Biogasprojekte - Praktische Beispiele aus Afrika
–
Experience of Biogas Plant Building in Africa
(Slide in English/Presentation in German)

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Overview

- 1. Introduction;
- 2. Examples of Biogas Plant Projects;
- 3. Experiences & Lessons learned and
- 4. Conclusion

1 Introduction

Experiences in Africa context

as Designer, Constructer, Consultant or Backstopper

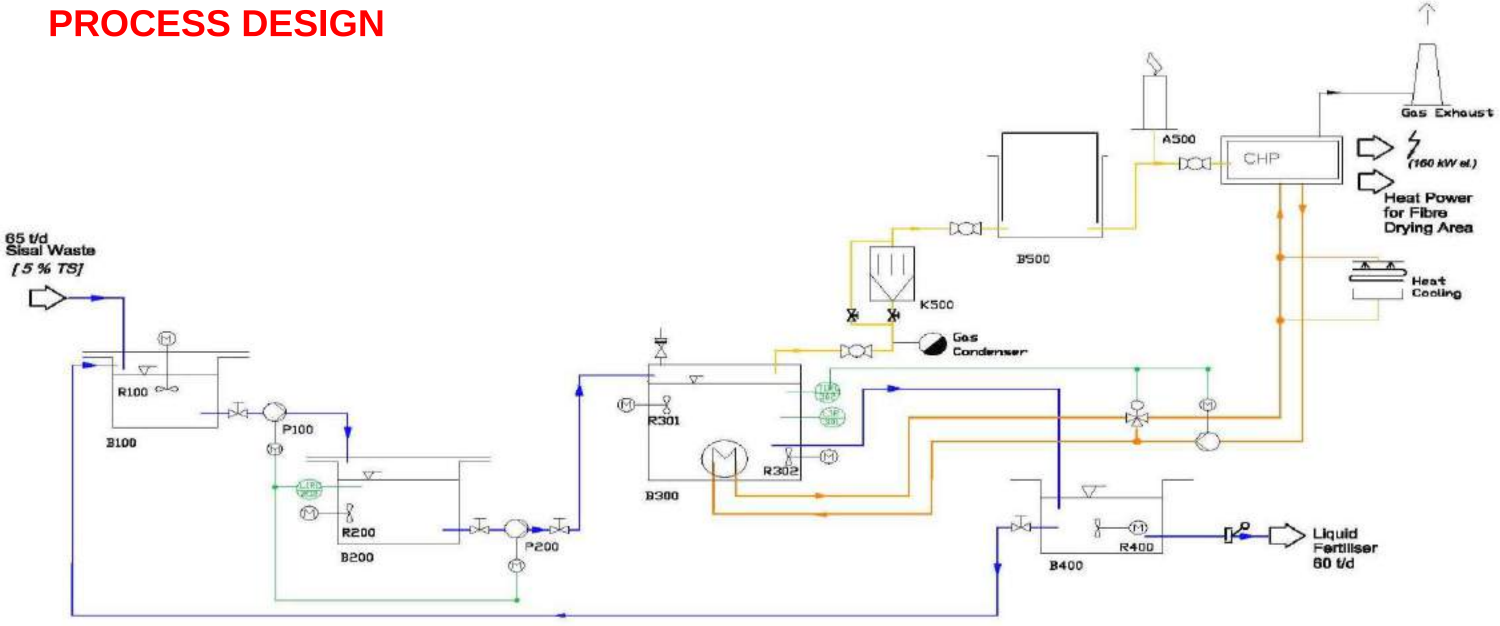
- Benin
- Burkina Faso
- Ghana
- Ivory Coast
- Kenya
- Lesotho
- Madagascar
- Marocco
- Sénégal
- Tanzanie
- Tunisie
- Uganda

Biogas Plant Engineering

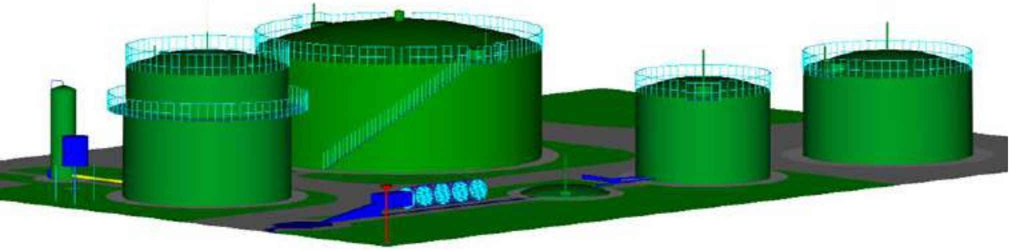
BASIC CALCULATION

Biogas plant for the treatment of sisal waste					
1. Main product, Substrates, Input quantity					
Total input:	65,0	t/d	**TS-Content:**	**6,0%**	
2. Energy from the biogas					
Biogasproduction out sisal waste			1.710	m^3/d	
Brutto energy per day			10.774	kWh/d	
Brutto energy per year			3.932.419	kWh/a	
3. Gas utilisation by CHP					
	Energy efficiency		Power [kW]		Energy/year [MWh/a]
El. Power generation	35,0%		171		1.371
Thermal process power	33,0%		160		1.280
4. Dimension of the plant					
Fermenter volume		Retention time		Loading rate	

PROCESS DESIGN



DRAFT LAYOUT



…. Feasibility Study

….Installation, Supervision, Start-Up

….Commissioning, and Hand-over

Typical German biogasplant Installation EEG 2000-2017 Cow Dung/Corn Sillage in Schlalach (Brandenbourg)

Total capacity: 20 m^3 / day cow manure and 0.2 t / day of corn silage
Settings: Digester size: 1770 m^3 CHP: 500 kW ele
Construction and Start-up: September 2013 - July 2016
Tasks: - Planning - Design and construction - Monitoring - Technical and biological commissioning

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Targets in International Projects

- Business Opportunity in new and emerging market;
- Engineering, Technology and Know-how transfer from Germany as

  - Large amount of “unused” organic waste available;

  - Untapped potential for renewable energy solutions;

  - Challenge on electrical supply or environmental aspects.

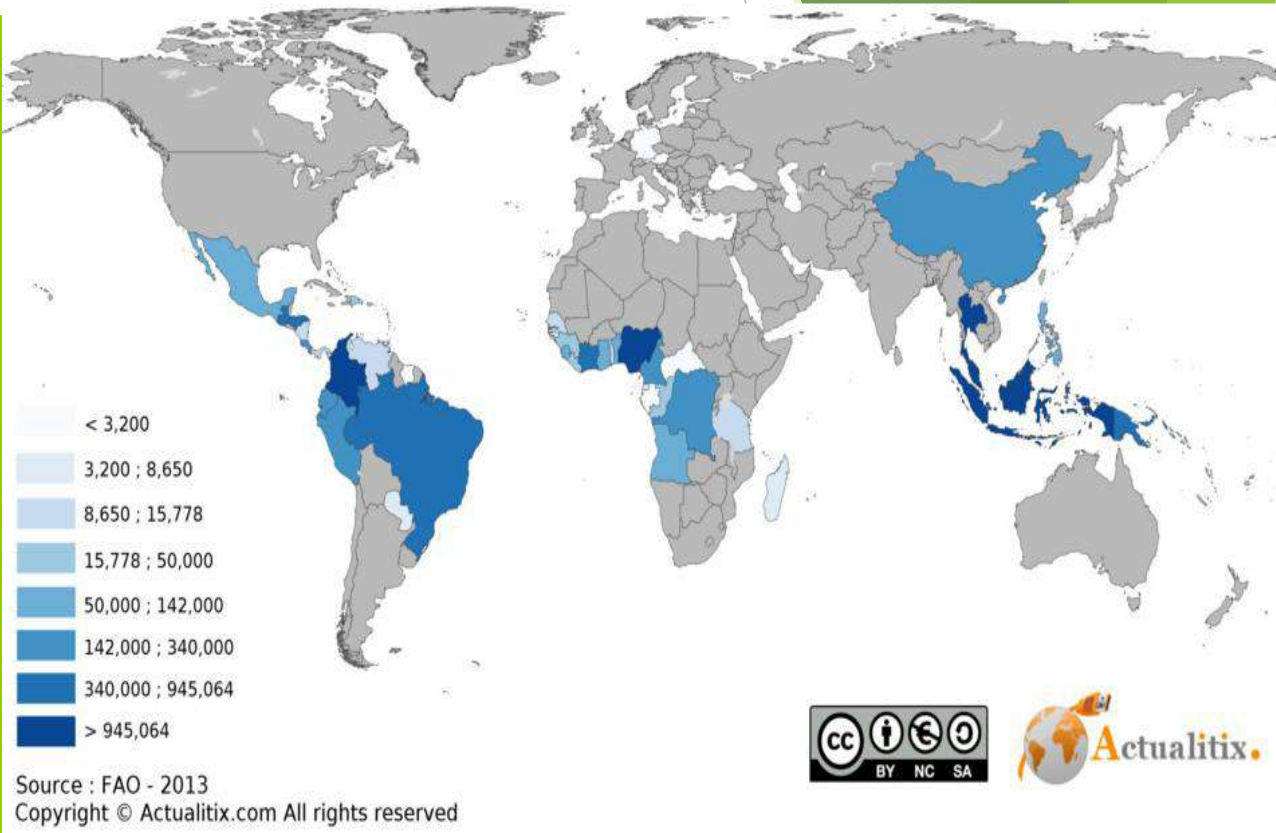
Example of organic waste “aboard”

Sisal Producing Countries

Global production of sisal fibre (2007)

- Brazil: 113,000 tons
- Tanzania: 37,000 tons
- Venezuela: 10,500 tons
- China: 40,000 tons
- Kenya: 27,600 tons
- Madagascar: 9,000 tons

Palm Oil Producing Countries



➢ Sisal

Other “exotic “organic wastes

- Jatropha press cake;
- Brewery waste;
- POME;
- Cocao;
- Cassava waste;
- Flower waste;
- Kitchen Waste;
- Fruit waste (Pineapple, Mango, Papaya,…)
- Faecal sludge;
- Water hyacinth;
- …
- Sisal

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Biogas Plants examples

1. Tanzania
Katani- Sisal Biogas plant Hale

Total capacity:
65 m³ / day sisal waste

Settings:
Digester size: 2200 m³
CHP: 2x180 kW $_{ele}$

Construction& Start-up:
May 2006 - September 2007

Tasks:
- Planning
- Design and construction
- Monitoring
- Technical and biological commissioning

Sisal leaves Processing and Waste

Corona Processing

Sisal leaves before ,
after processing and leaf waste

- The input material for fermentation process of the biogas plant is sisal liquid waste (**sisal leaf waste** + **wash water**).

2. Burkina Faso
Onea- Feacal sludge biogas plant in Ouagadougou

Total capacity: 400 m³/d fecal sludge and 5 t/d Jatropha press cake and brewery waste water	**Settings:** Digester size: 2,500 m³ + 1,500 m³ (lagoon) CHP size: 1MW +100 kW_{ele}
Construction, Start-up and commissioning: September 2015 - November 2019	
Tasks: - Design and planning assistance - Surveillance during implementation - Training assistance - Assistance at biological and technical start-up - Commissioning	

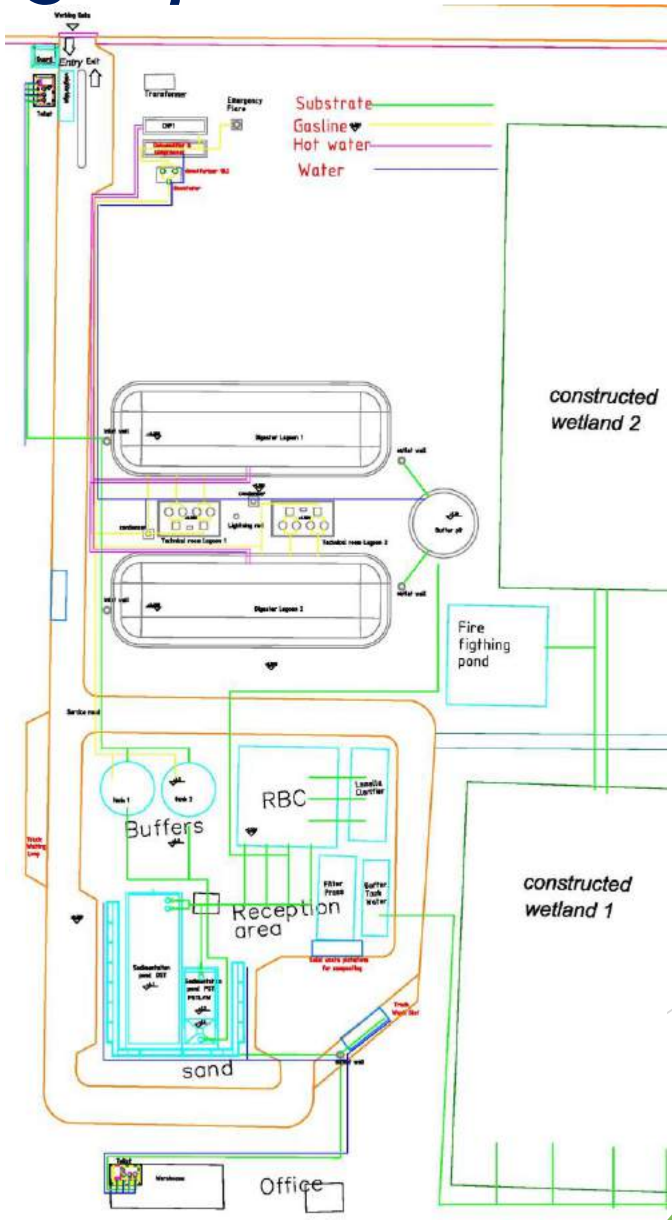
3. Ghana
Nungua Farms- Feacal sludge biogas plant at Great Accra

Total capacity:
1100 m^3 /day fecal Sludge
-domestic septic tank,
-septic tank latrine and industrial waste

Settings:
Digester size: 2x3500 m^3
CHP: 250 kW_{ele}

Construction& Start-up:
May 2018 - Ongoing

Tasks:
- Consulting and technical support for Plant Design and components selections



3 Experiences & Lessons Learned

Some experiences (I)

During the plant installation:

- Problem with extreme weather (high temperature and rain);
- Often power outages;
- Purchase of materials on local market very expensive;
- Difficult to find skilled workers (welders and electricians) at jobsite surrounding;
- Sickness (Malaria).

Some experiences (II)

After the Start-up a. Handover:

- Waste quality and quantity varies a lot;
- Component sustainability (corrosion);
- Maintenance cycle and spare parts availability;
- Searching for biogas plant output valorization opportunity;
- Difficult negotiations with the authority about Feed-In tariff (lack of reference examples for implementation)

Lessons learned (I)

- **Funding remains biggest problem:**
  - High capital investment,
  - poor access to clean energy financing,
  - very high interest rates on bank loans
- **Reliable cooperation partners on site / network partners;**
- **Forecasting and anticipating additional activities to plant running:**
  - Long term Co-substrate contract,
  - Market for fertilizer
- **Timeline of project implementation;**
- **Less reference of existing industrial plants and experience exchange;**
- **Purchase of equipment on local market more expensive:**
  - Cost trap, Risk cost explosion in construction;

Lessons learned (II)

- Hard to find adequate staff and skilled workers and link them to the project:

  - Staff turnover very high

- Maintenance cycle and facilities management is not optimal;
- So far no model comparable to the EEG;
- Prioritized decentralized and Power Auto-consumption then difficult negotiations with grid operators

Deduction from the experience

Technology, Process, Economical, Management aspects

- **Technology flexibility (Viability of some components):**
  - Select if possible regional/local supplier
- **Maximizing biogas plant output valorization opportunity:**
  - Concept for effluent as Fertilizer,
  - Heat/Cold conversion,
  - Biogas supply at Workers beside Electricity to the grid/Auto-consumption;
- **Plant operating with client over Hand-over period and training phase;**
- **Outreach with Keys-players to remove ambiguities and reluctance;**
- **Involvement in discussions with banks for credit lines;**
- **“B.O.T.”Model;**
- **Interdisciplinary team.**

4 Conclusion

Conclusion

- Go ahead and have a try;
- Enough documentations, pre and feasibility study available;
- People are looking for solution to improve the actual status ;
  - Mostly welcome, expected with an open arms and warmly received,
  - Long term relationship and support (joint venture, Branch office).
- Flexible claims, thinking structure and technology and
- Have long breath, be patient, and at the end of the day it usually looks better than it started.

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