

Project Case Study

Industrial end-users' CHP systems use boilers and reciprocating engines fueled by Renewable Energy project's transmission pipeline to produce revenue and electrical cost savings through Landfill Gas Purchase Agreements.

Presented by Joshua Griswold



References

1 - LMOP website: <https://www.epa.gov/lmop/landfill-gas-energy-project-data>

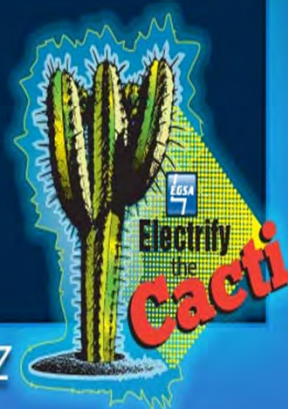
2 - Landfill Gas Energy Project Development Handbook, June 2017

3 - EGSA Reference Book: Chapter 19

4 - DSWA website:

<https://dswa.com/programs/landfillgas/>

5 - Cummins QSK60 C1100N6C Genset Data Sheet D5470a (June 2012)



What is landfill gas and how can it power a CHP system and create financial benefit?



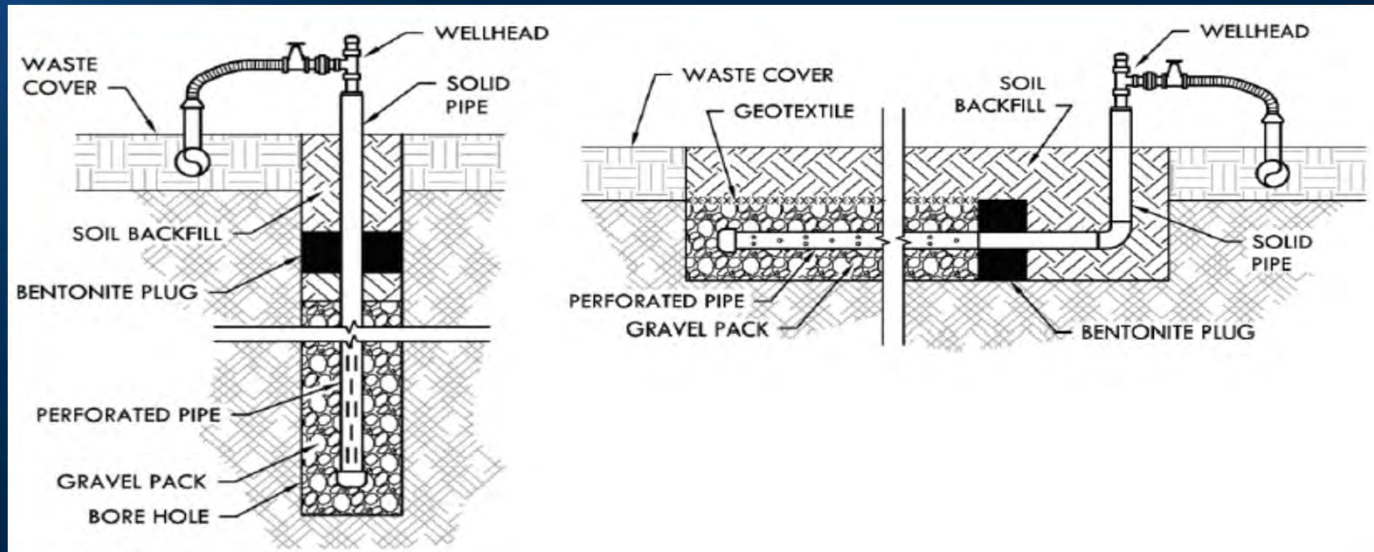
In 2009 the municipal landfill contained 11.8M tons of waste¹. Prior to this Project the gas collection system used a set of flares to destroy approximately 3,000 standard cubic feet of landfill gas per minute.

General rule: 1M tons of Municipal Solid Waste produces approximately 300 CFM

¹ LMOP website <https://www.epa.gov/lmop/landfill-gas-energy-project-data>



Landfill Gas Collection System



Landfill Gas Energy Project Development Handbook, June 2017



Landfill Gas Quality



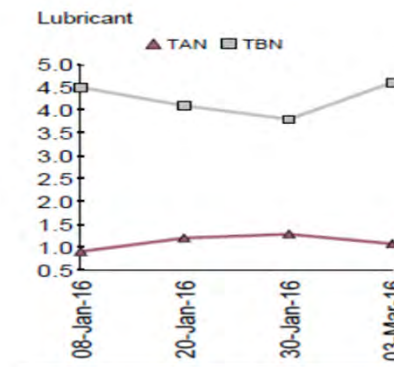
Conditioned landfill gas quality monitored by Siemens Ultramat 23



Landfill Gas Challenge

Sample Data				
Sample ID	6067472052	6034420033	6026307039	6013256036
Date Sampled	03-Mar-2016	30-Jan-2016	20-Jan-2016	08-Jan-2016
Date Reported	09-Mar-2016	04-Feb-2016	27-Jan-2016	18-Jan-2016
Brand	MOBIL	MOBIL	MOBIL	MOBIL
Lubricant Tested	PEG 1005	PEG 1005	PEG 1005	PEG 1005
Equip. Hours	19203	18992	18745	18513
Oil	19	712	465	233
Resv. Temp F	98		84	95
Make-Up	15	15	15	15
Oil Changed		N	N	Y
Filter Changed		N	N	Y

Lubricant Data				
Contamination	Normal	Normal	Normal	Normal
Equipment Rating	Normal	Normal	Normal	Normal
Oil Rating	Normal	Normal	Normal	Normal
Visc@100C (cst)	13.2	13.6	13.4	13.3
SAE Viscosity	40	40	40	40
Cl (Chlorine - Xray)	21	152	92	80
Coolant Indicator	NotDetected	NotDetected	NotDetected	NotDetected
Nitration (Ab/cm)	0	0	0	0
Oxidation (Ab/cm)	1	8	7	5
PQ Index	0	0	0	0
TAN (mg KOH/g)	1.06	1.29	1.19	0.91
TBN (mg KOH/g)	4.6	3.8	4.1	4.5
Water (Vol%)	NotDetected	NotDetected	NotDetected	NotDetected



Oil analysis result showing the rise of acid or TAN in oil of LFG Genset



Solution



Open trenching, jack and bore and directional drilling methods were used to install transmission pipeline



Hydrogen sulfide and siloxane removal vessels



Landfill Gas Purchase Agreement

- Hybrid contracts can use NYMEX index and fixed prices with “take or pay” clause
- Environmental attributes including Renewable Energy Credits can provide new revenue sources
- If LFG is being supplied to different equipment then separate pricing categories can be established based on volume and cleanliness requirements



Result

18,308.4 MWe or 2,000 homes annually PLUS
7.4mmBTU/hr² recovered from the Gensets' exhaust
and cooling water systems.

Landfill Name	State	City	County	Ownership Type	Landfill Owner Organization(s)	Waste in Place (tons)	Waste in Place Year	LFG Collection System In Place?	LFG Collected (mmscfd)	LFG Flared (mmscfd)
Cherry Island Landfill	DE	Wilmington	New Castle	Public	Delaware Solid Waste Authority	15,259,416	2017	Yes	4.176	0.576

Table retrieved from LMOP website <https://www.epa.gov/lmop/landfill-gas-energy-project-data>
² mmBTU/hr information taken from Cummins QSK60 C1100N6C Data Sheet D-5470a (June2012)



Wrap up Slide/Closing Thought/Thanks for Coming

