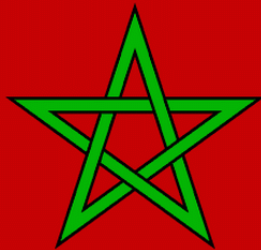


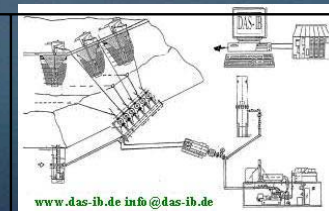
# Le nouveau Challenge de maitrise de récupération des gaz de décharge au Maroc!

Présentation de Wolfgang H. Stachowitz

**Captation du Méthane à partir des décharges :  
un art ou une évidence**  
**LFG extraction: Is it art & design or a matter of course –**



DAS – IB GmbH / LFG - & Biogas  
- Technology  
Technical Office / Post:  
Pretzer Str. 207  
D 24147 Kiel  
Financial Office / Flintbeker Str. 55  
D 24113 Kiel



phone.: # 49 / 431 / 68 38 14 / 53 44 33 - 6 oder 8  
Fax.: # 49 / 431 / 200 41 37 / 53 44 33 -7

Story of making .....

Money from LFG (Methane) / waste

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

Methane (méthane) + O<sub>2</sub> =



+ CO<sub>2</sub>

**GWP: 25**



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

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

# Story of making .....

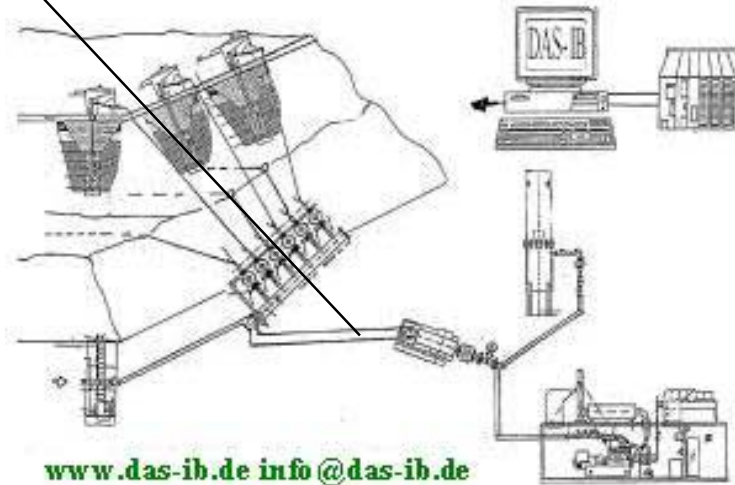
## Money from LFG (Methane) / waste

Methane  
(méthane) + O<sub>2</sub> =



+ CO<sub>2</sub>

**GWP: 25**



[www.das-ib.de](http://www.das-ib.de) [info@das-ib.de](mailto:info@das-ib.de)

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

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

Story of making .....

Money from LFG (Methane) / waste

**BUT .... MAIS**

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

---

## Fires at landfills (les décharges en feu)



Story of making .....

Money from LFG (Methane) / waste

**BUT .... MAIS**

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

## People on landfills

(Humains sur les décharges)



Story of making .....

Money from LFG (Methane) / waste

**BUT .... MAIS**

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

## animals on landfills

(animaux sur les décharges)



Story of making .....

Money from LFG (Methane) / waste

**BUT .... MAIS**

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

different climate conditions on landfill sites

(différents Conditions climatiques sur la décharge)



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

Story of making .....

Money from LFG (Methane) / waste

**BUT .... MAIS**

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

---

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.



## Story of making .....

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

## Money from LFG (Methane) / waste what do you really need ..

- ➡ **Basic data of the landfill (operator, dimensions, short description, location, infrastructure)**
- ➡ **Deposited amount of waste, deposition mode (packed bed, compaction),  
Waste composition see form at <http://www.das-ib.de/english/gasprognosis.htm> -> gas prognosis**
- ➡ **Landfill gas analysis, where required, with the components (CH<sub>4</sub>, CO<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, H<sub>2</sub>, Si, where appropriate)**
- ➡ **Floor plan of the landfill with height specifications (e.g.: 1:2000) and regional map, infrastructure, (streets, energy supply)**
- ➡ **Floor plan with plot numbers + list of the neighbouring proprietors**
- ➡ **Specifications regarding the connection distances to the next medium-voltage line, or even power grid / EU (electric utility) specifications about the capacity of the line**
- ➡ **Specifications about the possible point of interconnection (contact the power grid company (EU for details!) to be able to assess the possible grid connection costs. Delivery and energy supply**
- ➡ **Specifications regarding the local pay of skilled personnel (engineer, electrician, machine operator) Specifications regarding possible feed-in revenues (ct/kWh) outside Germany)**
- ➡ **Planning documents for upstream plant components (installation plan of the technical components at the landfill; buildings etc.) Which type of machines are required (size) to reach the landfill? Are there any crafts available on location: drilling excavation, pipelines etc.**
- ➡ **Information about possible heat users (distance to the installation place of the gas utilisation plant, heat requirements, heat spread)**
- ➡ **Information about the current annual electric energy consumption and costs (demand rate, price per kWh).**

# Operation ranges of gas plants

(l'exploitation des installations de gaz)

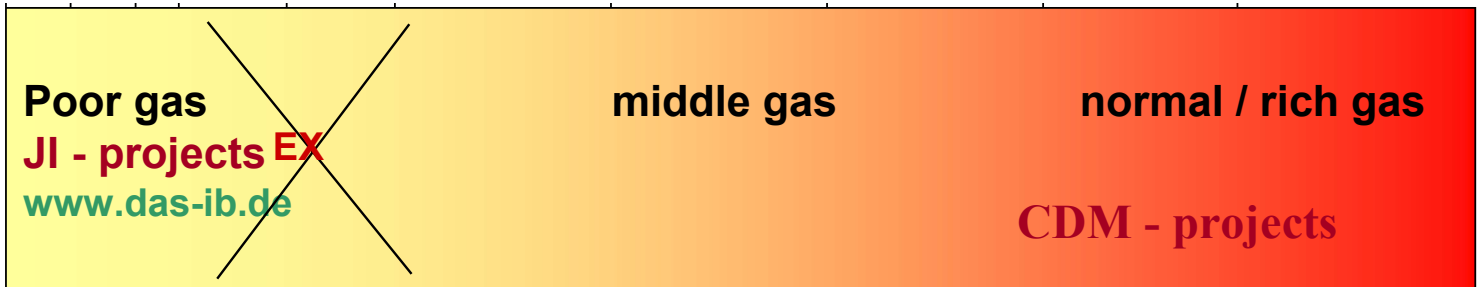
## Calorific values Landfill gas utilization:

(pouvoir calorifiques de l'utilisation du gaz d'enfouissement:)

Calorific value	0	0,22	0,4	0,5	1	1,5	2	2,5	3,5	4,5	kWh/m <sup>3</sup>
Methane content		2,2	4	5	10	15	20	25	35	45	Vol: % CH <sub>4</sub>

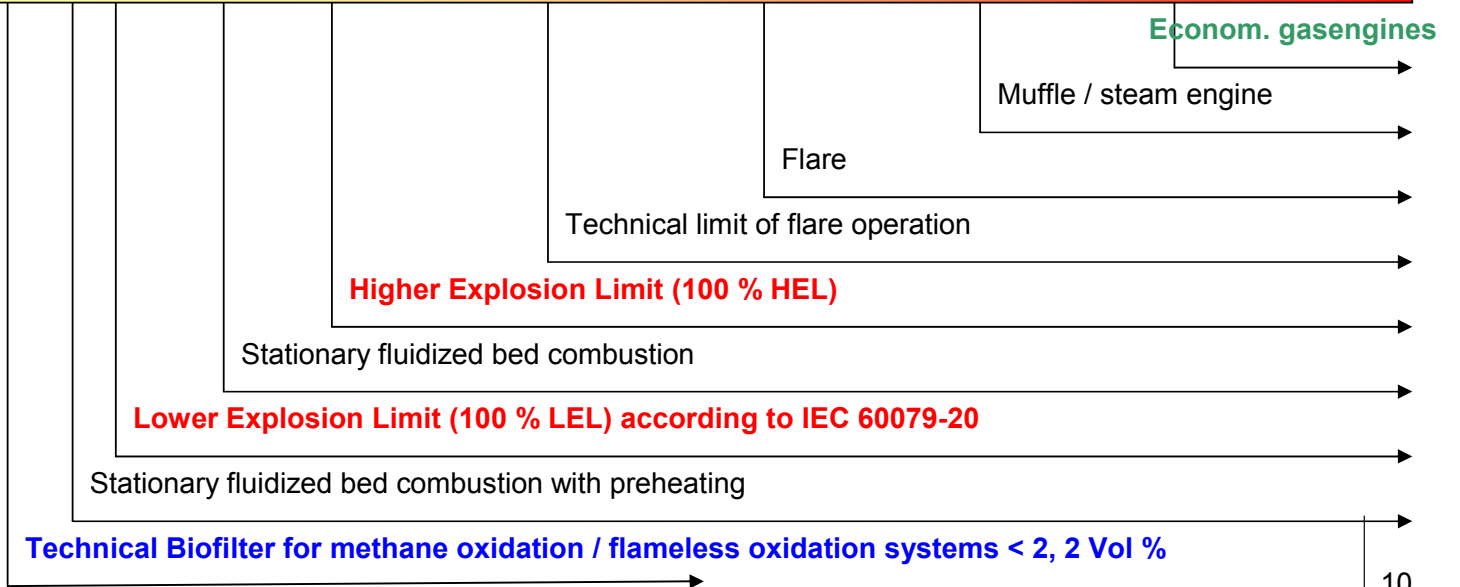
DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

Germany:  
 100 ppm by  
 FID



Gas plants

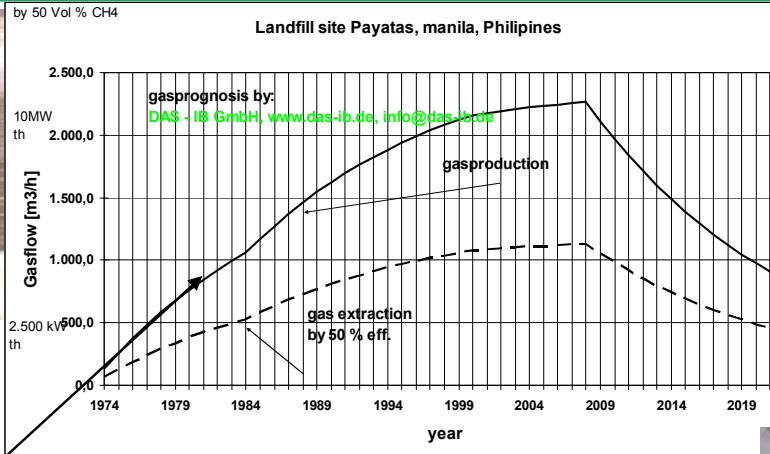
Different  
 status  
 quo:  
 Europe,  
 Africa,  
 Asia,  
 South  
 America  
 ..



# Risks and sometimes reality in LFG - projects

(Des risques et la réalité de LFG – projets)

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©



## Gas prognoses and technique on landfill sites – theory and practice

(Estimation de gaz et techniques d'enfouissement des déchets- théorie et pratique)



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

**Risks  
and sometimes reality  
in LFG - projects**

(Des risques et la réalité de LFG – projets)

**DAS – IB GmbH, LFG & Biogas – Technology**  
[www.das-ib.de](http://www.das-ib.de) ©

**Plastic tubes instead of HDPE – pipes**

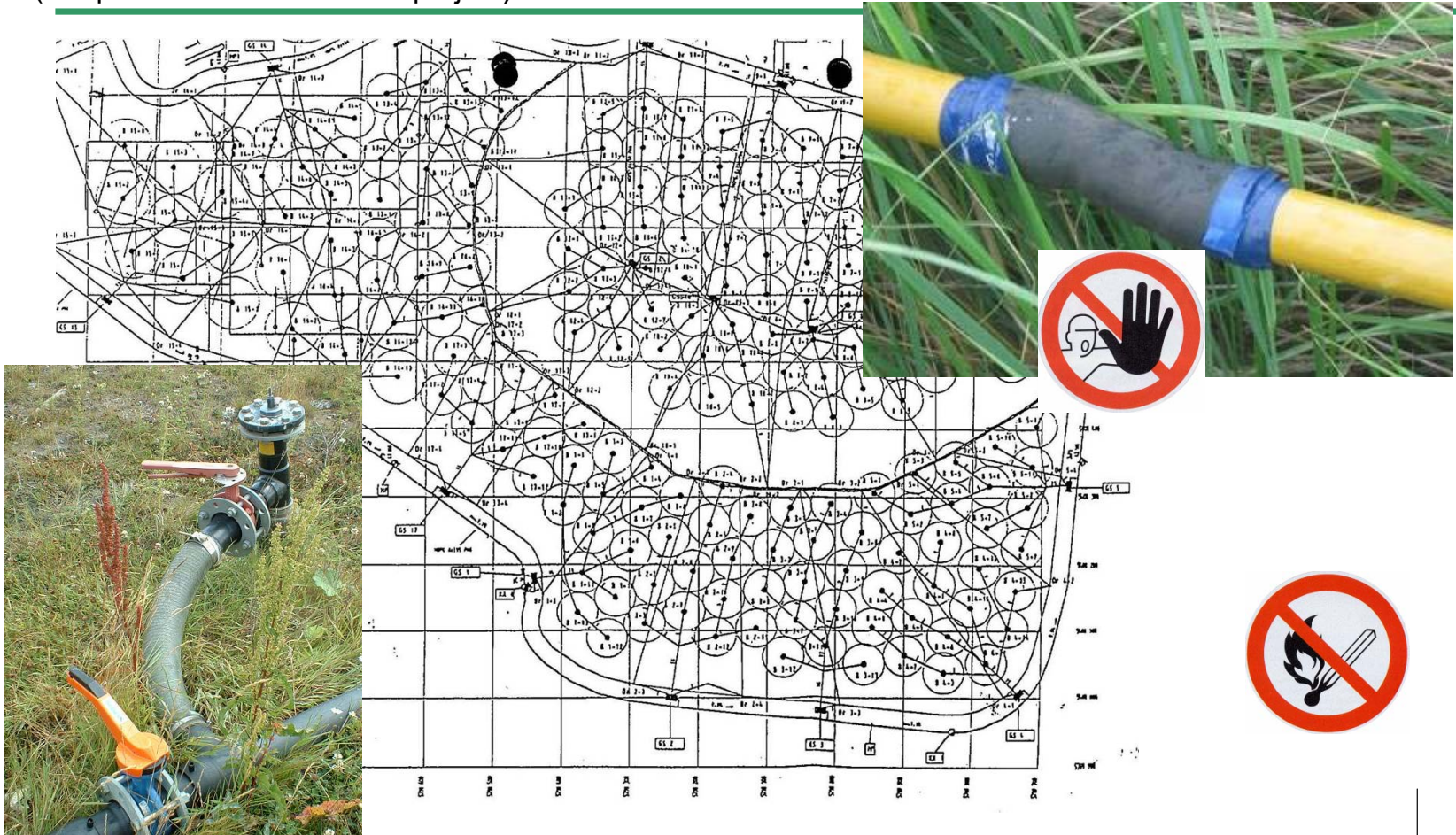
**(Tuyaux en plastique au lieu des Tuyaux HDPE-)**



# Risks and sometimes reality in LFG - projects

(Risques et réalité de LFG – projets)

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©



Story of making .....

Money from LFG (Methane) / waste  
so we make test on site – site visit

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©



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)

Story of making .....

Money from LFG (Methane) / waste  
so we make test on site – site visit

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©



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> etc.

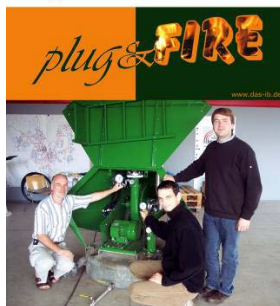


## Mobile flare systems for pumping trails to find out the different between theory (gas prognoses) and real gas flow and methane content

Les systèmes mobiles du pompage de gaz pour connaitre la différence entre la théorie (les prévisions de gaz) et le débit réel de gaz et de teneur en méthane

## DAS – IB GmbH, LFG & Biogas – Technology [www.das-ib.de](http://www.das-ib.de) ©

Kostenlose Prognose zum Testen – Free Test Prognosis

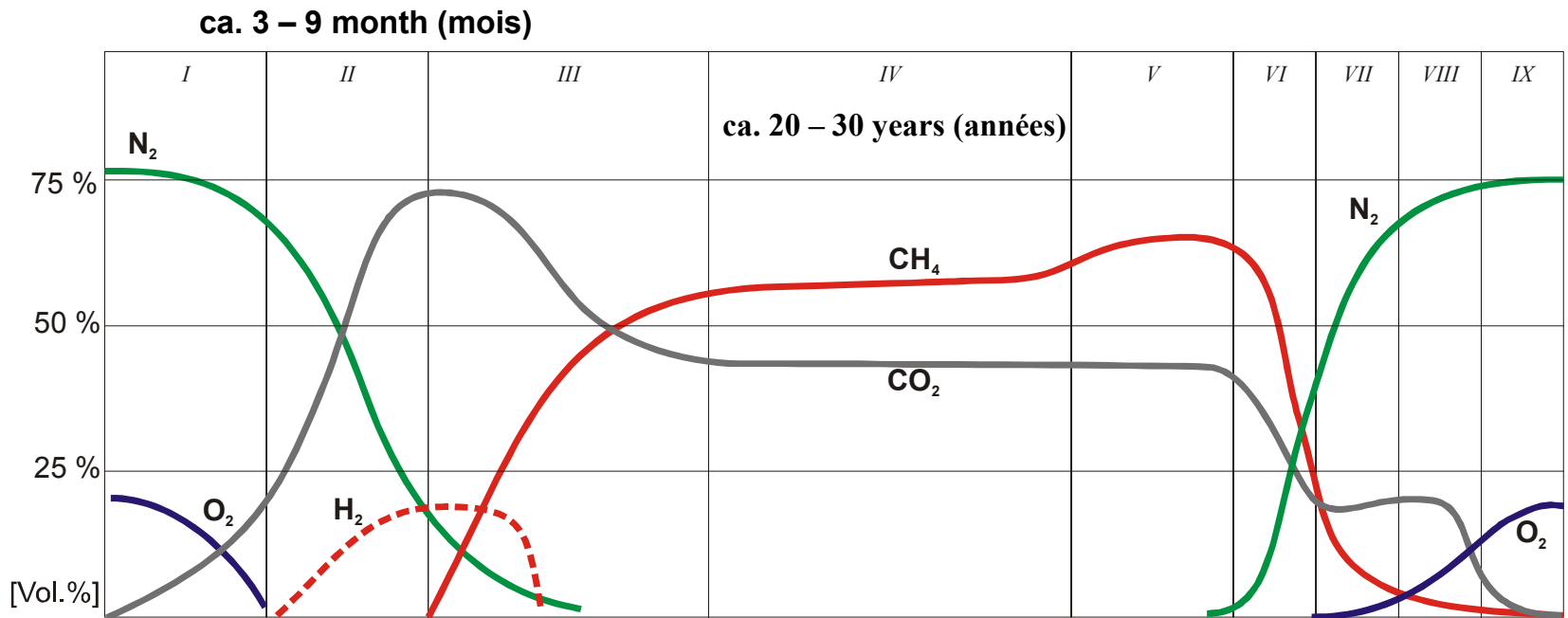


<b>Deponieangaben zur Erstellung einer Gasprognose:</b>	
<b>Specification of landfill conditions for predicting landfill gas generation:</b>	
<b>Standort der Deponie (Name, Adresse, Land etc.):</b> <b>Location of the landfill site (name, address, country ....):</b>	
Einbaubeginn (Verfüllung): Start of landfill operation:	
Einbauende: End of landfill operation:	
Einbaumenge pro Jahr: Landfill waste p. a. (tonnes/a) [m <sup>3</sup> /a]:	
<b>Zusammensetzung des eingelagerten Mülls (Müllsorten in % oder t):</b> <b>Composition of landfilled waste (type of residues in % or t):</b>	
Hausmüll: MSW (municipal solid waste):	
Sperrmüll: Bulky refuse:	
Bauschutt: Rubble, demolition waste:	
Organischer Müll: Organic waste:	
Hausmüllähnlicher Gewerbeabfall: Ordinary industrial residues (similar to MSW):	
Produktspezifischer Gewerbeabfall: Industrial residues from production processes:	
Klärschlamm & Straßenkehricht: Sewage sludge & road sweepings:	
Sonstiges Abfälle: Other waste: _____	
Basisabdichtung:       ? Ja    ? Nein: Land fill bottom liner:   ? Yes   ? No:	
Oberflächenabdichtung:   ? Ja    ? Nein: Surface sealing/Landfill cap: ? Yes   ? No:	
Dünnschichteinbau (ab wann): Thin layer compaction (since ....):	



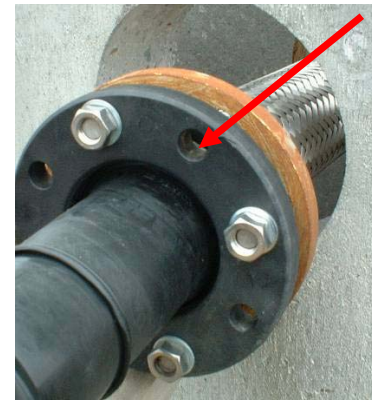
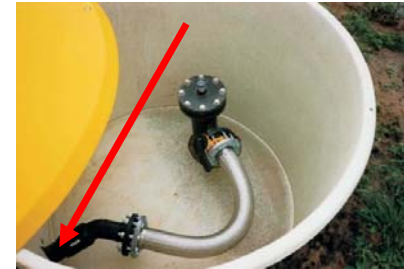
## Landfill gas over time

(Records des gaz d'enfouissement)

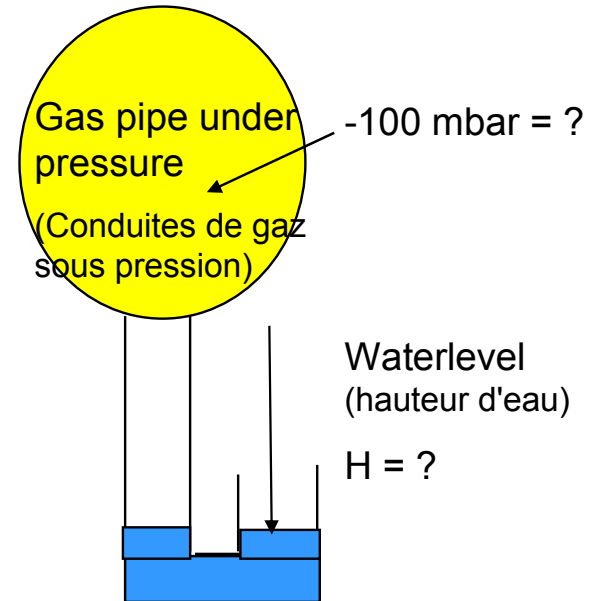


Where you are? Old gas – fresh gas ?  
(Où sommes nous ? Ancien gaz ou de gaz frais?)

Based on (Farquhar / Rovers 1973) with long term model of Franzius 1981 and Rettenberger & Mezger 1992



**Gas wells and pipe works from western Europe but worse – who is construction supervisor ?**  
Des puits de gaz et des pipelines de l'Europe sont mal construits- Qui est le controleur de construction?



**Save a condensate knock out pot and got new and more trouble with your gas extraction system  
– who is construction supervisor ?**

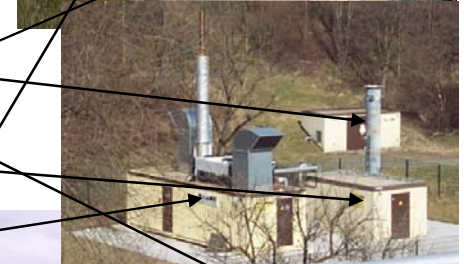
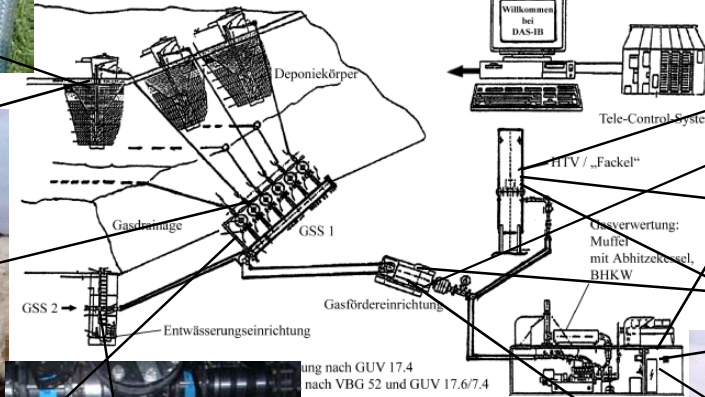
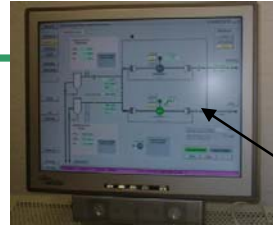
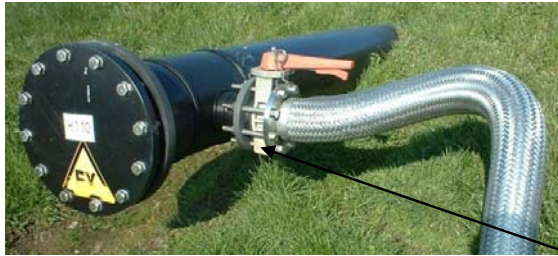
Mauvais Essaie d'économie de construction d'élimination du condensat des gazs avec des effets contradictoires - Qui est le responsable de la construction?

LFG - Systems

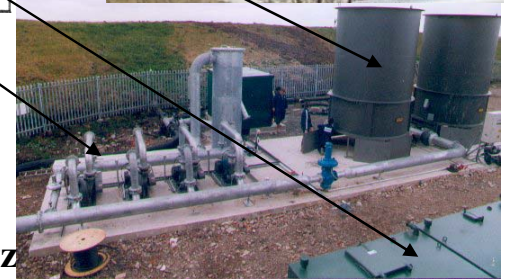
The big EASY

If the gas extractions system runs

(Si les extractions de gaz à court)



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



See (Voyez): Author **Wolfgang H. Stachowitz**  
15 Years of experience in the field of LFG disposal...

15 ans d'expérience dans le domaine d'élimination des gaz des décharges...  
Sardinia 2001, 8th International ...

Story of making .....

Money from LFG (Methane) / waste  
conclusions and necessary skills

DAS – IB GmbH, LFG & Biogas – Technology  
[www.das-ib.de](http://www.das-ib.de) ©

**Besoin nécessaire de Renforcement de capacités et de l'expérience pratique!!!**

**On site:**

inspections e.g. settlements, condensate, slope, measurements at wells, shafts, manifold stations etc., operation of the landfill gas extraction system incl. dewatering systems, checks of emissions over the surface

**Booster and flare station:**

inspections e.g. mechanical, electric and safety functions, measurements & checks analyses and safety devices, operation with right flow and pressure to site and flare

**Savoir faire de récupération de gaz:**

inspections par exemple établissements, de condensat, de la pente, les mesures dans les puits, arbres, etc stations multiples, y compris l'exploitation de gaz d'enfouissement système d'extraction. systèmes de déshydratation, les contrôles des émissions sur la surface

**Savoir faire de maitrise des techniques d'élimination de gaz: Booster et poste de torchage :**

Inspections: mécaniques, électriques et de sécurité..., mesures et analyses des contrôles et dispositifs de sécurité, parallèlement assurer un bon débit et la sous pression des gaz sur le site et la Torche

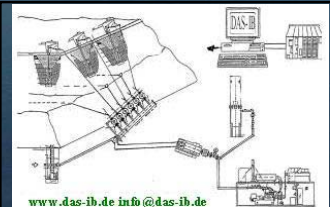
# Merci pour votre attention!

## Wolfgang H. Stachowitz

**DAS – IB GmbH**  
**LFG Technology, [www.das-ib.de](http://www.das-ib.de)**

- Biogas-, Sludge gas and Landfill gas technology:
- Consulting, planning & design, project management
  - Familiarisation and training of system operators
  - Independent Expert & Specialist
  - Expert in ATEX – Zoning according to 99/92/EG and 94/9/EG

Technical Office / Post:  
Preetzer Str. 207  
D 24147 Kiel  
Financial Office / Flintbeker Str. 55  
D 24113 Kiel



[www.das-ib.de](http://www.das-ib.de) [info@das-ib.de](mailto:info@das-ib.de)

phone.: # 49 / 431 / 68 38 14 / 53 44 33 - 6 oder 8  
Fax.: # 49 / 431 / 200 41 37 / 53 44 33 -7