

Waste Water to Energy Project

BNW / Faber Ambra / Gauff

2011

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Waste water to energy project

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2. Tequila-Industry Background
3. Waste water treatment /Biogas
4. Scenario
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BNW / Faber Ambra / Gauff

- Developing solutions for problems in the environmental sector.
- Experience of partners covers the areas of environmental protection, renewable energies and strategic financials.
- Target markets are for example Sugar and Palm Oil Industry as well as Distilleries and Slaughterhouses in Latin-America and Asia.

BNW / Faber Ambra / Gauff

- Philosophy
- “Recycling of industrial waste water and production of renewable energy from solid waste is definitely one of the answers to the 3 biggest problems facing mankind in this century (i.e. waste disposal, renewable energy source and water treatment).“

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Past



Future



Tequila - Industry Mexico

- Production Centinela: 700 m³
 - Effluent: COD* = 50.000 g/m³
 - Biogas from effluent: 60 – 65 % CH₄, 30 – 35 % CO₂,
ca. 1000 ppm H₂S
 - Utilization of biogas as fuel for burners and boilers.
- Tendency towards renewable energy, environmental protection and sustainability.

*COD...Chemical Oxygen Demand, waste water parameter

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Process – waste water treatment

Open Pond (Anaerobic)



Sludge-bed reactor (UASB = Upflow Anaerobic Sludge Blanket)



Anaerobic Open Pond Reactor (AOPR)

Process – waste water treatment

Open Pond (Anaerobic)

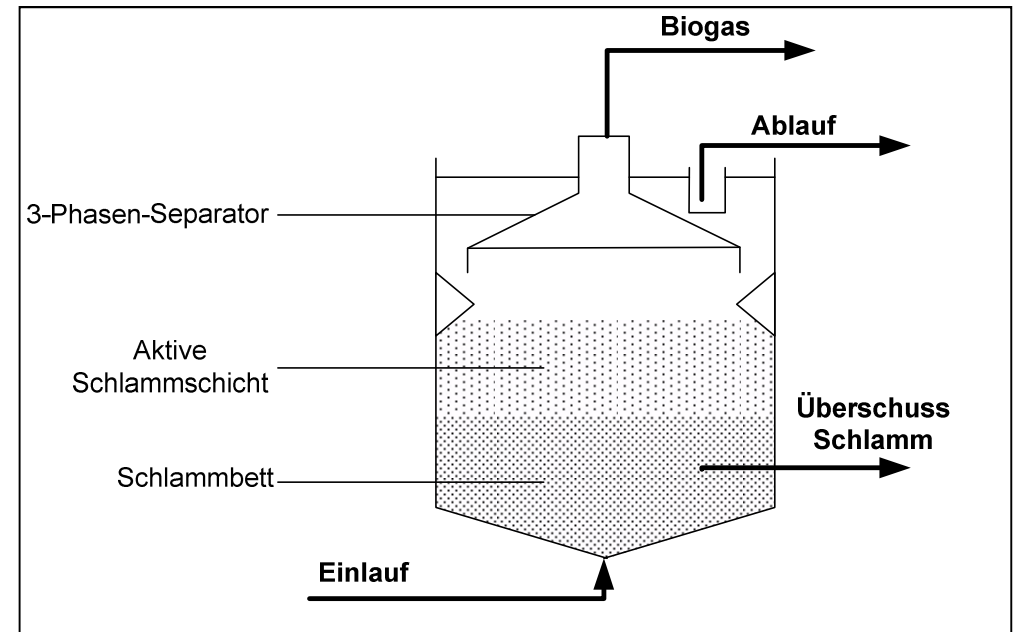
- Widely used low-cost solutions.
- The BOD/COD removal rates, biogas quantity and quality are low.
- Methane emits uncontrolled into the atmosphere.



Process – waste water treatment

Sludge-bed reactor (UASB*)

- UASB is the standard technology for anaerobic waste water treatment.
- The inflowing waste water passes an activated sludge layer in upflow direction.
- The 3-phase-separator at the top of the reactor leads the gas into the gas storage, while water is decanting and sludge remains in the reactor.

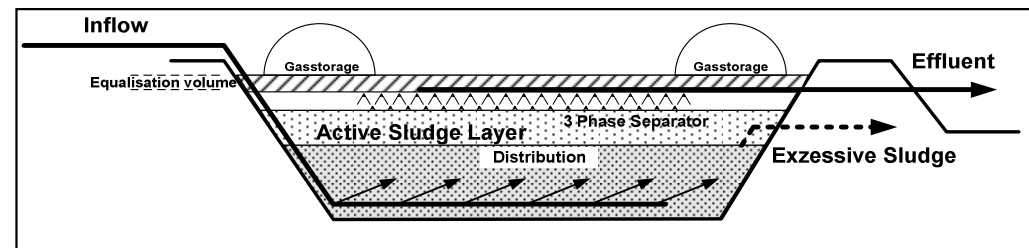


* Upflow Anaerobic Sludge Blanket

Process – waste water treatment

Anaerobic Open Pond Reactor (AOPR)

- The enhancement of the widely used pond and the UASB system leads to the AOPR-System.
- Combines the advantages of both systems.
- By adding process control equipment the system is enhanced into a high-rate reactor with high concentrations of active sludge.
- The COD removal rate and the retention time is comparable to UASB.



AOPR / Lagoon – Technology

Benefits of AOPR Technology

- ✓ Lower investment
- ✓ Easy installation
- ✓ Flexibility in size and capacity
- ✓ Flexibility in case of seasonal variations
- ✓ Flexibility to extreme waste water quality changes
- ✓ Shorter installation and expansion time
- ✓ Easy access to main parts
- ✓ Easy maintenance
- ✓ Comprehensive control

AOPR / Lagoon – Technology

- **Ponds:**
anaerobic pond, mixing pond, sedimentation pond, sludge storage.
- **Bottom layer:**
Liner to protect groundwater from contamination.
- **Mobile waste water distribution:**
Feeding the system in intervals optimizes the development of the activated sludge.
- **Sludge removal system:**
Periodical automatic removal of surplus sludge.
- **3 Phase Separator:**
The heart of the anaerobic system, to separate the phases gas, water, sludge.

AOPR / Lagoon – Technology

Substrate and Gas leading equipment

- **Substrate Pipes:**
PVC or PE. Connecting the different ponds and pumps.
- **Pumps:**
Proven technology from sludge and waste water treatment.
- **Gas pipes:**
HDPE or stainless steel. Other parts (gasflowmeter, Valves, Flame arrestor, pressure control etc.) are standard parts.
- **Gas storage:**
PE-double-membran, UV-resistant and flexible. Storage volume depends on ponds architecture.
- **Gas consuming units:**
Addititonally to the unit (CHP, boiler, turbine etc.) a flare has to be installed.

AOPR/ Lagoon –Technology

Measurement and Control

- Parallel System on laboratory scale to investigate:
 - waste water characteristics
 - sludge characteristics

The results lead to:

- knowledge of influencing parameters (e.g. inhibitors)
- conclusions of gas yield and pollution removal rates
- optimize effluent conditions
- optimal operation conditions

AOPR/ Lagoon –Technology

Measurement and Control

- Control Devices:
 - Are installed to secure the efficiency and the stability of the anaerobic process.
 - In means of temperature, pH, redox / buffer capacity, conductivity, dry matter, gas pressure, fat and floatate content, COD, biogas controlling.
 - Results are fed into the digital control system, the AOPR can be controlled and operated by SPS.
- Analytics:
 - Regular analysis of water, sludge and gas.

AOPR/ Lagoon – Technology



AOPR/ Lagoon – Technology

Results: Effluent

- Reduction of COD (Chemical Oxygen Demand), BOD (Biological Oxygen Demand), TSS (Totally Suspended Solids)
- Production of fertilizer
- Reduction of Greenhouse gases



AOPR/ Lagoon –Technology



Floating Three Phase Separator

Gas Collector

500 m³ AOP Reactor for Sugar Waste Water Treatment, in Jamaica

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Scenario – Site-Basics

- $\geq 400 \text{ m}^3$ Wastewater/day
- $\geq 1.000.000 \text{ m}^3 \text{ CH}_4/\text{y}$

- $\leq 700 \text{ m}^3$ Wastewater/day
- $\leq 1.750.000 \text{ m}^3 \text{ CH}_4/\text{y}$



Scenario – Investment Basis

- Average waste water: 600 m³/day
- Yearly Performance: 1491' m³ CH₄
- Basis price: 51 cts./m³ CH₄
- Yearly Costs: 760' €
- Lump-sum for operation: 4.5%



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Cooperation

We provide

- the hard ware and operation of the AOPR system
- no cost for hard ware, installation and operation for the tequila industry
- Production of Biogas and pre treated waste water
- Cooperation-Agreement → Lol

Tequila Industry provides

- Wastewater effluent, ponds and facilities to build the plant
- Off take / purchase agreement for Biogas → Lol

Cooperation

Opportunities

- Biogas to substitute oil/ fuel demand



Save nature and resources

- Receives pre treated waste water
- Receives quality fertilizer

Cooperation

Benefits

- Optimize energy costs / Fuel Switch
- Increases cultivable land for palm trees
- Helps to meet the criteria of RSPO
- Supports to fulfil the DOE standards
- Creates additional jobs in rural areas
- Know how transfer in waste water treatment and renewable energies
- Increasing additional income by gaining premium recognition

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References

- **Malaysia: Palm Oil Mill – Kahang**
in cooperation with University of Technology of Malaysia (UTM)
275 m³ POME per day

- **Thailand: Distillery – Chonburi**
500 m³ waste water per day
(extension planed to 1250 m³ per day)

CURRICULUM VITAE – Dieter B. Gauff

- Majority Shareholder of the Gauff Group and CEO in several of their companies. Dieter B. Gauff has over 26 years of experience as Manager and consulting engineer in the infrastructural sector. Since his graduate degree as civil engineer he gained experiences in numerous projects in over 100 countries.
- The Gauff Group is an independent Consulting Engineering Company with more than 500 employees, operating worldwide permanently in more than 40 countries with a turnover of over 50 million Euros. The main areas of activity are in Europe, Africa, North and South America as well as Southwest and Central Asia. Gauff Ingenieure rank among the 100 internationally leading companies in the Engineering New Record 2010 – ENR Top International Design List.

CURRICULUM VITAE – Wolfgang Tönges

CEO and shareholder of Faber Ambra

- Business economist
- Until 1992 executive level of financial institutions
- Until 2011 CFO of Faber Gruppe
- CEO of Faber Ambra
- Responsible for several projects and companies in Asia, Latin America, the Carribean and Europe

Faber Tecnologías S. de R.L. de C.V.
Avenida Cuauhtemoc 91
Colonia Roma Del. Cuauhtemoc
C.P. 06700 Ciudad de México
México

Andreas Brunner
mexico@faber-ambra.com

Germany:

Dieter Gauff
dbgauff@gauff.com
www.gauff.com

Wolfgang Tönges
W.Toenges@faber-ambra.com
www.faber-ambra.com

Kai Asmussen
k.asmussen@mbs-consults.com