Compact unsaturated/saturated vertical flow constructed wetland (VFCW) system under tropical conditions: nitrogen removal and footprint reduction.

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Taupinière plant (900 p.e.)
- In operation since October 2014
- Regulation objectives: 90% removal for COD, BOD₅ and TSS, 80% for TKN
- Two stages: first unsaturated/saturated VFCW, second: simplified trickling filter with volcanic stones

Unsaturated/saturated VFCW (A)
- 0.8 m²/p.e.
- Two lines of two filters in parallel
- Filtration layer: 40 cm 2/4mm
- Transition layer: 15 cm 11/22 mm
- Draining layer: 60 cm 20/40 mm with 40 cm saturated level

Simplified trickling filter (B)
- 0.1 m²/p.e.
- 150 cm volcanic stones
- Recirculation loop
- HLR: 4.6 m
- Sludge accumulated at the bottom of the filter are flushed twice a day to the first stage

Performances based on 22 daily flow composite samples (October 2014 – July 2016)

<table>
<thead>
<tr>
<th>Q in (m³/d)</th>
<th>BOD₅ (mg/L)</th>
<th>COD (mg/L)</th>
<th>TSS (mg/L)</th>
<th>NTK (mg/L)</th>
<th>NH₄ (mg/L)</th>
<th>NO₃ (mg/L)</th>
<th>PT (mg/L)</th>
<th>E.coli (u/100mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>43.9</td>
<td>479</td>
<td>32</td>
<td>16</td>
<td>967</td>
<td>109</td>
<td>51</td>
<td>93.4</td>
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<tr>
<td>SD</td>
<td>20.2</td>
<td>140</td>
<td>18</td>
<td>12</td>
<td>395</td>
<td>16</td>
<td>7</td>
<td>24.0</td>
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<tr>
<td></td>
<td></td>
<td>240</td>
<td>48</td>
<td>24</td>
<td>126</td>
<td>6</td>
<td>6</td>
<td>24.6</td>
</tr>
</tbody>
</table>

Performances regarding applied loads on the VFCW filter in operation. In green dry weather flow (average 75% of nominal hydraulic load) and in blue rainy events (average 287% of nominal load or 97 cm day⁻¹). Nominal organic loads are 375 g.m⁻².d⁻¹ for COD, 187.5 g.m⁻².d⁻¹ for TSS and 37.5 g.m⁻².d⁻¹ for TKN.

Conclusions and prospects
- With a compact design (< 1 m²/p.e.) the system ensure good performances despite strong variations in hydraulic and organic loads.
- Unsaturated/saturated VFCW design with 0.8 m²/p.e. achieve 85% removal for COD, 90% for TSS and 65% for TN.
- TN removal may be enhanced (recirculation loop, saturated level ...)
- Organic deposit accumulation have to be investigating