

SNOWLEOPARD

**SNOW LEOPARD PROJECTS
GMBH
BIOGAS IS OUR BUSINESS**

High Performance Anaerobic Digestion of Straw, Manure and Agricultural By-Products & Production of Solid Fertiliser

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Beijing, 23. October 2018



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Situation

**99,9% of biogas plants are build to treat
MAIZE SILAGE and SLURRY**

Future is not ~~Maize Silage~~.

Future are AGRICULTURAL BY-PRODUCTS:

- **Straw (maize, rice, etc)**
- **Manure**
- **Fibrous (=cellulosic) material**



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Flexibility in Feedstock

进料的灵活性

- Example SLP AD Plant Laburnum, UK 在英国建立的厌氧发酵工程



Straw 秸秆



Cattle Manure 牛粪



Corn moulded 玉米颗粒



Old potatoes
坏土豆



Residues of
pea plants 豌豆残渣



Vegetable Waste
素菜残余物



Chicken Manure 鸡粪



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Situation



China Can Supply About 250 Million Metric Tons of Crop Residues for Bioenergy Production Every Year

- ca. 50% rice straw
- ca. 30% maize straw

Source: http://www.efdinitiative.org/sites/default/files/publications/rb_15-06_final_nov_16_2015.pdf;



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Situation

Existing Biogas Plants cannot

Mix it

Heat it

Feed it

≡ FAILED Biogas Plants in China and Germany



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Solution

Batch Hydrolysis
works like the rumen of a cow

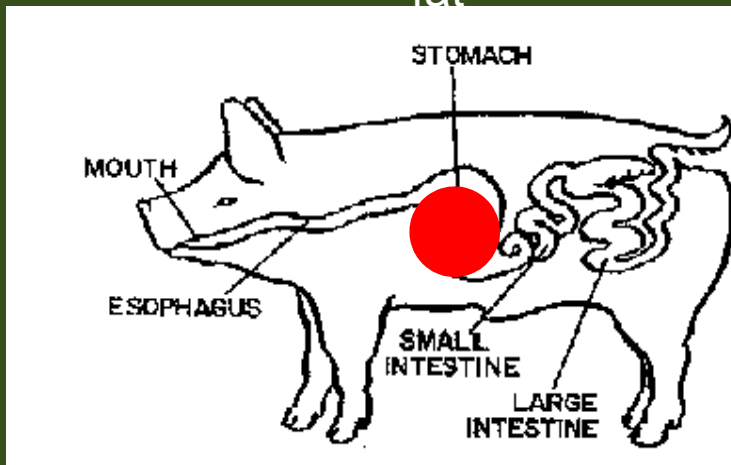


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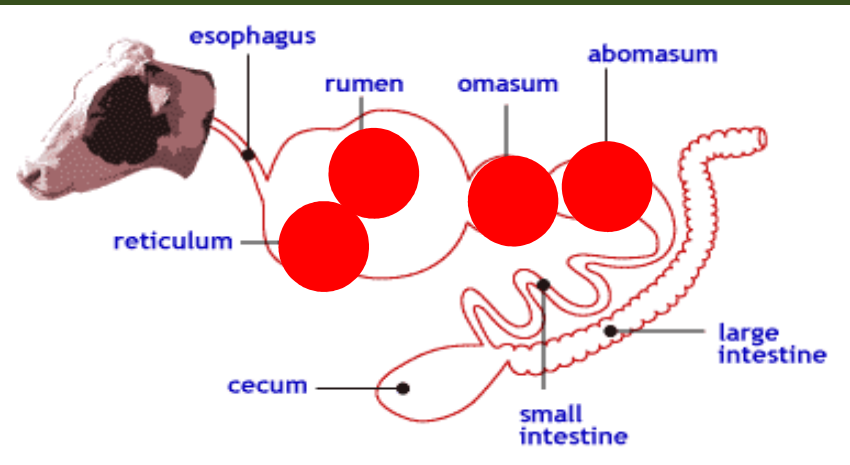
SLP – Mimicking the Bovine Digestion System

STRAW

Pigs have only 1 stomach
- and can only digest starch, protein and fat



Cattle have 4 stomachs
- and can digest cellulose



Cellulose is most common and cheapest biomass worldwide!
The aim is to digest cellulose!



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low fiber

Single Stage Biogas Plant

= P...mach

95% of the biogas plants are Single Stage

LOW FIBRE



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low fiber

Single Stage Biogas Plant

Important:

2 pigs do not
equal 1 cow!



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high fiber

2-stage Biogas Plant

= Cow Digestion System



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high fiber

2-stage Biogas Plant

Feedstock:

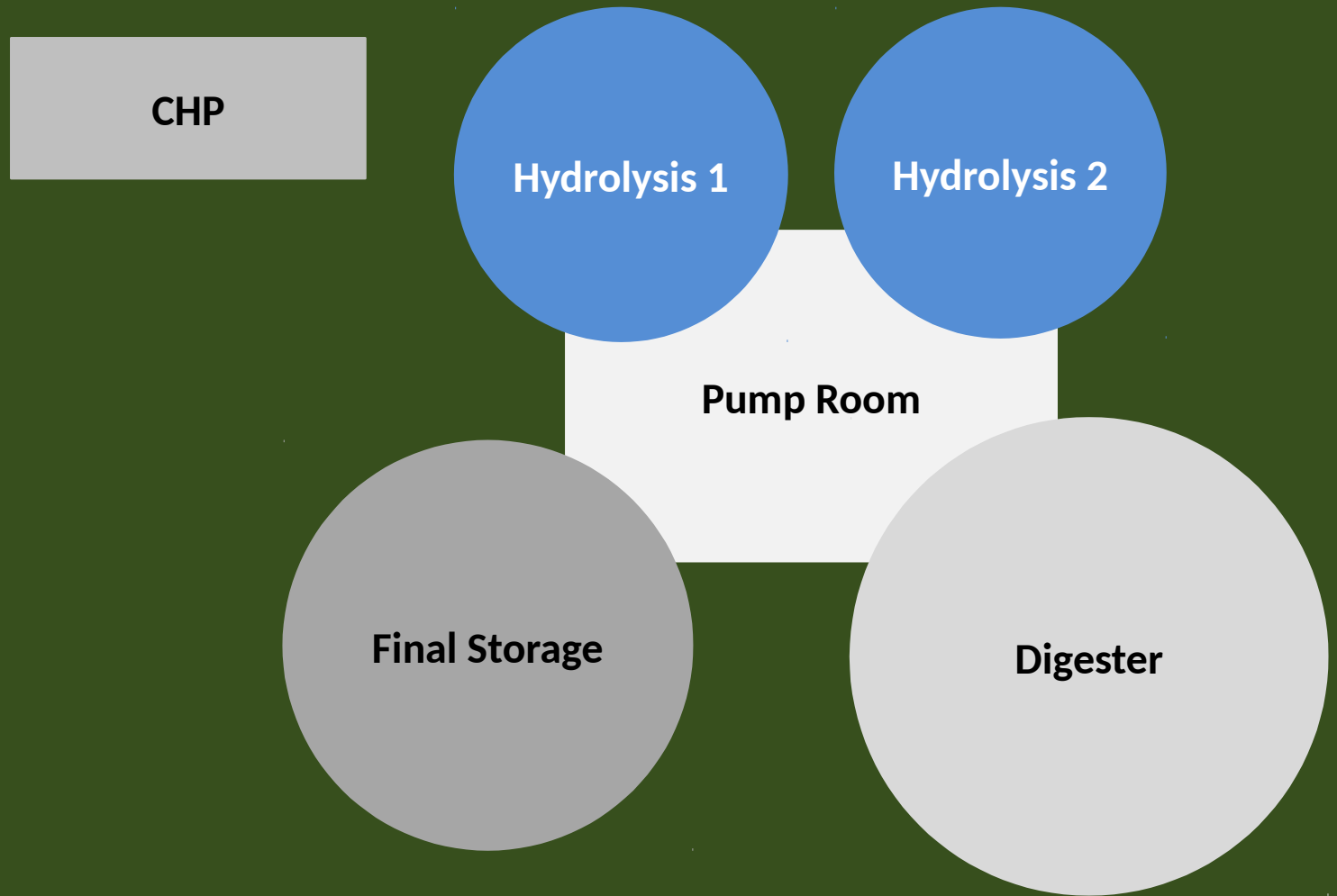
- Slurry
- Energy
- Cheap

High Fibre



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Basic-Layout



Solution

Batch Hydrolysis

- 60°C Temperature
- 40 – 50 kg VS/m³ loading rate (Mixed)

Example: 20 days retention time instead of 100 days retention time
leads to 20% tank volume, 20% pipe length

Solution

Batch Hydrolysis

- 60°C Temperature
- 40 – 50 kg VS/m³ loading rate (Mixers!)
- Batch process: ⇨ PROCESS CONTROL
- 100% Hydrolysis Gas is used

Hydrolysis gas can be burned in every biogas CHP

Solution

**What about existing
biogas plants?**

Solution

REPOWERING

with

Batch Hydrolysis

Repowering

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graph LR; H1((Hydrolysis 1)) --> H2((Hydrolysis 2)); H2 --> D((Digester));
```

Hydrolysis 1

Hydrolysis 2

Digester



Batch-Hydrolysis

Advantages

- Higher biogas yield / to input
- Cheaper and more available fibrous raw materials digestible
- High-energy raw materials digestible (Slaughterhouse waste)
- Without impairing the biology
- Seasonally available raw materials digestible (fruit waste)
- Independence of world prices (expensive raw materials)
- Higher flexibility (raw materials and feeding)



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A quick word on

Open and/or continuous hydrolysis

Continuous ≡ no process control

≡ 50% of material is not hydrolysed

Open ≡ **High methane slip** (after 1 year methane levels of up to 30% in the hydrolysis gas!)

≡ **Loss of biogas**

≡ **Greenhouse gas methane**
(21 times higher than CO₂!)



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Fertilizer Quality after 2-stage Digestion



- Nutrients are conserved in fertilizer
- Fertilizer contains only what is being fed



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SNOW LEOPARD PROJECTS GMBH (SLP)

**More than 20 years
experience in biogas**



**More than 12 years experience
with Straw as feedstock**



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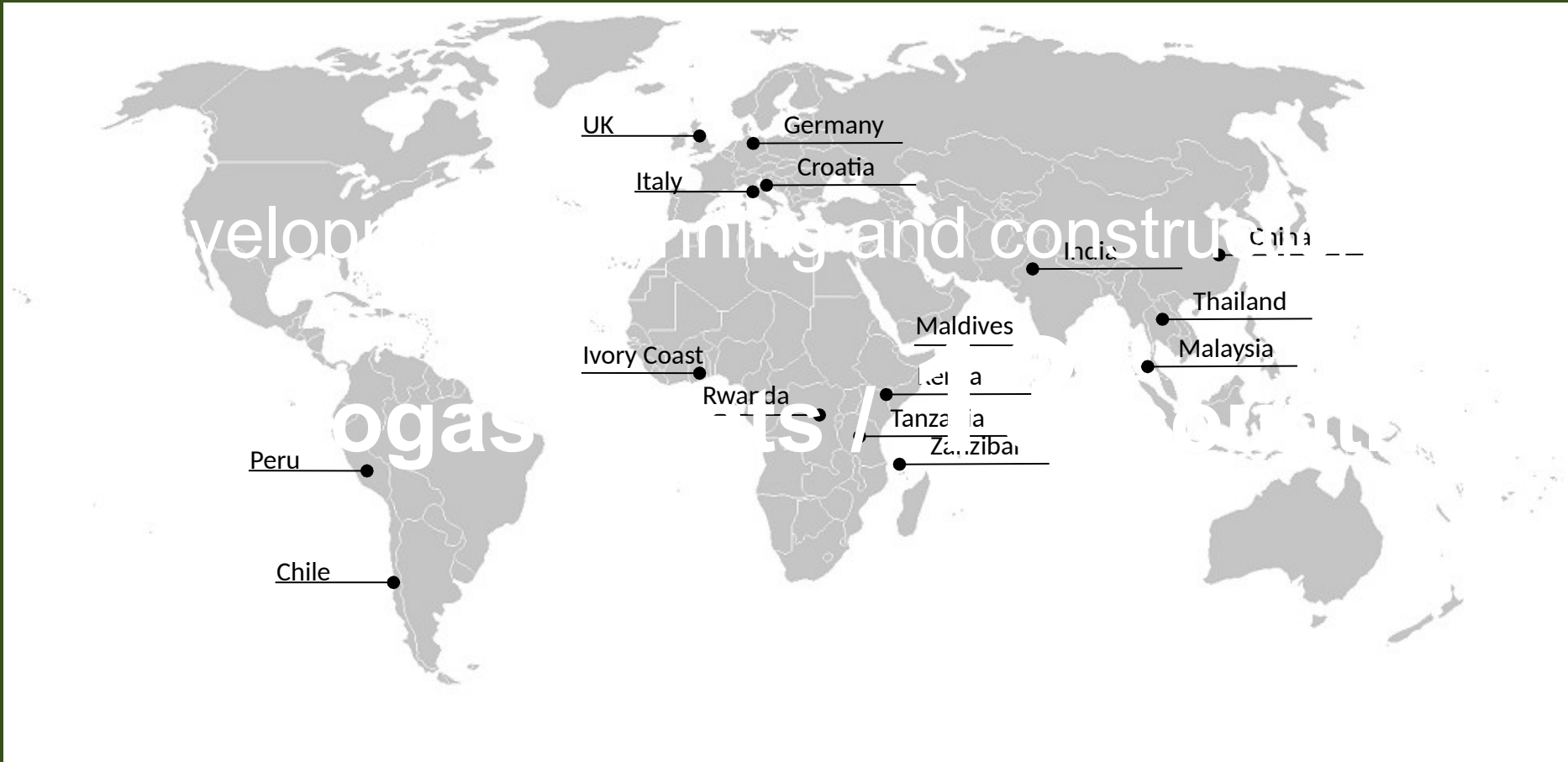
SNOW LEOPARD PROJECTS GMBH (SLP)

- More than 20 years experience
- Founded (2011) from Rottaler Modell (since 1994)
- Biogas Entrepreneur since 1994
- Managing Directors – Katharina Danner and Walter Danner
- Development, planning and construction of 50 biogas plants in 13 countries in Germany, Europe, Africa, Asia and South America
- Biogas Management School



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Acting Worldwide



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International Experience



from
10 kW



SNOWLEOPARD

International Experience



to
2.8 MW
(2,800 kW)



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SLP Statement

We know, how to
build & operate
biogas plants worldwide!



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Do YOU have
any questions?



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