

FlexEnergy

Lamb Canyon Landfill LFGTE: Unlocking the Power of Low BTU gases with Near Zero Emissions

**EPA 14th Annual LMOP Conference and Project Expo
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Brett Luedde, Director Business Development**

Who is FlexEnergy?

- **Company Background**

- Privately Held, Clean Tech Company
 - Over 80 employees at U.S. locations
- Headquarters - CA
- Microturbine manufacturing - NH
- Recuperator manufacturing - NC
- Engineering & Service – CA, NH, NC

- **Clean Energy Product Lines**

- ***Flex Powerstation***

- Low, medium & high strengths of methane gas to near zero emission energy

- ***Flex MT250***

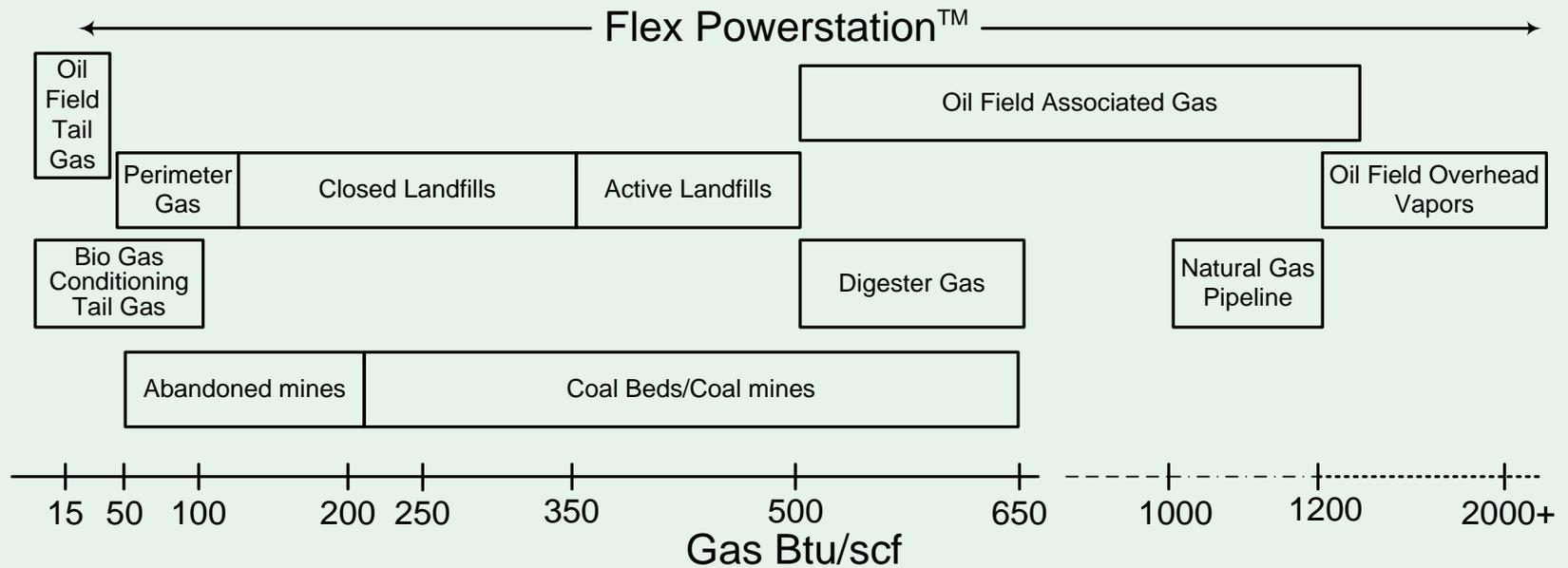
- Medium & High strengths of gas to low emission energy

- ***Recuperators***

- Durable high temperature heat exchangers for gas turbine efficiency improvement

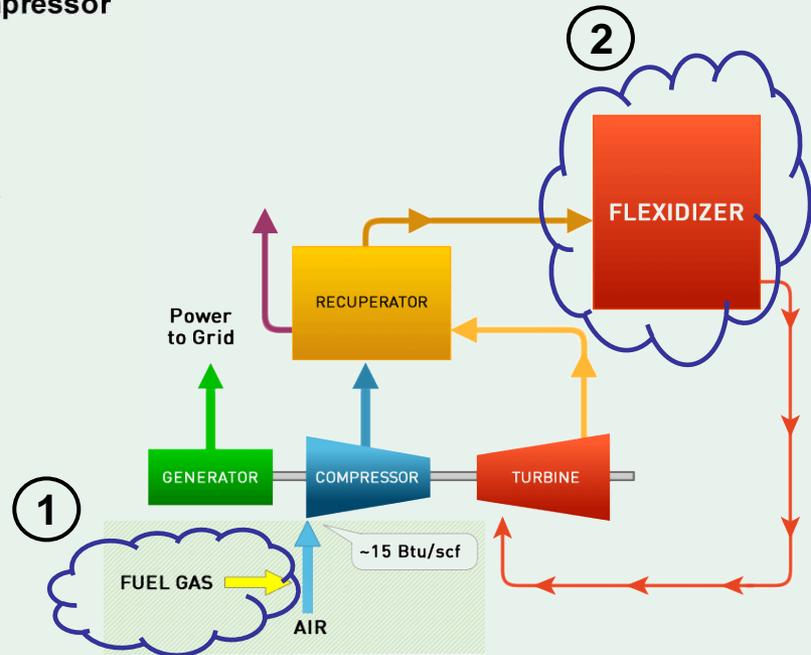
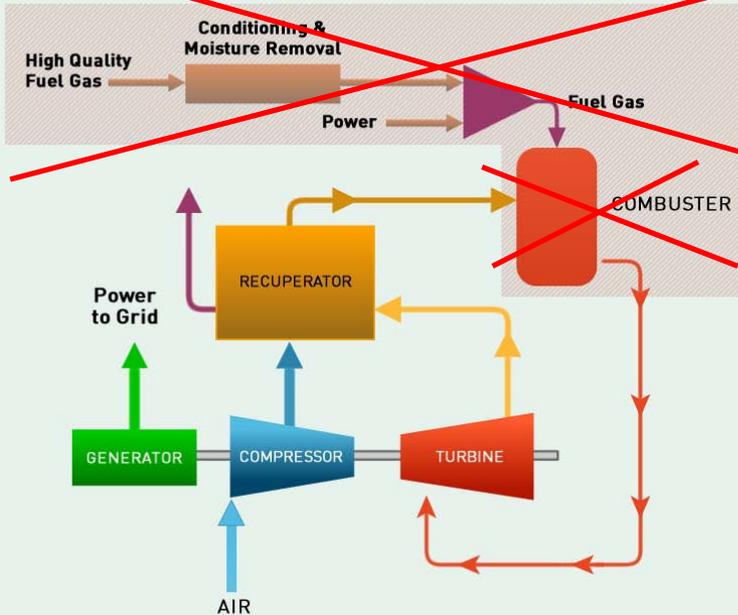


Fuel Flexible for Gas Applications



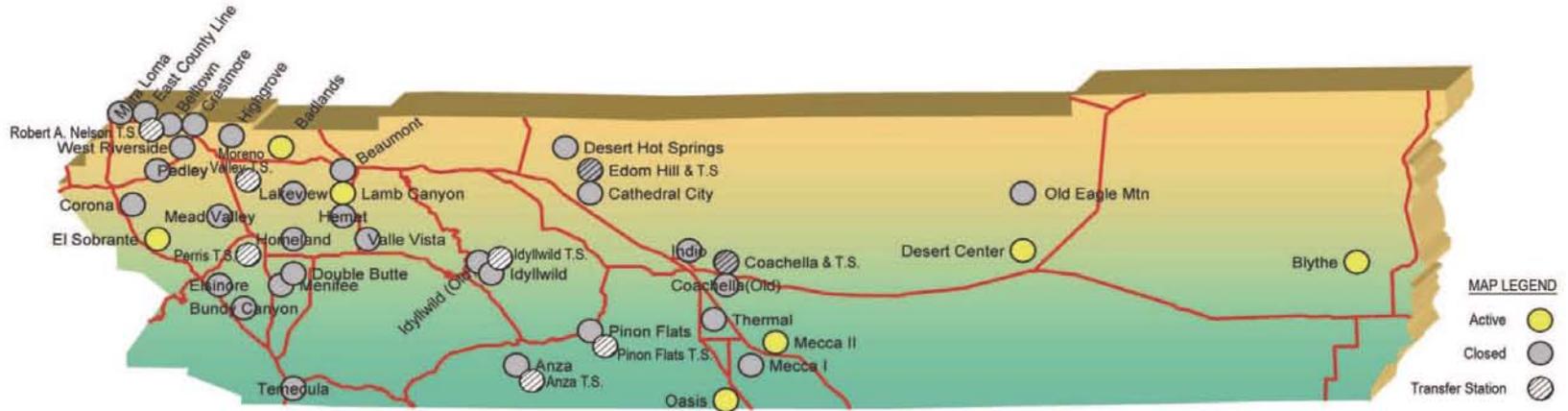
Flex Solution

~~Traditional Powerplant requires fuel conditioning & Compressor~~



- 1) Fuel Gas Aspiration at System Inlet Eliminates Need for High Pressure
 - Dilutes Gas Down to 1.5% Methane for Operation
- 2) Flexidizer (Thermal Oxidizer) Replaces Combustor & Eliminates Need for Fuel Conditioning
 - Avoids NO_x formation while destroying CO and VOC's
 - Temperatures maintained above 1450F & below 2000F

Solid Waste System



OVERVIEW

Riverside County Population - 21.5 Million

A total of 39 Landfills - 32 Closed & 7 Active
(6 Public & 1 Private)

A total of 8 Transfer Stations /
Collection Centers Privately Operated
(6 on Public Land & 2 on Private Land)

Tonnage Received in FY 09-10:
Total Riverside County = 1.7 Million tons
Out of County = 1.2 Million tons

Grand Total 2.9 Million tons

LAMB CANYON LANDFILL

Riverside County
Waste Management Department



GENERAL SITE INFORMATION

Total Property Acreage:	1,189 acres
site classification:	Class III Sanitary Landfill
Year opened:	November, 1970
Service area:	San Jacinto, Banning, Beaumont, Hemet and the Coachella Valley
Permitted Daily Tonnage:	5,000 tpd
Operations Work Schedule:	Monday through Saturday, 6:00 am to 4:30 pm
Average Daily Tonnage:	1,870 tpd during July 2010 (Monday through Friday)
Total Tonnage received in 2009:	548,839 tons

SUMMARY OF LANDFILL GAS SYSTEM

Flare Design Flow Rate	2,000 cubic feet per minute (cfm)
Current Flare Flow Rate	940 cfm at 45% methane (rate increasing 100 to 150 cfm each year)
Vertical Gas Wells	41
Horizontal Gas Wells	10
Header Pipe	2.2 miles

Flex Powerstation: Lamb Canyon Installation Overview

(A)

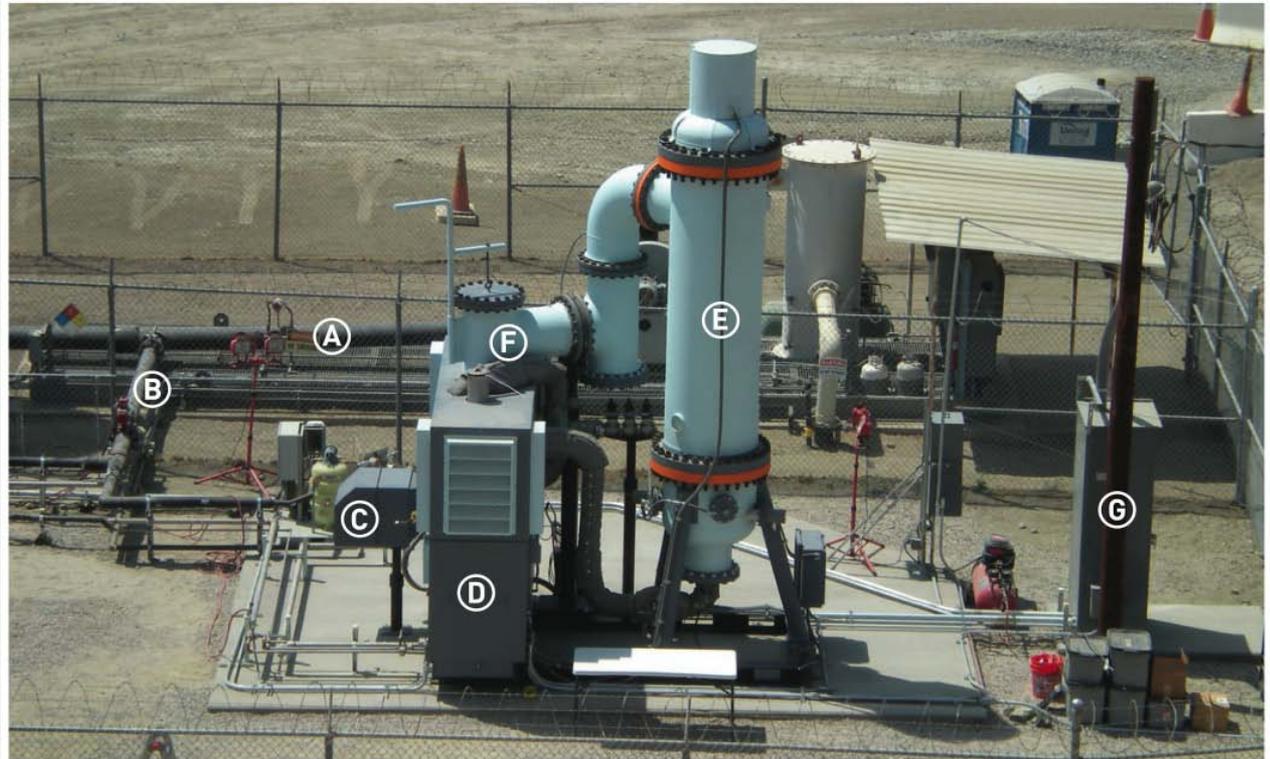
Methane gas generated by landfill is controlled and gathered by site collection system.

(B)

Flex takes gas after site collection system prior to site flare

(C)

Fuel is aspirated with air forming a 1.5% methane (15 Btu/cubic foot) mix at the inlet to the gas turbine.



(D)

The diluted gas air mix is compressed and preheated by the gas turbine

(E)

The pressurized preheated mixture is oxidized in the Flexidizer. The Flex algorithms control the temperature preventing Oxides of Nitrogen (NOx) formation while destroying Carbon Monoxide (CO) and Volatiles (VOC's).

(F)

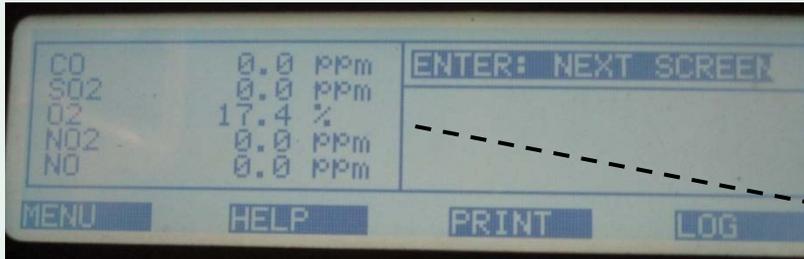
The near zero emission gas leaves the Flexidizer and powers the gas turbine. The clean hot gas energy is converted to electricity.

(G)

The renewable electricity created from flared gas is now available for use by the site or sold to the grid

Flex Emissions

Flexidizer Exhaust Emissions



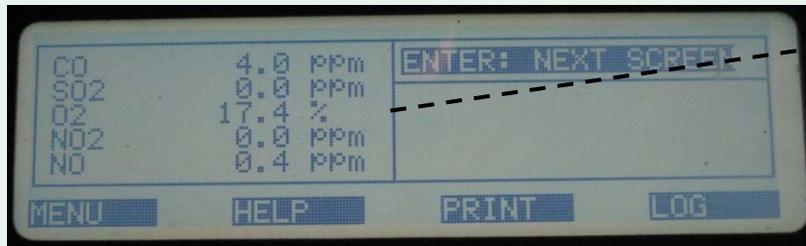
A screenshot of a handheld monitor displaying emission data for the Flexidizer. The screen shows CO, SO2, O2, NO2, and NO levels. The CO, SO2, NO2, and NO levels are all at 0.0 ppm, while O2 is at 17.4%. The screen also features a 'MENU' button, a 'HELP' button, a 'PRINT' button, a 'LOG' button, and an 'ENTER: NEXT SCREEN' prompt.

CO	0.0	ppm
SO2	0.0	ppm
O2	17.4	%
NO2	0.0	ppm
NO	0.0	ppm

MENU HELP PRINT LOG

ENTER: NEXT SCREEN

System Exhaust Emissions



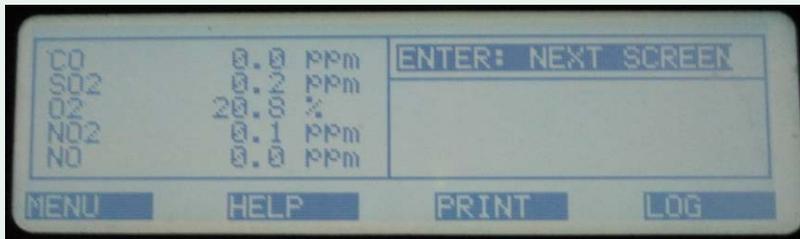
A screenshot of a handheld monitor displaying emission data for the System Exhaust. The screen shows CO, SO2, O2, NO2, and NO levels. The CO level is 4.0 ppm, SO2 is 0.0 ppm, O2 is 17.4%, NO2 is 0.0 ppm, and NO is 0.4 ppm. The screen also features a 'MENU' button, a 'HELP' button, a 'PRINT' button, a 'LOG' button, and an 'ENTER: NEXT SCREEN' prompt.

CO	4.0	ppm
SO2	0.0	ppm
O2	17.4	%
NO2	0.0	ppm
NO	0.4	ppm

MENU HELP PRINT LOG

ENTER: NEXT SCREEN

Ambient Air



A screenshot of a handheld monitor displaying emission data for Ambient Air. The screen shows CO, SO2, O2, NO2, and NO levels. The CO level is 0.0 ppm, SO2 is 0.2 ppm, O2 is 20.0%, NO2 is 0.1 ppm, and NO is 0.0 ppm. The screen also features a 'MENU' button, a 'HELP' button, a 'PRINT' button, a 'LOG' button, and an 'ENTER: NEXT SCREEN' prompt.

CO	0.0	ppm
SO2	0.2	ppm
O2	20.0	%
NO2	0.1	ppm
NO	0.0	ppm

MENU HELP PRINT LOG

ENTER: NEXT SCREEN



Source Test Results (July 28, 2010)

CO (Flexidizer)

- 0 ppm @ 15% O₂

NO_x (Flexidizer)

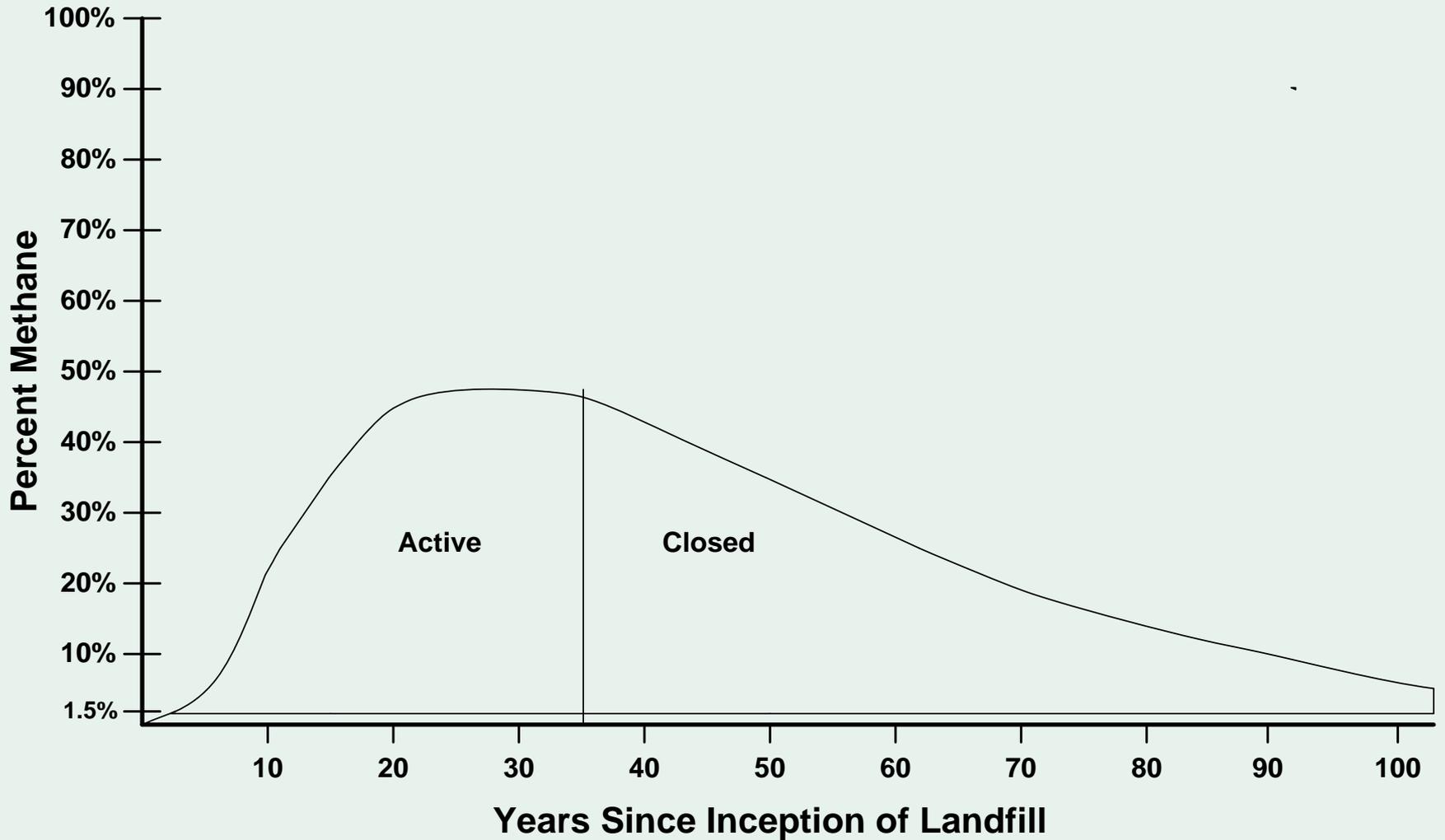
- 0.66 ppm @ 15% O₂

TABLE 1-2
SUMMARY OF TEST RESULTS
MICROTURBINE, LAMB CANYON LANDFILL
FLEXENERGY, LLC
JULY 28, 2010

Parameter	Inlet	Combustion Outlet	Turbine Exhaust	Reporting limit	Limit	Applicable SCAQMD Rule
O ₂ , %	2.5	17.1	17.2			
CO ₂ , %	32.9	3.5	3.6			
N ₂ , %	28.2	79.4	79.2			
H ₂ O, %	4.7		4.0			
LFG Flow Rate, scfm	37					
LFG Flow Rate, dscfm	35					
Stack Flow Rate, dscfm		803	803			
Temperature, °F			455			
LFG Btu/scf	373					
Total Heat Input, MMBtu/hr	0.8					
KW		27.1	30.4			
NO_x:						
ppm		0.45	0.09	1		
ppm @ 15% O ₂		0.66	0.15	1.6		
lbs/hr (as NO ₂)		0.0025	0.0005	0.006	0.07	P/C
lbs/MM Btu (as NO ₂)		0.0032	0.0007	0.007		
lb/MW-hr (as NO ₂)		0.093	0.018	0.192		
CO:						
ppm		0.00	3.8	5		
ppm @ 15% O ₂		0.0	6.2	8.1		
lbs/hr		0.0	0.014	0.018	0.6	P/C
lbs/MM Btu		0.0	0.017	0.023		
lb/MW-hr		0.0	0.45	0.59		



Life of A Landfill



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