Technology Reader
Agri Waste

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Contents

Summary

This technology reader represents a facility with cutting-edge solution for the sustainable treatment of agri waste such as maze, Napier grass, paddy, etc. and other organic waste. This document outlines the technical specifications and operational design of a facility developed for the anaerobic digestion of agri waste and organic waste streams. The plant is designed to receive, process, and convert high-solids agri waste and other organic waste into renewable energy and nutrient-rich fertilizers.

Trucked-in feedstocks—including mono-stream agri waste or combination of multi agri waste are collected and stored in dedicated bunkers and tanks. Prior to digestion, all materials are homogenized to ensure consistency.

The pretreatment technology for agricultural residues is a critical factor that directly influences the efficiency of the anaerobic digestion process. Since different types of agri-waste—such as maize stalks, Napier grass, and paddy straw—vary significantly in their fibre content, lignin structure, and moisture levels, the choice of pretreatment must be tailored to each specific biomass type. For example, high-lignin materials like paddy straw may require alkaline or steam explosion pretreatment to break down complex fibres and improve biodegradability, while Napier grass, with its high cellulose and relatively balanced C:N ratio, may only require size reduction and homogenization. Similarly, maize residues might benefit from mechanical shredding and moisture adjustment to facilitate digestion.

Despite these variations in pretreatment needs, we will consistently apply wet anaerobic digestion technology for this application. Wet digestion is particularly suitable for high-moisture feedstocks, which most agricultural wastes become after pretreatment or co-digestion. It offers advantages in substrate handling, microbial activity, and reactor stability, and is compatible with both mesophilic and thermophilic conditions. This approach ensures a robust, scalable, and cost-effective solution for converting agricultural biomass into renewable biogas, while also supporting sustainable waste management and circular economy goals in the agri-sector.

The core of the process is a temperature-controlled anaerobic digestion system that utilizes a two-step approach: pre-digesters initiate organic breakdown, while main digesters focus on methanogenesis to optimize biogas production. The resulting raw biogas is then upgraded via advanced membrane separation into high-quality renewable natural gas (RNG).

Post-digestion, digestate material is separated into solid and liquid fractions. The solid digestate is used as an organic fertilizer. The liquid portion undergoes ammonia stripping, recovering nitrogen in the form of ammonium sulfate—a concentrated and valuable fertilizer product.

This integrated facility demonstrates the future of circular, low-emission energy and nutrient recovery. A detailed video on the process flow can be seen here.

1 Introduction

Agricultural residues such as maize stalks, Napier grass, and paddy straw represent abundant and underutilized biomass resources with significant potential for renewable energy generation through anaerobic digestion (AD). These lignocellulosic materials are rich in organic matter—mainly cellulose and hemicellulose—which, under suitable pretreatment and digestion conditions, can yield substantial quantities of biogas.

- **Maize (corn)** residues are widely available post-harvest and offer moderate methane yields with proper shredding and moisture adjustment.
- **Napier grass** (elephant grass), a fast-growing tropical forage, is particularly promising due to its high biomass yield per hectare and favourable carbon-to-nitrogen ratio.
- **Paddy straw**, despite its high silica content, can also be a valuable biogas feedstock when co-digested or pretreated to improve biodegradability.

Utilizing these agri-wastes not only enhances energy security and supports decentralized bioenergy systems, but also helps mitigate open-field burning, reducing air pollution, and contributing to sustainable waste management in the agricultural sector.

The core objective of the facility is to transform organic waste into valuable resources through a controlled anaerobic digestion process. The resulting biogas is upgraded to renewable natural gas (RNG), while the digestate is separated into solid and liquid fractions for further recovery. The solids are utilized as organic fertilizer, and the liquid fraction undergoes ammonia stripping to recover nitrogen in the form of ammonium sulfate.

This facility represents a modern, sustainable approach to managing agri waste while supporting circular economy goals. It incorporates robust feedstock handling systems, advanced mixing technologies, grit management strategies, and downstream biogas purification and nutrient recovery processes. The following sections describe each system component in detail, highlighting their function, capacity, and integration within the overall process flow.

2 Feedstock Intake and Pre-Treatment

This section outlines the procedures and systems for receiving, handling, storing, and preparing feedstocks prior to anaerobic digestion. The primary solid feedstock, agri waste is collected from farms. All feedstocks are processed and homogenized to ensure consistent slurry quality for optimal digester performance.

Supporting systems include water addition, recycled liquid integration, and storage infrastructure designed for operational efficiency and emissions control.

The choice of pretreatment technology depends on the type of agricultural waste—such as maize stalks, Napier grass, or paddy straw—since each has different fiber content and biodegradability. High-lignin residues like paddy straw may need chemical or steam-based pretreatment, while others may only require shredding or moisture adjustment. Regardless of the feedstock, we will adopt wet anaerobic digestion technology, which is well-suited for high-moisture biomass, ensures efficient biogas production, and supports a scalable and sustainable waste-to-energy solution.

2.1 Process Sequence

The pretreated waste is received into underground bins and peristaltic pumps forward the waste to a distribution conveyor into the storage bunkers. The bunkers can get wetted to form a crust over the waste to reduce ammonia emissions into the air. From the bunkers, the waste is moved by skid steer as needed, to smaller underground bins where a screw conveyor picks up the waste and feeds peristaltic pumps, to pump the waste into the mixing tanks. Water is added to the waste with spray nozzles in the conveyor compartment to increase the efficiency of pumping the waste / water slurry to the mixing tanks.The mixers in tank stir the slurry mixture to ensure a homogenous slurry mixture for feeding the digesters.

2.2 Feedstock Overview - Grit Removal

Grit present in the waste can either be kept in suspension and allowed to pass through the anaerobic digestion process—where it would be removed along with the digestate solids post-digestion—or it may be removed earlier, either at the time of waste reception or after storage and before being fed to the digesters. Each option presents its own set of advantages, disadvantages, and cost implications, all of which must be carefully evaluated. The currently preferred approach is to remove grit using settling tanks and screens after digestion and prior to the separation of digestate solids.

3 Feedstock Receiving, Handling and Storage

3.1 Solids Receiving

The agri waste is received by way of 20 – 25 ton back dump trucks 5 days a week 8 hours of each 9-hour shift. The receiving area will accommodate two trucks at a time and each truck will be unloaded within 20 – 25 minutes allowing for receiving three to four trucks per hour.

The waste will be received into two underground bins with motor-controlled covers, each with a capacity of 40 tons. The truck will back up a ground level hopper chute and activate the motor control to open the bin cover. Once the cover is open, the truck will back-dump its load into the hopper chute, which directs the waste into the below-ground bin. After the truck is emptied, the driver will activate the closing of the bin cover and, once closed, will pull away to make room for the next truck.

3.2 Agri Waste Unloading and Storage

The agri waste will be unloaded into separate underground bins sized with a capacity of 40 tons.The average truck load will be about 20 to 25 tons but will vary between 15 and 27 tons in each load with a total of 15 -16 trucks per day required to deliver all the waste.

The bins are equipped with water spray nozzles to allow moisturizing each load of waste with about 10 tons of water per load.The bottom of the bin is equipped with a screw conveyor that will move the mixture to the suction side of peristaltic pump which will pump the waste to a distribution conveyor system above the storage bunkers.

Storage of the waste in the bunkers sized for 14 days of storage of each type of waste. Each bunker can hold about 884 m^3 of waste, a total of 10 bunkers will be constructed.

The bunkers will be covered with a building structure that has natural ventilation. The bunkers will have water sprayers to wet the waste with fresh water to crust the top of the storage pile and prevent excess ammonia vapors escaping into the atmosphere.

The bunkers will be filled from the bins using a distribution conveyor in each bunker, to allow for even distribution of waste within the bunker.

Bunker Silos Covered by Building

3.3 Solids Feedstock (Waste) Processing

The waste bunkers will be unloaded with a bucket loader with the waste dropped into the hatch of a covered underground bin with a capacity of 11.3 m^3 each, two bins total. Each bin will be equipped with a screw conveyor and water spray nozzles with water added as the waste is conveyed to a peristaltic pump. The waste and water slurry mix will be pumped to the mixing tanks.

3.4 Mixing and Mix Tanks

There will be two mixing tanks sized for one day capacity to achieve a homogenous mix of the feedstocks.

Mixing of the slurry in the tanks will be accomplished with external pumps recirculating the slurry mix with the suction of the pumps drawing from the bottom of the tank and returned through several piped connections along the outside of tanks creating a continuous horizontal and vertical stirring action of the mixture in the tanks.

The two mix tanks combine have a capacity for one day of storage plus 5% additional unfilled headspace, approximately 1 million liters each. The feedstock slurry will be pumped to the AD Hydrolysis Tanks using three pumps total each sized at 50% of the total pumping required, approximate flow rate of 742 lpm for each pump.

4 Anaerobic Digestion

The anaerobic digestion facility is designed to process a feed slurry with a daily input capacity of approximately 2,005.75 tons per day (tpd), equivalent to 1,823.4 metric tons per day (mtpd). This corresponds to a total volume of 2,032.4 cubic meters of slurry handled each day. The feed slurry is characterized by a dry matter/total solids (DM/TS) content of 16.86%, indicating a relatively high solids concentration suitable for high-solids digestion processes. The total nitrogen content of the feedstock is approximately 0.42% of the dry matter, which provides a balanced nutrient profile conducive to stable anaerobic digestion and efficient biogas production. These parameters define the input requirements necessary to maintain optimal operational performance of the biogas plant.

Hydrolysis is the first step in the anaerobic digestion of organic material. There are two hydrolysis tanks each sized for 5 days of HRT. Each tank is approximately 1,342,260 gallons (5081 m^3) plus head space. The temperature of the feed slurry in the anaerobic digesters shall be maintained in the thermophilic temperature range of 122 - 131^{0}F (50 to 55^{0}C).Total HRT for thermophilic anaerobic digestion is 20 days including hydrolysis.

Each hydrolysis tank will supply feedstock slurry to two digesters. Each of the digesters is sized for 15 days HRT, approximately 7,621.5 m^3 each plus head space. The feedstock slurry in the digesters will be continuously stirred by way of a recirculation loop drawing from the top of the digester tank, heated to a temperature of at least 52^{0}C (125.5^{0}F) with an external heat exchanger and returned to the digester near the bottom of the tank.

Each digester is equipped with four recirculation loops with an estimated flow rate of approximately 1,500 m^3/hour such that a total flow into and from the digester and heat exchangers is 6,000 m^3/hour.

4.1 Digester Slurry Heating

Temperature control of the digester slurry is provided by an external heat exchanger loop and gas fired hot water boiler supplied with the digester auxiliary equipment.

4.2 Biogas Collection

The hydrolysis tanks will have a positive suction ventilation system to draw out any biogas produced and will be piped to a common header with the AD tanks.
Each anaerobic digester shall be equipped with a double membrane roof and support structure that collects the biogas. The biogas outlet from the membrane roof of each digester is piped to a common header that includes the hydrolysis tanks vent lines. Two biogas blowers operating as part of the biogas treatment and upgrade system will maintain a low suction pressure drawing the biogas from the membrane roofs at a rate consistent with the amount produced.

4.3 Digester Effluent (Digestate)

Digester effluent (digestate) from the digesters using a common header pipe from the 4 digesters with two 100% sized pumps (alternating as needed) at a rate of approximately 66.25 m^3/hour is pumped to the digestate buffer tank.

4.4 Digestate

4.4.1 Digestate Buffer Tank

The digestate buffer tank will be a conical bottom tank used to settle grit to a screw conveyor for removal. The buffer tank provides for a continuous flow without upset to the digestate solids removal system and allows for any biogas trapped in the effluent time to percolate to the top of the buffer tank and be drawn out by a biogas blower to the biogas treatment system with the biogas collected from the digesters.

The digestate buffer tank shall is sized for a retention time of 30 minutes to allow grit to settle while the undigested solids and liquid is pumped to the digestate solids separation system by three pumps each sized at 50% flow.

The separated grit is processed through a screen that allows the water to be recycled while the grit is combined with the separated solids at the digestate solids cake dryer.

4.5 Digestate Solids Separation

4.5.1 Digestate Dewatering

The digestate will be dewatered utilizing three decanter centrifuges operating in parallel at a rate of 22.1 m^3/hour each. The solids will be dewatered to approximately 70% moisture. Polymers may be required to achieve separated solids of 70% moisture or less.

The solids from each centrifuge will be collected into a hopper and then transferred to a feed hopper for a rotary drum dryer by way of a screw conveyor. The hoppers and screw conveyor should be sized to handle 110 tons per day (100 metric tons per day) dry basis of solids transfer.

4.5.2 Decanter Liquid Fraction

The liquid fraction (centrate) will be stored in a buffer tank sized to hold the total flow for at least for a 6-hour period (one quarter of the total flow for 1 day). The expected total liquid fraction flow rate is approximately 1343 m^3/day. The buffer tank will be sized for at least 340.6 m^3.

4.6 Digestate Solids Drying

The digestate solids received at 35% dry matter and 65% moisture will be dried to 50% dry matter and 50% moisture using solar radiant heat. The digestate solid will be spread in layers in open drying rows and turned weekly to promote drying. When dried to 85% dry matter, the digestate solids will be collected by skid steer and loaded into a hopper for bulk loading or to a pelletizer that will compress and pelletize the digestate solids.

5 Biogas Treatment and Upgradation

5.1 Biogas Treatment

The raw biogas from the anaerobic digesters will be saturated with moisture and contain particulate matter, methane (CH_4), carbon dioxide (CO_2), hydrogen sulfide (H_2S), oxygen (O_2) and trace amounts of inert gases and volatile organic compounds (VOCs). The biogas treatment system is designed to remove moisture, particulate matter and H_2S.

The expected total flow rate is approximately 100,487 m^3/day. The biogas treatment system consists of two complete systems operating in parallel with a capability to clean 42.47 m^3/min each, 84.95 m^3/min of biogas total.
Each system will be designed such that media changes can be accomplished while the system is in operation. This will require lead-lag vessels. Media vessels may be shared between trains, for example the offline lag vessels can be valved as the lead vessels for either train as can each of the lead vessels when they become the lag vessel after a media changeout.

5.2 Biogas Scrubbing and CO_2 Recovery

The cleaned biogas will be upgraded to pipeline quality renewable natural gas (RNG) with a membrane separation system that allows separation of the CO_2 and the CH_4.

The system shall be designed for a flow rate of approximately 55,560 m^3/day and have an efficiency of at least 97.5% recovery of the biomethane with an option of 99% recovery.

5.3 CO_2 Recovery, Storage and Loadout

The CO_2 stream shall be recovered and chilled until it is in a liquid state to be stored for transport. An estimated 50,970 to 56,633 m^3/day of CO_2 should be recovered and processed into approximately 92 – 102 tons/day of liquid CO_2.

5.4 Specification/ Data Sheet Biogas Treatment and Upgrade

The biogas to be treated approximates the parameters in the first table below and the final values will be determined by the design of the AD system and mass balance information. The second table gives the parameters of Treated Biogas for Pipeline Injection.

Parameter	Unit	Average	Minimum	Maximum
Gas Flow	m^3/day			
Temperature	^{0}C	50	50	50
Pressure	Inches W.C.	70	70	70
Methane (CH_4)	%	55	55	65
Carbon Dioxide (CO_2)	%	42	35	44
Ammonia (NH_3)	ppm	TBD	TBD	TBD
Hydrogen Sulfide (H_2S)	ppm	TBD	TBD	TBD
VOCs	ppm	0	0	0
Moisture	%	95% Saturated	80%, Saturated	100%, Saturated

6 Ammonia (NH_3) Recovery, Storage and Loadout

6.1 Stripping Systems

The liquid fraction from the digestate solids decanter stored in a buffer tank will be processed by minimum of four stripping systems (streets), each system to consist of 3 ammonia strippers and 1 CO_2 stripper, total of atleast 12 ammonia strippers and 4 CO_2 strippers. In each stripper air and liquid fraction are brought in close contact with each other. The liquid fraction is sprayed in at the top of each stripper using full-cone spray nozzles to maximize the contact area between liquid and gas. The spray nozzles will be selected to optimize droplet size, but still sufficiently

Parameter	Unit	Average	Minimum	Maximum
Gas Flow	m^3/day	15,278	TBD	TBD
Temperature	^{0}C	27	4	50
Pressure	psig	TBD	30	TBD
Higher Heating Value (at STP)	Btu/SCF	1010	980	1100
Methane (CH_4)	% by V	96%	95%	100%
Carbon Dioxide (CO_2)	% by V	<2	<2	<2
Oxygen	% by V	< 0.2	< 0.2	< 0.2
Carbon Monoxide	% by V	< 0.1	< 0.1	< 0.1
Ammonia (NH_3)	ppm	< 140	< 140	< 140
Hydrogen Sulfide (H_2S)	ppm wt./wt.	<8	<8	<8
Mercaptan	ppmv	<7	<7	<7
Total Sulfur	ppmv	<160	<160	<160
Hydrogen	ppm	<600	<600	<600
Total Inerts	% by V	< 4.8	< 4.8	< 4.8
Moisture (at STP)	ppm	<147	<147	<147
Particulate	%>3 microns	<0.01%	<0.01%	<0.01%

large to avoid blockage. As such mass transfer area between liquid and gas will be maximized for fouling conditions. Air is introduced into each at the bottom via an air distribution system. The applied air flow rates will provide sufficient turbulence to maximize mass transfer in the system. Each stripper will be equipped with two pumps. One pump will provide internal circulation for spraying, while the other is used to feed the next stripper.

6.1.1 CO_2 Stripping

The goal of this stripper is to remove CO_2 from liquid fraction, thereby increasing its pH, avoiding the need for caustic soda (NaOH) dosing every day. Fresh air is used as the stripping gas. The CO_2 stripping is performed without additional heating since CO_2 is more volatile than NH_3. As such mostly CO_2 is stripped. The CO_2 stripper off-air is mixed up with the NH_3 laden air from the NH_3 strippers. The air mixture subsequently goes to the acid scrubber section for NH_3 recovery.

Each street of CO_2 strippers shall be capable of processing approximately 289 tpd (262.7 mtpd).

6.1.2 Ammonia Stripping

To strip ammonia, the liquid fraction will be heated to a temperature of 65°C (149°F). Each street will have heat exchangers on the feed to the first NH_3 stripper to provide the required heat. 3 NH_3 strippers are in place in each street. Liquid fraction will go through the system front to back, while air goes back to front. In each stripper the liquid fraction is contacted with air to maximize NH_3 transfer from liquid to gas. This results in an NH_3 laden air stream, and a liquid fraction stripped from NH_3. The NH_3 laden air stream is led to the scrubber section for NH_3 recovery as ammonium sulfate, $(NH_4)_2SO_4$. Scrubbed air is subsequently reused for stripping.

The influent ammonium concentration is around 3,526 mg N/L and the effluent concentration after stripping is 1,200 mg N/L. This means that 66% of the dissolved ammonium will be removed and recovered as $(NH_4)_2SO_4$.

6.2 Ammonia Recovery, Acid Scrubbing

Each street includes a scrubber section for NH_3 recovery. The gas stream resulting from combining the CO_2 stripper exhaust and NH_3 stripping exhaust is fed to the main scrubber, where the bulk of the NH_3 is absorbed into the liquid acid phase. 70% w/w sulfuric acid (H_2SO_4) is used to maintain acid conditions. The exhaust gas of the main scrubber is then split. The main fraction is recycled to the NH_3 strippers. The rest is purged through a small acid scrubber to prevent CO_2 accumulation in the air recycle. The small scrubber is operated at low pH (<3) to minimize NH_3 concentration in the purged air. The effluent ammonia concentration of the recirculated air is expected to be around 500 ppm. Purged air NH_3 concentration remains below 15ppm.

Ammonia rich air is introduced at the bottom of the scrubber column while the sulfuric acid solution is sprayed at the top, creating a counter-current flow between the liquid and air. In addition, the scrubber is filled with packing material to optimize the contact area between liquid and water. In the scrubber an ammonium sulfate fertilizer is created, $(NH_4)_2SO_4$. Water is added to the scrubber to obtain the desired fertilizer concentration (35% w/w) and compensate for volume losses due to evaporation. This is necessary to avoid ammonium sulphate crystallization in the scrubbers: above 35% w/w $(NH_4)_2SO_4$ the probability of crystallization considerably increases potentially resulting in process disruption. The system uses approximately 27.7 tpd (25.2 mtpd) of water and 13.4 tpd (12.2 mtpd) of acid to produce 36.2 tpd (32.9 mtpd) of fertilizer with 35% $(NH_4)SO_4$ and recover 3.7 tpd (2.44 mtpd) of ammonia nitrogen.

7 Annexure

7.1 Annexure 1: Glossory of Terms

Not all terms provided are used in this document but may be added as the Basis of Design is updated and are included herein only for reference.

Anaerobic Digestion (AD) – a material conversion technology that utilizes a series of biological processes along with microorganisms (such as bacteria) to biologically degrade organic feedstocks (or substrates) in the absence of oxygen. End products can include biogas, solid or liquid digestate, soil amendments and fertilizers for beneficial reuse as well as solid and liquid wastes that require treatment and disposal.

Biofilter – an odor control method that uses a combination of organic material (such as wood chips) along with microorganisms (such as bacteria) to capture and biological degrade odorous air emissions.

Biogas – a gas mixture that is produced during the anaerobic digestion process by microorganisms that biologically degrade organic feedstocks without the presence of oxygen within a digester or fermenter. The biogas primarily consists of methane and carbon dioxide along with other volatile organic and odorous emissions. The biogas can be further upgraded/conditioned for: 1) the production of renewable natural gas (RNG) for resale; and 2) use in combined heat and power systems to produce electricity and the capture of waste heat to heat the digesters or fermenters.

Centrate – the liquid fraction from a centrifuge, commonly used as a description of the liquid portion of the digestate.

Centrifuge or Decanter – equipment vessel that separates the solids and liquids of the digestate by density through the use of rotational or spinning vessels.

Agri waste – Feedstock or substrate comprised of grass, straw and other agri residues

Compressed Natural Gas – consists of the biogas from the anaerobic digestion process that has been first conditioned and upgraded to pipeline quality natural gas and then further compressed for use as an alternative fuel in placed of gasoline, diesel fuel or propane.

Digestate – the combined solid and liquid fraction of the raw feedstocks or substrates following the anaerobic digestion processes in the digesters or fermenters.

Digester or Fermenter – an equipment vessel with a covered tank that contains the anaerobic digestion process in which mixed solid and liquidate feedstocks or substrates are exposed to heat to promote decomposition and capture of beneficial end products.

Dilution Vent System – an equipment system that draws in fresh air for mixing with process air to reduce the concentration of contaminants within the air stream below in the threshold limit value or emissions limits of the contaminant.

Feed Hopper – an equipment vessel that is designed to receive solid feedstock or substrate from inbound vehicles and convey the material at a consistent and controlled rate to the feeder equipment.

Feedstocks or Substrates – the solid or liquid fractions of the organic waste material that will be used in the anaerobic digestion process.

Hydraulic Retention Time (HRT) – also known as residence time is a measure of the average length of time a soluble compound (such as wastewater) remains in a pretreatment system or bioreactor.

Pasteurization or Hygienization Tank – an equipment vessel used to treat the solid fraction of the digestate from the digesters or fermenters with heat for pathogen destruction. Not included in this project at this time.

Pasteurization or Hygienization – a unit process using heat for pathogen destruction. Not included in this project at this time.

Polymer or Polyelectrolyte – a pre-engineered material in solid or liquid form that is used to promote solids separation in the centrifuge or decanter.

Polyelectrolyte Preparator – the pre-engineered polymer feed system that prepares polymer solution to assist in solids separation at the centrifuges or decanters.

Pre-Tank or Slurry Tank or Mix Tank – an equipment vessel used for the storage and/or equalization of feedstocks or substrates to provide constant or metered flow to the digesters or fermenters. A secondary purpose of the pre-tanks are to provide preheating of the feedstock or substrate for an initial breakdown of complex organic molecules into sugars, amino acids, and fatty acids to aid the anaerobic digestion process.

Renewable Natural Gas – consists of the biogas from the anaerobic digestion process that is conditioned and upgraded to pipeline quality natural gas.

Reverse Osmosis – a wastewater pretreatment process that uses pressure to force the wastewater from the ultrafiltration process through filter media or semi-permeable membranes to remove contaminants to approximately 0.0001 microns.

Ultrafiltration – also known as microfiltration, a wastewater pretreatment process that uses pressure to force the wastewater from the pretreatment/bioreactor system through filter media or semi-permeable membranes to remove contaminants to approximately 0.01 microns.

7.2 Annexure 2: Abbrevations and Acronyms

Commonly used acronyms which may or may not be used in the Basis of Design document provided for reference.

AD	Anaerobic Digestion
BoD	Basis of Design
BOD	Biological Oxygen Demand
BOP	Balance of Plant
BTU	British Thermal Unit
COD	Chemical Oxygen Demand
CHP	Combined Heat and Power
CNG	Compressed Natural Gas
EPA	Environmental Protection Agency
GPA	Gas Processors Association
HRT	Hydraulic Retention Time
IBC	International Building Code
IECC	International Energy Conservation Code
IEEE	Institute of Electrical and Electronics Engineers
IFGC	International Fuel Gas Code
IMC	International Mechanical Code
IPC	International Plumbing Code
IPD	Integrated Project Delivery
LPM	Liter per minute
MMSCF	Million Standard Cubic Feet
MTPY	Metric Ton Per Year
NEC	National Electric Code

NFPA	National Fire Protection Association
OEM	Original Equipment Manufacturers
OSHA	Occupational Safety and Health Act
PFD	Process Flow Diagram
P&ID	Piping and Instrumentation Diagram
POTW	Publicly Owned Treatment Works
PPM	Parts Per Million
PSIG	Pounds Per Square Inch Gauge
RFID	Radio Frequency Identification
RO	Reverse Osmosis
RNG	Renewable Natural Gas
SCFM	Standard Cubic Feet Per Minute
SCF	Standard Cubic Feet
SF	Square Feet
TKN	Total Kjeldahl Nitrogen (Organic Nitrogen and Ammonia)
TN	Total Nitrogen
TPD	Tons per Day
TPY	Tons per Year
TS	Total Solids
TSS	Total Suspended Solids
TTO	Total Toxic Organics
UF	Ultrafiltration
UL	Underwriters Laboratories
VFD	Variable Frequency Drive
VOC	Volatile Organic Compound
W.C.	Water Column
WWTP	Wastewater Treatment Plant