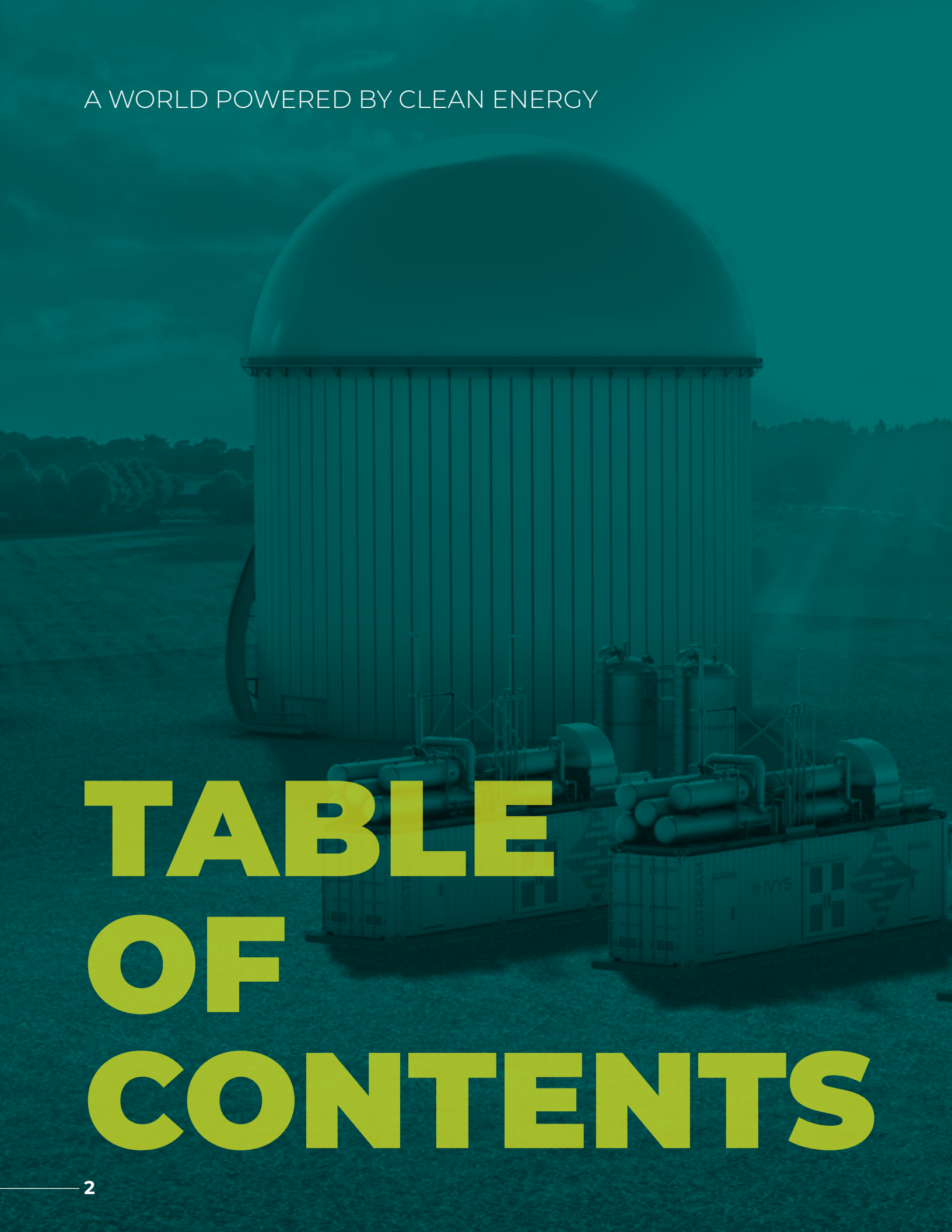
BIOSTREAM

A Fully Containerized Biogas Upgrading Solution

IVYS
Purely Driven

ivysads.com

A WORLD POWERED BY CLEAN ENERGY



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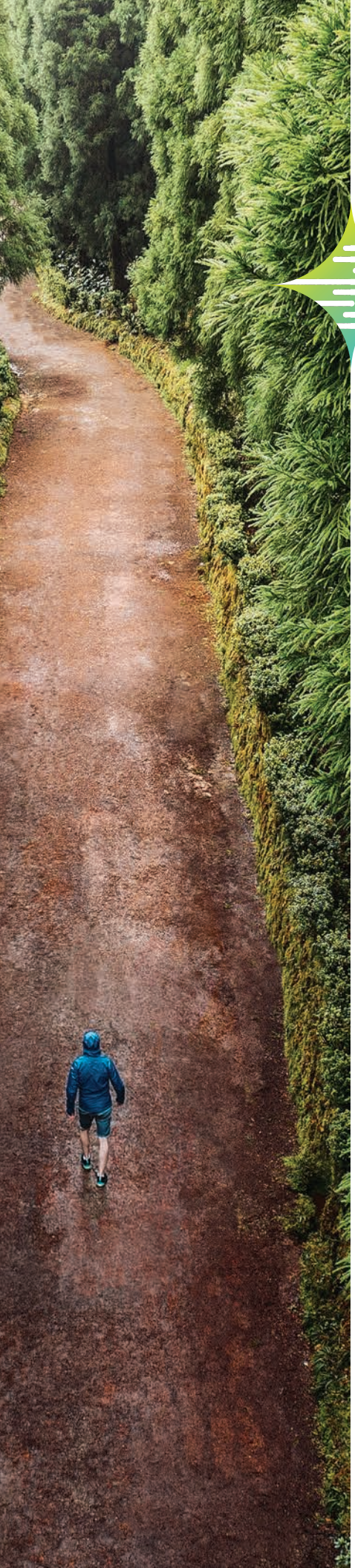
Our Vision



IVYS
Purely Driven

A World Powered by Clean Energy

By providing both high-performance and innovative technological solutions for the purification of biogas and by offering a wide range of equipment for the conditioning, compression and filtration of air and gas, Ivys is part of the great line of companies aiming to decarbonize the planet. A sustainable development model that integrates economic growth with social and environmental responsibility.

Our slogan, “Purely Driven,” reflects our vision of a cleaner planet, our continued search for more efficient solutions and our dedication to building an organization of excellence together that stays true to its values.

Our Reputation for Excellence

Ivys is recognized as an ethical, experienced and reputable player in Canada and on the world scene. Ivys is fully compliant with all North American and European codes and standards. As an Original Equipment Manufacturer (OEM), we guarantee the performance of our biogas upgrading systems.

CRN CE Ex PED c UL us LISTED
nqa ISO 9001 Registered GB TIIS ASME


Biostream

Fully containerized solution optimized for reliability, performance and life cycle costs

A standardized biogas upgrading solution with a scalable configuration designed for reliable and consistent Renewable Natural Gas (RNG) production at your Biogas site.

Plug and Play: Simple, Reliable and Scalable

Modularized, fully containerized units are designed for quick installation and plug-and-play operation. The units are factory-assembled, tested, certified and ready for operation at your site. Biostream solutions reduce site installation and commissioning times significantly and accelerate time to revenue generation.

Biostream modularity allows for fast and easy expansion of your biogas upgrading capacity. Simply add an additional Biostream unit to your site and increase your biogas processing capacity by 280 scfm and plan your capital investments over time. Avoid having stranded upgrading capacity and easily relocate your Biostream modules in your fleet of upgraders for maximum utilization of your biogas assets in a region.

Reliable Core Technologies: A cut above competing biogas upgrading solutions

At the core of the Biostream is Ivys' proprietary Pressure Swing Adsorption (PSA) technology, one of the most compact, economical, and reliable gas purification products on the market. The PSA's unique fast-cycle rotary valve technology and advanced adsorbents are optimally designed to maximize methane recovery even when the input biogas concentration fluctuates. A simple change in valve rotation speed ensures gas purity and optimal recovery.

Capacity
55-280 SCFM

RNG Purity
97+%

Turndown
20-100%

Methane Recovery
Up to
99+%

Converting waste to renewable energy

Creating profitable, clean-energy production assets

- Biogas is a valuable resource that can be derived through anaerobic digestion from agricultural, wastewater treatment plant, and food waste streams.
- Biostream is the cost effective solution to deliver RNG from smallscale and mid-sized biogas plants.
- Small scale biogas upgrading systems eliminate the need for gas conditioning systems at each small or mid-size site with transportation of biogas to centralized upgrading facilities, improving the economy of cluster projects.

The Biostream Advantage

Quality components lower life-cycle cost and drive revenue from upgraded biogas production.

- Low CAPEX
- Reliable gas purification technology
- Automation, monitoring & process automation
- Low power consumption
- Fast installation & activation

Key Benefits

Ivys' rotary valve and highly efficient proprietary adsorbent are the two core technology differentiators that are integrated into each advanced biogas upgrading system providing considerable CAPEX and OPEX cost savings.

Fully Certified for Site Operation

All units arrive on-site certified and listed by Intertek, saving on permitting and inspection costs and reducing site work time. Electrical, gas and fire regulators and inspectors may be directly referred to Intertek for certification details.

Intertek
LPC 1168662

CONFORMS TO
NFPA STD 79
UL STD 508A
UL STD 121201

Robust & High Reliability

Ivys PSAs have accumulated over 15 million hours of commercial operation with proven results.

Maximized Revenue

High recovery combined with low operating costs and robustness leads to an attractive life cycle cost compared to other upgrading technologies.

Low Power Consumption

One of the lowest possible power consumptions for biogas upgrading due to Ivys' advanced control systems and operation.

Easy to Control and Operate

Changes in gas composition require only the adjustment of the valve rotation speed. There are ONLY 3 buttons: START, STOP, and TRIP.

Oxygen Control

Biostream removes 40% of the total oxygen present in the raw biogas.

EQUIPMENT AVAILABLE

- **PSA System**
  Nine vessel, fast cycle, single rotary valve combined with high efficiency regenerative adsorbent.
- **Biogas Compressor**
  Biogas compressor package.
- **Water Chiller Package**
  A dewatering/compact cooler with heat exchanger.
- **Buffer Tanks**
  PSA inlet, recycle, biomethane, and exhaust gas buffer tanks to ensure smooth operation.
- **H_2S Removal Unit**
  A desulfurization unit for H_2S removal by activated carbon.
- **Rotary Equipment**
  Biogas blower package, biogas compressor package, regeneration vacuum pumps.
- **Post Treatment**
  On request.

MODULES INCLUDED

- **H_2S Removal System**
  Parallel vertical towers with a ladder and platform in between. The first filling—Darco BG1—is included. Each tower filling will last 90 days at nominal flow and 500 ppmv H_2S.
- **Dewatering System**
  Shell & Tube – one pass through – heat exchanger cooled to 40 °F-50 °F (4 °C-10 °C), and KO drum for condensate.
- **Feed Compressor**
  Oil flooded screw compressor – 125 HP – for feeding the biogas to PSA. The oil separator is integrated into the common block of the air end. The oil cooler is installed on top of the container and serves as a fan extractor.
- **PSA (Pressure Swing Adsorption) – Two Units**
  The two PSAs work in parallel, and the rotary valves operate at the same speed, at 115 - 120 PSIG (7.9 – 8.3 barg).
- **Exhaust Vacuum Pumps**
  Two vacuum pumps are installed for PSA regeneration. The pumps are oil-flooded, vane-type. The exhaust gas, containing mainly CO2, is sent to the atmosphere through a vent pipe installed on the top of the container.
- **Recycle Pump**
  A dry claw vacuum pump is used to recycle the residual methane from the PSAs before they undergo a regeneration process under deep vacuum.
- **Compressed Air System**
  Instrumental air is provided at -40 °F PDP and 120 – 140 PSIG. The compressor, air dryer and the wet air receiver are installed inside the Electrical room. Dry receiver is installed on top of the container.
- **Oxygen Generator for H_2S Removal Enhancement**
  Some oxygen injection may be required for the H_2S removal system to work effectively. Three oxygen generators are installed inside the electrical room. Each one can supply up to 9 litres/hour oxygen – 92% enriched.
- **HVAC**
  The electrical room has a controlled temperature (cooling & heating) ensured by a 36,000 BTU/h unit.
- **Chiller**
  The chiller provides cold glycol liquid (30% - 50% polypropylene glycol) for dewatering and to the feed compressor system, with the purpose of condensing moisture in the gas.
- **Top Skid**
  Installed on a frame, on top of the Biostream container, it contains the buffer tanks for inlet to PSA, RNG product gas, exhaust gas and recycle gas. The Fan extractor/cooler is mounted on the same skid.

Biostream Technical Specs

Capacity (NCMH & SCFM)	450 NCMH / 280 SCFM
RNG Purity	97+%
Methane Recovery	Up to 99.0+%
Lifetime Reliability	+20 Years
Delivery Pressure	6+ BARG/90+ PSIG
Turndown	40%-100% (Optional 20%-100%)
Control System	Fully automated
PSA Adsorbent Lifetime	+10 Years
Local Area Network (eWON-Tablet Access to control system)	Per Request
Remote Access to SCADA	Available
Fully Containerized Solution	Yes
Noise Level	<85 dB at 3 ft
Ambient Automatic Temperature Control Inside Container	Included
Gas Analyzer for Process Control	CH_4, CO_2, O_2, H_2S, (product and inlet gas)
Gas Flow Meters	Inlet Gas, RNG and Tail Gas
Instrument Air	Included
Water Chiller Package*	Included
H_2S Removal Unit	Included
VFD for All Rotary Equipment	Included
Interconnection Piping and Electrical Inside the Container	Included
Transportation, Installation, Commissioning/ Startup and Testing	On request

* Chiller and H_2S Removal Unit installed outside of container.

Control System

- Fully automated – Control Panel & Power Distribution Panels included
- PLC – Allen Bradley
- SCADA – Ignition Edge
- HMI – Local Touchscreen 19” provided
- eWon – For Remote Internet access to SCADA
- LAN – Tablet remote operation (250 ft) - on request
- Ambiental temperature control inside the Container
- Forced ventilation LEL control (Fan extractor)
- VFDs for all Dynamic Equipment
- Multipoint – Gas Analyzer for process control

Safety Features

Artificial ventilated room

One fan extractor is installed on top of the container. The continuous operation is monitored by two Positive Flow Switch instruments. Failure of either of the two PFS instruments will shut down, isolate and depressurize the unit.

LEL Continuous Monitoring

Two LEL detectors are installed in Biostream’s mechanical room. At 10% LEL, the fan extractor is accelerated to the maximum. At 20% LEL, the unit enters the shut-down, isolate, and depressurize sequence.

Each LEL instrument provides one analogical (0 to 100%), and two digital signals (H_{ALARM} at 10% LEL and HH_{ALARM} at 20% LEL).

One LEL detector will be installed in the electrical room and will have the same action as the ones installed inside the mechanical room.

Smoke Detector

One smoke detector is installed in the electrical room. An alarm on the smoke detector will trigger the shut-down, isolate and depressurize sequence.

Codes and Standards – Biostream

ASME BPVC VIII Div.
Rules for Construction of Pressure Vessels

ASME BPVC VIII Div.2
Rules for Construction of Pressure Vessels – Alternative Rule

ASME B31.3
Process piping

ASME BPVC II
Materials

ASME BPVC V
Non-destructive Examinations

ASME BPVC IX
Welding, Brazing, and Fusing Qualifications

NFPA 54
National Fuel Gas Code

NFPA 70
National Electric Code

NFPA 79
Electrical Standard for Industrial Machinery

API RP 520 Part I
Sizing and Selection of Pressure-relieving Devices

API RP 520 Part II
Installation of Pressure-relieving Devices

API RP 52
Guide for pressure relieving and depressurizing systems

API RP 500
Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1, and Division 2

API RP 505
Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2

API 497
Recommended Practice for the Classification of Flammable Liquids, Gasses, or Vapours and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

IEC/UL 60079-13
INTERNATIONAL STANDARD - Equipment protection by pressurized room “p” and artificially ventilated room “v”

ISA 106
Procedure Automation for Continuous Process Operations

UL 121201
Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

AINSI/CSA 149.6
Code for Digester Gas, Landfill Gas, And Biogas Generation and Utilization – used for field inspection

Service

Fast, Reliable Service

When you need it. Where you need it. Fully trained technicians available across North America to keep your Biostream operating at its peak.

Level	1	2	3
	Basic Support	Preventative Maintenance	Fully Managed Service
Remote access trouble shooting support	✧		
Off-site activity supervision	✧	✧	✧
Spare parts & consumables provided	✧	✧	✧
24/7 online & phone support		✧	✧
Remote equipment monitoring		✧	✧
Additional year of extended warranty		✧	
Annual managed/preventative services			✧
Spare parts inventory management			✧
On-site operations by field engineers			✧

Service, Maintenance, Commissioning & Training

Our range of local support services include remote access troubleshooting support with Tier II and Tier III service agreements.

Selected References

90+
installations worldwide

California Project

Biostream, Dairy farm to pipeline

California

Commissioned: 2021

Chantonnay Project

Biogas from Anerobic Digestion of local organic matter

Chantonnay, France

Commissioned: 2018

Fortis Project

Landfill gas to RNG into Fortis BC pipeline

Salmon Arm, B.C., Canada

Commissioned: 2013

Rumpke Project

Landfill gas to RNG into Duke Energy pipeline

Cincinnati, Ohio

Commissioned: 2009

Magic Valley Cleanup Hub

End-Use: RNG/CNG (Pipeline)
Digester Tech: Gas Cleanup

USA

Commissioned: 2021

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