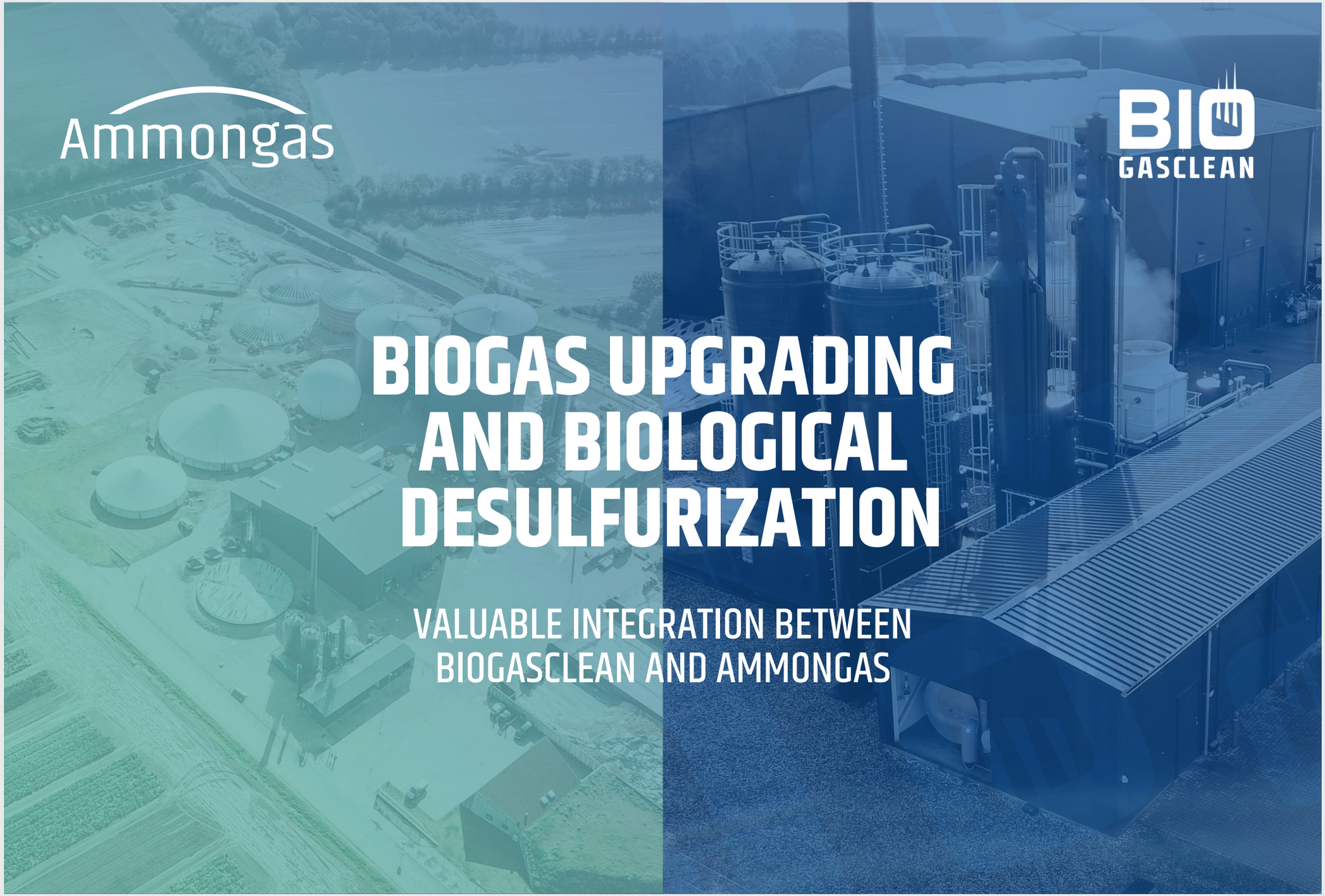
Ammongas
BIO GASCLEAN
BIOGAS UPGRADING AND BIOLOGICAL DESULFURIZATION
VALUABLE INTEGRATION BETWEEN BIOGASCLEAN AND AMMONGAS

WE CREATE A SUSTAINABLE, EFFICIENT AND ECONOMIC SOLUTION

Ammongas is a Danish producer of turnkey environmental facilities with more than 27 biogas upgrading plants across Northern Europe. Ammongas builds, delivers, and commissions amine biogas upgrading plants tailored for the specific needs at hand.

The upgrading process is designed to minimize heat and power consumption, by only compressing the upgraded biogas, and recuperating the heat used for stripping the CO2. By only compressing the upgraded biomethane the upgrading process runs pressureless and is thereby safe to operate and less expensive to build. The recuperated heat can be used as process heat in e.g. digestors, preheating of the organic material, or in heat pumps.

The upgrading plant is robust, and fully automated for autonomous operation. This setup saves working hours and keeps expenses low.

The upgrading plants are produced at a high quality which ensures a guaranteed operation time of 98 % (average +99 %), with only two short shutdowns for scheduled maintenance yearly.

H2S is handled in the CO2 stream by biological scrubbing from BiogasClean. By handling the H2S in the CO2 stream, air can be used for a more thorough and less expensive cleaning. Further the potential down-time of the H2S treatment will not affect the production of biomethane.

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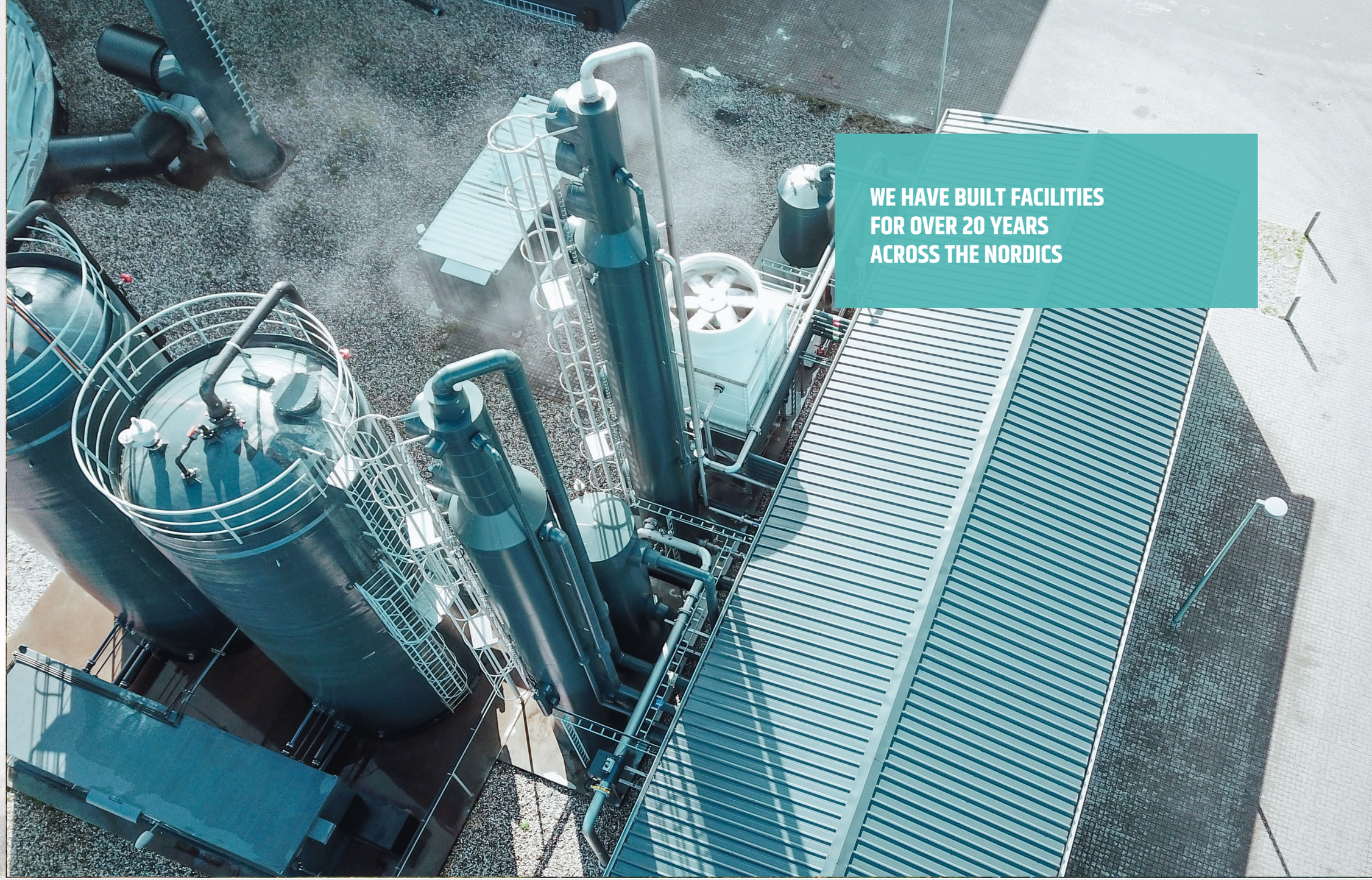
WE HAVE BUILT FACILITIES
FOR OVER 20 YEARS
ACROSS THE NORDICS

Ammongas

Biogas - renewable energy from organic waste streams

Biogas is a byproduct from anaerobic digestion of organic waste streams at livestock farms, food processing plants, breweries, palm oil mils, starch factories,ethanol distilleries, paper mills and other waste water treatment plants. Biogas is a renewable energy source and contains 50-70% methane (CH_4), 30-50% carbon dioxide (CO_2) and 0.1% to 3% (1,000 to 30,000 ppm) hydrogen sulfide (H_2S).When the H_2S is removed biogas can substitute oil and gas and be used for power and heat production or upgraded to natural gas quality.

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Why it is necessary to reduce the H2S

H2S will form sulfur dioxide (SO2) and sulfuric acid (H2SO4) during combustion which results in a very aggressive corrosion. The corrosion will literally reduce the lifetime of the downstream equipment by years! This is why gas engine manufacturers require that H2S in the clean gas must not exceed 100-250 ppm. Otherwise, the operating costs for change of engine oil, spark plugs and other maintenance will increase significantly. Furthermore, there will be high costs for repairs and income lost during overhauls and break downs. Air quality standards is another driver as combustion of un-cleaned biogas will result in acid rain from emissions of sulfur dioxide (SO2). Also health and safety standards may require H2S removal as H2S is toxic even in small concentrations.

Biogasclean A/S

Biogasclean is specialized in biological desulfurization of biogas and carbon dioxide without the use of chemicals. We develop, manufacture and supply fully automated gas cleaning systems for H2S removal combining low operating costs with high availability.

Our track record comprises mid 2021 more than 295 plants in operation or under construction in 40 countries. Biogasclean supplies clean gas to more than 650 MW gas engines and boilers and removes sulfur from more than 20 biogas upgrading units.

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BIO GASCLEAN | The key to innovative and efficient production of biogas

Amine upgrading combined with Biological H2S removal from the CO2 stream (off-gas) provides the highest methane efficiency and the lowest OPEX:

- Highest possible methane recovery: >99.9%
- Lowest possible loss of methane: <0.1%
- Lowest electricity consumption: <0.0035 kWh/scf raw biogas
- Net heat consumption: 0.003 – 0.006 kWh/scf raw biogas
- No need for pretreatment of the raw biogas
- No need for high pressure of the raw biogas
- High flexibility for possible variations in biomass
- Valuable integration between Biogasclean and Ammongas; Like reuse of low temperature water, control signals, pressurized and warm off-gas etc.

No.	Client	Country	Year	Biogas flow (scfm)	CO2 flow (scfm)	H_2S in CO2 (ppm)
1	BB Biogas, Vraa	Denmark	2017	1.650	710	1.500
2	Nature Energy Månsson, Brande	Denmark	2017	935	350	7.500
3	Lundsby, Grønhøj	Denmark	2017	910	360	1.000
4	Lundsby, Iglsø	Denmark	2018	965	380	2.220
5	Lundsby, Storde	Denmark	2018	850	320	2.220
6	Lundsby, Outrup	Denmark	2019	1.090	460	4.500
7	Ribe Biogas	Denmark	2019	1.870	880	5.550
8	Michael Sangild, Extension, Roedekro	Denmark	2019	1.000	350	5.000
9	Iglsoe Biogas, Extension	Denmark	2019	1.090	580	2.750
10	Lundsby, Vinkel	Denmark	2019	4.240	1.590	6.700
11	Lundsby, OL Bioenergy, Phase 2	Denmark	2020	685	340	4.500
12	Lundsby, Vesthimmerland	Denmark	2020	4.240	1.130	6.700
13	Nature Energy, Glansager	Denmark	2020	2.490	1.270	7.500
14	Renew Energy, Blaabjerg Biogas	Denmark	2021	1.560	590	5.000
15	Lundsby, Grauballegaard	Denmark	Under construction	1.030	460	4.500
16	Storde Biogas	Denmark	Under construction	910	320	2.222

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