP repair: 20,000 – 50,000 EUR	Purchase: 8,000 – 10,000 EUR
Loss of income: 1,000 – 10,000 EUR	Installation: 1,000 EUR
	Maintenance: 1,500 EUR / year
Total: 21,000 – 60,000 EUR per case	Total: 15.000 – 20.000 EUR in 5 years
Thread: Bankruptcy of plant operator	Additional benefit: Use measured parameter to operate the plant more efficient and economic

COMBIMASS® - Thermal mass flow meter and gas analyzer for biogas



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BETTER CONTROL. BETTER ENVIRONMENT.



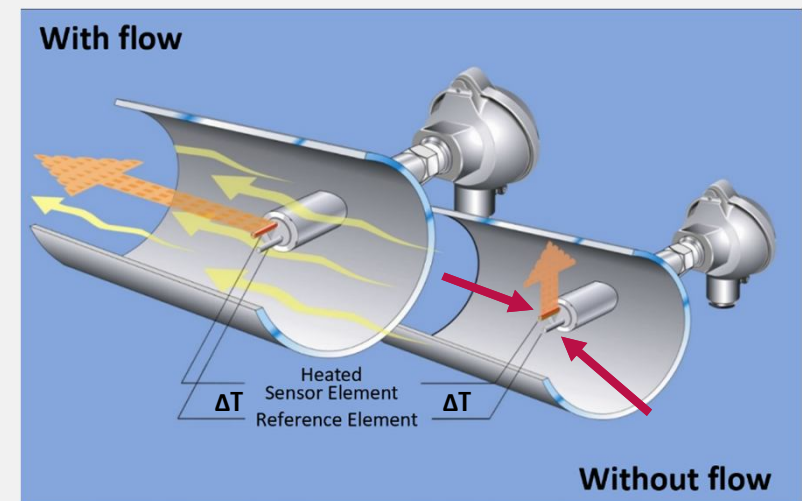
COMBIMASS® Thermal dispersion mass flow meter

Gas molecules cross the heated sensor tip and cool it down /than more molecules than higher ΔT

$$\Delta Q = \dot{m} \cdot c_p \cdot \Delta T$$

Absorbed amount of heat =
Gas mass flow · specific thermal capacity of the gas
Differential temperature

- Thermal dispersion technology determines gas mass flow directly
- Gas temperature can be measured at the same time
- C_p must be known – simple for pure gases, sophisticated for gas mixtures



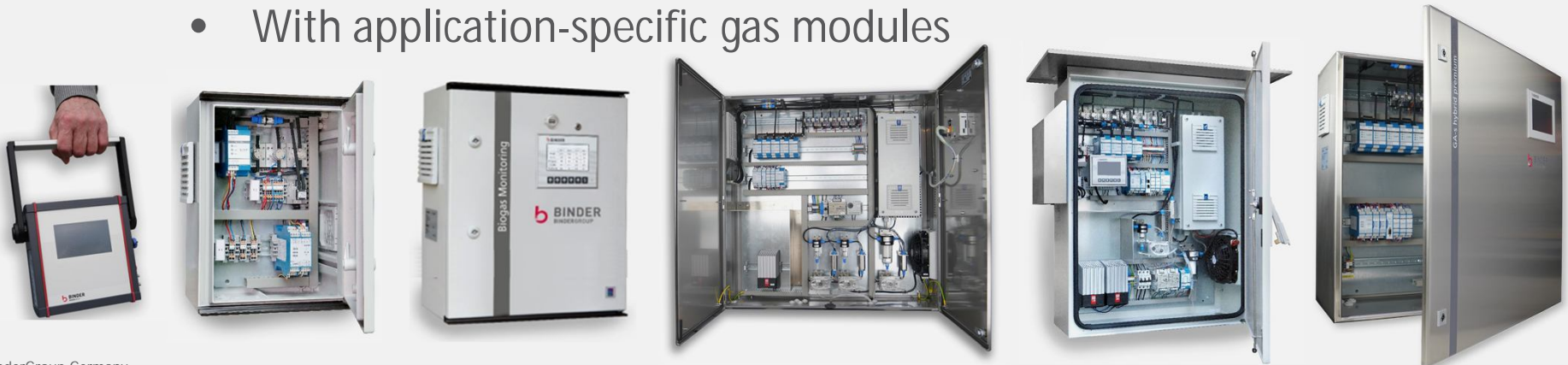
Advantages

- Unaffected by pressure and temperature changes
- Corrosion-resistant (sensor made of 316 Ti)
- Very precise due to customized calibration
better **+/- 2.5% of reading + 0.2% of full scale**
- Precise also at very low pressure and low gas flow rates
- Reference sensor can be used to measure gas temperature too
- Long-term stable, preventive maintenance free



Analyzer systems of COMBIMASS® series

- Mobile analyzer type GA-m for biogas, digester and landfill gas
- Completely modular analyzer station GA-s hybrid:
 - Simple and standardized OEM-design hybrid eco with fixed configuration
 - Variable with the hybrid premium
 - With application-specific gas modules



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Maintenance is made smart & easy

It is imperative to maintain this equipment, to ..

- No special skills of technicians at site is required
- Use Ethernet/Internet remote control, troubleshooting and diagnostic assessment
- Manual calibration and on site Auto calibration is possible

→ **Any downtime will put your plant at risks!**

Pump



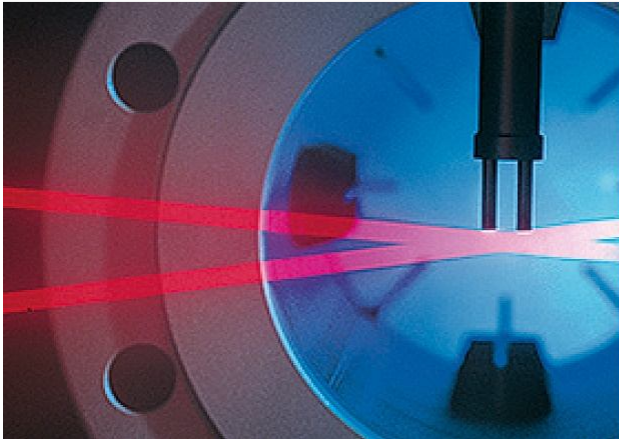
Valve



Summary

- Quantitative and qualitative plant monitoring of gas production and use
- User friendly operation
- Modular technology suitable up to 70°C ambient temperature and hazardous zones
- Applicable in all solid waste treatment and sewage treatment, biogas plants and landfills
- Smart maintenance can be done easily at site

→ **Stable, safe and profitable** operation of your biogas plant!



Any questions?

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