RF - MINI GRID CONTAINERISED WATER TREATMENT SOLUTIONS

WE SPECIALISE IN THE DESIGN, MANUFACTURE, SUPPLY, INSTALLATION OF CONTAINERISED SOLUTIONS THROUGHOUT SUB-SAHARAN AFRICA.

RENEWABLE FUTURE
A RED ENGINEERING BRAND
TWO PRODUCTS ARE ON OFFER: potable water treatment and sewage treatment

POTABLE WATER TREATMENT

Water description
Potable water can be abstracted from various sources. Generally these include:

- Surface water such a collection dams and rivers
- Borehole and well point
- Natural springs
- Sea

Treatment procedure
In general, raw water is stored in buffer tanks prior to treatment. Post treatment, purified water is stored in clean water holding tanks. The clean water tanks are elevated to provide a pressure supply. If elevation is not possible, a booster pump arrangement is supplied with the treatment plant.

Treated water quality, water treatment
The South African Department of Water Affairs standards are used a guideline (see Table 1 below). Treatment requirements vary from country to country. It is generally accepted that the South African limits are of world class standard, well within WHO recommendations.

OVERVIEW

The water treatment plant is constructed in the container itself. The container is modified to perform the function of control room and water tank.

Package water treatment plants supplied in shipping containers offer numerous advantages such as:

- Speedy installation
- Minimal site requirements
- Improved treatment performance
- Reduced energy consumption
- Efficient and simple process control
- Robust construction and durability
- Tamper proof, no need for fencing
- Cost effective solution
QUALITY CONTROL

Coating
- Containers are cleaned and kept as dust free as possible;
- All welds are treated with an Etch Primer (this includes any joints, or cut metal);
- Steel surfaces are:
  - Sanded lightly
  - Cleaned with lacquer thinners
  - Sprayed with an under etch coat primer
- Wooden floors of the container are treated with NUI Ultracoat 520-020 wood primer;
- Tanks are sprayed with 3 x 1 mm polyurethane coats;
- All overlapping polyurethane joints are treated with NUI overspray 520-003

Hydrostatic test
All tanks are filled to capacity and monitored for leaks over a 48 hour period.

Implementation procedure
Waste water treatment is a multi-faceted procedure involving numerous organizations and procedures. At RF we strive to deliver a fixed price total solution, from statutory requirements to daily operations.

Typically, a project would run in the following sequence:
- Instruction to proceed issued by client
- Site visit: Representative from RF to visit the site, establish contact with relevant sub-contractors, establish site conditions.
  At this stage recommendations and design considerations are forwarded to the client;
- Client / RF agreement: delivery period, payment terms, utility requirements (water, electricity, chemicals), site preparation;
- Legislative compliance: RF will liaise with the relevant authorities;
- Construction phase: time frame stipulated in agreement;
- Transport;
- Installation: experienced RF member will be sent to site for installation and commissioning;
- Commissioning: Start of 12 month operational period;
- Operation: 12 month operational period. Weekly site visits, M&E guarantee for 12 months, monthly sampling

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Units</th>
<th>Class I (Accept.)</th>
<th>Class II (Max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical and organoleptic requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>mgPt/l</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Conductivity at 25 °C</td>
<td>mS/m</td>
<td>70</td>
<td>150</td>
</tr>
<tr>
<td>Dissolved solids</td>
<td>mg/l</td>
<td>450</td>
<td>1,000</td>
</tr>
<tr>
<td>Colour</td>
<td>TON</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>pH value at 25 °C</td>
<td>pH</td>
<td>6.0 - 9.0</td>
<td>5.0 - 9.5</td>
</tr>
<tr>
<td>Taste</td>
<td>FTN</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Turbidity</td>
<td>NTU</td>
<td>0.1</td>
<td>1</td>
</tr>
</tbody>
</table>

TABLE 1: SANS 241 (NOT ALL PARAMETERS LISTED)
SEWAGE TREATMENT

Waste water description

Domestic sewage generated from small communities tends to have a variable and often high organic load. The conductivity of the waste water is a function of chemicals used at the facility and this too is variable. From our experience, removal of the waste water organic load is the most capital intensive. Best possible management can only partially reduce organic discharge. Organic and nutrient load in the waste water is analogous to sugar in coffee. It cannot be filtered out with conventional filtration. Like sugar, it is biodegradable and can be removed successfully in a carefully designed biological environment. Domestic sewage usually has a COD concentration of < 1000 mg/l.

The flow to the works will generally contain the following:

- Organic and inorganic solids. The solids may be biodegradable or non-biodegradable (e.g., disposable nappies, sanitary pads, and plastic)
- Nutrients, mainly in the form of nitrogen and phosphorus
- Ammonia
- Grit (mainly small amounts of sand)

Wastewater is pumped or flows by gravity to the treatment works

Treatment procedure

Inlet Works

A pump sump arrangement is supplied with the treatment plant, including a solid handling sewage pump. The pump sump is a cylindrical shaped tank with submersible pump support brackets and guides. Inlet heights are site specific and accommodated accordingly.

<table>
<thead>
<tr>
<th>Substance/Parameter</th>
<th>General Limit</th>
<th>Special Limits</th>
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</thead>
<tbody>
<tr>
<td>Faecal Coliforms (per 100 ml)</td>
<td>1000</td>
<td>0</td>
</tr>
<tr>
<td>Chemical Oxygen Demand (mg/l)</td>
<td>75*</td>
<td>30*</td>
</tr>
<tr>
<td>pH</td>
<td>5.5–7.5</td>
<td>5.5–7.5</td>
</tr>
<tr>
<td>Ammonia (ionised and non-ionised) as Nitrogen (mg/l)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Nitrate/Nitrite as Nitrogen (mg/l)</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Suspended Solids (mg/l)</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>Electrical Conductivity (mS/m)</td>
<td>70 mS/m</td>
<td>50 mS/m</td>
</tr>
</tbody>
</table>

* Após a remoção de algas

Biological treatment

Organic treatment of the wastewater takes place in a high rate activated sludge bioreactor. The bioreactor is sized and aerated to remove COD, nitrogen and phosphorous. The activated-sludge process is a biological method of wastewater treatment that is performed by a variable and mixed community of microorganisms in an aerobic aquatic environment. These microorganisms derive energy from carbonaceous organic matter in aerated wastewater for the production of new cells in a process known as synthesis, while simultaneously releasing energy through the conversion of this organic matter into compounds that contain lower energy, such as carbon dioxide and water, in a process called respiration. This consortium of microorganisms is known collectively as biomass.

Hydraulic flow and organic load to the treatment plant is variable. It is expected that at times the biomass population will exceed the available process volume. This process is monitored by regularly measuring the sludge volume index (SVI). When the SVI reaches a predetermined maximum value, a portion of the aerated biomass is discharged to a drying filter which is integrated above the shipping container.

Dried biomass will be periodically removed and can be used in the landscaped areas of the facility as an organic supplement.

Screening

The Dragon Sock™ is a highly effective screening mechanism developed and used by RF. The Dragon Sock™ is positioned at the post-anoxic overflow to aeration zone. Screenings are gently captured in the Sock and simultaneously cleaned in the aerobic bioreactor.

Treated water quality, sewage treatment

Again, South African standards are used a guideline for design purposes. In Table 2 some of these parameters are listed.

Table 2: Discharge limits and conditions set out in the South African National Water Act (not all parameters listed)
SERVICES

- Solar PV System Design & Engineering
- Commercial & Industrial
- Residential Rooftop
- Battery Storage Systems
- Energy Efficiency Consulting (ISO 50001, European Energy Manager)

PRODUCTS

MINIGRID

- SOLAR POWER
- WATER
- GAS TO POWER
- MULTIPURPOSE

ENERGY MANAGEMENT

- POWER
- WATER
- MEASUREMENT
- BILLING OPTIONS

WATER

- TREATMENT
- SEWAGE
- AIR TO WATER
- CONTAINERISED SOLUTIONS

GAS TO POWER

- CHP (COMBINED HEAT & POWER)
- GAS GENSETS