# BIOKUBE

## Wastewater & Circular Economy

- Wastewater treated abouve the requirments
- Sludge reused for energy or fertilize
- Treated water safe to reuse



## UN development Goals BIOKUBE



### **BioKube's mission statement**

BioKube wastewater treatment systems shall always treat wastewater better than required by the authorities with the lowest possible energy consumption.

BioKube will actively take part in Circular Economy to help fulfill The United Nations Sustainable Development Goals by offering wastewater treatment systems where:

- Treated water can safely be reused
- Sludge can be converted to energy or fertilizer

### Reuse of treated water **BIOKUBE**

The lack of water is a global problem. In order to carry out all our social, productive and recreational activities large quantities of water is used and required. The reuse of waste water helps thereby to limit the withdrawal of surface and ground water, reducing the impact of discharges on rivers and promoting water savings through the multiple use of purification water.



#### Irrigation Use

Treated wastewater can safely be used for irrigation. The system will be equipped with UV lighting to remove all harmful bacteria. The residue of nitrogen and phosphorous in the water will act as nourishment to the plant thereby reducing the need for fertilizer.



#### Civile Use

Examples of civil use: irrigation of parks, green areas, golf courses, etc; domestic use in toilets; commercial uses (eg: vehicle washing); ornamental uses (eg: fountains). Its distribution should be used to be so-called "dual systems" of distribution: a network that carries water for "potable" use and another that contains water for reuse for "non-drinking" use.

#### Industrial Use

With the current systems it is possible to re-use the purified water in almost most situations often than drinking water. In fact it is possible to use the purified water for many activities: plant cooling, fire fighting water, washing, process, industrial plant thermal cycle, company vehicle washing and all that involves the use of water free from pollutants. The reuse of water can be defined as a real investment for the company that will have to deal with the ordinary maintenance of the plants.





## Reuse of sludge waste

The management of sludge produced by wastewater treatment plants is one of the most difficult problems to solve in both industrialized and developing countries. This is because sludge produced by wastewater treatment plants amounts to only a few percent by volume of the processed wastewater, but it's handling accounts for up to 50% of total operating costs.



In addition, in recent years, the need to achieve a sustainable sludge management strategy has become of great concern, due to the restrictions, and in some cases legal banning, of conventional and more traditional recycling options, like direct utilization in agriculture and other land uses. The development of innovative systems to maximize recovery of useful materials and/or energy in a sustainable way has therefore become necessary.

### Agricultural fertilizer

Sewage sludge from municipal sewage treatment plants contains a host of valuable plant nutrients. Rich in nitrogen, phosphorous, potassium and trace elements such as copper and zinc, such compost is used as an organic fertilizer by farmers. Apart from providing plant nutrition, the organic substances contained in compost stabilize and/or improve soil humus content.



#### Biogas

Biogas typically refers to a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen.

Biogas can be produced from a urban wastewater plant.

The waste from the anaerobic digestion process of biogas production is named compost, it can be used as agricultural fertilizer.

Biogas is a renewable energy source.



### Energy saving

# ΒΙΟΚUBEΩ

Energy is a limited resource, it's limited by what we can afford, the infrastructure needed to make and distribute it and the availability of the raw materials. Reducing the amount that each one of us consumes addresses all of those issues.



One of the main concerns for many is the pollution caused in the generation process and how that impacts on the climate. Pollution from fossil fuel generation is immediate as the fuel is consumed and converted into energy and with the waste products of carbon dioxide and other gases escape into the atmosphere. The waste gases are known to add to the global warming process which is thought to be changing the climate. So, saving energy is important.

#### **Minimizing Energy Consumption**

Biokube wastewatwer systems uses a high efficiency blower, to provide oxigen to the biofilm. The amount of oxygen used by the system is calibrate to the minimum necessary. The air which flow through the blower is controlled and it dependes on the amount of water which passes throught the system. The system registers if no water is comming from the house and sets the blowers on energy saving mode if less oxygen is needed.

This is most advantageous for Biokube energy system which spend significant amounts of time designing a technology may become more common with more environmental friendly approach.



#### Charcoal

The easiest and cheapest solution to reuse the wastewater sludge is creating charcoal which can be used as a source for heating during the daily cooking.

The sludge is dewatered and dried in the drying beds, the dry sludge is collected and burnt in a charcoal retort, compressed and the charcoal is ready to be used.

The charcoal could be burned and used for cooking proposer, it has an high calorific value and it is a great alternative then electricity, gas or wood as a source of heating.



### Sludge Drying Beds

# ΒΙΟΚUBEΩ



**Description:** A sludge drying bed is a common method utilized to dewater sludge via filtration and evaporation. Perforated pipes situated at the bottom of the bed are used to drain sewage water or filtrate. A reduction of about 70% in moisture content is expected after drying. Each normal size sludge bed will be 3x6 m<sup>2</sup> (18 m<sup>2</sup>), a small size sludge bed will be 2x4 m<sup>2</sup> (8 m<sup>2</sup>).

Daily Capacity of STP	50 m³/day	250 m³/day	500 m³/day	1000 m³/day
Number of sludge beds required	2 (small size bed)	2	3	4
Yearly expected amount of Slud- ge	4 m³/year	20 m³/year	40 m³/year	80 m³/year
Week expected amount of Sludge	77 kg/week	385 kg/week	770 kg/week	1540 kg/week
*Incoming wastewater is assumed to be standard domestic bousebold sewage water				

Key Considerations			
Advantages	Disavantages		
Economic Solution.	Relatively large space requirements		
Dried sludge can be composed and used as agricultural fertiliser or charcoal.	Can temporarely cause odor issues but it is possible to reduce it adding chemicals		
Easy to operate, no skilled personel required.	Only appliced during dry season or roof needed		
Much reduced sludge volume.	Manual Labor or machinery needed for dried sludge re- moval		
Can achieve patogen removal if approved disinfectant is added			
Can be built with local materials			

#### BioKube Scope of delivery



Simple Design Drawings



Sludge Tranfer pump



40 m flexible sludge



Control Unit for Pump etc connected to BioKube STP Control Unit

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piping

### Geotube Dewatering Bag

# ΒΙΟΚUBEΩ



**Description:** Geotube dewatering containers are an effective dewatering technology fabricated from a specially engineered textile, which will holds of the fine solids inside the bag, while allowing water to permeate through the engineered textile. Over 99% of solids are captured.

Daily Capacity of STP	10 m³/day	50 m³/day	100 m³/day	500 m³/day
Yearly expected amount of dry Sludge	2,5 m³/year	11 m³/year	22 m³/year	110 m³/year
Week expected amount of Sludge (20% of dry	50 kg/week	270 kg/week	530 kg/week	2600 kg/week

\*Incoming wastewater is assumed to be standard domestic household sewage water.

\*\* Suggested size of membrane, it can be ordered in a preferred size depending on the specific needs.

#### **Key Considerations**

Advantages	Disavantages	
Dewatering and containment in one operation.	Mechanical components included.	
One geotube bag can be filled up to 4 times.	Requires handling of flocculants.	
Used both during dry and wet season .	Requires additional footprint.	
Solids can be disposed of in a landfill or reused as fertilizer or as charcoal.		
It can be use in a track and be moved on the preferable location.		
It can be a good solution from a minimum of 150 people		
Sludge volume of 100 m <sup>3</sup> in the septic tank can be reduced with Geotube system		

### BioKube Scope of delivery



Polymer preparation and dosing sta-



Sludge Tranfer pump



Preserve

40 m flexible sludge GeoBags



Control Unit for Pump etc connected to BioKube STP Control Unit

piping

### Sludge Screw Press

# ΒΙΟΚUBEΩ



**Description:** Sludge dewatering treatment with Sludge Screw Press effectively generates dewatered cake with high dry solids content and a good quality of centrate water, resulting in significant sludge volume reduction. Hence, costs associated with sludge disposal will be minimized.

Daily Capacity of STP	10 m³/day	50 m³/day	100 m³/day	500 m³/day
Yearly expected amount of Sludge	2 m³/year	11 m³/year	22 m³/year	110 m³/year
Week expected amount of wet Sludge (30% dry	35 kg/week	180 kg/week	360 kg/week	1750 kg/week

\*Incoming wastewater is assumed to be standard domestic household sewage water.

Key Considerations			
Advantages	Disavantage		
It can be a good solution from a minimum of 1000 people.	Qualified personnel are required for management		
Low energy use	The windings can create maintenance problems		
Simple installation and operation	Filtrated liquid with high solid content back to the wastewater system		
Low noise and vibration levels			
Wide use applications			
Automated mode			

#### BioKube Scope of delivery



Polymer preparation and dosing station



Sludge Tranfer pump



40 m flexible sludge piping



Control Unit for Pump etc connected to BioKube STP Control Unit

### Case:Luxury Hotel

# ΒΙΟΚUBEΩ



#### Reference Case: English Point Marina - Kenya

This BiokubeJupiter plant was installed during Construction of the prestigious luxury hotel English Point Marina in Mombassa Kenya: www.englishpointmarina.com. The plant is situated in the basement of the hotel.

#### Treated wastewater reused

The hotel reuses the wastewater primarly per toilet flushing and surplus water for irrigation of the hotels lawn and plant premises.

Reference Name	English Point Marina
Product Type	4 x Jupiter 75
Country	Kenya
Application	Luxury Beach Hotel
Client	English Point Marina
Capacity [M³/day]	260
Year of Installation	2014



"Since the treatment plant was installed we have been extremely satisfied not least from the benefits we have by being able to use the treated sewerage water for the flushing of our toilets as well as keeping our compound clean and our flowers and plants green and healthy at all time."

Alnoor Kanji, Director English Point Marina

### Case: Irrigations

# ΒΙΟΚUBEΩ

#### Residential plant for public office - Saudi Arabia





#### Treated wastewater reused

This Mars Biokube treatment system is installed in the office of the local department for the Saudi Minister of Environment and the treated wastewater are reused for irrigation.

#### Venus with reuse of water - Greece

Reference Name	Public office
Product Type	Mars 3000, 3C, UV
Country	Saudi Arabia
Application	House
Client	HRH Prince Faisal Mohammed Saud Abdulaziz
Capacity [M³/day]	7
Year of Installation	2016





#### Treated wastewater reused

This plant was installed in Greece where the priority of the plant was reuse of the treated wastewater for garden irrigation. The plastic tank collects the treated wastewater and can afterwards be pumped out for garden irrigation via drip lines during the night

Reference Name	Venus with reuse of water
Product Type	Venus 1850 – 5PE
Country	Greece
Application	House
Client	Carol Cox
Capacity [M³/day]	0,75
Year of Installation	2008

## Case: Sludge Charcoal

## ΒΙΟΚUBEΩ

Accra Wastewater Plant - Ghana



Ghana's capital Accra has a reputation for poor waste management, but is trying to turn this to its advantage - recycling human waste into cooking fuel.

#### Sludge charcoal reused

This project shows low cost 100 % circular economy of wastewater in a developing country.

- Raw sewage is collected from holding tanks
- Sludge is dewatered and dried
- The dried sludge is used to make charcoal.
- The water is cleaned and reused for irrigation.

Reference Name	Accra Wastewater Plant
Product Type	Municipalitie Wastewater Plant
Country	Ghana
Application	Sludge Reuses
Client	Accra Wastewater Plant
Capacity [Tracks/day]	40
Year of Installation	2017



"In the next few months we will be able to process 100 % of the waste water and to reduce the liquid waste discharged to the sea, moreover we will apply the Danish technology all over the country to reduce to reduce the sludge dumping in Ghana."

President of Ghana John Dramani Mahama

ΒΙΟΚUBEΩ

Selection of Companies who have choosen BioKube Systems



Countries with BioKube representation. BioKube has more than 5000 systems installed worldwide in 50



#### Your local BioKube distributor