

Biothermica



Landfill Gas to Energy Facility at
the Nejapa Landfill site, El
Salvador

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PRESENTATION

- The project's actors
- **Biothermica:** Technology provider
- Nejapa Landfill gas to energy project
- Landfill gas assessment et model
- Basic operational concept



Projects Actors



- **Biothermica:** CDM project developer and technology provider, owner of the LFG recovery system
- **Bioenergía SA de CV:** Built and operate a LFG recovery system and, eventually, a LFG power plant
- **MIDES:** Landfill operator
- **Bionor SA de CV:** Developer and owner of a LFG power plant



ESTRATEGIA DE DESARROLLO



Canadian technology firm

Project registration

Engineering and construction

Technology transfer

Financing



Canadian firm specialized in
power plant management

Technology transfer



Local company

Power Plant and Biogas
Recovery System Operation
and Maintenance

Biothermica



Company Profile

Technology Leader in Thermal Treatment of Gases

- Founded in 1987 – Family owned (100%)
- Technology & construction firm
- EPCC in air pollution control and landfill gas
- Canadian leader in landfill gas collection & utilization
- R&D in LFG, particulate filtration & VOC oxidation
- Financed and structured private LFG power plant projects on a BOO/BOOT around the World
- Developed, financed & structured emission reduction (ER) Projects in Latin America





LFG Collection and Utilization Mission and Expertise

Resource
Evaluation

1



Resource Collection
& Management

2



Resource Utilization

3



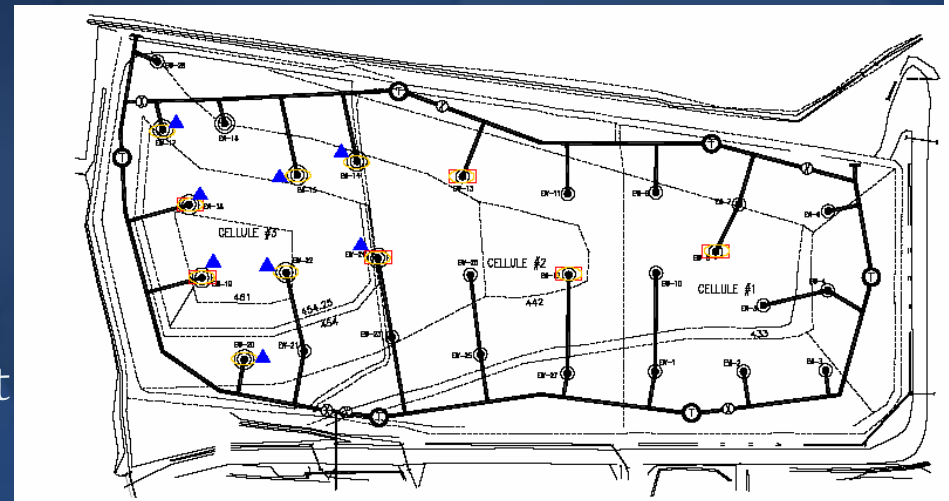
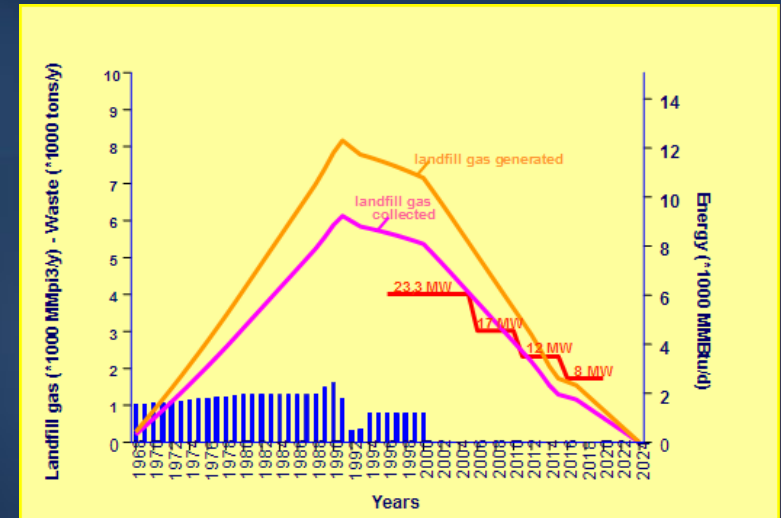
LFG combustion generated CO2 credits





Resource Collection and Management Recovery System - Engineering

- Gas piping system designed for handling the maximum biogas generation rate
- The collection system designed such that landfill gas is effectively collected from all areas of the landfill
- Design provisions should be taken for proper soil cover to minimize air intrusion and efficient condensate removal systems





LFG Collection and Utilization Resource Valorization

CDM Project



25 MW
Operating since 1996
Montreal, Canada



Project 0167 : Landfill Gas to Energy Facility at the Nejapa Landfill Site, El Salvador

Project title	Landfill Gas to Energy Facility at the Nejapa Landfill Site, El Salvador Project design document (855 KB) Registration request form (56 KB)
Host Parties	El Salvador Approval (752 KB) Authorization (752 KB) Authorized Participants: Biothermica Energia Inc.
Other Parties Involved	Canada Approval (1795 KB) Authorization (1795 KB) Authorized Participants: Biothermica Energia Inc.
Activity Categories	Waste handling and disposal (Sectoral Scope 13)
Activity Scale	LARGE
Methodologies Used	SMB001 : Consolidated methodology for project activities
Amount of Reductions	183.725 metric tonnes CO ₂ e
Fee level	USD 20000
Validation status	Request for information (26 KB) Information responses (26 KB) Request for communication (2094 KB)
Other documents (descriptions provided by the DOE)	Validation Report and Protocol (1013 KB)
Public availability information	Upon publication of the request for registration. Compilation of all comments received (26 KB)
Requests for issuance and related documentation	no monitoring reports available at present

UNFCCC Approved

Flaring since Oct. 2006
6 MW plant in 2008
Nejapa, El Salvador

Biothermica



Project key dates

Contrat regarding the ownership of LFG signed between Biothermica y el Mides : February 2005

Biothermica has implemented the following activities

Project regristration : June 2005 to March 2006

Engineering and construction: December 2005 to August 2006

Operation (through BioEnergia): Since August 2006

Other important activities realized by Biothermica:

MIGA (World Bank) insurance: June 2006

First worldwide carbon finance project insured by MIGA

ERPA transaction with government of Luxemburgh : January 2007

First Monitoring report: March 2007



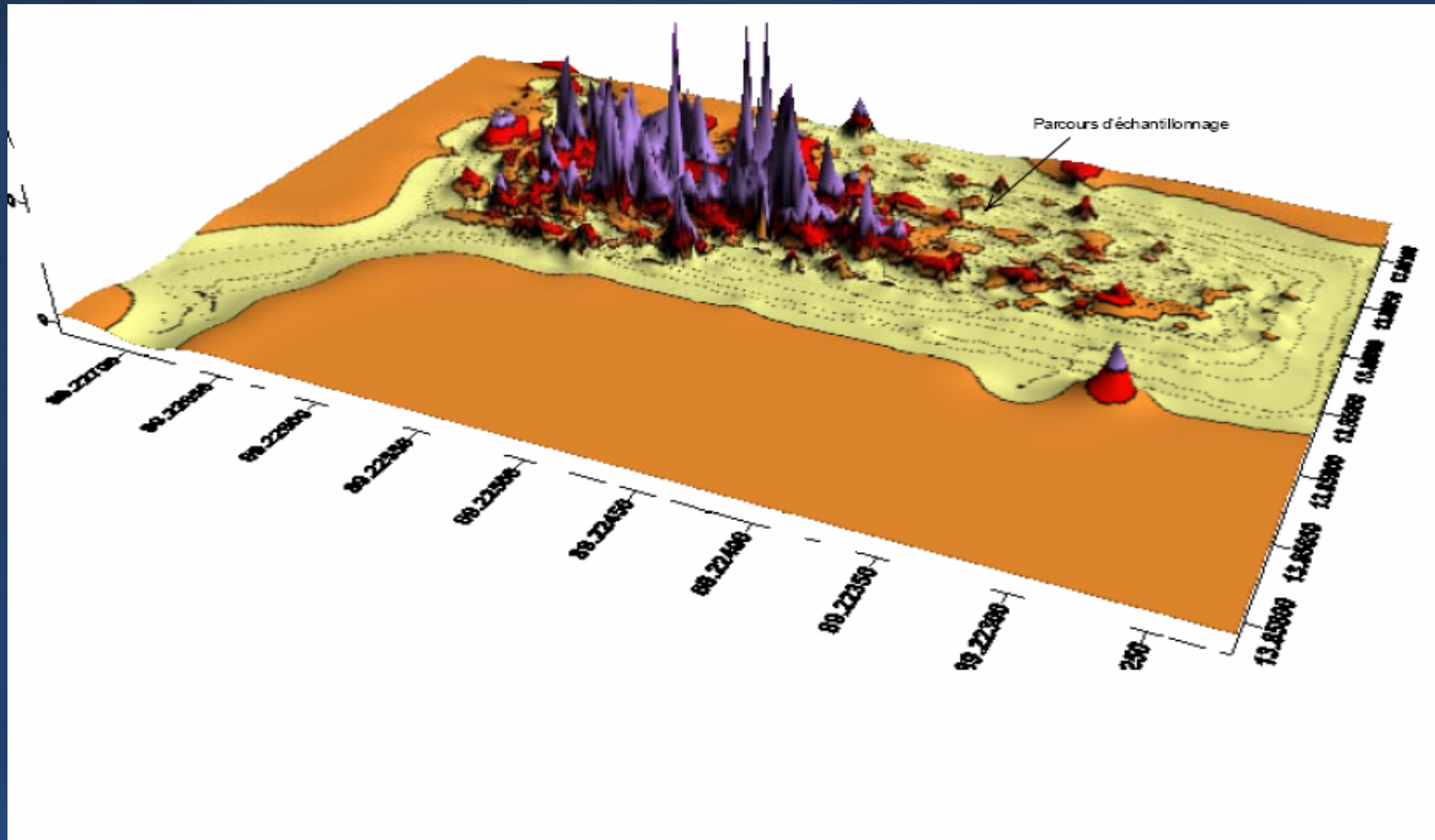
Landfill gas flaring Recovery System and Production Data

- **Recovery system (Cell no. 3-4-5)**
 - 37 wells in operations equipped with pumps
 - 5 horizontal collection (300m) located in the landfilling area
 - 7 liviviat collectors
- **LFG burned (March 2007)**
 - 2300 Nm³/h at +/- 50% CH₄
 - 4 MW equivalent
- **Power plant construction will starts in January 2008**
 - 2008: 6 MW
 - 2010: 10 MW
 - 2012: 13 MW
 - 2014: 16 MW
 - 2018: 20 MW



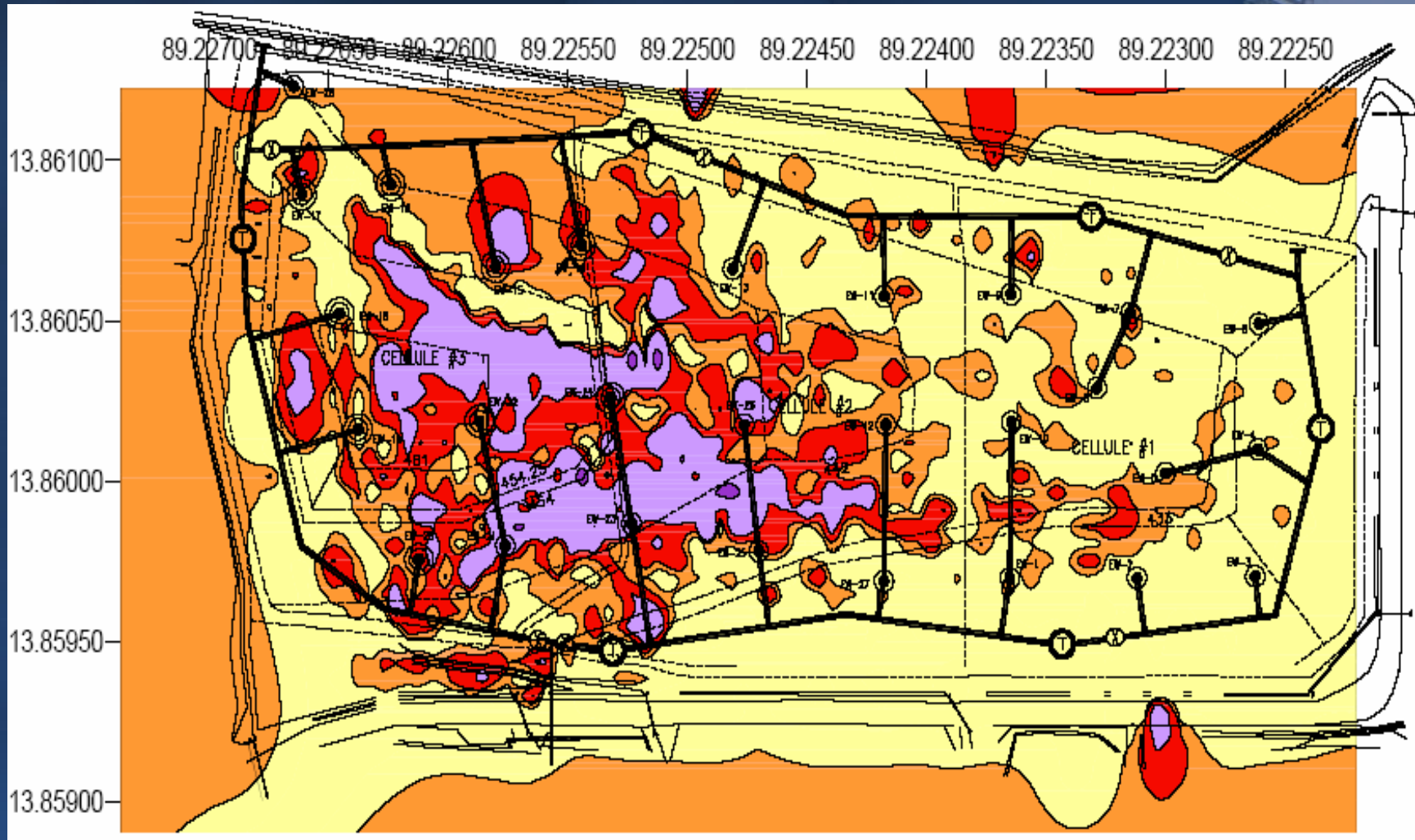


Nejapa LFG Proyecto Biogas evaluacion





Nejapa LFG Proyecto Biogas evaluacion





Recovery system operation

Basic concepts

Cells	Average PPM	Methane emission (m3/h)	Methane flared (m3/h)	Total Methane production (m3/h)
1				
2	172	184	0	184
3	27	30	277	307
4	262	306	259	565
5	212	193	763	957
	168	713	1299	2012

Surface sampling and energy balance have been done the 7th of February 2007

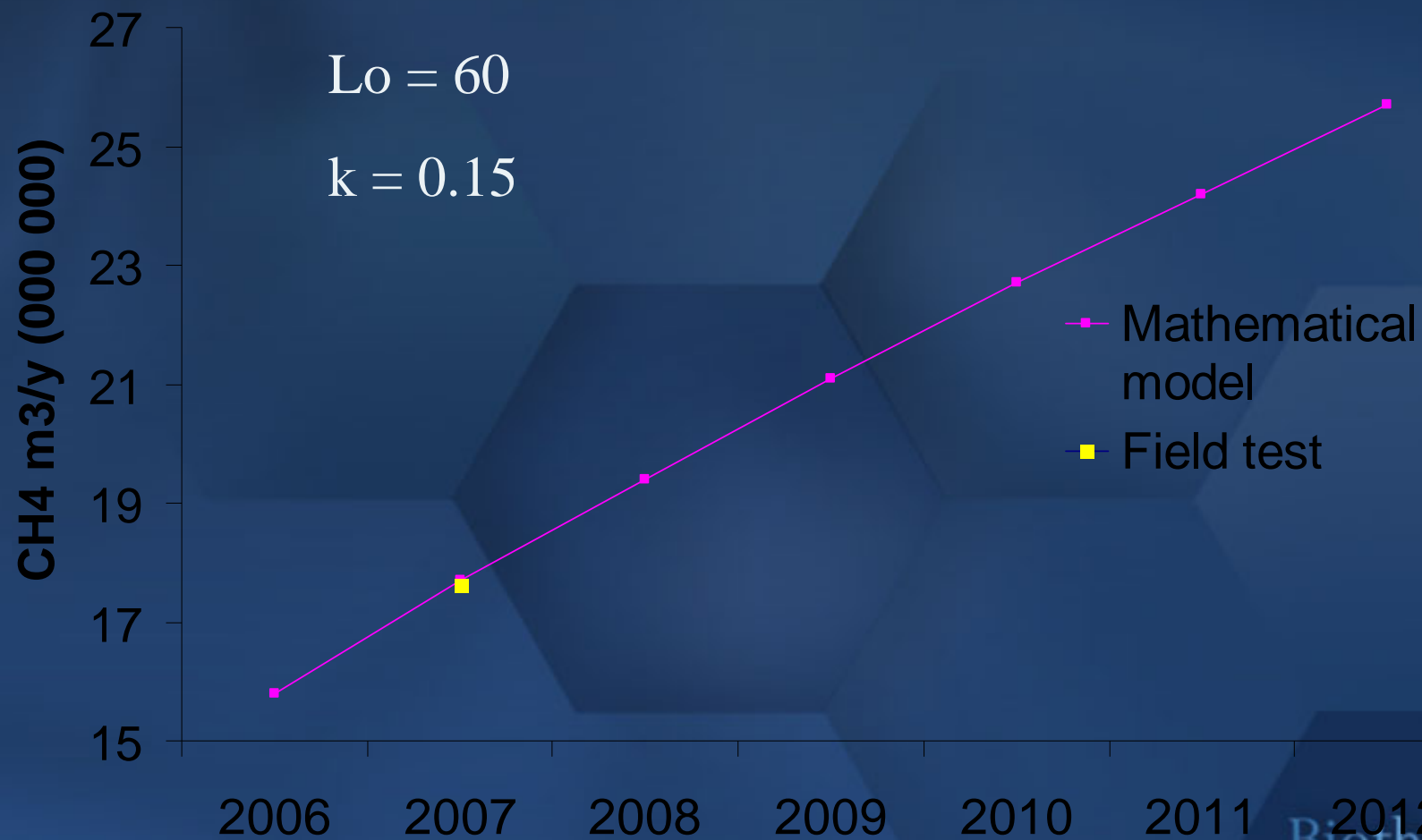
Global energy potential of 5.1 MW according to field measurements

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Recovery system operation

Basic concepts





Recovery system operation

Basic concepts

Recovery System Basic Objective

- Minimizing air intrusion while maximizing methane recovery
- Air intrusion affect anaerobic process

$\text{CH}_4/\text{CO}_2 = 1.5$ (60%/40%) (normal condition)

$\text{CH}_4/\text{CO}_2 < 1.5$ (air intrusion)

→ O_2 kills methanogenic bacteria

→ O_2 reacts with CH_4



Recovery system operation

Methane recovery optimization

In order to maximize methane recovery, two basic concepts must be applied

- Periodic wells calibration

CH₄ concentration > 45%

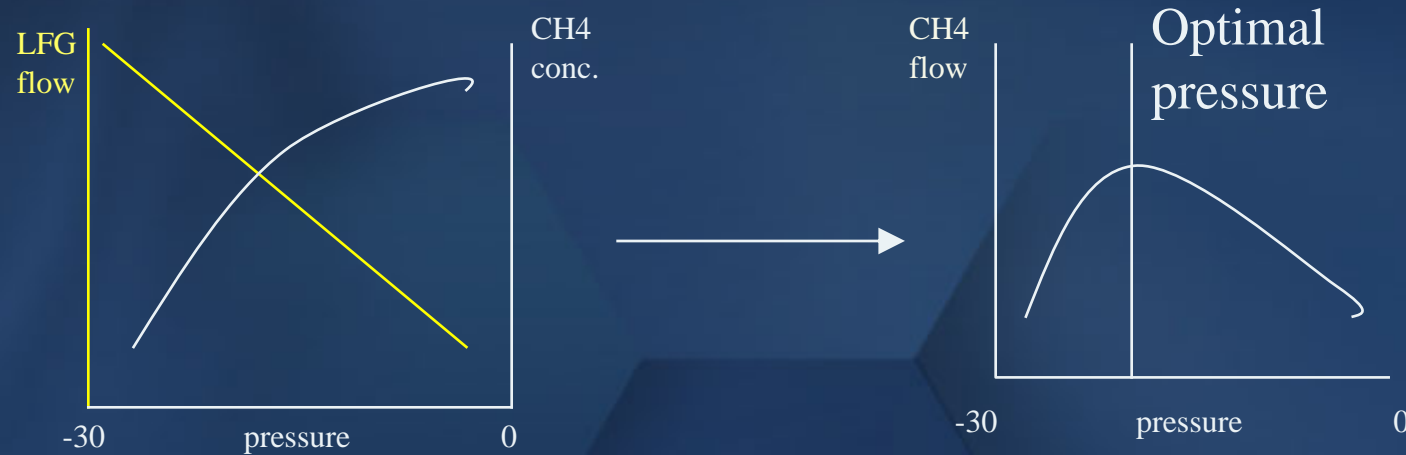
- Adjust pressure level in the recovery system

For a given recovery system status exists an optimum pressure set point



Recovery system operation

System pressure optimization



CH4 flow flared vs pressure applied for a given recovery system status and LFG production rate and flow pattern

- Optimum set point constantly changed
 - Wells calibration change the system status
 - Atmospheric pressure changes modified LFG flow rate
- Constant work



Recovery system operation

Basic activities

- Wells calibration
- Blower power adjustment
- Water level in wells
- Wells depthness
- Systeme drainage
- Flare damper ajustement
- Gas analyzor calibration



Recovery system operation

Energy balance

February 7th 2007

	m3/h	% contribution
Horizontal collectors	644	50%
Lixiviat collectors	378	29%
Wells	277	21%
Total	1299	100%

	m3/h	% contribution
Cell 1	0	0%
Cell 2	0	0%
Cell 3	277	21%
Cell 4	259	20%
Cell 5	763	59%
Total	1299	100%



Recovery system operation

Recovery System Efficiency

From the surface sampling

Cells	CH4 emission (m3/h)	CH4 recovered (m3/h)	total	Efficiency
1				
2	184	0	184	0
3	30	277	307	90%
4	306	259	565	46%
5	193	763	957	80%
	713	1299	2012	65%



ENERGIA LIMPIA EN EL SALVADOR



San Salvador, 29 de Marzo del 2007

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