Comparison of Wastewater Treatment Technologies

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Business Development Manager
Key Points

- Wastewater Treatment Overview
- Various Wastewater Technologies
- Feasibility Study
Wastewater Treatment Overview

Philippine Laws:
- P.D. 1586 - Environmental Impact Statement
- P.D. 984 - Pollution Control Law
- **R.A. 9275 - Clean Water Act**
- R.A. 8749 - Clean Air Act
- R.A. 6969 - Toxic Substances and Hazardous and Nuclear Wastes
- R.A. 9003 - Ecological Solid Waste Management
Wastewater Treatment Overview

Environmental Effects:
- Water pollution
- Disruption of aquatic systems
- Diseases
- Water scarcity
- Loss of biodiversity
- Climate change
Wastewater Treatment Overview
Wastewater Treatment Overview

**Preliminary Treatment**
- Screening (Coarse, fine, grit removal)
- Flow Equalization

**Primary Treatment**
- Primary Settling Tank
Wastewater Treatment Overview

Secondary Treatment

Biological Aeration

Secondary Clarifier
Wastewater Treatment Overview

Tertiary Treatment

Disinfection

Sludge Dewatering
Key Points

Wastewater Treatment Overview
Various Wastewater Technologies
Feasibility Study
Conventional Activated Sludge (CAS)

1. Raw Wastewater
2. Screening
3. Primary Clarifier
4. Biological Aeration
5. Secondary Clarifier
6. Chlorine Contact
7. Sludge Holding
8. Thickener & Dewatering
9. Treated Wastewater
10. Biosolids
Membrane Bio Reactor (MBR)

- Raw Wastewater
- Screening
- Biological Aeration
- Chlorine Contact
- Membrane
- Backwash
- Permeate
- WAS
- RAS (Retentate)
- Sludge Holding
- Thickener & Dewatering
- Chemical Dosing
- Biosolids
- Treated Wastewater
- Polymer
Key Points

Wastewater Treatment Overview

Various Wastewater Technologies

Feasibility Study
# Feasibility Study

## Facility Profile:

<table>
<thead>
<tr>
<th>Location</th>
<th>Panglao, Bohol</th>
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</thead>
<tbody>
<tr>
<td>Wastewater type</td>
<td>Domestic and Commercial</td>
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<tr>
<td>Capacity</td>
<td>5 MLD (Phase 1: 1 MLD)</td>
</tr>
<tr>
<td>Year of study</td>
<td>August 2020</td>
</tr>
</tbody>
</table>
| Technologies considered | ▪ CAS  
▪ SBR  
▪ MBBR  
▪ MBR  
▪ BioCleaner |
BioCleaner Technology

1. **Raw Wastewater**
2. **Screening**
3. **Anaerobic Digestion**
4. **Biological Aeration**
5. **Chlorine Contact**
6. **Treated Wastewater**
7. **Solid Waste**
8. **Return Feed**
## Feasibility Study

### Multi Criteria Analysis

<table>
<thead>
<tr>
<th>Requirement</th>
<th>CAS (MLE)</th>
<th>SBR</th>
<th>MBBR</th>
<th>MBR</th>
<th>BioCleaner</th>
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<tbody>
<tr>
<td>Low footprint</td>
<td>2</td>
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<td>3</td>
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<tr>
<td>Compliance to DAO 2016-08 effluent standards</td>
<td>2</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>Low energy consumption</td>
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<td>2</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Low chemical consumption</td>
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<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<td>Ease of operations</td>
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<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>&gt;10 reference installations</td>
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<td>1</td>
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<td>Listed technology in WWTP journals and handbook</td>
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<td>3</td>
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<td>Process stability</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>18</strong></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>18</strong></td>
<td><strong>16</strong></td>
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</table>

**Legend:**
- 0: Unmet target
- 1: Below target
- 2: Meets target
- 3: Exceeds target
### Cost Comparison

<table>
<thead>
<tr>
<th>Technology</th>
<th>Area ( m^2 )</th>
<th>CapEx ( M, \text{PhP} )</th>
<th>Without Recycling</th>
<th>Effluent Type</th>
<th>With Recycling</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Operational ( M, \text{PhP} )</td>
<td>Rating</td>
<td>Savings ( M, \text{PhP} )</td>
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<tr>
<td>CAS (Modified Ludzack-Ettinger)</td>
<td>880</td>
<td>37</td>
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<td>SBR</td>
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<td>BioCleaner</td>
<td>932</td>
<td>72</td>
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<td>18</td>
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Feasibility Study

Results:
- **BioCleaner** was the chosen technology
  - Modern and innovative
  - Cost-efficient
  - Environment friendly
  - Sustainable
- Awaiting start of facility construction