SOLUTIONS FOR BIOGAS AND BIOMETHANE TREATMENT

Advanced technologies for renewable gas conditioning.

Parker

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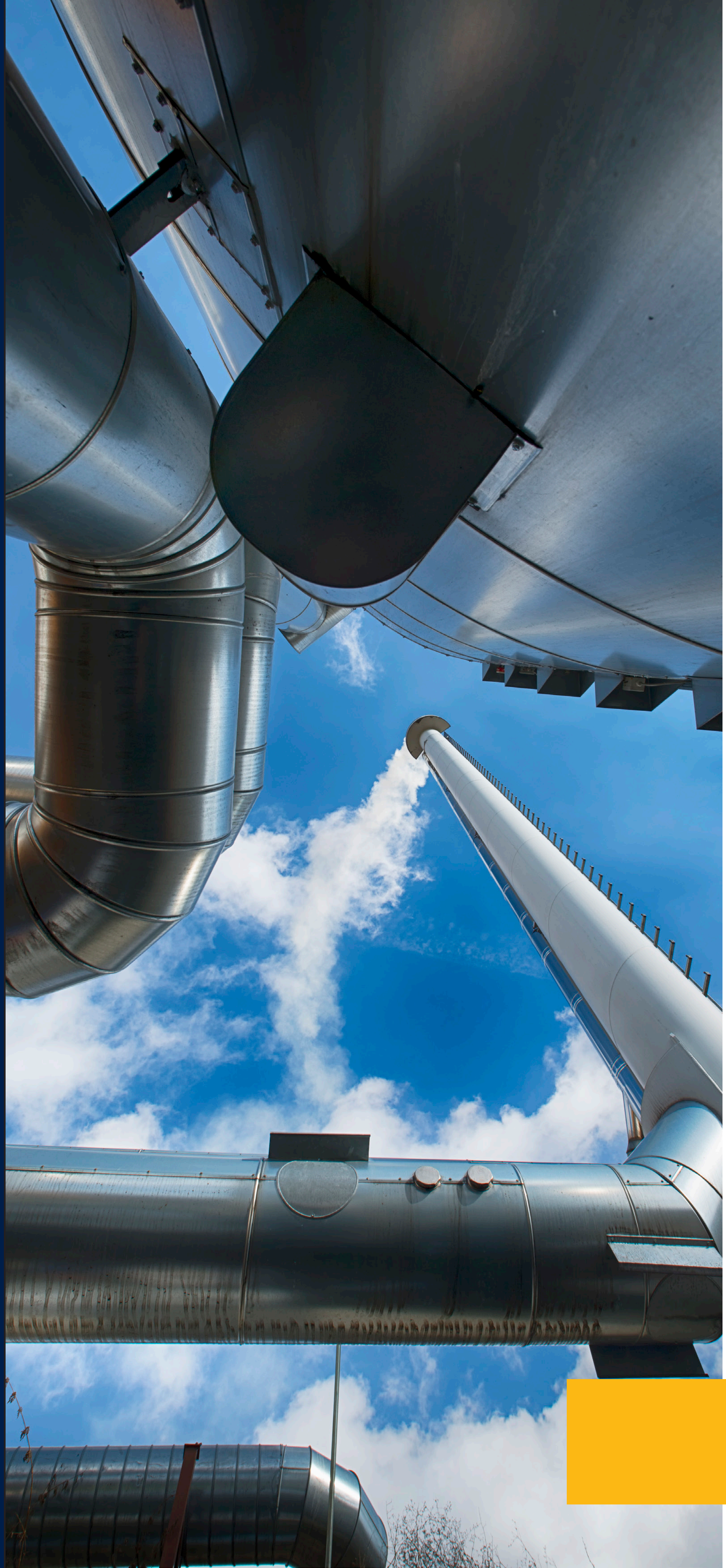


BIOGAS ORIGINS

DIGESTER GAS

Anaerobic digestion involves converting organic materials such as animal waste, agricultural residues and food processing waste into digester gas. The waste material is placed into an airtight digester where critical parameters such as temperature, pH level and retention time are carefully monitored.

The resulting biogas, composed primarily of methane (CH_4) and carbon dioxide (CO_2), can be utilized directly for energy production or further upgraded into biomethane for grid injection or vehicle fuel applications.

LANDFILL GAS

Landfill gas is generated through the natural anaerobic decomposition of municipal and industrial solid waste. The collected gas mainly consists of methane and carbon dioxide, but often contains siloxanes, halogenated hydrocarbons and a variety of volatile organic compounds (VOCs) originating from everyday products and industrial residues.

The gas is extracted through underground well systems, compressed and treated for energy recovery or biomethane upgrading.

WASTEWATER TREATMENT GAS

Biogas is produced during the anaerobic digestion of biosolids in wastewater treatment plants. This gas stream typically has high methane content but also exhibits high concentrations of hydrogen sulfide, ammonia and water vapor, making it chemically aggressive and corrosive.

Inadequate biogas filtration dehumidification and water separation can damage biogas CHP engines and upgrading equipment.

COMBINED HEAT AND POWER GENERATION

Biogas, once properly treated, represents an excellent renewable fuel for combined heat and power (CHP) units. In a CHP system, biogas is burned in gas engines to generate both electricity and thermal energy simultaneously, maximizing energy efficiency.

Raw biogas as produced from digesters, landfills, or wastewater plants is saturated with water vapor and contains impurities like hydrogen sulfide (H_2S), ammonia and particulates. If not adequately treated, these contaminants can lead to serious issues such as corrosion of engine components, fouling of internal surfaces, reduced combustion efficiency, and ultimately, costly downtime and repairs.

This pre-treatment stage not only safeguards the performance of the CHP unit but also maximizes the economic return of the biogas plant by minimizing downtime and increasing energy output.

Challenge

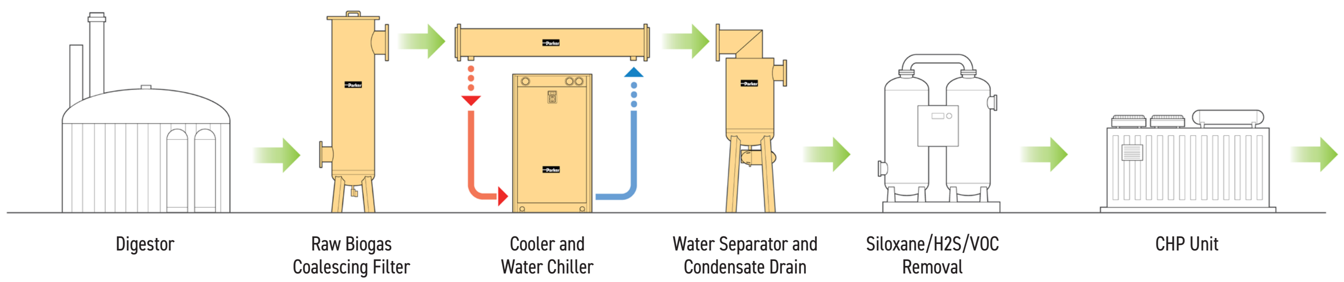
Contaminants such as water vapor and particulates can cause corrosion, deposits and overall system degradation, impacting the performance and availability of CHP units.

The selection of an effective and reliable biogas dehumidification is crucial to improve overall efficiency, reducing maintenance and running costs.

Solution

Parker's complete range of filtration, cooling and separation technologies ensures that biogas is clean and dry before it reaches the engine. By removing corrosive moisture, Parker's solutions protect engine valves, turbochargers and combustion chambers, extending maintenance intervals and improving operational reliability.

Flow Diagram



SOLUTIONS

Raw biogas pre-treatment and dehumidification.

Preparing raw biogas for either cogeneration or upgrading begins with the removal of moisture and particulates that compromise process efficiency and equipment life.

With Parker's modular and scalable approach, pre-treatment systems can be precisely tailored to different plant sizes, flow rates and environmental conditions. Parker offers a comprehensive range of technologies dedicated to this critical phase:

Hyperfilter BioEnergy (FFB)

Highly advanced raw biogas coalescing filter combining ultra-high particle retention efficiency, with extremely low pressure drops, eliminating solid particles, foams and suspended matter from the biogas stream. The advanced stainless steel (AISI 304/ AISI 316L) construction ensures durability even in harsh, corrosive environments.

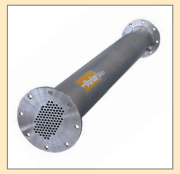
MORE INFO

Hyperchill BioEnergy (ICE/ ICEP Series)

Process chillers specifically designed for biogas applications, providing safe and reliable operation in the harshest environments. Available with special coatings for bioenergy applications, they are engineered for low energy consumption and reliable performance across a wide ambient temperature range, thanks to high performance components and a compact design, including storage tank and pump.

MORE INFO

Hypercool BioEnergy (WFB Series)



Shell and tube heat exchangers optimize thermal transfer to maximize cooling efficiency while maintaining low pressure drops. The advanced stainless steel (AISI 304/ AISI 316L) construction ensures durability even in harsh, corrosive environments.
Re-heater exchangers (RBB series) are also available.

MORE INFO

Hypersep BioEnergy (CSB Series)

Cyclonic separators specifically designed for low pressure applications, maximizing water separation efficiency, minimizing pressure drops and avoiding any condensate dragging . The advanced stainless steel (AISI 304/ AISI 316L) construction ensures durability even in harsh, corrosive environments.

MORE INFO

Hyperdrain BioEnergy (HDF Series)

High capacity zero-loss mechanical condensate drains designed to work with dirty condensate and for low pressure operations. Without any electrical wiring, it automatically removes water condensate without releasing biogas, ensuring optimal operation without energy loss.

MORE INFO

Skid-Mounted Packages (ON REQUEST)

Skid-mounted packages are compact, robust and easy to handle. The Parker skid solution is a plug and play biogas dehumidification package specifically designed for outdoor installations and reliable performance in harsh operating conditions. The dehumidification skid has energy efficiency at the forefront of its design. The in-built flexibility to use a wide range of cooler/chiller combinations ensures the closest match to customer requirements thus delivering constant dewpoint performance regardless of fluctuations in operating conditions.

BIOGAS UPGRADING

Biogas originating from biomass, wastewater plants and landfills is an increasingly important alternative and a renewable energy. In raw form, it is primarily composed of methane and carbon dioxide with smaller amounts of hydrogen sulfide, ammonia, nitrogen and carbon monoxide. Before utilization, the raw biogas must first be treated to remove water vapor and other contaminants.

Biogas upgrading plants refine raw biogas into biomethane, a renewable gas with characteristics similar to natural gas, suitable for grid injection or use as vehicle fuel.

The result is a highly reliable and energy-efficient upgrading process that maximizes methane recovery and ensures compliance with strict biomethane quality standards, both for gas grid injection and CNG/LNG vehicle applications. Additionally, CO_2 separated from the methane can be purified and sold as a product to multiple industries.

Challenge

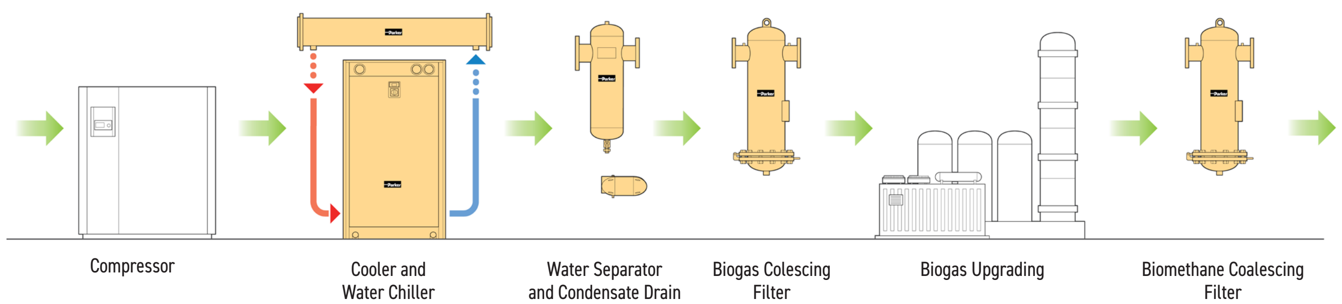
Upgrading processes—whether based on membrane separation, PSA (Pressure Swing Adsorption), or water scrubbing—require an extremely pure and stable gas feed. Even minimal traces of water, oil aerosols, or particulates can severely impact the separation media, reducing system performance, increasing maintenance costs and in worst cases, leading to early replacement of critical components.

Even minimal contamination can damage sensitive upgrading media, such as membranes or PSA beds, leading to inefficiencies, increased maintenance and reduced gas quality.

Solution

Parker's solutions for biogas upgrading focus on ensuring that the biogas is perfectly conditioned before compression and CO_2 separation. Through high-efficiency chillers, heat exchangers, separators and coalescing filters, Parker ensures that moisture, solids and oil residues are effectively removed.

Biogas Upgrading Process Flow Diagram



SOLUTIONS

Biogas Upgrading & Biomethane Treatment

Following pre-treatment, biogas destined for upgrading must undergo additional critical conditioning and filtration, particularly after compression, where temperature rise and oil aerosol formation become major concerns.

Parker provides highly specialized solutions to manage this phase:

Hypercool (WRA/ WRS series)

Post-compression shell and tube heat exchangers cool compressed biogas efficiently, preparing it for separation stages while maintaining low operational pressure drops.

MORE INFO

Hyperchill BioEnergy (ICE/ ICEP Series)

Process chillers specifically designed for biogas applications, providing safe and reliable operation in the harshest environments. Available with special coatings for bioenergy applications, they are engineered for low energy consumption and reliable performance across a wide ambient temperature range, thanks to high performance components and a compact design, including storage tank and pump.

MORE INFO

Cyclonic Liquid Separators (SFH-A / STH-A)

Cyclonic liquid separators positioned after cooling, remove condensate and liquid contaminants, protecting downstream filters and upgrading equipment.

MORE INFO

Stainless Steel Coalescing Filters (TGE Series)

Coalescing filters capture ultra-fine oil aerosols and residual liquids, guaranteeing the highest gas purity levels required by membrane and PSA systems. Housings are made from stainless steel and are ATEX-certified for hazardous environments.

MORE INFO

Hyperdrain (HDF Series)

High capacity zero-loss mechanical condensate drains, without any electrical wiring, operate reliably up to 16 barg, removing condensate without gas loss.

MORE INFO

Aluminum Coalescing Filters (G-BIO Series)

Final polishing filters installed after the upgrading stage ensure biomethane meets specifications for moisture, hydrocarbons and particulates prior to grid injection or CNG purposes. Housings are made from aluminum and are ATEX certified.

Thanks to Parker's engineering excellence, upgrading systems achieve longer life cycles, lower operating costs and consistently high biomethane yield.

EXPANDED APPLICATIONS AND INDUSTRIAL INTEGRATION

Beyond traditional CHP and upgrading applications, Parker's biogas treatment technologies integrate seamlessly into a variety of advanced renewable gas solutions:

CNG (Compressed Biomethane)

Compressed biomethane (Bio-CNG) is biomethane that has been purified and compressed to high pressure (typically 200–250 bar) for use as a renewable fuel in transport or for injection into dedicated CNG grids.

To ensure safe and efficient compression, the gas must be completely free of moisture and contaminants.

Parker provides advanced filtration and drying solutions that guarantee clean, dry biomethane prior to compression—protecting compressors, storage systems and downstream distribution.

LNG (Liquefied Biomethane)

Liquefied biomethane (Bio-LNG) is produced by cooling upgraded biomethane to cryogenic temperatures (around -160°C), reducing its volume for easier storage and transport, especially for long-distance or heavy-duty mobility applications.

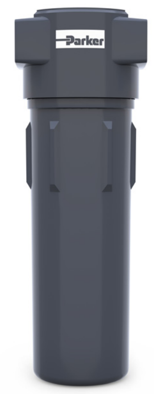
The liquefaction process demands ultra-pure, dry gas to prevent solidification, corrosion, or damage to cryogenic systems.

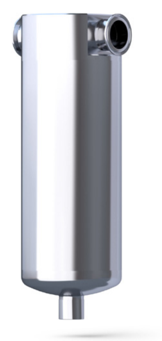
Parker supports Bio-LNG production with precision cooling and separation technologies, ensuring reliable gas quality before liquefaction.

CO_2 Liquefaction

As an important co-product of biogas upgrading, captured CO_2 can be purified and liquefied for reuse in food processing, industrial applications, or greenhouse fertilization. Parker supplies the necessary cooling, separation and purification equipment for efficient CO_2 recovery.

With its complete technology portfolio, Parker enables biogas plant operators to diversify their revenue streams, enhance plant profitability and contribute meaningfully to the circular economy





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