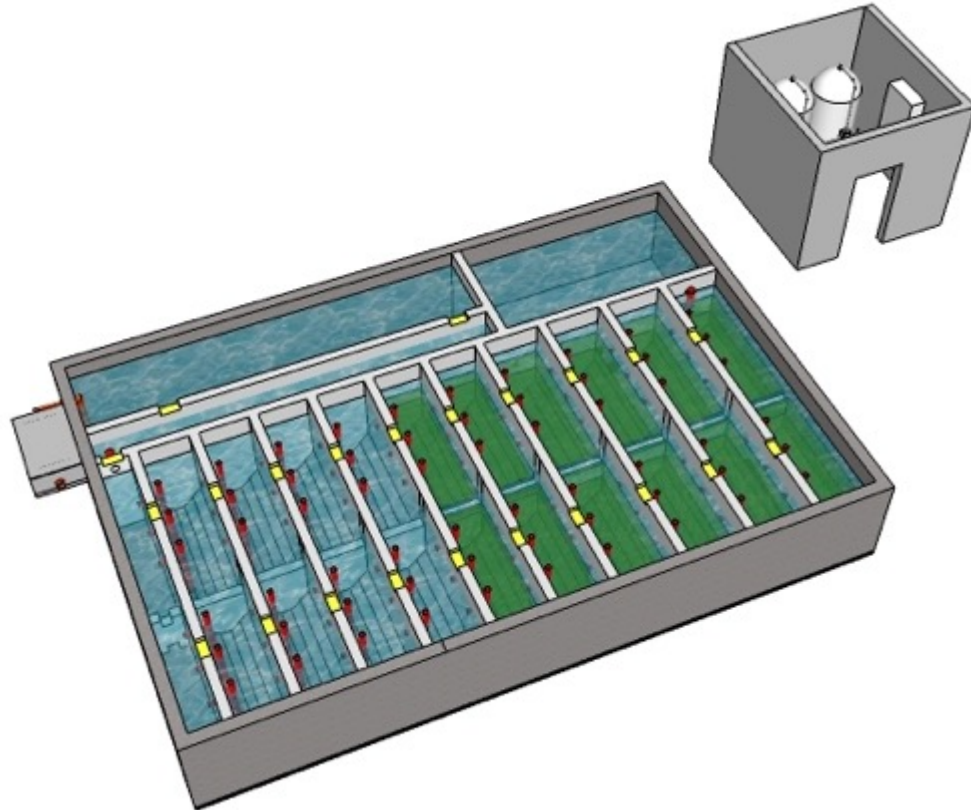


Client: Empire Industrial Centrum - Ambarnath

Technology – “Green STP AD+”



Zero Discharge Sewage Treatment Plant

Reuse of treated water for Landscape, Irrigation & Flushing

Date: 14th April 2017 – Mumbai [INDIA]

Preamble

As per Indian Pollution Control Board norms it is mandatory to reuse treated waste water for non-potable applications. These applications can be WC flushing, landscape irrigation, cooling tower make up, floor & glass washing, dilute any other stream of waste water, sell to other agencies, etc. Indian Green Building Council [IGBC] encourages designers to use Energy efficient technology by offering higher rating in “LEED” certification. It is also mandatory to use ozone technology, instead of chlorine since disinfectants By-Products [DBPs] are quite negligible, and ozone technology is non-hazardous & environmentally safe.

Chemtronics with along with its Switzerland partner has developed a “GREEN STP AD+” which is self-sustained, and conserves water up to the efficiency of more than 95 %. The core treatment works on natural anaerobic degradation process with gravity flow & does not require any energy to treat waste water as per pollution norms. This unique technology produces energy in the form of biogas to make treated waste comfortably reusable. Ozonation is an integrated as a part of high efficiency tertiary treatment producing high quality results.

Since entire anaerobic tank can be made underground, it requires very small foot print for plant room area. Also there is no need of any air handling system and foul odor mechanism required as all tanks are air tight. The AD tank has estimated life of 100 years & is so self-sustained that it does not require any qualified team of operators. The processes by product are liquid & gas, due to which frequency of sludge handling is once or twice a year.

Considering the remote location of the site, we have proposed self-sustained, scientifically developed, natural recycling treatment plant, with least operation & maintenance compared to any technology in the world.

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Project Proponent

Name of the project	:	Empire Industrial Centrum at Ambernath
Requirement	:	Sewage Treatment Plant
Type of project	:	Residential
Application of Treated Water	:	Land irrigation, Gardening, WC flushing & any other non-potable applications
Location of the project	:	Ambernath.

Objective

- ✓ Natural Self-Sustained design
- ✓ Underground STP
- ✓ Least possible Operation & Maintenance
- ✓ Most Energy efficient technology
- ✓ Maximum recovery of water
- ✓ Lower Footprint
- ✓ Environmental Friendly
- ✓ No foul odor
- ✓ Long life span
- ✓ Economical – Capital Cost
- ✓ Economical – Operational Cost
- ✓ Simple to operate
- ✓ Meets International Pollution Standards

Water Balance/ Budget

The plant is designed to treat sewage generated of having following details.

(We need below listed details or water balance & recycled water reuse calculation)

Source of Sewage	:	Residential
No. of units/flats	:	
Kitchen	:	
Bathroom [Bathing]	:	
Washing Machine	:	
Wash Basin	:	
Water Closet [WC]	:	
Misc./Any other source	:	[Specify]

Client Data

Source of Waste Water	:	Domestic Waste Water generated from Residents, Kitchen, Washing machine, Bathroom, WC, Wash basin, etc.
Capacity of STP	:	400 KLD
Number of Units / flats	:	_____ nos.
Number of Staff	:	_____ nos.
Application of Treated Water	:	Land irrigation, Gardening, flushing & other non-potable application

Design Consideration & Estimation

Water require per person	:	_____ liters per day
Total Sewage Water Capacity	:	400 KLD (as per client 400 KLD is produced per day)
Plant Operating Hrs	:	22 - 24 HRs
Plant Flow Rate	:	18 m ³ /hr
Treatment	:	Anaerobic Digestion [AD] + Polishing + Ozonation
Green STP/AD+ Model No.	:	AD+/STP-400

Water Quality – Raw Sewage & Treated / Recycled

Parameters	Raw Sewage Water Quality	Treated Water Quality For Reuse
Color	Slightly brownish	Clear
Odor	Characteristic	Unobjectionable
pH	5.0 – 8.0	5.5 – 8.0
TSS	100 – 150 ppm	≤1 ppm
BOD (3 days 28 °C)	150 – 200 ppm	≤10 ppm
COD	300 – 450 ppm	≤100 ppm
Oil & Grease	20 – 25 ppm	≤ 10 ppm



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Treatment Technology

Concept - Green STP AD+

Green STP AD+ combines state of the art High Rate Anaerobic Reactor (HRAR) technology with a selection of adequate tertiary treatment methods of filtration & disinfection. This full-blown decentralized wastewater treatment and reuse systems is aligned with the project specific conditions and requirements. We provide our clients custom and tailored wastewater solutions with outstanding economic and ecologic performances while making maximal benefit out of on-site reuse of products out of wastewater treatment. Our STPs are engineered to comply with the respective regulations and norms.

AD+ [Anaerobic Digestion +] is a waste water treatment, particularly suited to organic material & is commonly used for effluent, sewage & grey water treatment. Anaerobic waste water treatment is a biological treatment without the use of air or elemental oxygen. Many groups of anaerobic bacteria work together in absence of oxygen to degrade complex organic pollutants into methane / bio gas and carbon dioxide. In anaerobic digestion the micro-organisms responsible for the conversion of the organic matter or the other constituents in the waste water to gases & cell tissues are maintained in-suspension within the liquid. Anaerobic digestion is a simple process that can greatly reduce the organic matter without using any other resource & any form of energy.

Core Treatment - High Rate Anaerobic Reactor Technology

High Rate Anaerobic Reactors (HRAR) refers to bioreactors which can retain active biomass in the reactor independently of the incoming wastewater (Hydraulic Residence Time HRT). Slow growing anaerobes can be maintained in the reactors at high concentrations, enabling high reaction rate per unit reactor volume and high resistance of organic or hydraulic shock loads. HRAR can be used to treat wastewater from various sources and strengths like waste water from domestic sources, hospitals and industries like distilleries or food-processing.

The HRAR we use are cascaded in series to multi-step anaerobic systems, enabling separation of the anaerobic treatment steps (Hydrolysis/Acidogenesis/Acetogenesis/Methanogenesis) without difficult process controlling. With respect to sustainability and cost-effectiveness, anaerobic treatment has the core advantage of avoiding the loss of energy for destruction of organic matter, while energy is reclaimed from the organic waste constituents in the form of methane in biogas.

Salient Features:

- * Overall Organic & Inorganic content reduction (BOD, COD & TSS) with color & odor.

* Treated Sewage Water Quality	- Most suited for Irrigation & Landscape.
* Energy Efficiency	- Highest - 50 - 90 % less consumption
* Sustainability	- Self Sustained [Autark]
* Reusable Output	- Highest - more than 99 %
* Operation & Maintenance	- Least - Operator not required
* Sludge Management	- Least - Once in a Year
* Consumables	- Minimum
* Life Span	- Very High - 100 Years [Core Technology]
* Foot Print	- Minimum 70 - 80 % less [Being Underground]
* Nutrients	- Rich
* Process & Technology/R & D	- GREEN STP AD+ from Switzerland

Advantages – HRAR [AD] :

- * Low Process Control
- * Low Process Energy
- * No Chemicals
- * Low Sludge Production
- * MLSS and SVI monitoring not required
- * Energy Generation in the form of Biogas
- * Minimum Mechanical & Electrical Parts
- * Under Ground Structure (Can be above ground)
- * High Shock Load Resistance [Organic & Hydraulic]
- * High Treatment Performance In Terms Of COD, BOD & TSS
- * Self-Sustained
- * Reclaimed Water more than 99.0 %
- * Innovative still natural treatment process
- * Energy efficient. 60 – 90% lesser power
- * Extremely stable to hydraulic shock loads
- * High treatment performance
- * Low operating cost
- * Low space required – being subsoil
- * No foul odour
- * Long life – at least 50 years



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Process Description

Primary Treatment

Screening: - This is the first unit of the Green STP AD+. Sewage water from sewage collection chamber is collected into an AD tank through a bar screen by gravity. Bar screen is provided to trap floating materials like leaf, flowers, cottons, plastic, half eaten food, papers, etc.

Oil & Grease Chamber: - Sewage water from the kitchen which contains free oil, if not removed creates scum accumulation and affects the functioning of microbes. To avoid this, oil & grease, a chamber is provided after the bar screen where free floating material oil is arrested prior to entry in the AD Tank. Accumulated oil will be removed periodically and disposed of properly.

Secondary Treatment

Biological Treatment: -

Sewage from Oil & Grease chamber will pass through the AD Tank. The AD Tank is a cascade of three major treatments steps i.e. Settler, High Rate Anaerobic Reactor [HRAR]/Anaerobic Baffle Reactor [ABR] and up flow Anaerobic Filter which is constructed below ground level. These three different phases are built together in a single AD Tank with interconnecting compartments. The AD Tank performs the core treatment of the sewage water oxidization & decomposition of organic pollutant with the help of anaerobic microorganism to provide higher surface area for micro – organisms, floating random media is provided, on which micro- organisms growth takes place. Generally activation of AD tank with full sewage load can take 40 to 50 days and come to its optimum efficiency.

1. Settler

The first compartment of AD Tank is a settler. The settler has two treatment processes. First is a sedimentation in which the liquid part is separated from the solid matter and second is stabilization, which settles out most of the solids in the waste water.

2. High Rate Anaerobic Reactor /Anaerobic Baffle Reactor (HRAR/ABR)

In this treatment phase, biological and natural chemical processes are used to digest and remove most of the organic matter. In this high rate anaerobic reactor, without oxygen mechanical mixing is applied. Treatment is achieved by anaerobic digestion by naturally selected anaerobic microbial. This gives good retention time to waste water and development of a thick sludge blanket in the bottom of compartment.

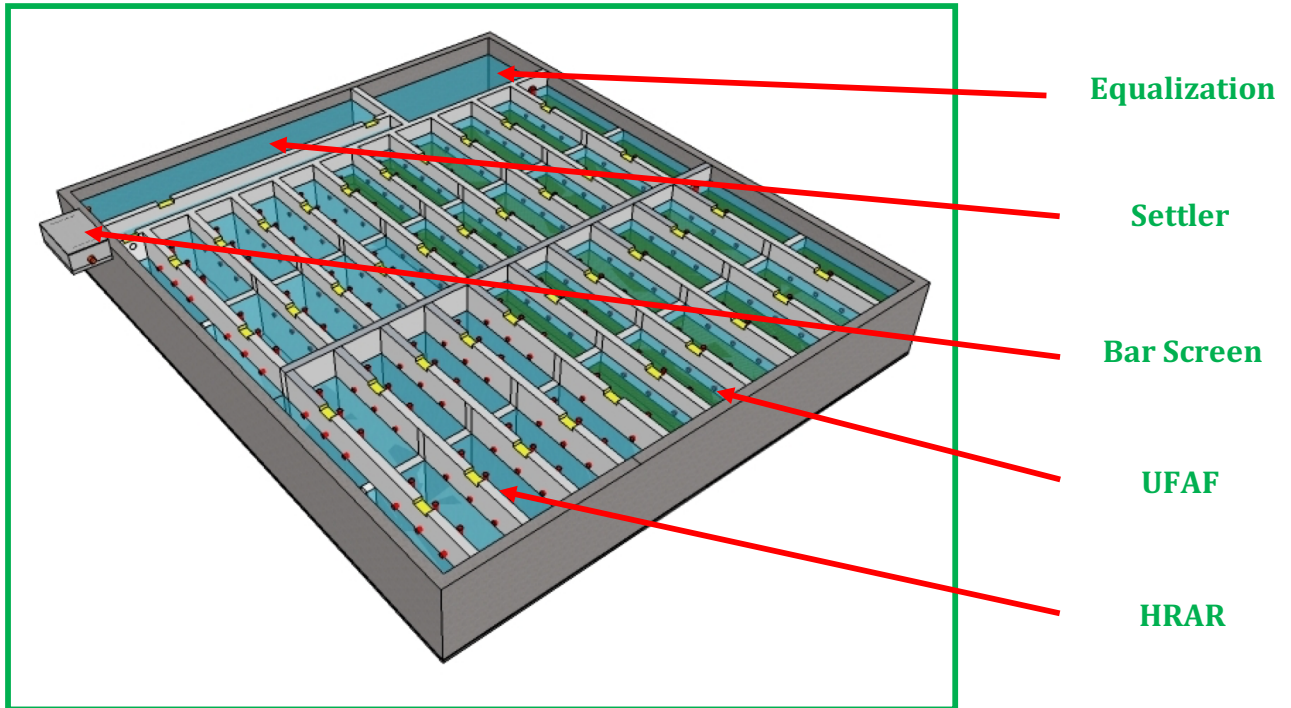


Fig. 1, Anaerobic Digester [AD] Tank - Civil On Site Construction

3. Up flow Anaerobic Filter

After the HRAR/ABR Treatment sewage water is transferred into up flow Anaerobic Filter compartment in order to improve further treatment efficiency, a filter media allowing widespread contact with the waste water stream is used which is very efficient in retaining and digesting the left over pollutants. The process works with fixed plastic bio media. The waste water passing out of the anaerobic filters has 90% of the original pollution load removal.

Polishing Tertiary Treatment

Secondary (biological) treated water from AD Tank will be collected in a equalization tank. This treated water is ozonated for pathogen disinfection. Ozonation also reduces foul odor & tint of color, if present in treated water. Post Ozonation water is filtered by "**Charged Activated Media Filter [CAMF]**" through a filter feed pump to trap tiny suspended particles from water. Ozonation of treated sewage water reduce tiny organic and inorganic impurities from water.

From backwash cum Treated Water Tank water is used for backwashing of filters. From this tank water will be further collected in main treated water tank.

As per MPCB, ozonation in STP tertiary treatment is mandatory.



Fig. 2, Tertiary Treatment: Charged Activated Pressure Filtration + Online Ozonation

Process Flow Diagram

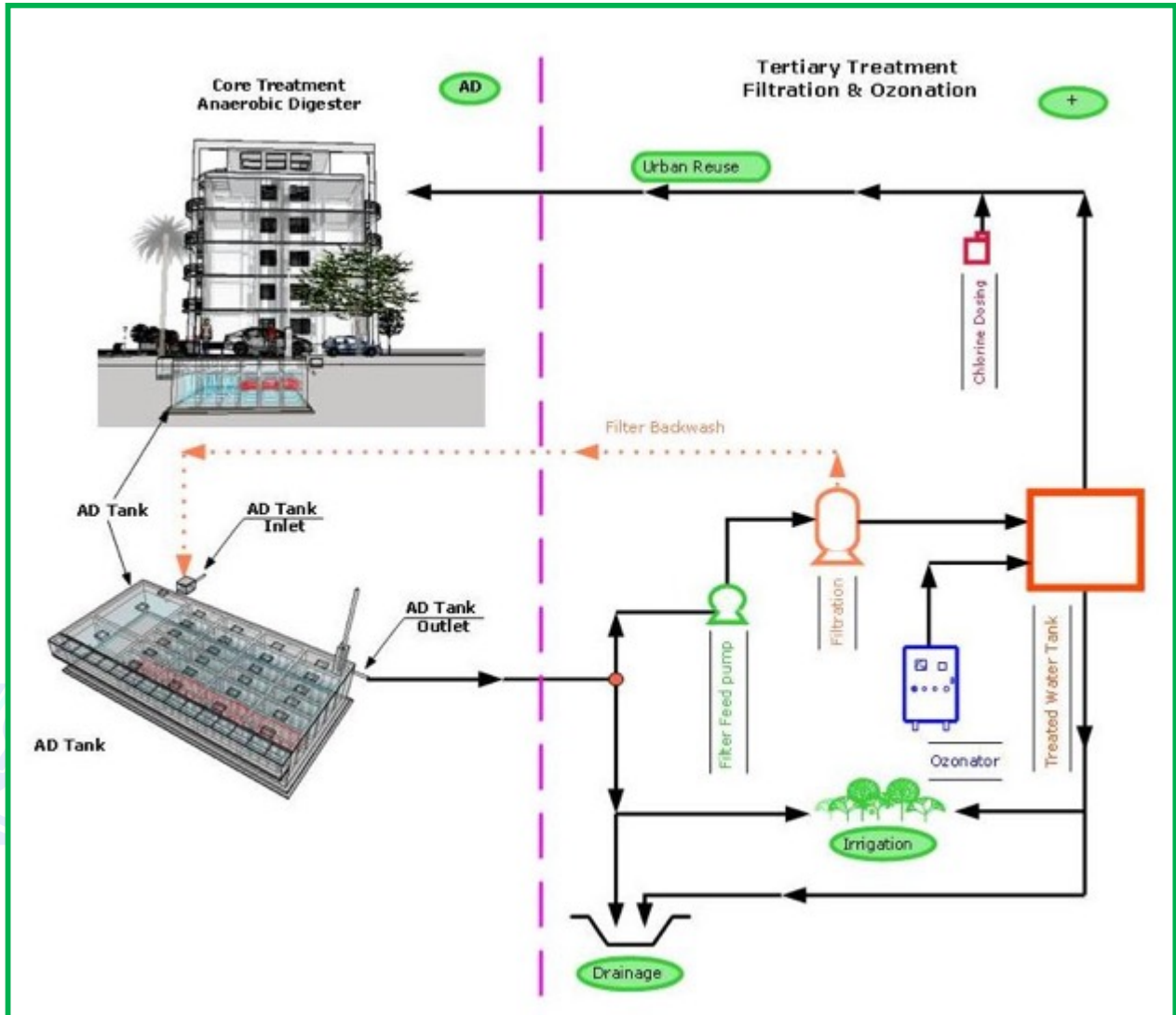


Fig. 3, Process Flow Diagram of "Green STP AD+"

Technical Specification

There are two options for anaerobic tank construction:

Option 1 – Civil Tank Construction Under Ground

Option 2 – Civil Tank Construction Above Ground

In option 1, the construction of the sewage collection cum treatment tank & treated water tanks are to be constructed on site below ground by our or your civil contractor & we will give the dimensional drawings. In option 2 the construction of the sewage collection cum treatment tank & treated water tanks are to be constructed above ground. The bio-media & pipe grid will be installed by our team, after the tank is constructed along with the construction of top slab. Also, the tertiary treatment plant will be supplied & installed by our team.

In any of the opted option, once the tanks are ready, they will be inoculated for anaerobic bacteria at the site.



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Option 1 – Civil Construction – Below Ground

Foot Print – AD Tank

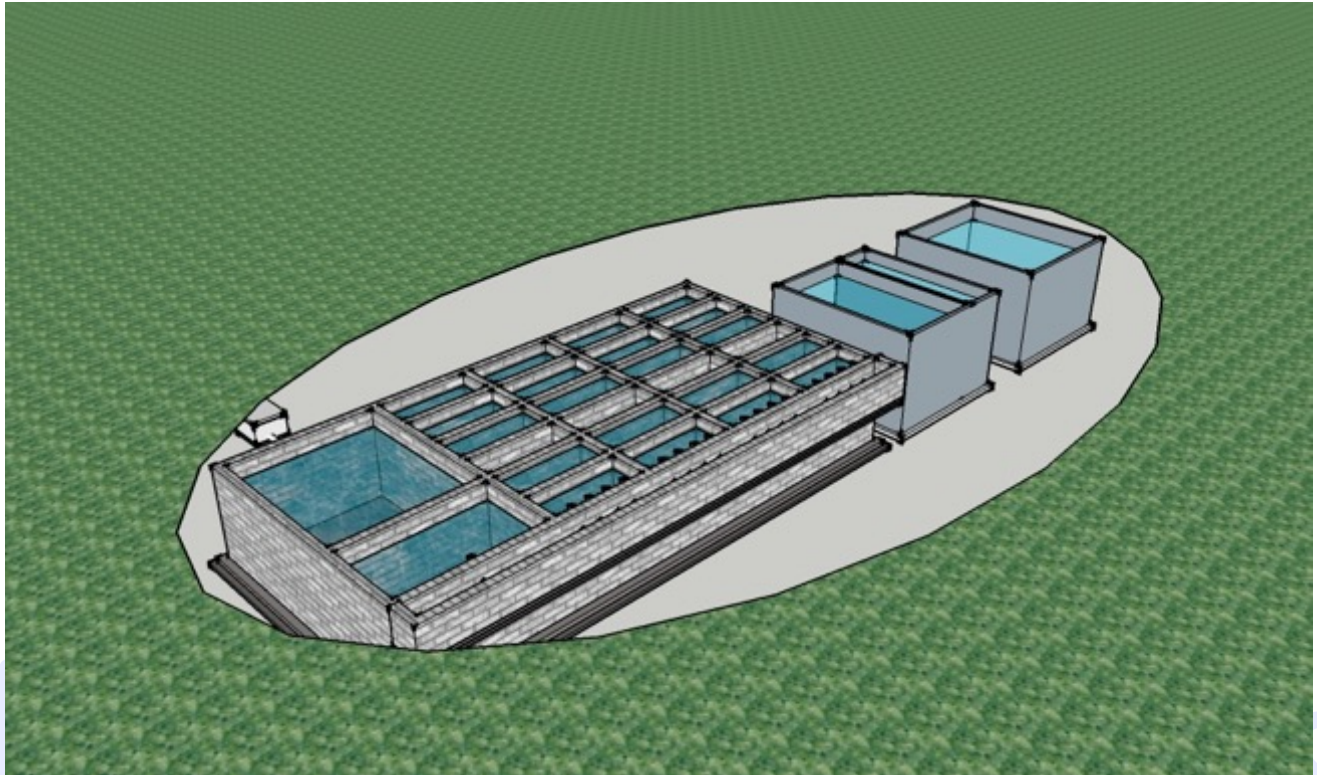


Fig. 4, AD Tank, Oxidation Tank & Final Treated Water Tank can be located below landscape

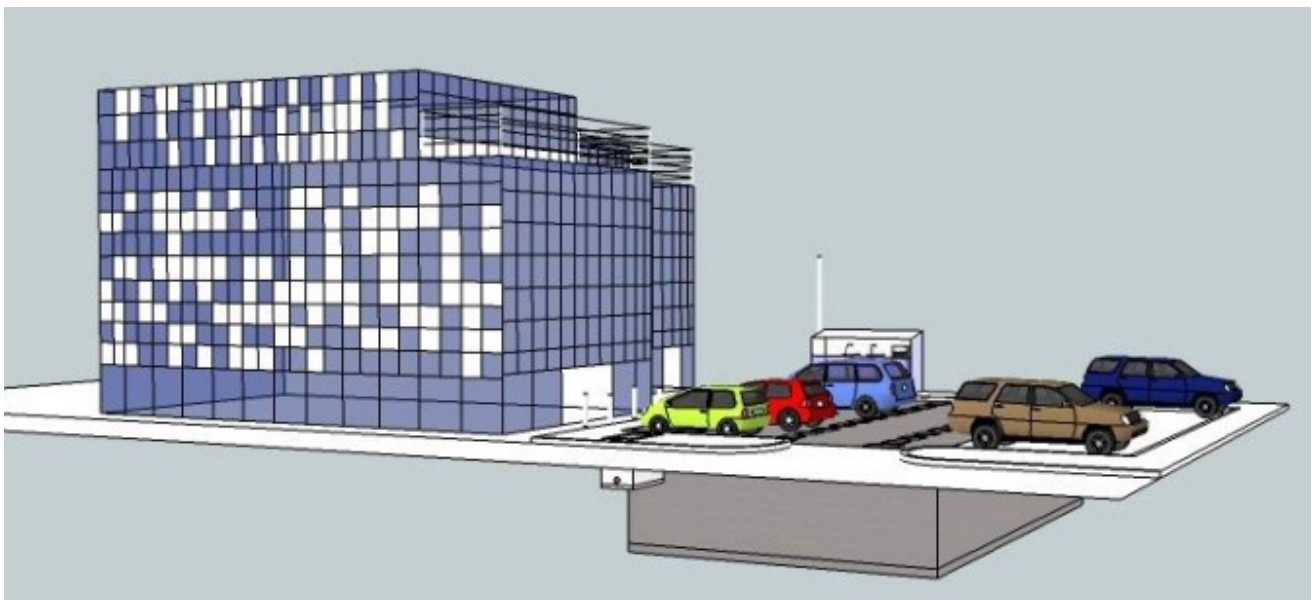


Fig. 5, AD Tank, Oxidation Tank & Final Treated Water Tank can be located below car park.

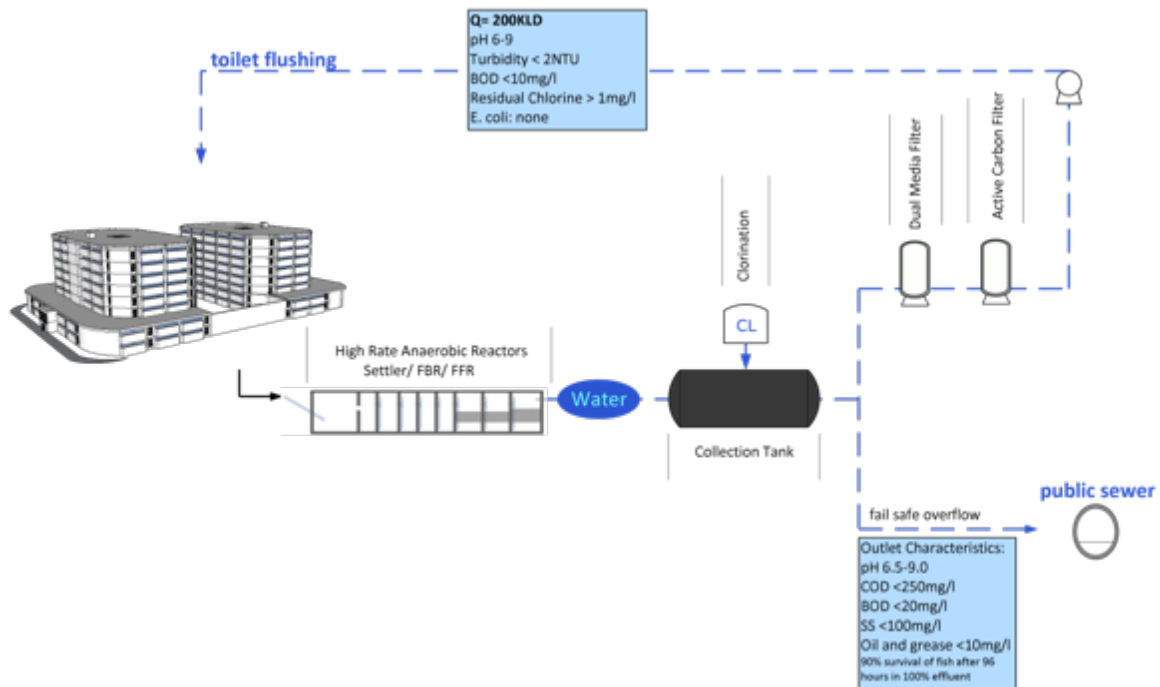
Actual Site Picture – 600 KLD - 2008



GREEN STP AD +
Below Car Parking



Chem



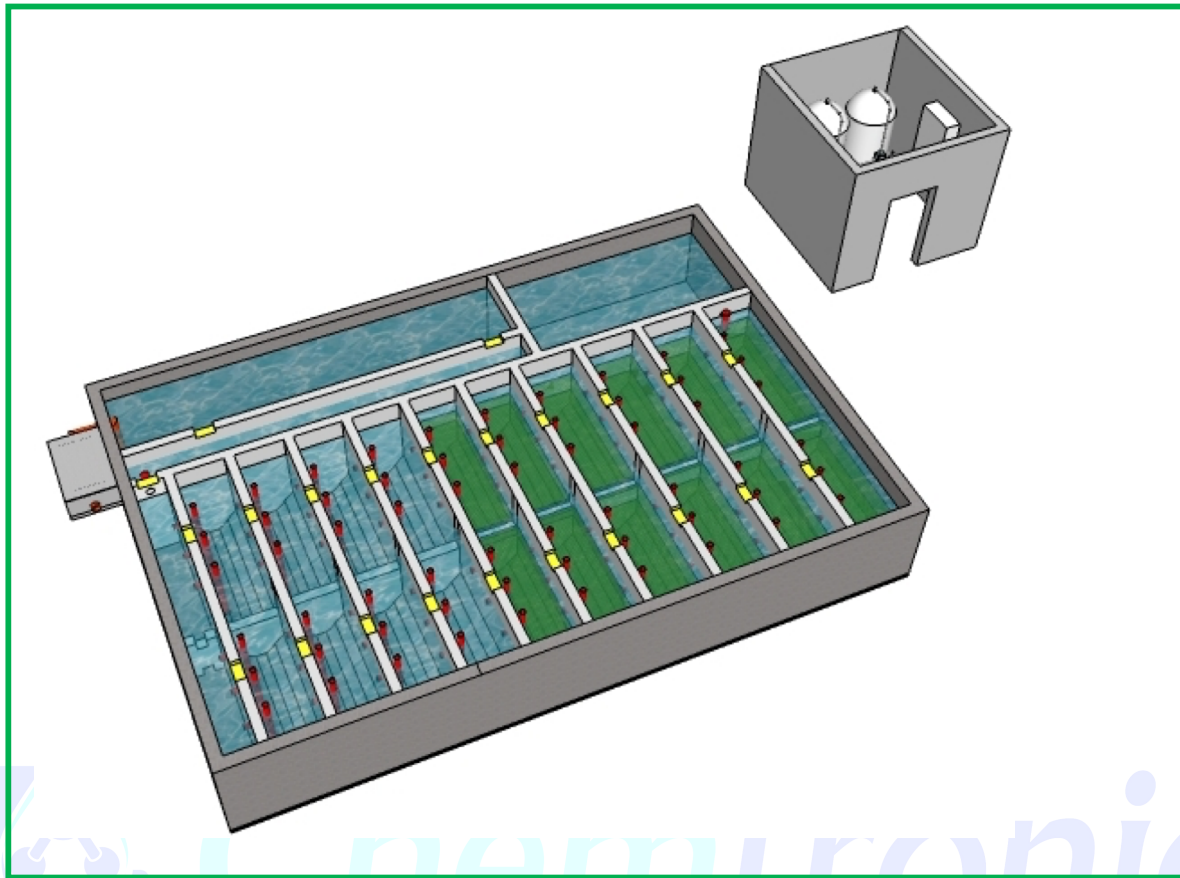


Fig. 6, AD Tank, Oxidation Tank, Final Treated Water Tank & Plant Room.

AD Tank	: Under Ground / Above Ground	: 950 m ² [Area] X 3.0 m [Depth]
Oxidation Tank	: Under Ground / Above Ground	: 20 m ² [Area] X 3.0 m [Depth]
Treated Water Tank	: Under Ground / Above Ground	: 20 m ² [Area] X 3.0 m [Depth]
Backwash Water Tank	: Above Ground [Above plant]	: 10 m ² [Area] X 2.5 m [Height]
Plant Room	: Above Ground	: 30 m ² [Area] X 3.5 m [Height]
Total Area Required	: Under Ground / Above Ground	: 1,020 m²

Foot Print – Equipment

AD Tank	:	Above or Below Ground	:	990 – 1,000 m² x 3.0 m [Ht/depth]
Plant Room	:	Above Ground	:	25 - 30 m² x 3.0 m [Height]

Power Rating

ABR + AF	:	0.0 Kw	
Tertiary Treatment	:	1.5 Kw x 24 hrs	= 36.0 Kwhr [Units]
Ozonation	:	2.5 Kw x 24 hrs	= 60.0 Kwhr [Units]
Final transfer Pump	:	1.5 Kw x 24 hrs	= 36.0 Kwhr [Units]
Plant Room [Lights & Fans]	:	0.5 Kw x 1 hr	= 0.5 Kwhr [Units]
Total Power Rating	:	6.0 Kw [3 Phase]	= 132.5 Kwhr [Units]

Reclaim Efficiency

Treated Water Quantity	:	400 KLD	:	97 – 99 % Recovery
Biogas Production	:	___ m³/day	:	Electricity of 10 kw/day *

*at 50 % efficiency.

Life span

AD Tank – Core Treatment	:	50 Years
Tertiary Treatment	:	50 Years
Ozonation Plant	:	20 Years

Operation & Maintenance

In AD tank waste water flows naturally by gravity. Tertiary treatment & disinfection process can be automatic and does not require any operator. Only a part time non-technical operator is required for general supervision & log keeping. Sludge management is also minimal & does not demand for frequent sludge handling.

Maintenance & Replacement Frequency

Sludge Monitoring	:	Once in 6 Months	
Sludge inspection	:	Once in 6 Months	
Sludge Maintenance	:	Settler	:
			Once in a Year
	:	ABR/AF	:
			Once in 3-4 Years

Consumables

Chemicals

No Consumable chemicals are required.

Man Power

Non-technical operator is required for part time. : **1 hr/day**

Electricity

Core Sewage treatment plant	: 0 units/day	: 0.0 Kw/m ³	
Tertiary Filtration	: 36 units / day	: 0.09 Kw/m ³	
Ozonation	: 60 units/day	: 0.15 Kw/m ³	
Final Transfer Pump	: 36 units / day	: 0.09 Kw/m ³	
Misc / Plant room lighting	: 0.5 units / day	: 0.003 Kw/m ³	
Total	: 132.5 units/day	: 0.331 Kw/m³	[Rs. < 4.0 per m³]

Spares

ABR & AF	:	Bio groth Media/Pipe Grid	:	50 Years
Tertiary Treatment	:	Filtering Media	:	50 Years
Ozone Generator	:	Ozone Cell	:	2 Years
Oxygen Generator	:	Molecular Selves	:	2 Years

Annual Maintenance Contract

Annual maintenance contract is available post hand over during warranty period & post warranty, for rest of plant life.

Operation Charges	:	Rs. 60,000/= per year
Comprehensive Maintenance Charges	:	Rs. 60,000/= per year
Total	:	Rs. 120,000/= per year [Rs 0.07 per m3]

Capital Cost

Civil Tank Construction	[Under Ground]	:	₹ 3.0 – 3.5 Cr
Civil Tank Construction	[Above Ground]	:	₹ 2.6 – 3.0 Cr
Plant Room Construction		:	₹ 12.0 – 13.0 Lakh
GREEN STP AD + & Ozone Tertiary Equipment		:	₹ 53.0 Lakh ± 2.0 %
Installation & Commissioning + Inoculation		:	₹ 4.0 Lakh ± 2.0 %
TOTAL	Option 1	Below Ground	: ₹ 3.69 – 4.2 cr
	Option 2	Above Ground	: ₹ 3.29 – 3.7 cr

Operational Cost

Consumables & Spares		Cost per Month	Cost Per Year
Electricity	[132.5 units/day]	₹ 0.39 Lakh	₹ 4.68 Lakh
Operator		₹ 0.05 Lakh	₹ 0.60 Lakh
Chemicals / Misc.		₹ 0.01 Lakh	₹ 0.12 Lakh
Spares & Labor		₹ 0.05 Lakh	₹ 0.60 Lakh
TOTAL		₹ 0.50 Lakh	₹ 6.0 Lakh

Taxes & Other Charges

All Taxes, duties & other incidental charges are extra as applicable as listed below

Vat on Construction material	Extra @ 5.0 %
Service Tax on Construction labor	Extra @ 4.5 %
VAT on Equipment Supply	Extra @ 13.5 %
Service Tax on design, I & C, inoculation	Extra @ 15.0 %

Time Duration

Construction of AD Tank [Below Ground]	7 – 8 months
Construction of AD Tank [Above Ground]	6 – 7 months
Construction of the Plant Room	1 – 1.5 month [simultaneously]
Supply of Tertiary Stage Equipment	1.5 – 1.8 months [Simultaneously]
Installation & Commissioning in AD Tank	1.0 months [Simultaneously]
Installation & Commissioning of equipment	2 weeks
Inoculation	1.0 week post sewage feed
Start up	2 – 3 months, post inoculation



Savings / Return on Investment

Above Ground construction	30.0 m ²	Saving in F S I
Energy Efficient	79 % less	LEED Points / High ROI
Design	Indo-Swiss - Innovation	LEED Points
Sludge / Water Recovery	2 – 3 % Sludge + 99 % water	LEED Points / High ROI
Technology	Self-Sustain & Environmental Friendly	
Operation	1 hr/day [Only Monitoring]	
Life Spane	50 Years	High ROI
Operator	95 % less	High ROI
Chemical	90 % less	High ROI
Repairs & Spares	90 % less	High ROI

Assumptions

For comparison, we have assumed standard data of Aerobic Sewage Treatment Plant of 400 KLD.

Electricity	Raw sewage transfer	1.5 Kw
	Blower	3.0 Kw
	Aerator	15.0 Kw
	Filter feed Pump	1.5 Kw
	Final transfer Pump	1.5 Kw
	Ozonation	2.8 Kw
	Plant Room [L & F]	0.5 Kw
	Total	25.8 Kw

Operation time **24 hrs**

Total Electrical Consumption **25.8 Kw x 24 hrs** **619.2 Kwhr [Units]**

Electricity Cost per day **[@ Rs 10/- per unit]** **Rs. 6,193/-**

Electricity Cost per year **Rs. 22,60,000/-**

Chemicals	Chlorine	[Without Ozonation]	20 ppm
		[With Ozonation]	5 ppm
	Alum		5 ppm

Operator **24 x 7**

Repair & Spare **Routine**

References



Cairn India Ltd – Factory - Bhogat – Jamnagar, Gujarat	12 CMD
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Essar Projects – Residential – Papua New Guinea	50 CMD
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Vascon Engineers – Labor Camp – Andheri	45 CMD
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Akash Developer – Resi – GTP Bombay Central	25 CMD
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Craftsman Automation – Factory - Prithampur [Madhya Pradesh]	15 CMD
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Rhythm Resort – Resort – Lonavala	60 CMD
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Manipal Hospital – Hospital – Bangalore	600 CMD
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**Yakshashri
Beverage**

Yakshashri Beverage – Factory – Katjat -	3 CMD
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**Lotus
IT Park**

Lotus IT Park – Commercial Building – Parel	50 CMD
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**OP
Infra**

Grand Fort City – Residential – Agra	60 CMD
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Dream Mall - Sunrise Hospital – Bhandup -	50 CMD
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Collaboration Certificate

Certificate of Collaboration

**THIS IS TO CERTIFY THAT THE TECHNOLOGICAL COLLABORATION IN BETWEEN TWO PARTIES
HAS BEEN DONE, DETAILS OF WHICH IS AS UNDER**

PARTY 1

Chemtronics Technologies (India) Private Limited a company registered in 2004 under the Companies Act, 1956 and having its Head Office at #28, Salyam Industrial Estate, Subhash Road, Jogeshwari (East), Mumbai - 400060.

PARTY 2

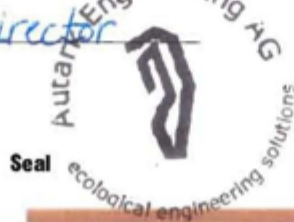
Autark Engineering AG registered in 2010 in the commercial register of KI. Giarus in Switzerland having its office at Hauptstrasse22, 8775 Halzingen, Switzerland.

Collaboration Motto	:	Innovative Wastewater Solutions for Decentralized Applications.
Collaboration Date	:	05 th September 2012
Collaboration Place	:	Mumbai, India
Collaboration Validity	:	04 th September 2016
First Extension	:	04 th September 2020
Documents Evidence	:	Memorandum of Understanding duly signed by both Parties dated 5. September 2012.

For and on behalf of :

Autark Engineering AG.

Signature N. ZIMMERMANN
Name Mr. Nandoz Zimmermann
Designation Director



For and on behalf of :

Chemtronics Technologies (India) (P) Ltd.

Signature MR. JUNIL SHAH
Name MR. JUNIL SHAH
Designation DIRECTOR



Please click on below links to know about the more Information on



- [!\[\]\(38441ceaa711016e0bf2ad46ad394ff4_img.jpg\) Details - Green STP AD+](#)
- [!\[\]\(6e027340d4263908f264926b1ad81c5e_img.jpg\) Presentation – Features of Green STP AD+](#)
- [!\[\]\(781510d64f329bf3c880acf086e884d6_img.jpg\) Presentation – Green STP AD+](#)
- [!\[\]\(93cdf5b84f2bfec404f7441e84b6ba5c_img.jpg\) Catalogue – Green STP AD+](#)
- [!\[\]\(0f0f932ce3b5577a82f34ad23239a6e5_img.jpg\) Collaboration System](#)
- [!\[\]\(eae2be0f6c865f0a2febc97c99fc2475_img.jpg\) Site Photos](#)
- [!\[\]\(beb73fa08c38b910d1745a8873b27d81_img.jpg\) Green STP AD+ - Video](#)
- [!\[\]\(b5401e964162c76526213b8e70b40c2e_img.jpg\) Site Video – Lotus Mumbai](#)
- [!\[\]\(865f2722fc1818c7fea1a14e09a6e1a6_img.jpg\) Site Video – Essar Project – Papua New Guinea \(PNG\)](#)
- [!\[\]\(40e8be9c7fbc03824b9e3a0db89df497_img.jpg\) Client list – please find attached](#)
- [!\[\]\(ac93afa5970ce35aafca08e0a61927af_img.jpg\) Company Profile – Chemtronics'](#)

Contact Us :

Chemtronics Technologies (India) Pvt. Ltd.

28, Satyam Industrial Estate, Subhash Road, Jogeshwari (East), Mumbai-400 060. INDIA

URL : www.chemtronicsindia.com; Mail : sales@chemtronicsindia.com; Office : +91-22-2825 9933

Contact Person :

Mr. Sunil Shah – Director (Technical) – India – [+91-93212 34527]

**Mr. Nanchoz Zimmermann (Principle “GREEN STP AD+” Designer) – Switzerland,
switzerland@chemtronicsindia.com**