

**METHANE DETECTION AT THE SURFACE OF LANDFILL  
SITES AND BIOGAS PLANTS**

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**LFG- & Biogas - Technology**

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# **METHANE DETECTION AT THE SURFACE OF LANDFILL SITES AND BIOGAS PLANTS**

**14 th Intern. Waste Management and Landfill Symposium Sardinia 2013, Sept 30th - Oct. 4th**

**Wolfgang H. Stachowitz / Marcel Mattern**  
**DAS - IB GmbH**

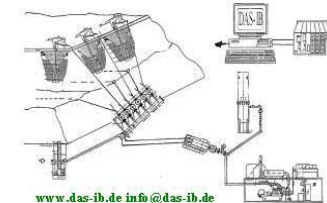
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**LFG - & Biogas - Technology**

Biogas, sludge gas and landfill gas technology:

- Consulting, planning, project management
- Training of system operators
- Expert i.a. in accordance with § 29a of the Federal Immission Control Act; and Qualified Person reg. the Ordinance on Industrial Safety and independent expert

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## Emissions of methane: environment and money

Methane + O<sub>2</sub> =

+ CO<sub>2</sub>

**GWP: 25**



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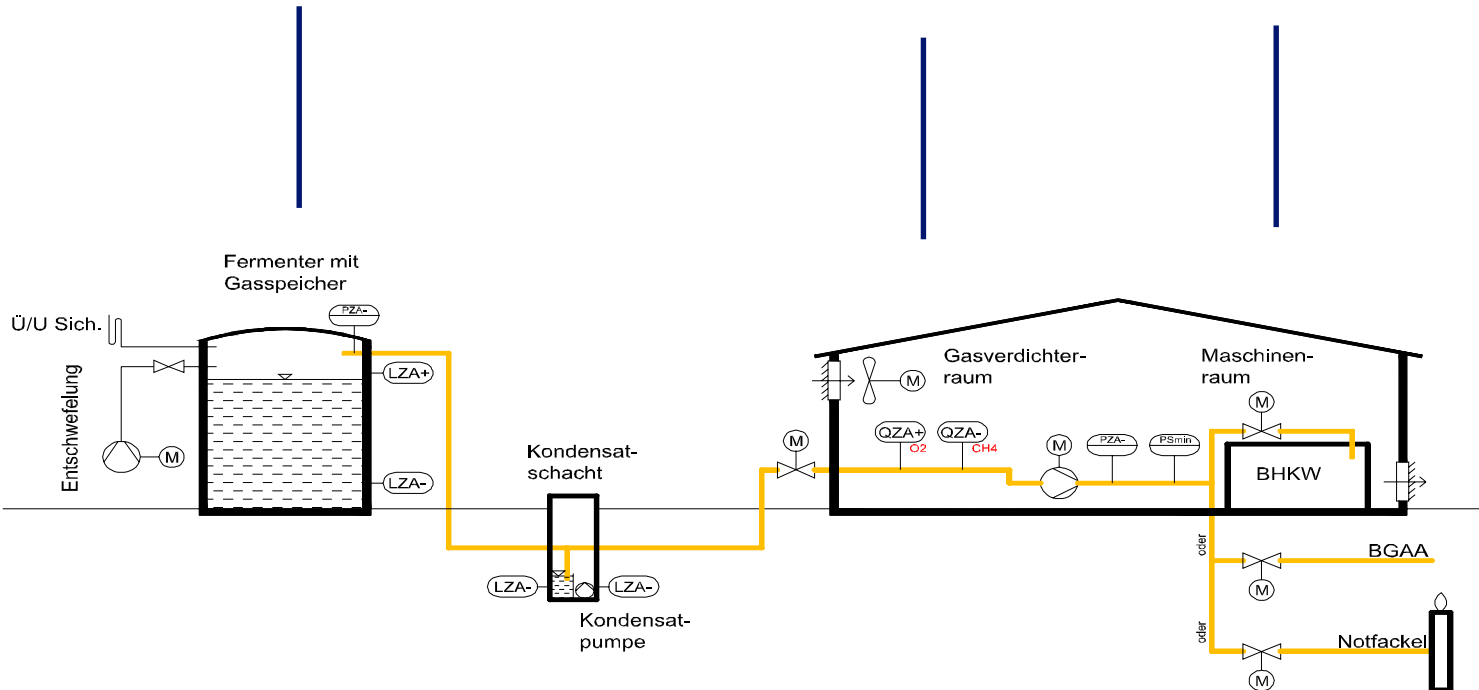
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## Biogas plant / systems engineering

Fermenter approx. 4 mbar

neg. pressure ?      positive pressure ca. 60 – 80 mbar



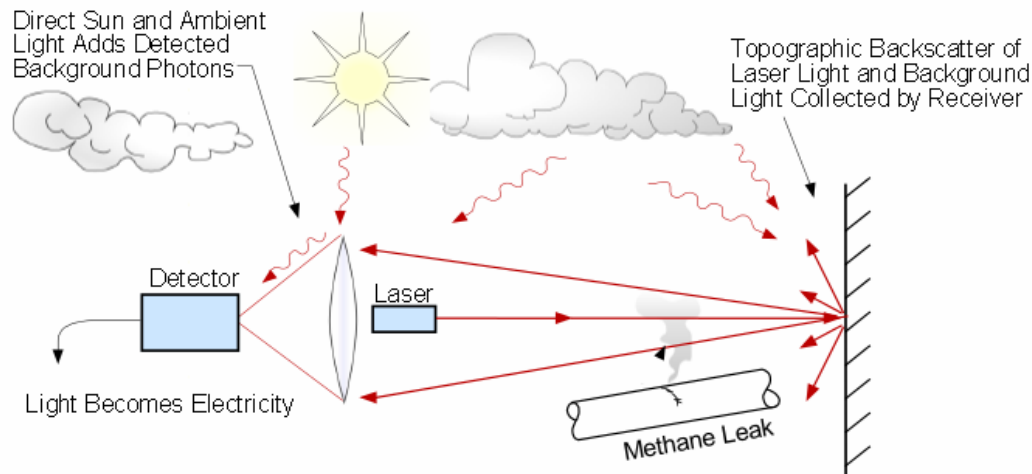
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## RMLD

### (Remote Methane Leak Detector) – Laserabsorptionsspectrometer



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**RMLD – selektiv CH<sub>4</sub>**

**(Remote Methane Leak Detector)**

**- Laser**



MBT / MBP– mechanical biologic pre-treatment plant



Gas holder

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**Gas leakiness at the Fermenter: gasholder & concrete pass – concentration and amount with foam / bubbles**



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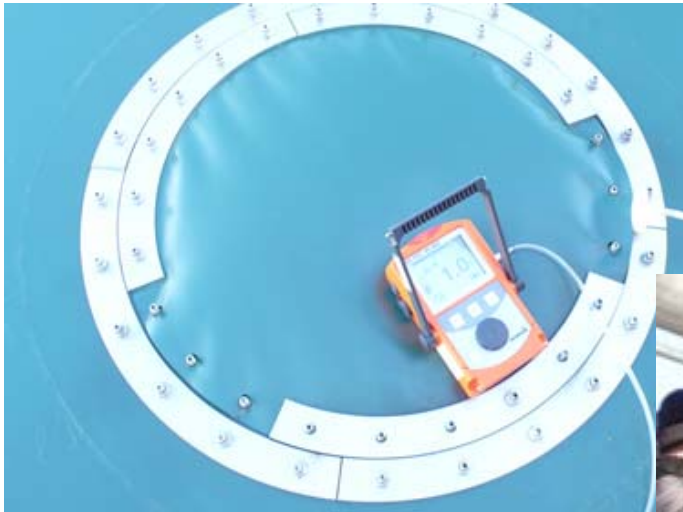


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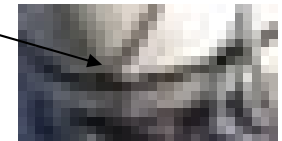
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**Gas leak ness at the Fermenter: gasholder & concrete pass – concentration and amount  
with foam / bubbles**



**Gas leak :**  
**Camera, ..**  
**quality and**  
**quantity**





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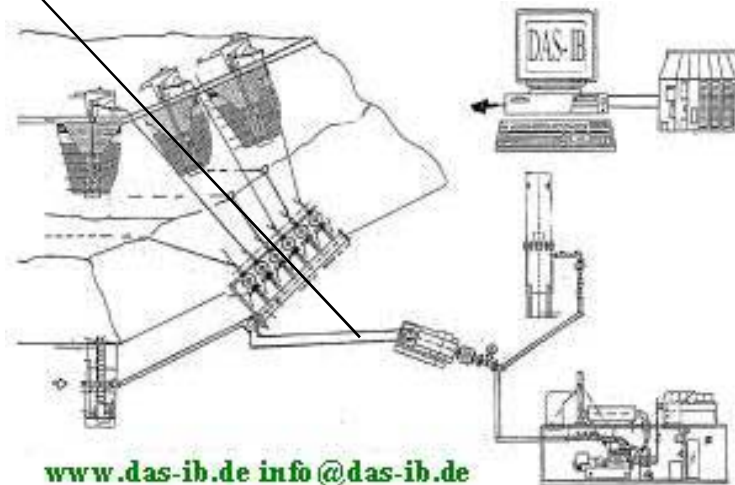
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Methane  
(méthane) + O<sub>2</sub> =



+ CO<sub>2</sub>

**GWP: 25**



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It looks easy – money from waste ... **BUT** ....

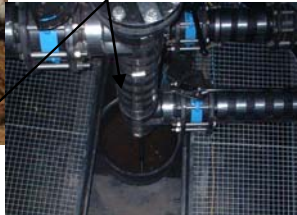
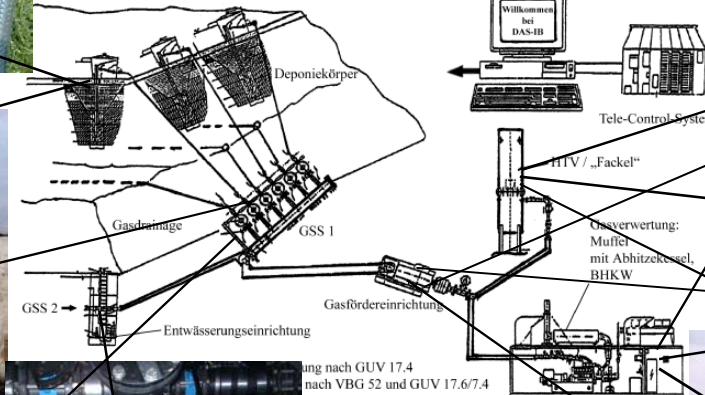
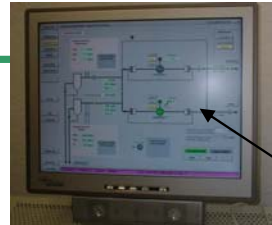
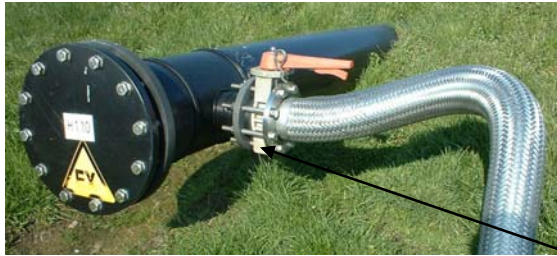
Il semble facile de faire de l'argent à partir des ordures ... **MAIS**...

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**The big EASY**

**If the gas extractions system runs**



ung nach **GUV 17.4**  
nach **VBG 52** und **GUV 17.6/7.4**



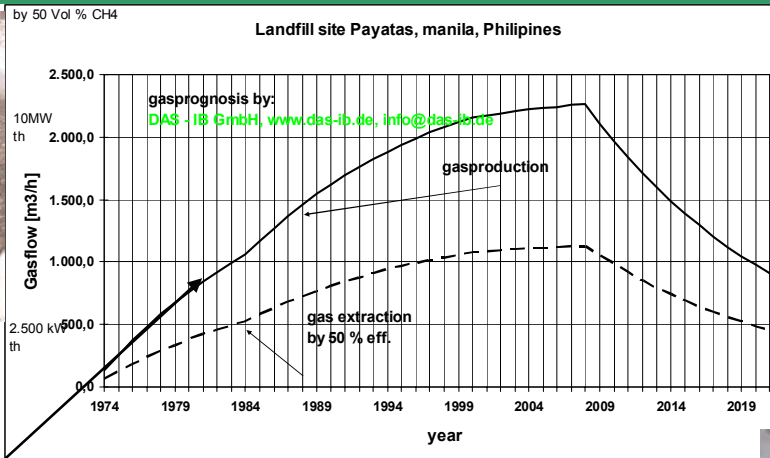
**See: Author Wolfgang H. Stachowitz**  
**15 Years of experience in the field of LFG disposal ..**  
**Sardinia 2001, 8th International ...**

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## Risks and sometimes reality in LFG - projects



See Author Wolfgang H. Stachowitz  
 15 Years of experience in the field of LFG disposal ..  
 Sardinia 2001, 8th International ...



$$Q_{at} \left( \frac{m^3}{a} \right) = 1,868 \cdot M \cdot TC \cdot f_{a0} \cdot f_a \cdot f_o \cdot f_s \cdot k \cdot e^{-k \cdot t}$$

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different climate conditions on landfill sites – emissions in a level of 1.2 m over surface

(différents Conditions climatiques sur la décharge)



So you do need a good gas prognoses – tests on sites – pumping trails – etc. etc.

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Measurement at manifold station:

(Mesure à la station de collecte du gaz: )

p, F, T, Q: CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>S, ...

Plus samples for a laboratory:

(Plus des échantillons pour le laboratoire: )

F, Cl, S, Si, CO, NH<sub>3</sub>, H<sub>2</sub>S etc.

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Measurement at gas wells:

(Les mesures dans les puits de gaz: )

$\rho$ , F, T,

Q: CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>S, ...



Measurement on surface:

(Mesure en surface: )

“VOC”

Volatile organic compounds

(Les composés organiques volatils)

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## Raw gas analyses / inspections



Methan	Vol-%	27,6	DIN 51872-5*;KI
Kohlendioxid	Vol-%	5,6	DIN 51872-5*;KI
Sauerstoff	Vol-%	26,1	DIN 51872-5*;KI
Stickstoff	Vol-%	< 0,5	DIN 51872-5*;KI
Wasserstoff	Vol-%	< 0,5	DIN 51872-5*;KI
Kohlenmonoxid	Vol-%	< 0,5	DIN 51872-5*;KI
<b>NebenkompONENTEN</b>			
Schwefelwasserstoff	mg/m³	2190	Sewerit;KI
Ammoniak (NH3)	mg/m³	> 76,0	Sewerit;KI
<b>Siliciumkomponenten</b>			
Hexamethyldisiloxan	mg/m³	0,7	E VDI 3860 Bl. 2;KI
Hexamethylcyclotrisiloxan	mg/m³	< 0,4	E VDI 3860 Bl. 2;KI
Octamethyltrisiloxan	mg/m³	< 0,1	E VDI 3860 Bl. 2;KI
Octamethylcyclotetra-siloxan	mg/m³	1,5	E VDI 3860 Bl. 2;KI
Decamethyltetrasiloxan	mg/m³	< 0,1	E VDI 3860 Bl. 2;KI
Decamethylcyclopenta-siloxan	mg/m³	0,5	E VDI 3860 Bl. 2;KI
Summe Siloxane	mg/m³	2,7	E VDI 3860 Bl. 2;KI
Summe Siloxane als Si	mg/m³	1,0	E VDI 3860 Bl. 2;KI
<b>Summenparameter</b>			
Chlor gesamt	mg/m³	< 1	E VDI 3860-2;KI
Fluor gesamt	mg/m³	< 1	E VDI 3880-2;KI
Schwefel gesamt	mg/m³	1600	E VDI 3860-2;KI

*Handwritten notes on the table:*

- Next to Schwefelwasserstoff: **X**
- Next to Ammoniak: **2 end of measurement div.**
- Next to Sewerit;KI for Ammoniak: **> 5.355**
- Next to Sewerit;KI for Ammoniak: **186**
- Next to Summe Siloxane: **2,44**
- Next to Schwefel gesamt: **3512**

--- = Statistischer Bestimmtheitsmaßgrenze n.B. = nicht bestimmbar \* = nicht akkreditiert FV = Fremdvergabe

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## IR – Laser (RMLD) checks of the surface and raw gas at well





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Different kinds of measurements on site: FID, Laser (RMLD), semiconductor



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## Gas prognosis ... and test cell with mobile system – pumping trail



## Die mobile Kleinst-Fackel – the small scale mobile flare



DMF V:  
 Feuerungswärmeleistung /  
 firing capacity:  
 0 - 150 kW<sub>th</sub>



er Gasbrunnen und  
 ung  
 ferdichter und  
  
 der Fackeln:  
 – Luft (29.X.2007),  
 ten Vordruck von  
 entflähter  
 ung  
 gen, Druckmessungen  
 "1" saug- und  
  
 isalfreien Kontaktes bei  
 AUS"  
 is äußerer Blitzschutz  
 ichtig / Belüftung  
  
 ng:  
 bder: 1:15  
 ngswärmeleistung  
 = 250 mbar  
  
 CO<sub>2</sub>, O<sub>2</sub> zur  
 Durchfluß-, Druck- und  
 g

### FIELDS OF APPLICATION:

- \* Barbecue – only with Natural gas!
- \* LFG- & Biogas Pumping trails
- \* Protective LFG degassing
- \* Optimization of individual gas wells and gas manifold stations
- \* Training / schooling / instructions
- \* Training at the flare, booster and measuring devices

### BASIC CONFIGURATION OF THE FLARES:

- \* Design according to TA air (2007),
- \* Control range for a pressure of 5 to 99 mbar (g) to flare
- \* Operation with an own LFG-booster
- \* H – O – A Start
- \* Supervision of the combustion chamber - burner control unit (BCU)
- \* Temperature measurements, pressure measurements

- \* Analysis connection: "1/2" "1/2" on the suction and on the pressure side
- \* slam shut valve
- \* Output of a potential-free contact via DMG on mobiles "ON" and "OFF"

### TECHNICAL DESIGN:

- \* Control range: 1:100 (manual), 1:15 (automatic)
  - \* 0 – 150 kW<sub>th</sub> firing capacity
  - \* 0 – 200 m<sup>3</sup>/h at d = 250 mbar
- OPTIONs:
- \* Raw gas analysis: CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub> for the permanent measurement
  - \* Electrical / manual flow, pressure, and temperature measurement
  - \* INDUTU – operation

**Time >> 6 month on site !! For a stable LFG flow  
 DAS – mobile flares on trailers until 1,6 MW<sub>th</sub>**

**Or small scale flares less than 100 kW<sub>th</sub> on a trolley**

### Wir helfen ihnen gerne.

- Biogas-, Klärgas- und Deponiegastechnologie:
- \* Beratung, Planung, Projektierung und Ausführung
  - \* Schulung von Betriebspersonal
  - \* Sachverständigen-Attesten (i.a. nach § 20a BImSchG und befähigte Person (sd BetrSichV)
  - \* CO<sub>2</sub>-Zertifizierungshandel
  - \* Erstellen von Explosionsschutzdokumenten

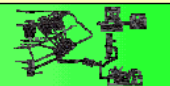


### We are able to assist & help you:

- Biogas, sewerage gas and landfill gas (LFG) technology:
- \* Consulting, planning & designing, projecting
  - \* Special schooling and training of system operators
  - \* Independent expert & specialist
  - \* Expert in ATEX-Zoning
  - \* CO<sub>2</sub>-trading with methane (carbon trading / LFG – projects)
  - \* Creating of explosion protection documents
  - \* Bigger mobile flares DMF I (1 MW<sub>th</sub>) until DMF II (1,6 MW<sub>th</sub>)

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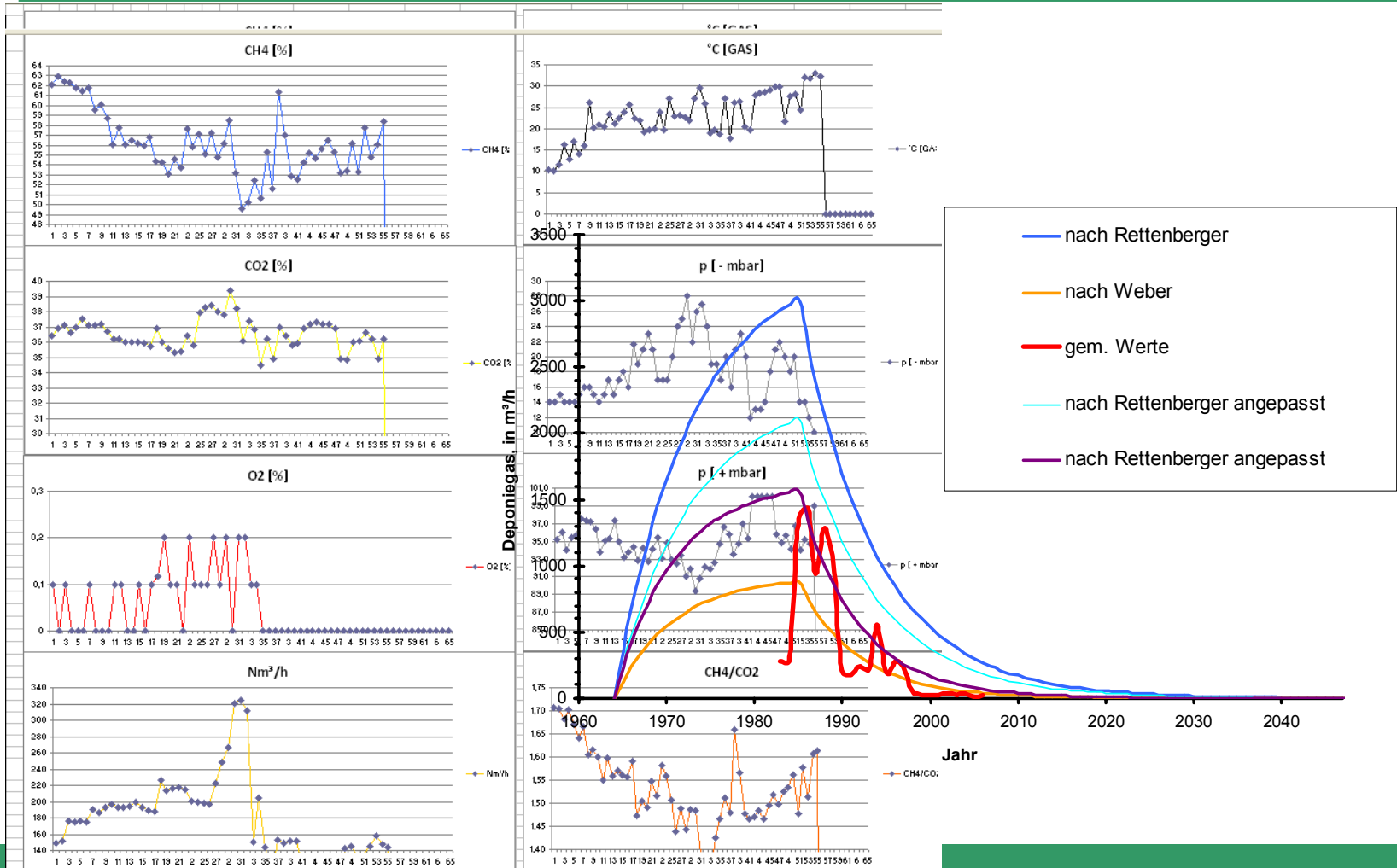


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## Gas prognosis and reality – LFG = f (t)



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### Gas prognosis and reality



**Small scale flares instead of big engines ....**

**It's better to use realistic gas prognosis and the right equipment to measure the row gas, surface**



Please note all landfill sites are different

- Weather conditions
- size, high, input,
- etc.

Chaque décharge est un cas particulier

- Conditions climatiques
- Dimension, hauteur, input
- etc.

# Any questions left?



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know where to find it:

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Or we see us at your site or here e.g. next break