

Guild Associates, Inc.

Pipeline Gas Sales from the Billings Montana Landfill



A Guild System for Landfill Gas

A high-BTU gas project is operating to provide pipeline gas from the City of Billings landfill. The state of the art facility is noted for the minimal process steps, elimination of pretreatment and the removal of N₂ contamination.

Production of the pipeline gas included the installation of a gas collection system at the landfill by Wenck Associates. Overall project management was provided by LFG Technologies, Inc and the gas clean-up Molecular Gate PSA systems were provided by Guild Associates, Inc. The project is owned by Montana-Dakota Utilities who uses the gas in their natural gas distribution system.

In the delivery of feed gas at up to 2400 SCFM the raw gas is compressed to 110 psig and routed to two stages of Guild Molecular Gate PSA systems with pipeline quality sales gas delivered at 90 psig. In the first stage water vapor, VOC's, H₂S, siloxanes and CO₂ are adsorbed and removed. Heavy impurities and VOC's are non-detectable in the product from the first stage and CO₂ is removed to less than 1%.

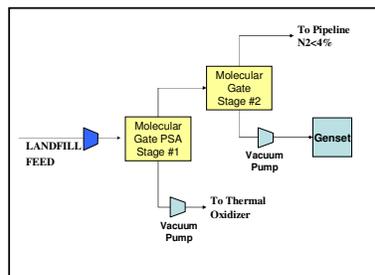
When saturated with impurities the adsorbent beds are depressurized and impurities are desorbed through vacuum pumps. The first stage regeneration gas contains the CO₂ and heavy impurities and is routed

to a thermal oxidizer. Since the system removes H₂S and siloxanes there is no need for separate media for their removal. Importantly the first stage CO₂ PSA product contains no VOC's and, though not required at Billings, if O₂ removal to ppm levels were required for the product stream a Deoxo unit could be placed after the CO₂ PSA unit.

At Billings the resulting product gas is sent to a second stage unit that removes the N₂ and a portion of the O₂ and produces pipeline quality product. The second stage system rejects the N₂ as a low pressure tail gas. Since this tail gas stream contains methane and has been previously scrubbed of undesirable impurities in the first stage PSA it is a high quality fuel and used in a genset to provide power to the site.

The two stage approach allows for automatic purity control and independent adjustment of each stage to manage the unavoidable variations in the feed gas composition. The two stage design also eliminates any concern with high levels of CO₂ reaching the N₂ removal section.

Though deep O₂ removal is not required at Billings systems can be designed for O₂ removal when required.



To maximize the economical returns for the site the tail gas from the second stage PSA is available as

fuel to a genset which in turn can provide much of the power demand of the facility. While it is possible to purge the first stage PSA with the tail gas from the second stage PSA to improve the methane recovery this was not done at the Billing site since the second stage tail gas is genset fuel.

The Billings site now operates the 32nd and 33rd Molecular Gate PSA systems from Guild Associates. To date 12 units have been provided for biogas applications (landfill and digester gases).

About Guild Associates

Guild provides adsorption and catalyst systems to a variety of markets, as well as shop fabricated engineered systems. Guild Associates is the licensee of the Molecular Gate™ technology originally developed by Engelhard Corporation (now a part of the BASF Group) and has provided all systems to date.

About LFG Technologies

LFG Technologies provides compressors and flares and landfill project expertise with combined experience with over 50 landfill gas projects.

About Wenck Associates

Wenck Associates, Inc. is a leader in engineering, environmental, and consulting services. Wenck provides industries and local, state, and federal agencies a full spectrum of services related to infrastructure, water, air, land, waste, and industrial processes

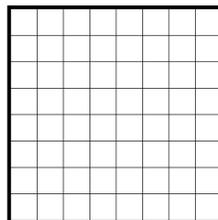
About Montana-Dakota Utilities

Montana-Dakota Utilities is a division of MDU Resources and a diversified energy company that provides retail natural gas and/or electric service to MT, ND, SD and WY.

Contact

To learn more about Molecular Gate technology contact Michael Mitariten by phone, at 908-752-6420 or by email at mike@moleculargate.com. You can also visit us on the Internet at www.moleculargate.com.

Guild is a licensee of Molecular Gate® Adsorbent Related Technology and Guild is solely responsible for all representations made herein.



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