Guild Associates, Inc.

Molecular Gate™

Case Study : Nitrogen and Carbon Dioxide Removal from Landfill Gas

A landfill in Billings Montana uses a dual PSA system to remove CO2 and N2 to produce pipeline quality Renewable Natural Gas (RNG)

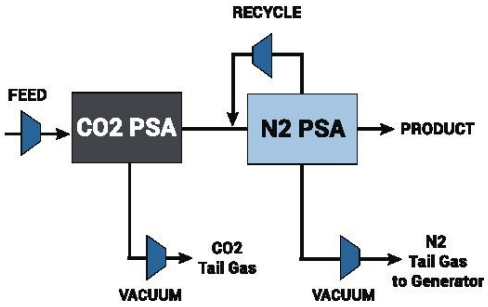
The City of Billings, Montana landfill wanted to monetize their landfill gas through upgrading to pipeline standards. The feed gas from the landfill necessitated removal of both N2 and CO2. The solution chosen is a Guild Associates' Molecular Gate™ Pressure Swing Adsorption (PSA) system using two PSAs in series, the first removes CO2, followed by N2 removal.

The landfill feed gas is compressed and cooled to remove the bulk of the water as condensate. This low-moisture gas is re-heated with the waste heat of the compressor to 150°F and fed into the CO2 PSA, where carbon dioxide, water, hydrogen sulfide (H2S), VOCs, siloxanes and other trace impurities are removed.

The product gas from the CO2 PSA is fed to the N2 PSA, which removes the nitrogen to pipeline quality. The resulting product gas of the N2 PSA is injected into the local natural gas grid at 90 psi.

In order to improve the overall methane recovery, about 15% of the feed gas is recycled back to the N2 PSA feed, which increases the methane recovery of the N2 PSA to 88%. The overall plant methane recovery is ~81%.

The planned capacity was 1600 SCFM, increasing to 2400 following landfill gas collection improvements. This plant has been operational since 2011, and is using the original adsorbent charge. In 2016 the Billings plant recorded 8506 operational hours, equating to 98% uptime.



Mass Balance Table				
	FEED	CO2 TAIL	PRODUCT	N2 TAIL
Feed Flow, SCFM	1600	791	672	137
Pressure, psig	0	5	90	5
Temperature, °F	158	150	80	150
COMPOSITION (mole %)				
Methane (CH4)	50.00	12.13	95.30	46.45
Nitrogen (N2)	5.85	0.59	4.00	45.50
Carbon Dioxide (CO2)	43.50	86.93	0.00	5.93
Oxygen (O2)	0.50	0.05	0.70	2.10
Water (H20)	0.15	0.30	0.00	0.00

About Guild Associates

Guild Associates is the sole licensee of BASF's Molecular Gate™ Adsorbent. PSA systems using Molecular Gate™ adsorbent were first commercialized in 2004.

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