



Digester Gas Booster Skid Packages

Recover and reuse a noxious byproduct

Turn a pollutant into an economical fuel

Hermetically sealed system, zero leakage

Highly resistant to corrosive gases

Digester gas, biogas, sludge gas, landfill gas, sewage gas — whatever you call it, it's a smelly, noxious byproduct of biological decomposition. The typical makeup is 65-70% methane along with hydrogen sulfide, carbon dioxide, trace amounts of other gases, moisture, particulates and oil. It's a serious potential pollutant but also a valuable potential energy source. Digester gas can be used as an inexpensive fuel for boilers, gas turbines, micro-turbines, sludge heaters, fuel cells and auxiliary power — but first you have to establish a stable supply at a boosted pressure.

That's where Spencer comes in. We design and manufacture gas booster systems that move digester gas and raise its pressure to desired levels. These systems are piped, prewired and packaged with all system accessories on a compact skid. To deal with corrosive gases, the multistage gas booster is made of stainless steel with anodized aluminum impellers and an Inconel electrical connector. The explosion-proof motor is located inside the gas booster housing, where it is cooled by the digester gas flow. Spencer's completely hermetic design has zero leakage to the environment.

These systems are so effective, we often see engineering specifications that stipulate Spencer digester gas boosters or equal, with the added comment that the "Engineer knows of no equal."

Spencer Advantages at a Glance

- Multistage, continuous-duty gas booster
- Explosion-proof motor and controls
- Hermetically sealed for zero leakage
- Self-contained, prewired and piped
- Very high corrosion resistance
- Customized for new or retrofit installations



Spencer digester gas booster skid package using anaerobic digester gas (ADG) at a fuel cell application in Hunts Point NYC funded by New York Power Authority.



Spencer booster system installed at a California WWT plant includes a filter separator, heat exchanger and moisture separator for delivery of digester gas from maximum design volume down to "0" scfm.

Natural Gas Dilution System – Another Spencer Innovation

Being a biological process, digester gas production can be variable and unpredictable at times. This creates a problem if the output demand remains constant. A Spencer natural gas dilution system is the answer. It keeps your system online by diluting natural gas with air, creating a temporary replacement fuel with matched energy content to digester gas. Like Spencer's digester gas booster, the natural gas dilution system is furnished as a skid-mounted package.

Natural gas dilution system automatically mixes air with natural gas to maintain a constant delivery of combustion fuel at the same BTU content as digester gas. ▶



Typical Digester Gas Booster Package Components

Spencer supplies each digester gas booster as a turnkey module, ready for hookup to on-site piping and electrical systems. Each package has its own control panel, hermetically sealed gas booster with internal explosion-proof motor, isolation valves and other customized components such as intercoolers and aftercoolers.

Skid Package – All system components are mounted and interconnected on a common skid, either painted or galvanized carbon steel, that is custom-sized to the footprint necessary for either new or retrofit installations.

Gas Booster – The leak-tight gas booster housing is constructed of 304 or 316 stainless steel. The multistage gas booster has anodized aluminum impellers and an Inconel electrical connector for maximum corrosion resistance to saturated digester gas with hydrogen sulfide. Spencer engineers select from a variety of impeller geometries to customize a design that will operate efficiently in your application including constant pressure over a full volume range.

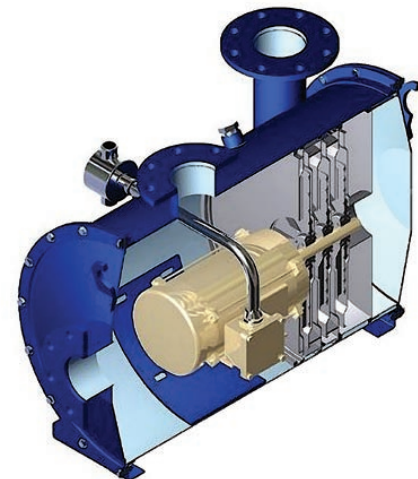
Control Panel – UL/CUL Listed with integrated process control logic and NEMA 7 explosion-proof electrical conduit.

Recirculation Loop – Maintains motor cooling and accommodates low gas demands. Heat exchanger (air or water) removes heat of compression to maintain proper temperature.

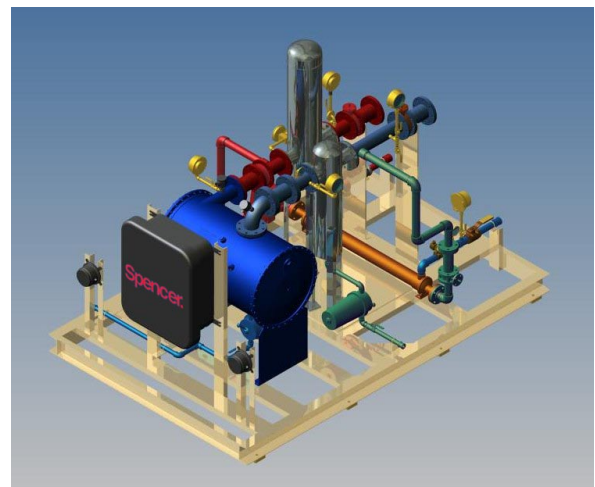
Drip Traps – Two traps, manual or automatic, prevent corrosive puddles in the gas booster housing.

Filters/Separators – These help deliver clean, dry fuel to your process while protecting the gas booster and other system components from corrosion.

Temperature/Pressure Switches and Gauges – These protective devices are designed to avoid damaging overheating or digester drawdown.

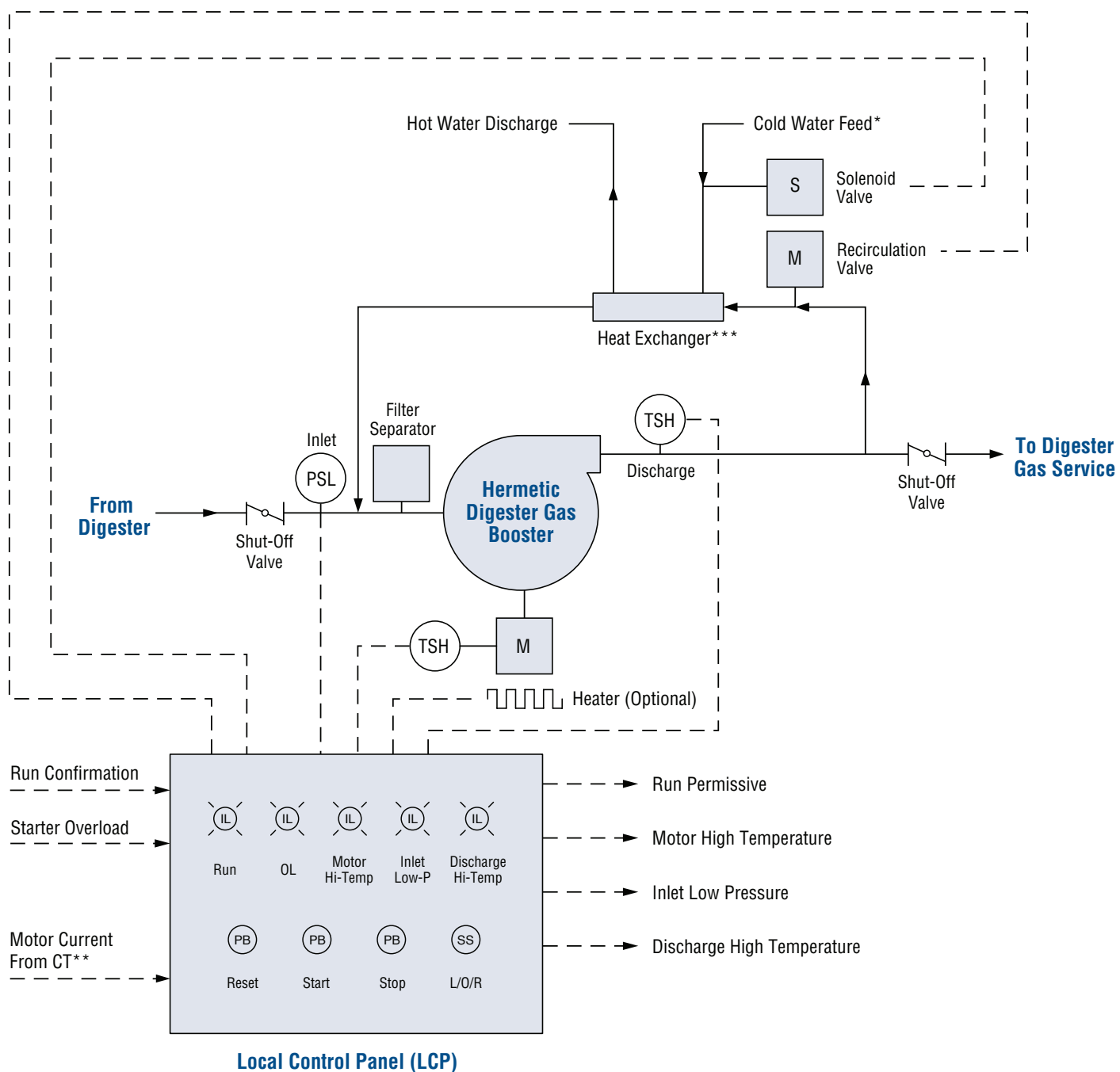


Hermetic Gas Booster Cutaway



Typical Skid Package

Typical Digester Gas Booster Process and Instrumentation Drawing (P&ID)



* Plant effluent is an acceptable cooling fluid.

** Amp draw is proportional to volume at constant speed.

***Configuration also available with the Heat Exchanger as an after cooler for process gas cooling.

A number of instruments and controls are available from Spencer for gas booster, motor and system protection. Depending on your application and its needs, Spencer engineers will plan a comprehensive system and select the appropriate components.

These are some of the most-used devices:

- **Recirculation loop** – allows a portion of the discharge gas to be reintroduced to the gas booster inlet so that flow through the gas booster remains above the gas booster allowable flow minimum. If the low flow condition is constant, an on-off recirculation valve is activated to open fully, then close when higher flows are available to provide a constant pressure gas flow.

If the gas booster discharge gas temperature is too high to reintroduce to the inlet, a solenoid valve can be activated to provide water to a water-gas heat exchanger. (Alternatively, an air-gas heat exchanger can be turned on).

- **Low inlet pressure switch** – will cause gas booster shutdown in the event of low pressure from the digester during periods of low production. This important system protection prevents the gas booster from “drawing down” the digester and inlet piping system. This switch should have an automatic reset. To avoid on/off cycling of the gas booster as inlet pressure rises to just over the set point, then drops off again when the booster turns on, time delay relay is incorporated in LCP.
- **Internal motor temperature switch** – is an additional safety feature that will shut down the motor on high temperature.

Options:

- **Load control** – prevents motor overloading, surge and/or motor overheating during low flow conditions. Control can be designed to alarm and/or shut down.
- **Starter/Disconnect** – can be included in the control panel.
- **Calibrated ammeter** – displays volume in amps and scfm.
- **Process protection** – monitors and stops gas flow in the event of a failed recirculation valve, component or critical variable.
- **Additional controls** – may include SCADA interface, and added functionality – Contact Spencer.



Control Panel featuring NEMA 7 enclosure controls the supply of bio-gas used as boiler fuel at a West Coast facility. It includes alarm and fault protection for high temperature and both low and high gas pressure.

For product selection assistance, please email marketing@spencer-air.com or visit our website at www.spencerturbine.com to locate the Spencer representative in your area.

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