EFFLUENT RECYCLING THROUGH SOIL BIO-TECHNOLOGY

Presented By: SUGAM PARYAVARAN VIKALP, MUMBAI
Vision & Mission

**Vision:**

Making pure & plentiful water available to everyone through seminal integration of technology and enterprise.

**Mission:**

Delivering quality and value “Every time, On time”
Who we are?

A. Privately held company
B. Year of establishment 2005
C. Expertise
   1. Wastewater Recycling
   2. Drinking Water Purification
   3. Environmental Governance
D. Dedicated for promotion of wastewater recycling in order to build water security.
What we do?

A. Market & Implement “Soil Biofilter Technology” i.e. SBT with IIT Bombay

B. Apply SBT for
   a. Effluent Treatment & Recycling
   b. Sewage Treatment & Recycling
   c. Grey Water Recycling
SOIL BIOTECHNOLOGY
(SBT SYSTEM)

By:
Sugam Paryavaran Vikalp
EFFLUENT TREATMENT ISSUES???

Facts of the ETP treatment:
• Recalcitrant COD
• Odour problem
• High TDS
• Lack of dissemination of information for appropriate technologies for effluent treatment & recycling
• Confusion about technology selection wrt:
  - Recalcitrant COD removal
  - Effluent quality suitability for recycling
  - Sludge Management
  - Issues for Disposal
• Pressure for Zero discharge
GENERAL GUIDELINES FOR SELECTION

- Low energy consumption.
- Less moving parts
- Low or No bio sludge formation.
- Efficient removal of BOD, COD & Nitrogen
- Feasibility for Reuse
- Feasible O & M Cost
- Long life.
- Unskilled operations
TECHNOLOGY OPTIONS...

- CONVENTIONAL AEROBIC TREATMENT: ASP/ SBR
- CONVENTIONAL ANAEROBIC TREATMENT: UASB
- CONVENTIONAL AEROBIC TREATMENT FOLLOWED BY MEMBRANE TECHNOLOGIES
- CONVENTIONAL ANAEROBIC TREATMENT FOLLOWED BY MEMBRANE TECHNOLOGIES
- MEMBRANE TECHNOLOGIES (RO – MBR)
What is SBT?

- Technology Developed by IIT Bombay

- Evergreen biological purification engine

- Process uses formulated media, culture & additive to achieve desired water quality
Technology Credentials

- Indigenously developed by IIT Bombay
- Covered under US & Indian Patent
  (US Patent No: 6890438 B2)
- “Best innovation” award by Siemens – Water
- “One of the four best innovations” – Ministry of External Affairs, GOI
- Listed by Ministry of Defense & Navy for wastewater recycling
- Already in the domain of MCGM, KDMC, BBMP, GAP etc.
WHY SBT??
There is nothing called Non Biodegradable COD for SBT.

Is it possible ???
WHY SBT?

✓ Recalcitrant COD handling

✓ No sludge

✓ Ammonical Nitrogen (NH3-N)

✓ Recycling potential: Cooling Tower/Process/Agriculture

✓ Shock loadings

✓ Non availability of skilled Man Power

✓ Less dependency on power

✓ Robustness
PILLARS OF SBT

- Culture & Catalyst
- Geological Media
- Plantation
- Additive

SBT
COMPONENTS OF SBT MEDIA

Media: Respiration

\[(CH_{2}ON_{x}P_{y}S_{z}K_{y})_{n} + nO_{2} + nH_{2}O = nCO_{2} + 2nH_{2}O + \text{Mineral} + \text{Energy}\]
\[NH_{4} + NO_{2} = N_{2} + H_{2}O\]
\[4C_{3}H_{7}O_{2}NS + 8H_{2}O = 4CH_{3}COOH + 4CO_{2} + 4NH_{3}\]
\[3CH_{3}COOH + CO_{2} = 4CH_{4} + 3CO_{2} + 2H_{2}O\]

Plantation: Photosynthesis

\[nCO_{2} + 2nH_{2}O + (N,P,S,K) + \text{Sunlight} = [CH_{2}ON_{x}P_{y}S_{z}K_{y}]_{n} + nO_{2} + H_{2}O\]

Additives: Weathering

\[CO_{2} + H_{2}O = HCO_{3}^{-} + H^{+}\]

Primary mineral + CO_{2} + H_{2}O = M^{n+} + nHCO_{3}^{-} + \text{Soil/clay/sand}\n
Catalytic \ O_{2}\n
Culture/ Microorganisms (Task Force) + Geophagus worm (Controls ecology)
FACTS OF WEATHERED GEOLOGICAL MEDIUM

- **Microbial Diversity** (Curtis & Sloan, *Science* 309, 2005)
  - Soil: $10^{12}$-$10^{16}$ cells/g soil; $10^5$-$10^6$ genera
  - Water: $10^3$ genera

- **Energetic (ca.)**
  - Land: 3.2 kJ/g.live C.yr
  - Water: 700 kJ/g.live C.yr

- **Oxygen diffusion coefficient** (Perry’s Handbook, 1999)
  - Soil: $10^{-5}$ m$^2$s$^{-1}$
  - Water: $10^{-9}$ m$^2$s$^{-1}$

  Solubility of Oxygen in water is very low (0.3 millimol/L at 20°C)

- Immobilization of pollutant; hence high reaction rates Vs local pollution becomes global; low reaction rates due to dilution

- Heterogeneous system; housing multiple microenvironment viz. oxic, anoxic and anaerobic within same niche Vs only one within the same niche..

- Has multiple food chain and food web

Oceans: 160 per mL;
Soil: 6400-38000 per g;
Sewage: 70 per mL
ENERGY CONSUMPTION IN DIFFERENT HABITATS

1. Water  700 kJ/g live C. yr

✓2. Land  3.2 kJ/g live C. yr
GENERAL FEATURES OF Technologies

- Adopt to local climatic conditions, topography
- Low energy consumption.
- All green natural process.
- Least Mechanical Items
- No bio sludge formation.
- Efficient removal of BOD, COD & Ammonia-N
- Low O & M Cost
- Garden like ambiance.
- One time media installation.
- Long life.
- Unskilled personnel sufficient to operate
SBT PROCESS FLOW DIAGRAM
Layout for processing of Wastewater
POTENTIAL APPLICATIONS

• Pharmaceutical Effluent
• Textile Effluent
• Dyes & Pigments
• Sugar Effluent
• Distillery Condensate recycling
• Petrochemicals
• Food Industries
• Dairy Industry
• Ammonia rich wastewater: Fertilizer Industries & Many More…
## OUTPUT WATER QUALITY

<table>
<thead>
<tr>
<th>Parameter</th>
<th>GPCB Limit</th>
<th>SBT output water</th>
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</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.5-7.5</td>
<td>6.5-7.5</td>
</tr>
<tr>
<td>TSS</td>
<td>&lt; 100 mg/L</td>
<td>&lt; 30 mg/L</td>
</tr>
<tr>
<td>COD</td>
<td>&lt; 250 mg/L</td>
<td>&lt; 100 mg/L</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td>&lt; 50 mg/L</td>
<td>&lt; 30 mg/L</td>
</tr>
<tr>
<td>Color</td>
<td>Colorless</td>
<td></td>
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</table>
## SBT: SELECTED EXAMPLES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SUGAR</th>
<th>PHARMA</th>
<th>Dyes</th>
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<tr>
<td>pH</td>
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<td>6.5-7.5</td>
<td>6.5-7.5</td>
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<tr>
<td>TSS</td>
<td>&lt; 30 mg/L</td>
<td>&lt; 30 mg/L</td>
<td>&lt;30 mg/L</td>
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<tr>
<td>COD</td>
<td>&lt; 200 mg/L</td>
<td>&lt; 150 mg/L</td>
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<tr>
<td>Ammonia-N</td>
<td>&lt; 50 mg/L</td>
<td>&lt; 30 mg/L</td>
<td>&lt;30 mg/L</td>
</tr>
<tr>
<td>Color</td>
<td>Colorless</td>
<td>Colorless</td>
<td>Colorless</td>
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USP’s

- It provides primary, secondary and tertiary treatment all in one unit; in a single evergreen facility open to atmosphere.
- It is very simple to operate, maintain.
- It does not require skilled man-power.
- It is cost competitive particular with reference to O&M cost.
- No pre-treatment
- No chemical usage
- Absence of any moving part
- Odour-free
- Low energy requirement and
- Manageability of O&M
- Environmentally responsible
- Green environment are its unique features.
# Treatment Comparison

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>SBT</th>
<th>MBBR</th>
<th>ASP</th>
<th>SBR</th>
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<tbody>
<tr>
<td>Water Recovery</td>
<td>98%</td>
<td>85%</td>
<td>80%</td>
<td>85%</td>
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<tr>
<td>Water Quality</td>
<td>EXCELLENT</td>
<td>GOOD</td>
<td>GOOD</td>
<td>GOOD</td>
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<tr>
<td>Sludge Handling</td>
<td>NO</td>
<td>EXTRA</td>
<td>EXTRA</td>
<td>EXTRA</td>
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<tr>
<td>O&amp;M</td>
<td>EASY</td>
<td>SKILLED</td>
<td>SKILLED</td>
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<tr>
<td>AMBIENCE</td>
<td>GREEN</td>
<td>NON-GREEN</td>
<td>NON-GREEN</td>
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<tr>
<td>ENERGY CONSUMPTION</td>
<td>LOW</td>
<td>HIGH</td>
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<td>HIGH</td>
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<tr>
<td>MECHANICAL EQUIPMENT</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>
ETP or Garden??
LOVEGROVE SITE: MCGM
M P. Airport, AAI, Udaipur, Rajasthan
SBT Plant (Zydus Cadila, Ahmedabad)
SBT CLIENTALE..

- Zydus Cadila, Ahmedabad
- Torrent Pharmaceuticals, Dahej
- Ami Life Sciences, Vadodara
- Union Park Chemicals, Tarapur
- Anupam Rasayan, Surat
- Ministry of Defence
- Airport Authority of India
- Bombay Municipal Corporation, Mumbai
- Brihat Bangalore MahanagarPalike
- Kalyan Dombivli Municipal Corporation
- Bombay Presidency Golf Club, Mumbai
- Godrej Industries, Puduchherry

- Reliance Industries, Vadodara
- Madhi Sugars, Madhi
- NOCIL, Dahej
- Adroit Pharmachem, Vadodara
- Ami Organics, Surat
- Delhi Travel Tourism Dev Corporation
- University of Hyderabad, Hyderabad
- Lavasa Corporation
- IIT Bombay
- Shamik Builders, Lonavala
- ACCEPT Society, Bangalore
- Mughal Sheraton, Agra
- & Many More...
CONTACT US

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