



# SOG Trickle Filter™



*Saving the world,  
one trickle at a time™.*

# IDEAL FOR EFFLUENT & SEWAGE TREATMENT

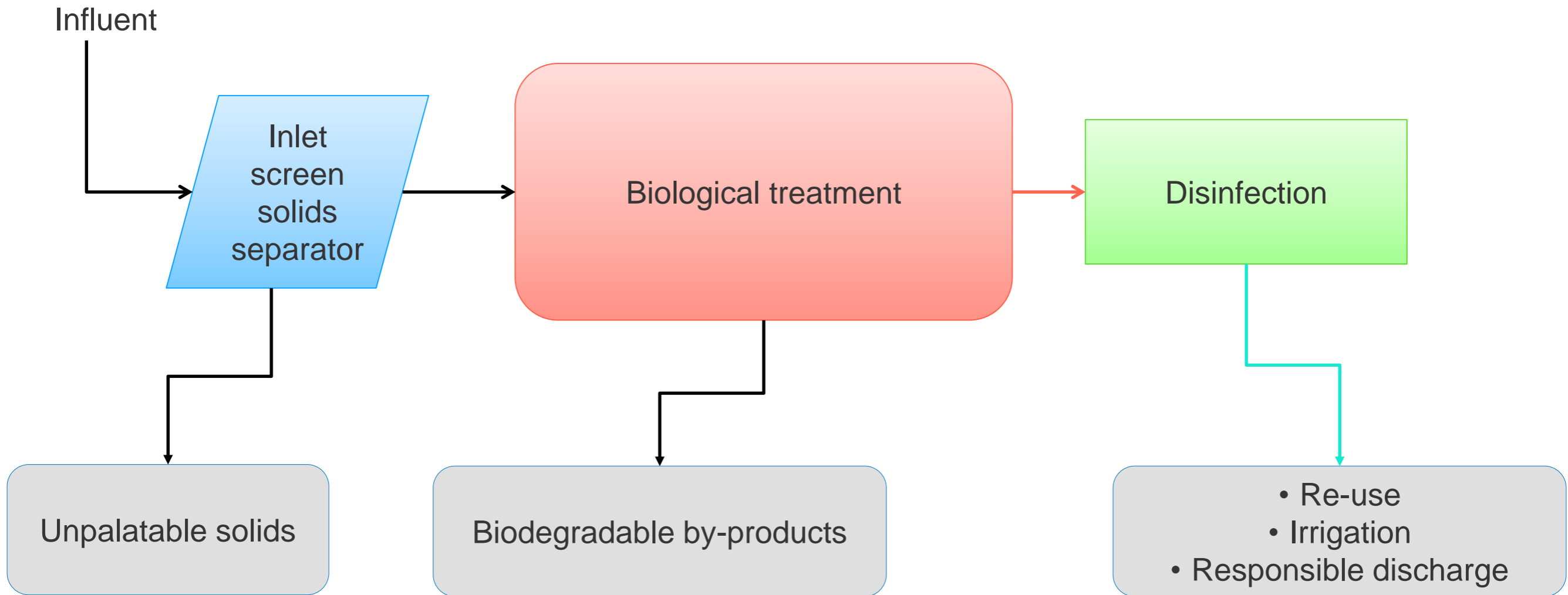
- HWT was established in 1994 [www.hwt.co.za](http://www.hwt.co.za) Andrew Hulsman is a qualified Process Engineer M.Sc.Eng with a Masters in Water Treatment-Sewage from UCT.
- Dave Marock has a Masters in Safety Health and Environment from University Southern Queensland USQ. His specialty is Bioremediation of Polluted Soil and Water. Dave is a qualified Hazmat Responder Technician NFPA 472 and qualified in NBCF Nuclear Biological Chemical Fire Decontamination I.E Chemical Warfare. [www.sheqplus.co.za](http://www.sheqplus.co.za) & [www.lichengroup.co.za](http://www.lichengroup.co.za).
- Wynand du Plessis, Hein Fourie. GCX Africa

# IDEAL FOR EFFLUENT & SEWAGE TREATMENT

- Sewage treatment has never been easier. And not just sewage treatment. The **SOG Trickling Filter™** can also purify biodegradable industrial effluents.
- The **SOG Trickling Filter™** is a South African innovation, developed to suit the needs and budgets of any serious environmentalist. Not so long ago, the DWS (Department Water & Sanitation) made a plea to Sanitation Engineers; *“Please make sewage treatment easy”*.



# IDEAL FOR EFFLUENT & SEWAGE TREATMENT



*Simplified sewage treatment*

# IDEAL FOR EFFLUENT & SEWAGE TREATMENT

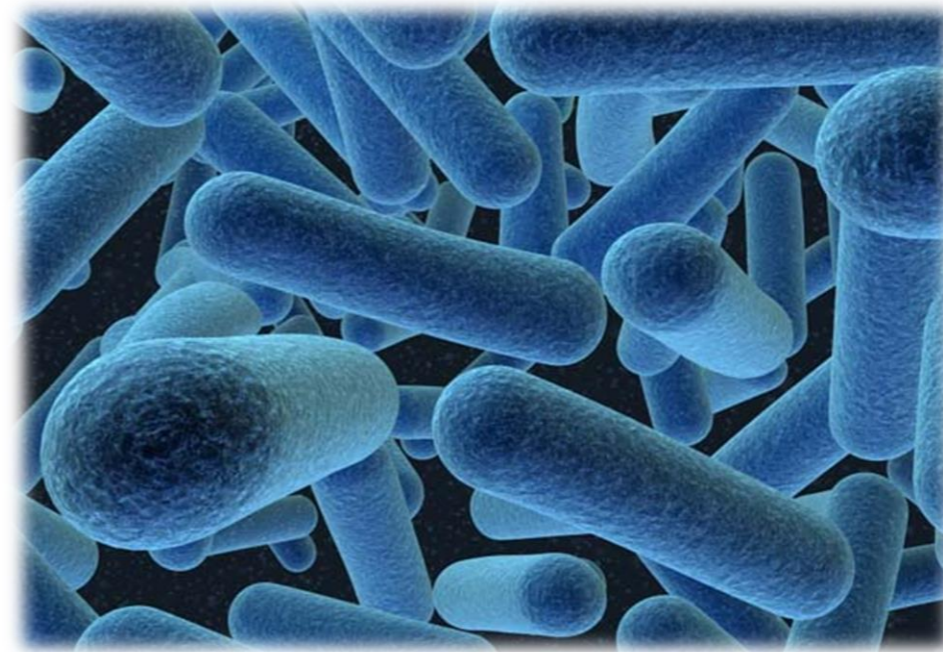
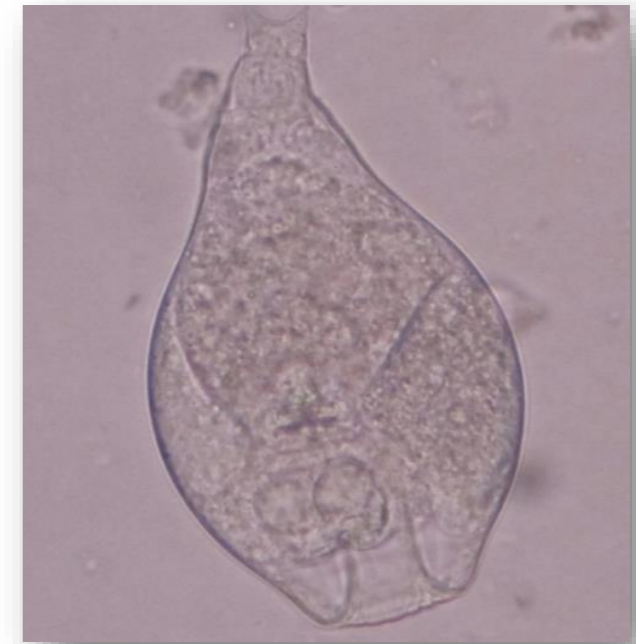
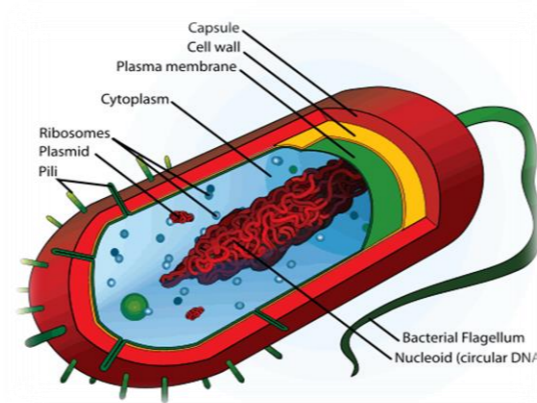
**“To the modern student of Ecology and Environment, it is instructive that all artificial pollution events, both regional and global, find their origin in *MAN* and his activities and, at the same time, the major modes of natural cleansing are accomplished by *MICROBES* through their activities;**

**on the one hand, and arguably the highest achievement in creation is found doing the most destruction,**

**while the lowliest form of life-form, does the janitor’s duty”**

**Author Unknown. Ref: Practical Environmental Bioremediation – *The Field Guide***

# IDEAL FOR EFFLUENT & SEWAGE TREATMENT



Biological process – sugar converted to bacteria



# IDEAL FOR EFFLUENT & SEWAGE TREATMENT



What do we do with all the biomass ?



# IDEAL FOR EFFLUENT & SEWAGE TREATMENT

250,000 litres per day  
HWT built in 1998 – MLE Activated Sludge



- 1) Space required- plus biomass drying area
- 2) Large electrical running cost.
- 3) Qualified person to run the conventional sewage plant at a cost of ±R15,000 per month
- 4) Does not respond well to sudden changes in flow and load



# IDEAL FOR EFFLUENT & SEWAGE TREATMENT

Can sewage treatment be done any other way?

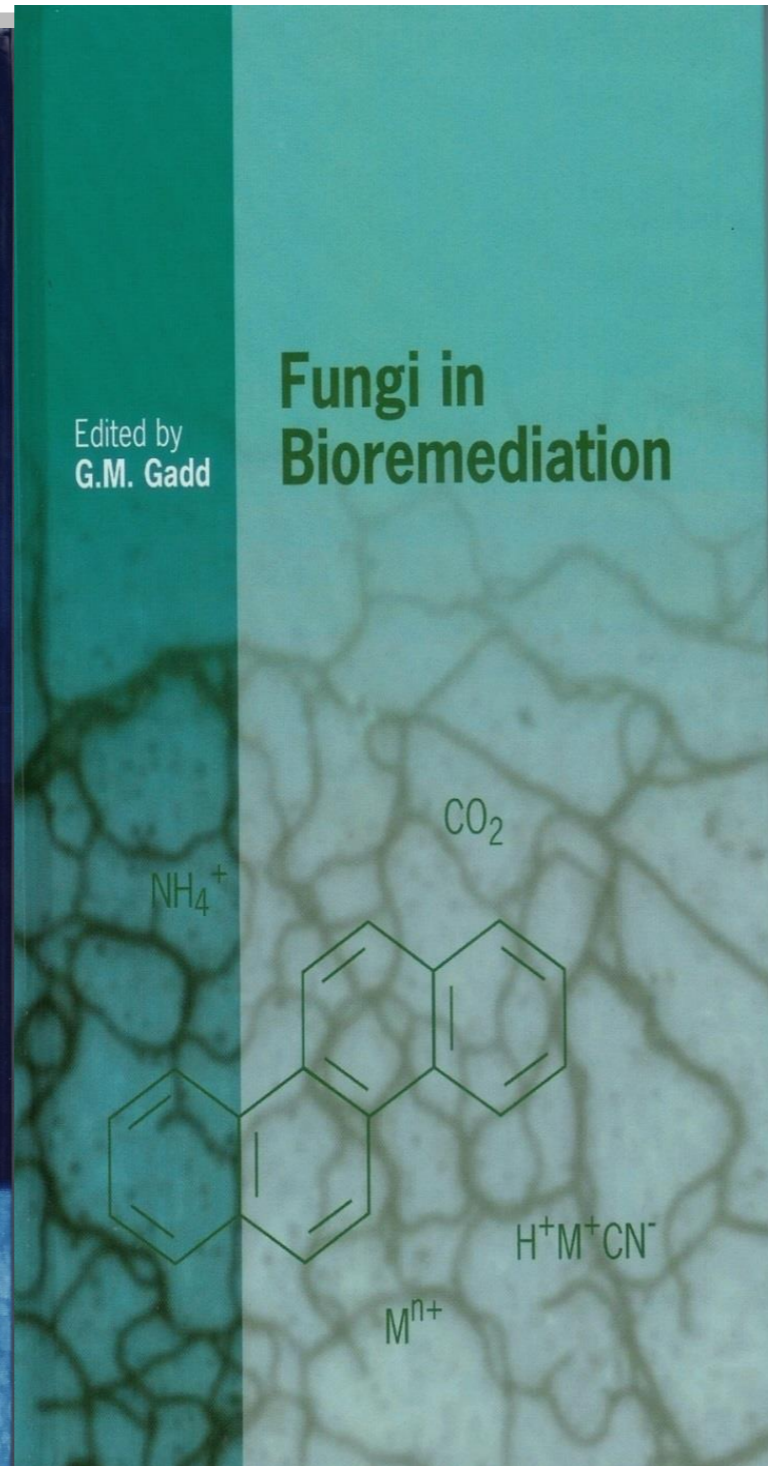
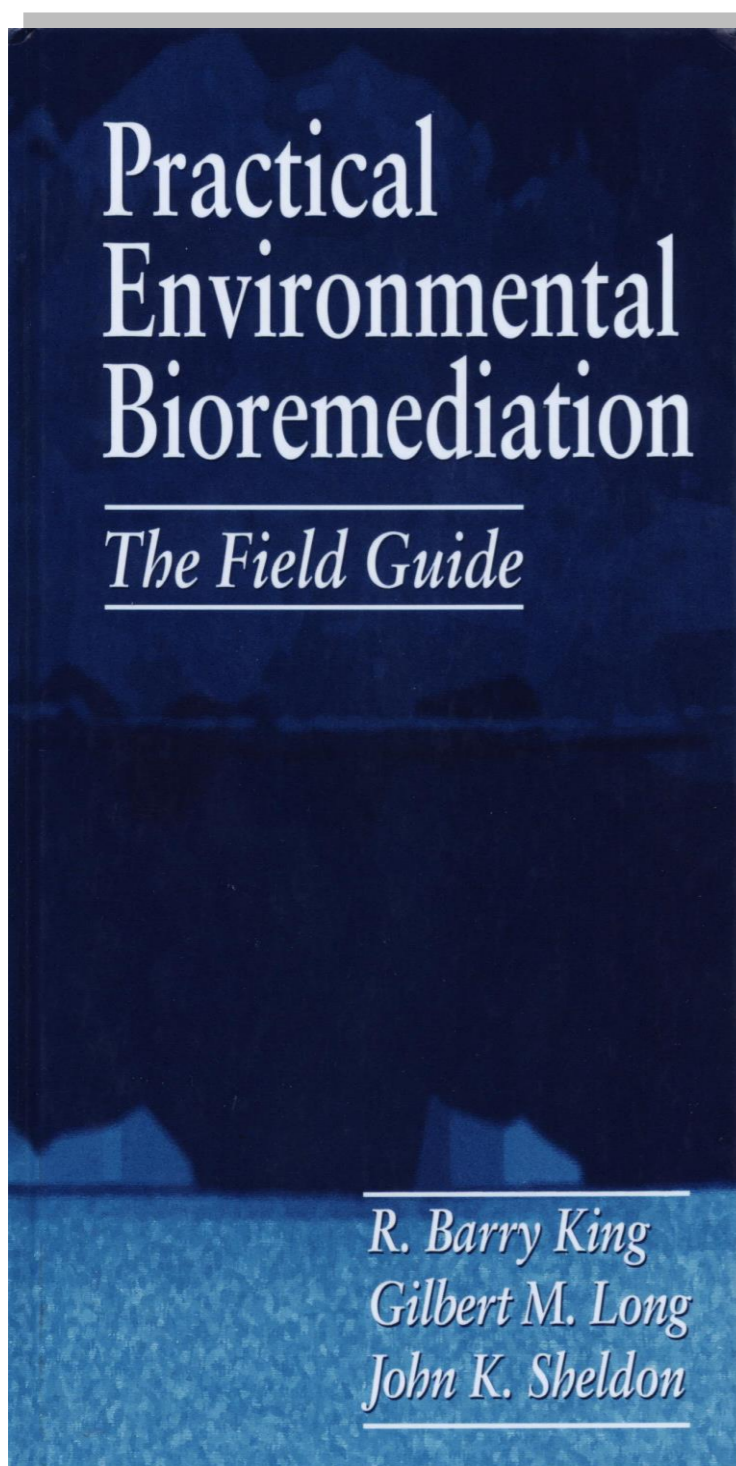
## SOG TRICKLING FILTER

The SOG filter evolved from experience obtained in [bioremediation](#) and includes;

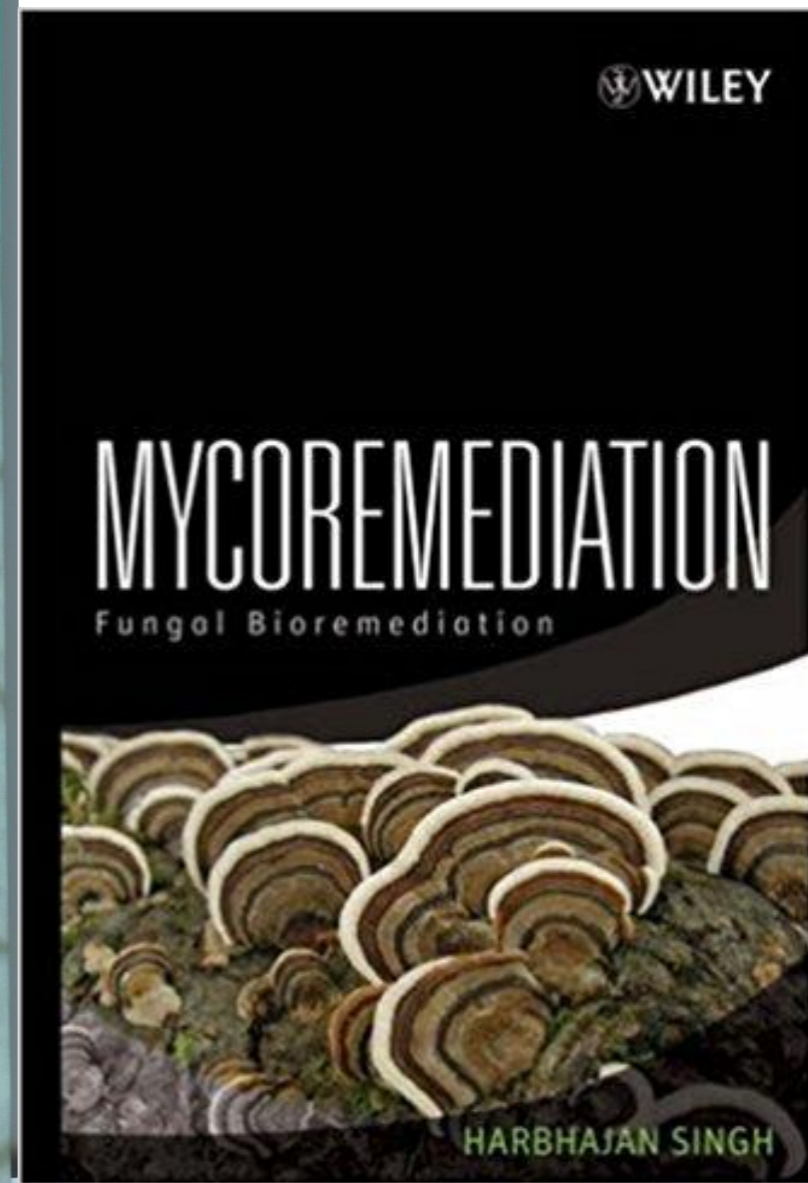
- Filtration
- Biological component
- Mechanical/chemical process



# IDEAL FOR EFFLUENT & SEWAGE TREATMENT



The talk is based on 75 years of combined expertise from the authors.



# BIOREMEDIATION of the ENVIRONMENT

“A treatability technology that uses biological activity to reduce the concentration or toxicity of a pollutant.”

It commonly uses processes by which micro-organisms transform or degrade chemicals in the environment<sup>1</sup>.

The Romans in 600 B.C. started bioremediation with waste water and an intricate system of sewers.<sup>2</sup>

*Ref 1: NETAC Bioremediation Panel, 1991, National Environmental Technology Assessment Corporation Pittsburgh, PA.*

*Ref 2: The Concise Columbia Encyclopedia, 1983, Columbia University Press, New York, p 907.*

# FILTRATION

- In conjunction with the presence of various habitats, the **SOG Trickling Filter™** makes use of media that has absorptive properties. Portions of dissolved organic material are trapped in the media. In times of low or no flow, the trapped material becomes available as a food source (substrate) for organisms that thrive on sewage.
- If no flow conditions persist, the organisms will consume all available and trapped substrate.
- When flow recommences, the media will absorb the substrate and allow the concomitant regrowth of organisms.



# BIOLOGICAL TREATMENT THE 5 KINGDOMS

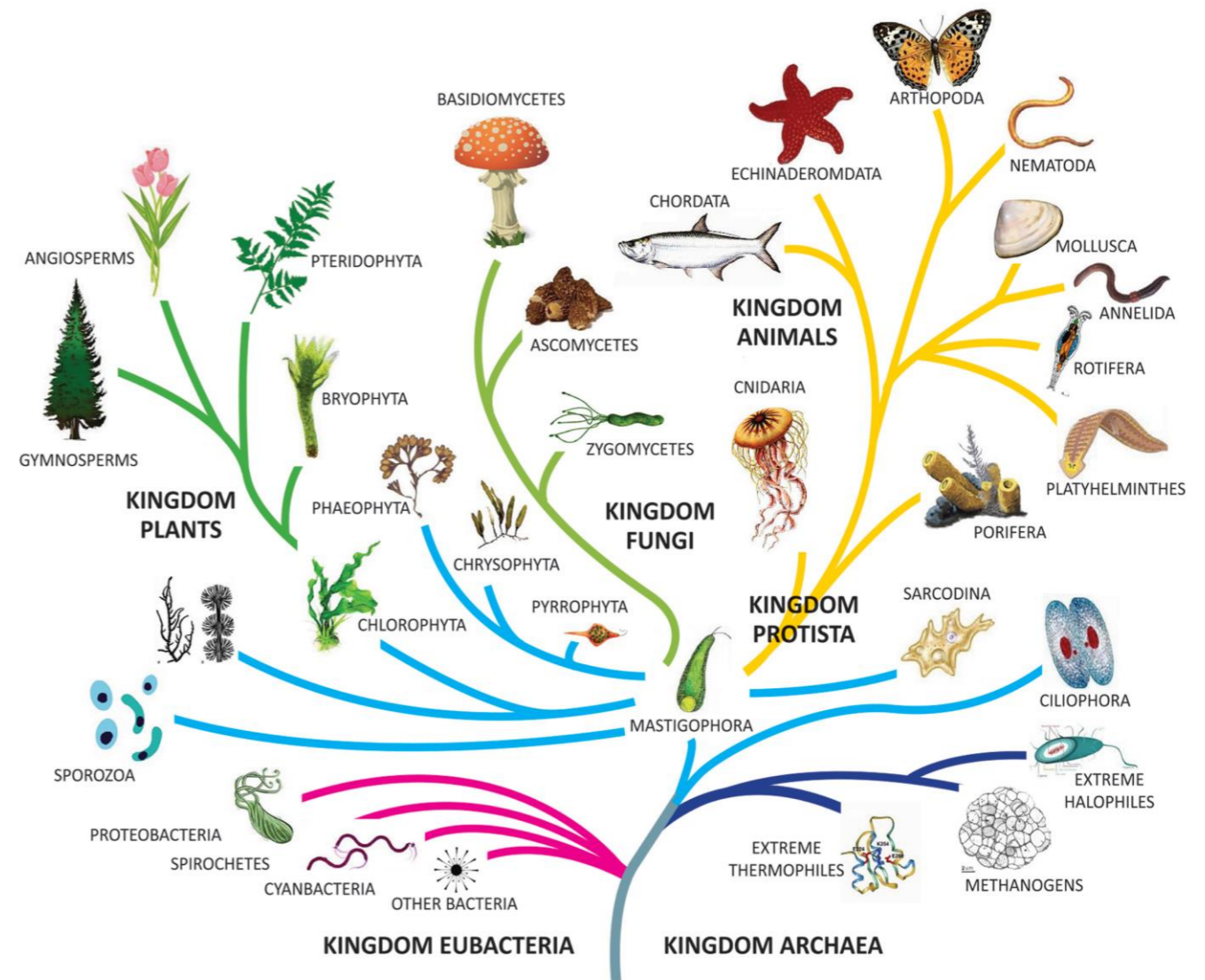
Biological processes –

A microbe can be a bacteria or fungi or both

- bacteria
- fungi
- protista
- plants and
- animals

Sugar (dissolved organic material) converted to

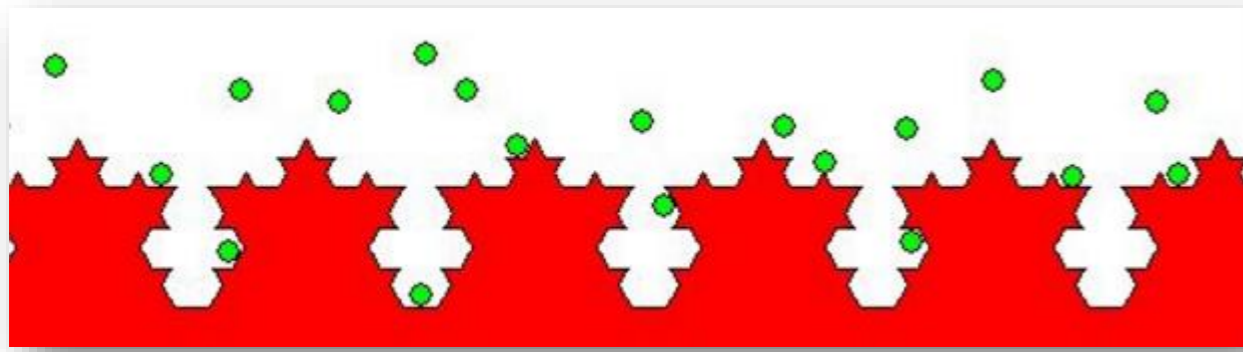
- bacteria and
- ultimately to heat
- gas and liquid by-products
- minimal sludge management



# MECHANICAL / CHEMICAL ACTIVITY

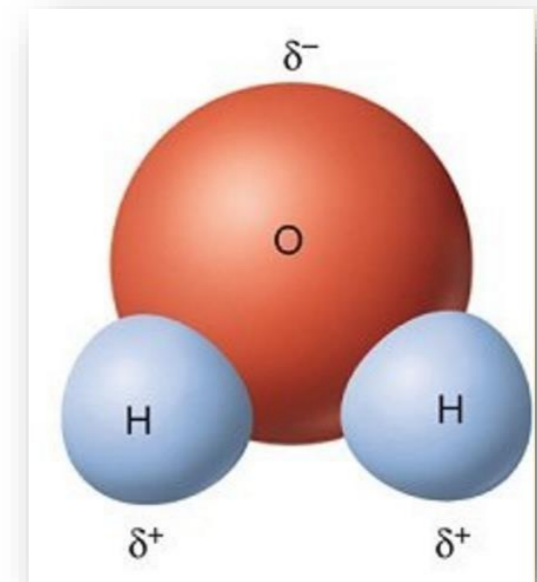
SOG filter – genius of nature

1. Mechanical/chemical properties



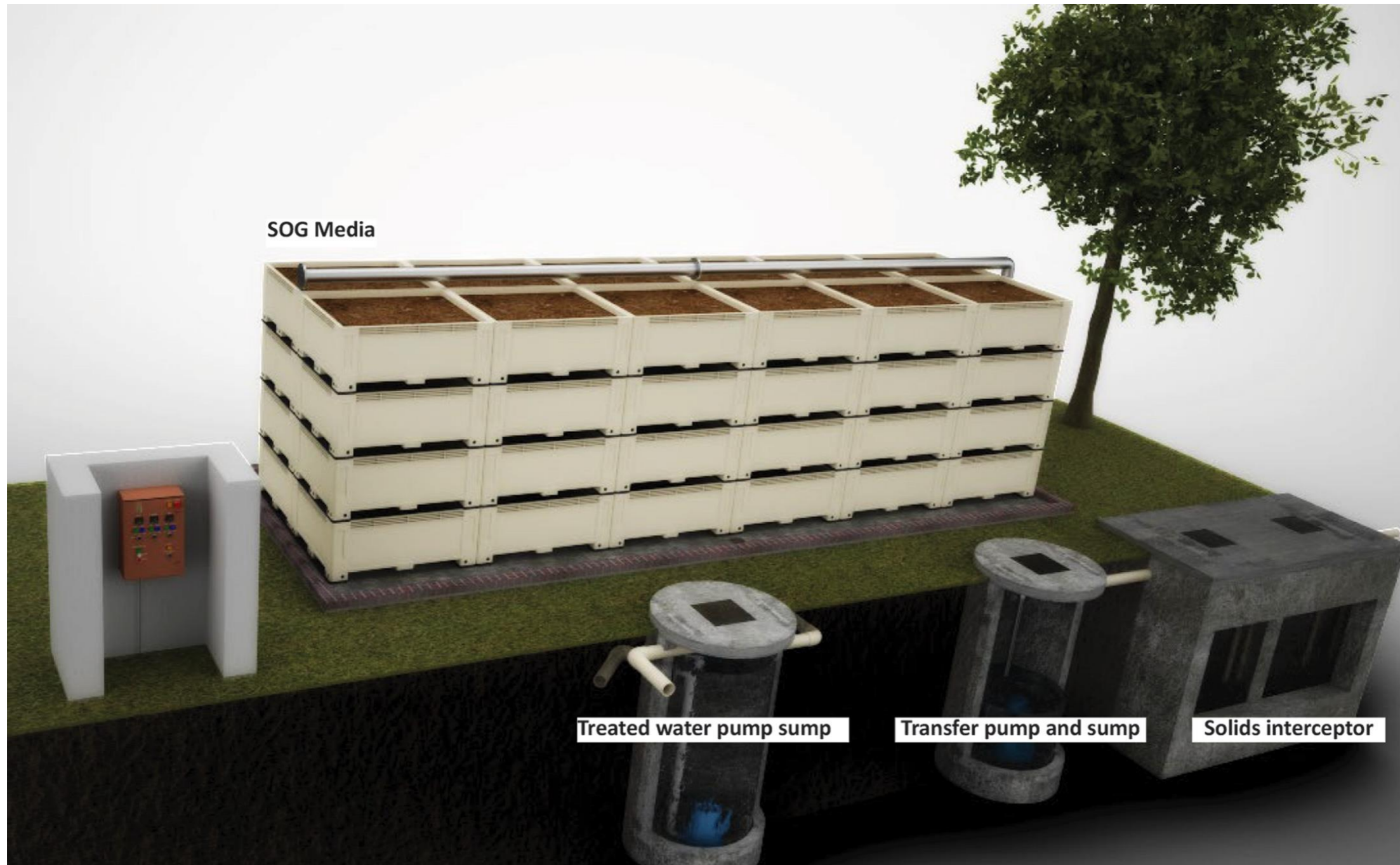
Active sites –

- separate dissolved material from water (overcome forces of polar attraction)
- serve as a pantry for microbes when food source dries up



Water molecule with dipolar charge

# TYPICAL INSTALLATION OF The SOG TRICKLING FILTER™ INSTALLED POST SOLIDS INTERCEPTOR





**Uva Mira Mountain Vineyards, Stellenbosch**  
Domestic sewage and wine cellar effluent treatment  
Treated water used for irrigation



**Clover Production Facility, Gauteng**  
Treated water used for irrigation





Life in a SOG filter. Image showing plant and activity on a SOG filter



Life in a SOG filter. Image showing plant and moss growth.

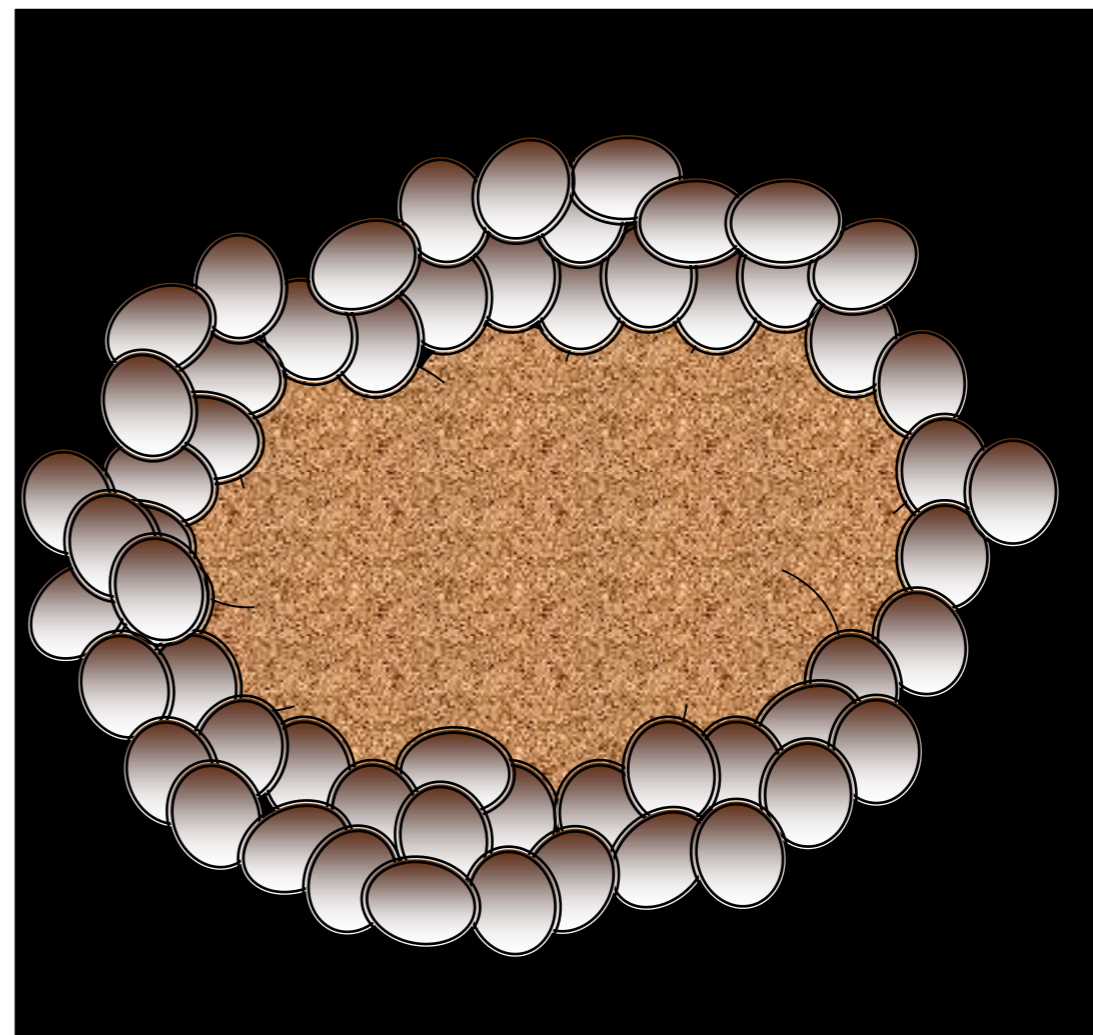
Mycelium the vegetative part of a fungus, consisting of a network of fine white filaments (hyphae). The microbe can be a bacteria or fungi or both and they travel up and down the fine white mycelium filaments looking for food-substrate that they convert to CO<sup>2</sup> or H<sup>2</sup>O. In layman's terms mycelium looks like a spider web.

**•SOG filtration Medium is an  
•ABSORBENT**



**•REQUIRES 4 BAR PRESSURE  
56 PSI to release**

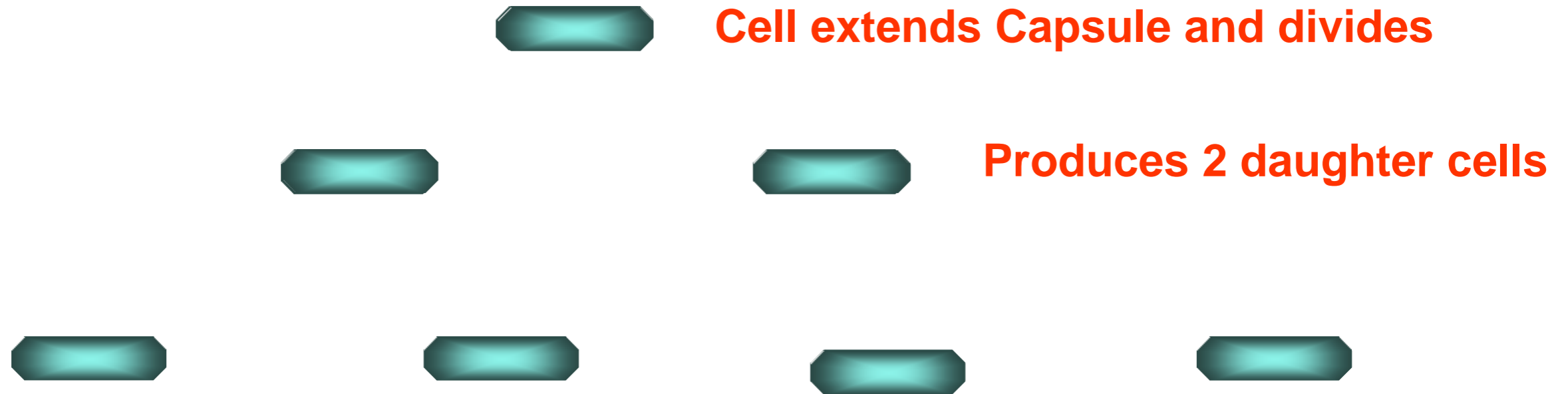
**•ADSORBENT**



**CLING TO THE OUTSIDE OF  
THE PARTICLE BY SURFACE TENSION**

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## MICROBIAL BACTERIA FUNGI EXPONENTIAL GROWTH



**Daughter cells contain enzymes (the workers)  
Identically reproduced**

**Cells divide every 17-20 minutes under ideal conditions  
producing 2 daughter cells with complete replicated DNA**

# BACTERIAL GROWTH

**Stationary Phase:** As more and more bacteria are competing for dwindling food & nutrients, booming growth stops & the number of bacteria stabilizes.

**Stationary phase**

**Endomorphic Death Phase**

**Death Phase:** Target food source is depleted

**Log Phase:** Once the metabolic machinery is running, they multiply exponentially, doubling in number every 17-20 minutes.

**Log Phase**

**Lag Phase:** Growth is slow at first, while the bacteria acclimate to the food and nutrients in their new habitat.

**Lag Phase**

Bacteria ↑

Time →



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*Streptococcus pyogenes*

Responsible for necrotizing  
fasciitis, these have been  
called "flesh-eating bacteria"  
by the tabloid press

Speed = x 240

# 360 SOG FILTRATION SYSTEM BACK TO POTABLE WATER





Old Mutual, The Estuaries, Century City, Cape Town  
Office block waste water recycled via The **SOG Trickling Filter™**. Additional RO reverse osmosis ensures potable water quality.

# BENEFITS

## SOG TRICKLING FILTER - ADVANTAGES

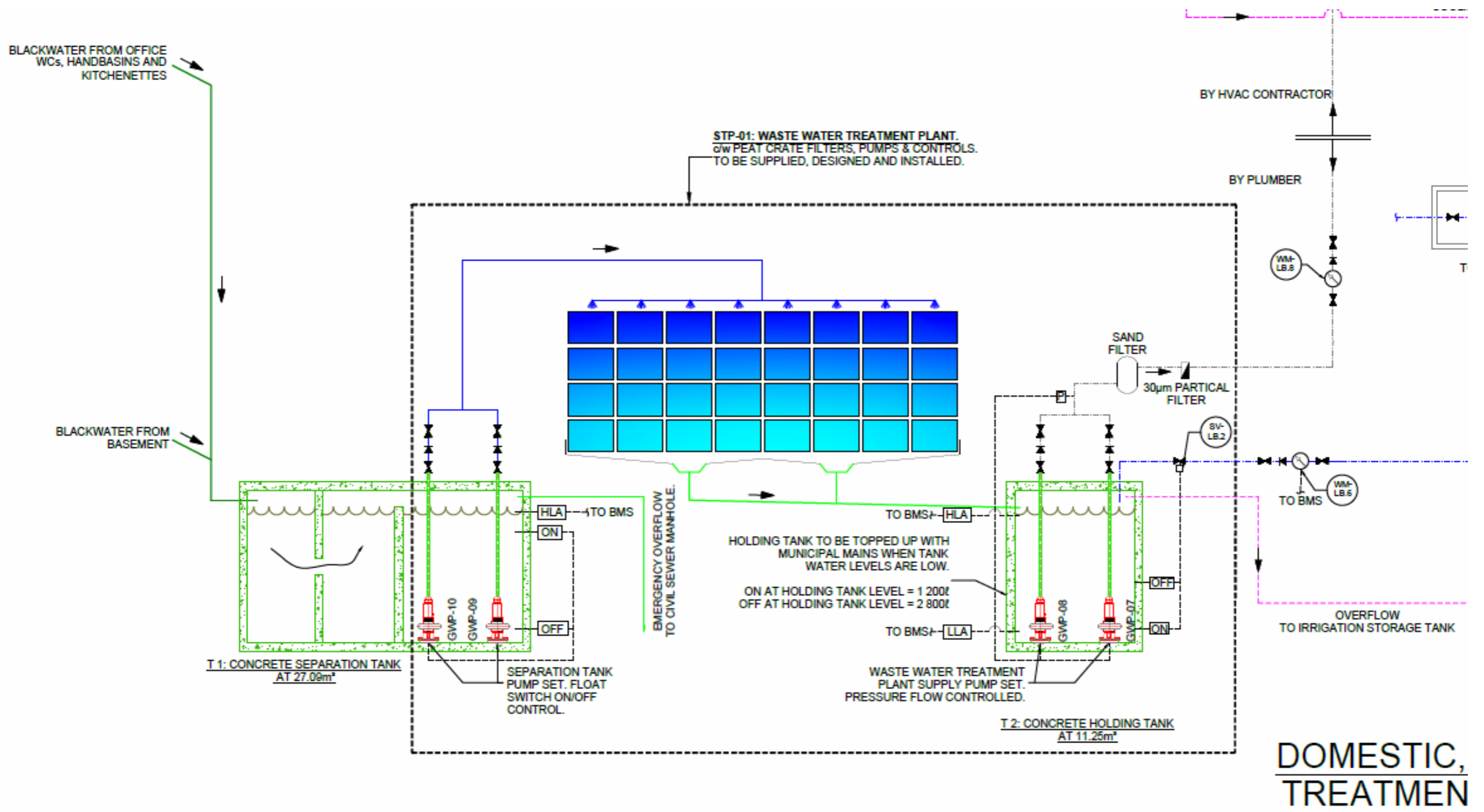
1. has very low running costs – typically < 10% of conventional activated sludge systems
2. low process and mechanical maintenance requirements
3. minimal sludge handling costs
4. easily up-scaled, Lego effect
5. rapid de-activation after dormancy

## SOG TRICKLING FILTER-pointers.

1. similar capital costs to conventional activated sludge systems
2. no variance on primary solids treatment
3. constructed above ground – more expensive to install below ground



# KARL BREMER



# SOG Filtration Medium

Bryopsida; Lichen; Moss- Bryophyta	49%
Ligneous 26% + 4% Coco Coir Chunks	30%
Herbaceous & Rootlets	19%
Charcoal	1 %
Detritus rubbed and unrubbed fibre 2% organic	1 %
Total	100 %

Organic Content	96 -98 %
Ash Content	1-2%
Carbon Nitrogen ratio	±50:1



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