AMRUT SEWERAGE –CONSTRUCTION OF 5MLD STP FOR MEDICAL COLLEGE THIRUVANANTHAPURAM

DETAILED PROJECT REPORT

Kerala Water Authority

Project Division

November 2016

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Executive Summary

Thiruvananthapuram Medical College is in Thiruvananthapuram city, the capital of Kerala state, India. It was founded in 1951 and was inaugurated by Jawaharlal Nehru, the first prime minister of India. This is the oldest and most prestigious medical college in Kerala. In official records, it was named simply Medical College (of Thiruvananthapuram) since it was the only medical institute in the state at its inception. It is being upgraded to the status of an All India Institute of Medical Sciences (AIIMS).

The Kerala model of health care,globally acclaimed for cost effectiveness, is attributable to the alumni of this institution. The SreeAvittomThirunal Hospital, offering comprehensive health care for women and children was added in 1952 .

Over the years its picturesque campus has attracted major institutions like the SreeChitra Institute of Medical Science and Technology, the Regional Cancer Centre, the Achutha Menon Center and the Child Development Center , all of which together forms a health city on the outskirts of the capital city of Thiruvananthapuram.

The institution has over 2500 beds for inpatient care and offers courses at graduate, post graduate and post doctoral levels in medicine,public health, nursing and pharmaceutical sciences.

The College Campus has 139 acres (0.56 km2) of picturesque land with a number of hillocks surrounded by evergreen coconut groves and paddy fields, facing the sea which lies at a distance of three kilometres, and is located on the North – West border of the Trivandrum city. The College, is linked with the different sections of the city by bus routes, is very near the national highway NH 47 and the nearest railway station is just few kilometres from the college. The topographical layout and the architectural designs were prepared by Mr. J.A. Ritchie from Bombay. The College and the hospital buildings are separated by playgrounds for football, hockey, a cricket pitch, courts for tennis, basketball, badminton and volleyball and a 400 meter track.

A super-specialty block with state-of-the-art technology and modern equipments, exclusively housing all the medical and surgical super-specialties of the college, has been completed and has started functioning as the OP block of the super-specialties from July 1, 2010. It was funded under the Prime Minister's SwasthyaBheemaYojna scheme and by the State government. The 253-bed SS block, spread over 160,000 sqft (15,000 m2) on seven floors, houses the outpatient clinics and inpatient wards of the six super specialties, eight operation theatres, 29-bed six intensive care units, haemo dialysis unit and renal transplant unit, apart from administrative blocks. Full fledged functioning of the complex will commence after its proposed dedication to the nation by the Prime Minister.

The water supply and sewerage system is well maintained by Kerala Water Authority. Medical College & Hospital Campus presently has a well laid existing sewerage system which need renovation.The existing sewerage system which was laid long time back is insufficient to meet the present flow. At present the sewage generated in this campus is collected in the wet well of an existing pump house of Kerala Water Authority, on the periphery of the campus which ultimately discharges into the sewage Plant at Muttathara, where the sewage is treated by extended aeration process.

Since the hospital waste is to be treated separately as per the norms of pollution control board, a proposal was submitted in the AMRUT 2015-16 for constructing a decentralised Sewage Treatment Plant. The Proposal was approved in the SAAP 2015-16 and 2016-17. It is proposed to construct 5MLD STP with MBBR technology and to reuse the treated water for the other purposes such as toilet flushing , gardening, A/C chiller unit etc .**The Total expected cost is Rupees 17.75 Cr** (5.90 cr+ 13.85)

Construction of 5MLD Capacity Sewage Treatment Plant and Recycling Unit for Medical College, Trivandrum		
General Abstract		
Sl.No.	**Description**	**Amount (in Rs.)**
1	Inlet Chamber and Screen chamber	**4,251,253**
2	Collecton Tank	**20,435,686**
3	MBBR Chambers	**15,077,103**
4	Flocculation Tank	**5,395,872**
5	Plant Room	**4,339,865**
6	Clarifier	**6,188,877**
7	Clarified Water Tank	**3,602,091**
8	Sludge Holding Tank	**3,570,946**
9	Treated Water Tank	**9,820,328**
10	Substation Building	**1,080,474**
11	Clorination Building	**917,412**
12	Laundry Collection Tank	**2,921,870**
13	Laudry pre clarifier	**1,544,560**
14	Laundry clarifier	**1,600,627**
15	InterConnecting Channel	**1,422,979**
16	Compound wall	**9,535,434**

17	Transmission main & effluent Disposal pipline	**5,154,126**
18	Electrical and Mechnical Installations	**62,979,000**
19	Deposit to be made to KSEB for availing Electrical Connection and substation equipments	**1,338,315**
20	Landscaping1%	**2,417,652**
21	Mantenance of the STP for 5 years	**13,905,530**
	Total	**177,500,000**
Say Rs 17.75 Cr		
Rupees Seventeen Crore Seventy five Lakhs Only		

AMRUT –SEWERAGE - 5MLD STP for Medical College	
Fund Allotment	
2015-16	5.90 Cr
2016-17	13.85Cr
Total	17.75Cr

PROJECT AT A GLANCE

CONSTRUCTION OF 5MLDSTP AT MEDICAL COLLEGE CAMPUS THIRUVANANTHAPURAM

1.	Water Supplied through KWA	:	4mld
2.	Project Area	:	139 acres (0.56 km2)
3.	Implementation period	:	2017 - 2047
4.	Design capacity	:	80% of water Supplied say 4.0 MLD
5.	Projected Capacity	:	5MLD
6.	Technology Adopted	:	MBBR
7.	Location	:	Medical college campus ,Trivandrum
8.	Intake arrangements	:	New Collection Well near Existing SPH
9.	STP Components		

1. Bar Screen Chamber
2. Equalization Tank
3. MBBR -1
4. MBBR-2
5. Lamella for Clarifier
6. Clarified Water Tank
7. Tertiary treatment
8. Disc Filter
9. Activated Carbon Filter
10. Treated water tank
11. Sludge Holding Tank

10.	Project service period	:	30 years
11.	Estimated Cost	:	Rs. **1775**lakhs

EXISTING SCENARIO

The water supply and sewerage system is well maintained by Kerala Water Authority. Medical College & Hospital Campus which includes SreeChitra Institute of Medical Science and Technology, the Regional Cancer Centre, the Achutha Menon Center and the Child Development Center.All the institutions in the campus are presently has a well laid existing sewerage system.But these net work need renovation.Because the existing sewerage system was laid long time back .As the hospital campus is developing very fast the system is insufficient to meet the present flow.

At present the sewage generated in this campus is collected in two Collecting wells of diameter 3 meter and 3 meterdeep.Using 2nos @ 50 HP centrifugal Pumps the sewage collected is pumped to main sewer line connecting Kannamoola terminal Pumping Station.Earlier these sewage were pumped to the sewage farm at Muttathara.In JnNURM Project a 107 MLD STP was constructed and the sewage is discharged into the sewage Plant at Muttathara, where the sewage is treated by extended aeration process.

The sewage collected in the Medical college Pumping station is differentcharacteristics.They are:-

1)Biofluids (waste water from the labs and operation theatre liquid waste)
2) waste water from Laundry
3)waste water from in house kitchen (cooking and washing of hands
4) waste water from Toilets

At present the collecting well is in damaged condition.The sewage is overflowing to the nearby canal causing public protest.Thebreak down of the pumps is also causes the over flow of the sewage . In order to get rid of the present issues it was proposed to treat the sewage at the campus itself and the current proposal is considered under AMRUT

The project aims at to improve the atmosphere as well as the aesthetics of the entire Medical College campus, Thiruvananthapuram and to get a clean and hygienic environment to patients as well as to the public living in and around the area and to provide a separate Sewage treatment plant for the campus within its boundary. A thorough investigation has been conducted to assess the sewage load at the existing pump house based on number of inpatients, out patients, visitors, staff and inmates in the various hostels, quarters and staff of other institutions functioning inside the campus. Matter has also been discussed at various levels including Principal, Medical College, to access the future requirements. It is envisaged that an additional hospital block and trauma block with about 200 beds is planned as immediate future development.

DEMAND CALCULATION

The Present Water supply from KWA

Medical college	:-	1.00Mld
SAT	:-	1.00Mld
Regional Cancer Center	:-	0.50Mld
Sreechitra Hospital	:-	0.75Md
PulayanarkottahTB Hospital	:-	0.25Mld
Medical college Quarters	:-	0.25Mld

Water pumped from own well

In Medical college Hospital	:-	0.25Mld

Based on the present and future developments over 50 years, a total requirement of 4 MLD capacity has been assessed for the present flow and 5 MLD over next 50yrs for STP.

A 5 MLD Sewerage Treatment has accordingly been proposed to meet the requirements of next 30 yrs.

Test Result of the RAW Sewage

Tel:(D) 0484 2207781
PABX: 0484 - 2207783 - 86
Fax: 0484 - 2207783
e.mail: ces@keralapcb.org
kspcbcl@asianetindia.

KERALA STATE POLLUTION CONTROL BOARD
CENTRAL LABORATORY, GANDHI NAGAR, KOCHI - 682 020.
കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്,
സെൻട്രൽ ലാബോറട്ടറി, കൊച്ചി - 20
www.keralapcb.org

ANALYSIS REPORT

Analysis Report No.	**PCB/CL/1113/16-17**	**Date**	22 Oct 2016	Format No: PCB/CL/CH/F-7
Ref.No.	KWA/PD-T/DB2/484/2016-17	**Date Of Collection**		03 Oct 2016
Received From	Kerala Water Authority	**Date Of Receipt**		04 Oct 2016
No. Of Sample	1	**Period Of Analysis**		04 Oct 2016 - 22 Oct 2016
Source	Medical college sewage pump house	**Scientist-in-charge**		Geetha P
Sample Condition	Fit for analysis	**Sample Type**		Waste Water
Sample collected by	Executive Engineer, Kerala Water Authority	**Sample volume & container type**		2.5L Plastic can
Sample preservation	As per APHA/ IS :3025(Part-1)			

Sample ID : 1

Sl.No	Parameters	Unit	Value	Test Method	Detection Limit
1	Colour	CU	30	APHA, 2120-C,2120B,22nd Ed.,2012	5CU
2	pH	–	6.8	APHA, 4500-H+B, 22nd Ed., 2012	0.1
3	Suspended Solids	mg/l	85	APHA,2540-D	10 mg/l
4	Chloride	mg/l	48	APHA, 4500-Cl/B ,22nd Ed., 2012	1.0mg/l
5	Nitrate as Nitrogen	mg/l	0.58	APHA, 4500-NO3-E,22nd Ed.,2012	0.01mg/l
6	Biochemical Oxygen Demand (BOD)	mg/l	111	IS 3025 part 44 1993	1mg/l
7	Chemical Oxygen Demand (COD)	mg/l	240	APHA, 5220-B, 22nd Ed., 2012	3.2 mg/l
8	Oil and Grease	mg/l	26	APHA, 5520-B,22nd Ed.,2012	10 mg/l
9	Cadmium	mg/l	BDL	APHA, 3111-B, 22nd Ed., 2012	0.02 mg/l
10	Chromium Total	mg/l	BDL	APHA, 3111-B, 22nd Ed., 2012	0.03mg/l
11	Copper	mg/l	0.02	APHA, 3111-B,22nd Ed., 2012	0.02mg/l
12	Manganese	mg/l	0.16	APHA, 3111-B,22nd Ed., 2012	0.05mg/l
13	Nickel	mg/l	BDL	APHA, 3111-B. 22nd Ed., 2012	0.05mg/l
14	Lead	mg/l	0.06	APHA, 3111-B 22nd Ed., 2012	0.05mg/l
15	Zinc	mg/l	0.05	APHA, 3111-B, 22nd Ed., 2012	0.02mg/l

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Tel:(D) 0484 2207781
PABX: 0484 - 2207783 - 86
Fax: 0484 - 2207783
e.mail: ces@keralapcb.org
kspcbcl@asianetindia.

KERALA STATE POLLUTION CONTROL BOARD

CENTRAL LABORATORY, GANDHI NAGAR, KOCHI - 682 020.
കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്,
സെൻട്രൽ ലാബോറട്ടറി, കൊച്ചി - 20
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Format No: PCB/CL/CH/F-7

Analysis Report No: PCB/CL/1113/16-17

16	Phosphate	mg/l	6.66	APHA, 4500-P/D,E,22nd Ed., 2012	0.01mg/l

Note :

* The sample had disagreeable odour.

-- End of Report --

Checked by
GEETHA
Assistant Environmental Scientist

Authorised by
B. USHAKUMARI
Asst. Environmental Scientist

Note: The test results relate only to the sample submitted for analysis and it shouldn't be reproduced except in full without the written permission of the authorised signatory of the lab.

Tel:(D) 0484 2207781
PABX: 0484 - 2207783 - 86
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ANALYSIS REPORT

Analysis Report No.	PCB/CL/1114/16-17	Date	22 Oct 2016	Format No: PCB/CL/CH/F-7
Ref.No.	KWA/PD-T/DB2/484/2016-17	Date Of Collection		04 Oct 2016
Received From	Kerala Water Authority	Date Of Receipt		04 Oct 2016
No. Of Sample	1	Period Of Analysis		04 Oct 2016 - 22 Oct 2016
Source	Medical college sewage pump house	Scientist-in-charge		Geetha P
Sample Condition	Fit for analysis	Sample Type		Waste Water
Sample collected by	Executive Engineer, Kerala Water Authority	Sample volume & container type		200ml Plastic bottle
Sample preservation	As per APHA/ IS :3025(Part-1)			

Sample ID : 2

Sl.No	Parameters	Unit	Value	Test Method	Detection Limit
1	Total Coliform Organism	cfu/100ml	21000	APHA 9222 B, 22nd Ed.2012	1cfu/100ml
2	Fecal Coliform	CFU/100ml	16000	APHA, 9222-D, 22nd Ed.2012	1CFU/100 ml

-- End of Report --

Checked by
P.GEETHA
Assistant Environmental Scientist

Authorised by
K. V. M. V. Shanavas
Senior Environmental Scientist

Note: The test results relate only to the sample submitted for analysis and it shouldn't be reproduced except in full without the written permission of the authorised signatory of the lab.

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CURRENT STANDARD OF TREATED EFFLUENT FROMSTP

Sl no	Industry	Parameters	Standards for New STPs (Design after notification date)*
1	Sewage Treatment plant	pH	6.5-9.0
2		BOD,mg/l	10
3		COD,mg/l	50
4		TSS,mg/l	10
5		NH4-N,mg/l	5
6		N total,mg/l	10
7		FecalColiform (MPN/100ml)	<230
8		PO4-p,mg/l	2
Note (i) These Standards will be applicable for discharge in water resources as well as for land disposal. The standards for fecal Coliform may not be applied for use of treated sewage in industrial purpose			

DESIGN NOTE FOR 5 MLD MBBR PLANT

1. INTRODUCTION

This design note is for the purpose of explaining the design philosophy of the waste water treatment system designed for the hospital campus where there is a requirement for conserving fresh water and reusing waste water for various purposes. The source of waste water is from medical waste, operation theatres, toilets, rooms, hostels, kitchens and from the laboratories.

This note covers the proposed facility for collection, treatment and recycle of these effluents.

2. USE OF TREATED WATER :

The treated Water can be re-used for

a) Gardening /irrigation and

b) Toilet Flushing

3. DESIGN BASIS

Capacity : 5 MLD

Quality of waste water :

PH	:	6.5 – 8.5
BOD	:	200- 250 mg/lit
COD	:	400 – 600 mg/lit
TSS	:	200 mg/lit

Quality of treated water:

PH	:	6.5 – 8.5
BOD5	:	< 10 mg/lit
COD	:	<50 mg/lit
TSS	:	< 10 mg/lit

Bio Fluids from Labs

10 Labs – Medical College and Hospital
4 Labs – Regional Cancer center
4 Labs – Sri Chitra Institute

Bio Fluids from Operation Theatre

6 Labs – Medical College and Hospital
5 Labs – Regional Cancer center
5 Labs – Sri Chitra Institute

Laundry Water

Capacity – 700 KLD

Toilet Waste water from
Medical College and Hospital
Regional Cancercenter
Girls and boys Hostel
Sri Chitra Institute

Canteen
1 Canteen – Medical College and Hospital of 2000 meals/day
5 canteens- Girls and Boys Hostel – 750 meals/day each
1 Canteen – Regional Cancer center – 1500 meals/day each
1 Canteen – Sri Chitra Institute– 1500 meals/day each

4. TREATMENT SCHEME

Bio Fluids from Labs

Total No of Labs – 18 Nos

Bio fluids from 18 labs is collected in 18 nos of tanks which is of 500 Lts. Chlorine is dosed into the tank with the help of dosing pump for disinfection. The over flow of disinfected water flows again into 18 no of tanks which is of 500 Lts where a 0.5 HP capacity of venture aerators are placed for aeration. The aerated water then flows collection tank through a common pipe line

Bio Fluids from Operation Theatre

Total No of Labs – 16 Nos

Bio fluids from 16 OT is collected in 16 nos of tanks which is of 5000 Lts. Chlorine is dosed into the tank with the help of dosing pump for disinfection. The over flow of disinfected water flows again into 16 no of tanks which is of 5000 Lts where a 1 HP capacity of venture aerators are placed for aeration. The aerated water then flows collection tank through a common pipe line

Laundry Water

Laundry water from Medical College and Hospital, Girls and boys hostel, Regional Hospital and Sri Chitra Institute is collected in a common Laundry pit. De-foamer dosed to remove foams and HCL is dosed to maintain pH in the laundry pit. The water then pumped through a submersible pump and collected in a pre-clarifier tank. The water then overflows into clarifier where coagulant is added for flocculation. The clarified water is then flows into collection tank through a common pipe line.

Treatment methods

Earlier the proposal was to set up a STP based on Activated Sludge Process. But considering several Criterias for Selection of Treatment Methodsome Important factors has to be considered..

1. Process applicability
2. Applicable flow range
3. Influent Sewage Characteristics
4. Inhibiting Constituents
5. Climatic constraints
6. Process sizing based
7. Performance requirements
8. Treatment of residuals
9. Environmental factors
10. Chemical requirement
11. Energy requirements
12. Personnel requirements
13. Operating and Maintenance Aspect
14. Reliability
15. Complexity
16. Compatibility
17. Economic evaluation
18. Land availability.

Different methods available for Sewage Treatment are studied in detail. But due to space constrain, technology with less space requirement has to be selected.Finally MBBR Technology is selectedbecause amongthose several treatment methods available for treating the sewage.MBBR technology suite the requirement. This Sewage treatment technology is a combination of unit processes put together in a manner to achieve a desired end result. There are

many combinations that could be used to achieve the same degree of treatment. The designer's problem is to determine what combination of units will provide engineering solution for a given system.

MBBR (MOVING BED BIO REACTOR) TECHNOLOGY

The treatment process for MBBR technology for submerged and above ground includes the following Stages:

1. Bar Screen Chamber
2. Equalization Tank
3. MBBR -1
4. MBBR-2
5. Lamella for Clarifier
6. Clarified Water Tank
7. Tertiary treatment
   a. Disc Filter
   b. Activated Carbon Filter
8. Treated water tank
9. Sludge Holding Tank

The waste water from labs, Operation Theatre, kitchen, laundry & toilets flows through a common pipe line passes through a 2 stage of manual screening system ie 8mm bar screen followed by 6mm bar screen and enters into equalization tank. Waste water from equalization is then pumped into MBBR tank 1where Biological treatment takes place followed by MBBR 2. The over flow from the MBBR 2 tank enters the Lamella Clarifier. In the clarifier biological sludge settles down and over flow of clarified water flows into Clarified water

Coagulant is added before Lamella clarifier in flocculation tank to thicken the chemical sludge which settles down. The under flow sludge from the Lamella clarifier is pumped into the Sludge holding tank and then transferred to Dewatering system through a sludge pump. The clarified water from clarified water tank is then pumped into two separate streams of Disc Filter followed by Dual Media carbon filter. The filtered water is disinfected on line before it is collected in a treated water tank.

The MBBR Aeration tanks are two in number and are located next to each other. Each of the tanks shall be provided with aeration pipelines at the bottom, which shall be in anti corrosive material and are manifold to cover the total periphery of the tank. Aeration tank is filled with a specific quantity of the bio-media, which is made of plastic material with a specific gravity just below that of water, to enable it to remain in suspension.

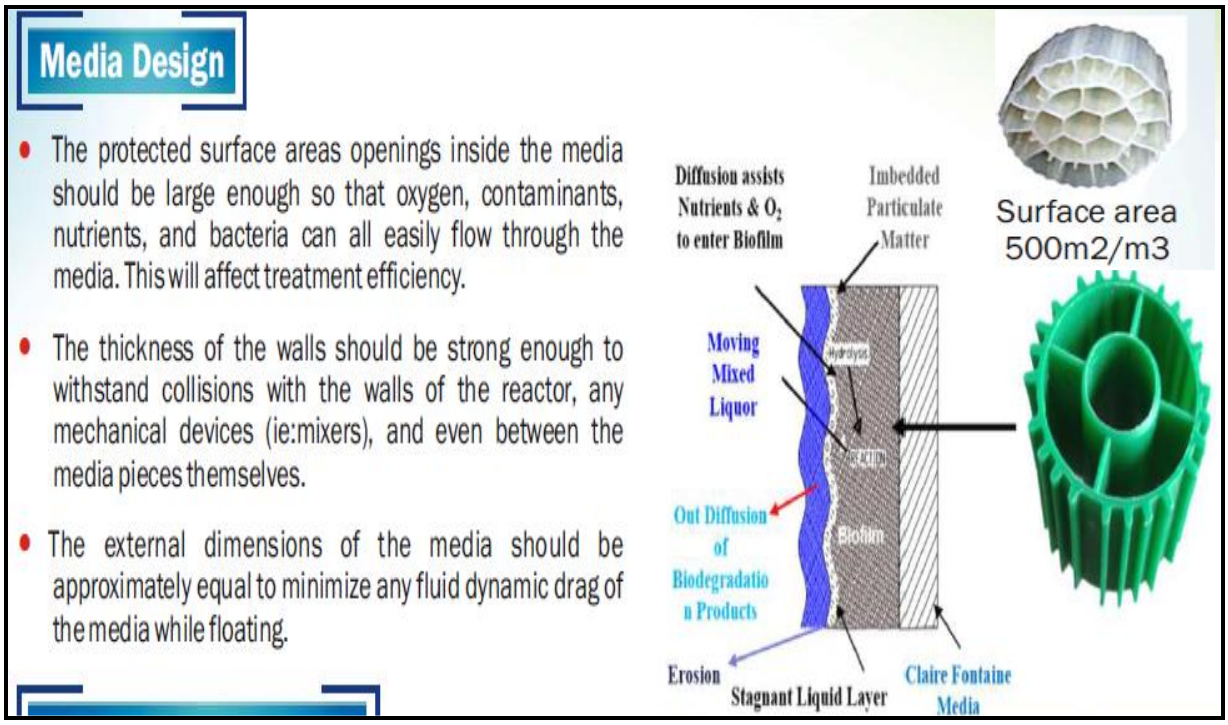
The inlet is on the top with the waste water falling freely into the MBBR tank. The outlet is located on the opposite side, which has a perforated Screen mounted on it, which prevents the bio-media from flowing out of the MBBR Tank. Both compartments are connected to each other by openings, which has Perforated Pipe on each side.

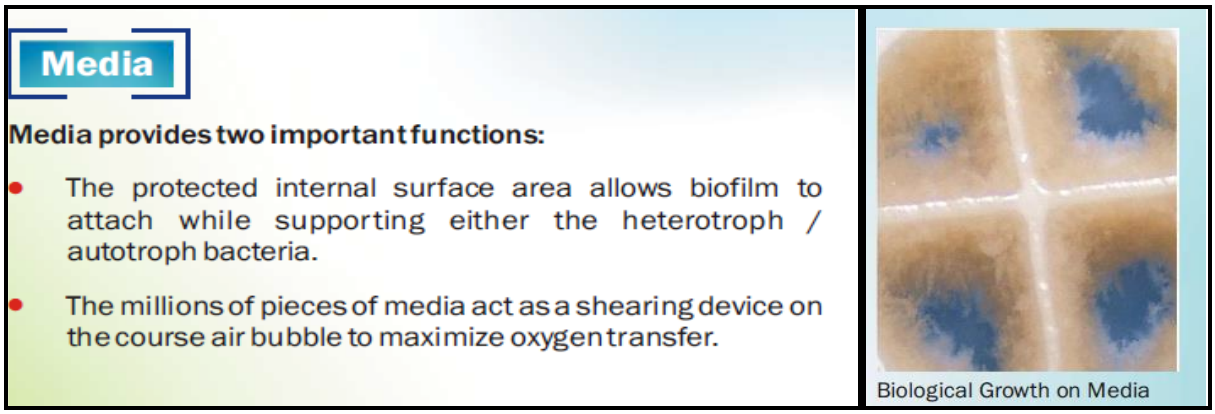
MBBR Media having a surface area of 500m2/m3, which is made of 100% Virgin HDPE material with a specific gravity of 0.94gm/cc.

Proposed Component Size

MARKS	DESCRIPTION	DIMENSION	CAPACITY
LCT	LAUNDRY COLLECTIONTANK	6.80m x 8.30m x 5.5m(5.0mLD)	2000.0KL
PCL	LAUNDRY PRECLARIFIER	6.80m x 2.70m x 5.5m(5.0mLD)	2000.0KL
LCL	LAUNDRYCLARIFIER	6.80m Dia x 5.5m(3.8mSWD)	138.0KL
CT	COLLECTIONTANK	10.0m x 30.0m x 5.5m(4.6mLD)	1380.0KL
MBBR-1	MOVING BED BIOREACTOR	10.0m x 10.0m x 5.5m(5.0mLD)	500.0KL
MBBR-2	MOVING BED BIOREACTOR	10.0m x 10.0m x 5.5m(5.0mLD)	500.0KL
FCT	FLOCCULATIONTANK	10.0m x 9.40m x 5.5m(1.4mLD)	130.0KL
CLARIFIER	LAMELLACLARIFIER	9.40m Dia x 5.5m(3.4mSWD)	250.0KL

CWT	CLARIFIED WATERTANK	7.50m x 9.40m x 5.5m(4.1mLD)	290.0KL
SHT	SLUDGE HOLDINGTANK	5.60m x 9.40m x 5.5m(5.0mLD)	250.0KL
TWT	TREATED WATERTANK	15.0m x 20.0m x 5.5m(5.0mLD)	1500.0KL





ADVANTAGES OF MBBR TECHNOLOGY

a. BOD/COD Reduction
b. Nitrification(Total Nitrogen and Phosphorous Removal)
c. Small Foot Print
d. High Loading Conditions
e. Single Pass Treatment
f. No Recycling
g. Biology self-regulating (No need to monitor MLSS)
h. No operator adjustments for process or running the plant
i. Effectively **handles peak** flows and upset loads
j. Low 20 year life cycle cost
k. Quick and easy setup

5. AERATION GRID & SEIVES

Aeration Grid & Sieves

A stainless steel coarse bubble aeration system is employed to mix the suspended media evenly throughout the reactor while provided the mixing energy required to slough old biofilm from the internal surface area of the media and maintain the dissolved oxygen required to support the biological treatment process.

Stainless steel wedge wire sieves retain the cultivated biofilm / media in a process-designated reactor while allowing the treated wastewater and sloughed biofilm to flow through to the next treatment phase.

6. TECHNICAL SPECIFICATION OF MEDIA

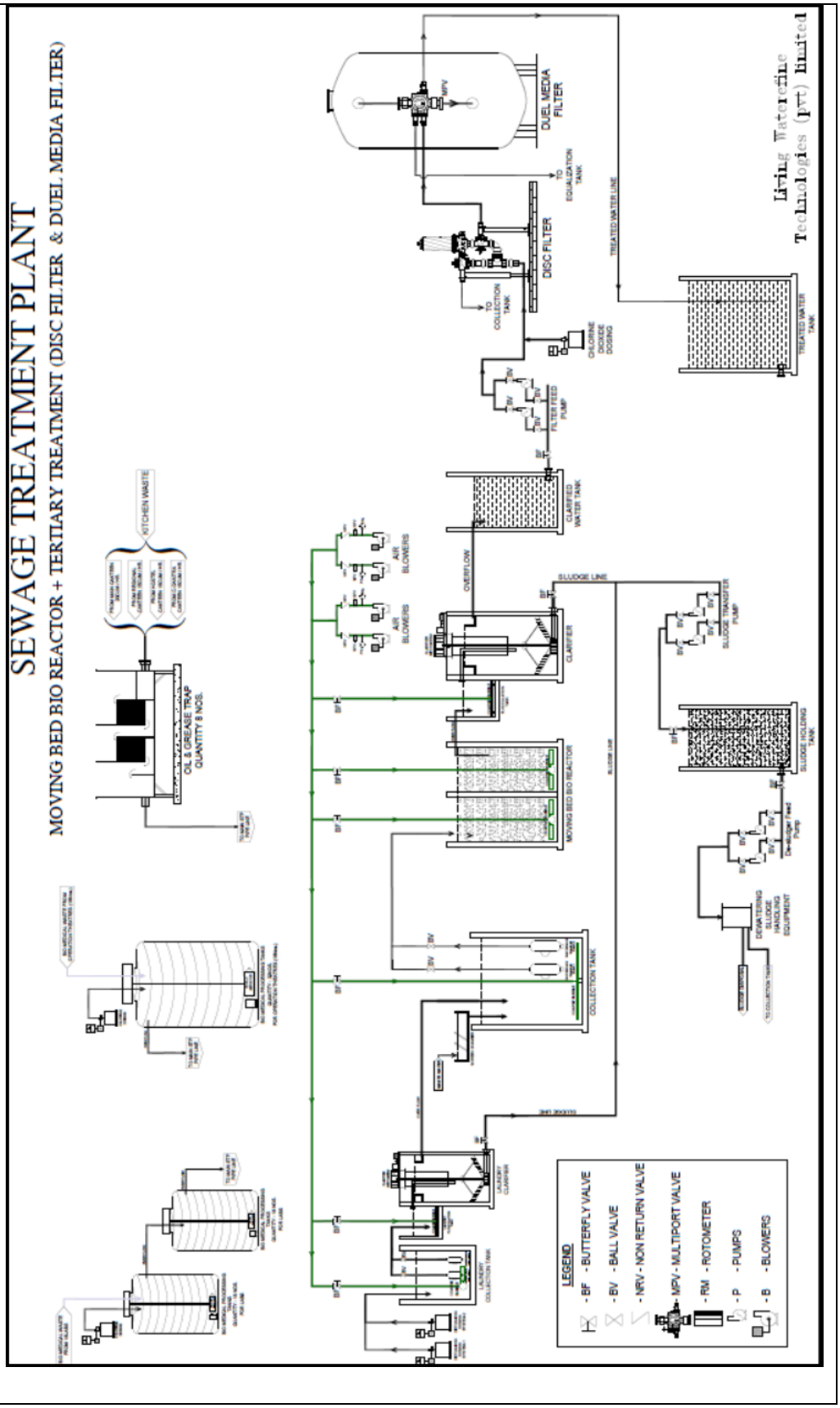
7

Technical Specifications

Sl.#	Property	Value
1	Tensile Strength	Min 3190PSI
2	Density	Min 0.94 gms/cc
3	Vicat Softening Temperature	Min 123 Deg Celsius
4	IZOD Impact Strength	Min 36 J/M
5	Flexural Modulus	Min 101500 PSI
6	Tensile Elongation	Min 12%
7	Temperature With standing	80 Deg Centigrade
8	Material Characteristics	100% Virgin HDPE
9	UV Resistant	With UV Stabilizer

Model	Dia Meter	Height	Protected Surface Area
CF 350	21 mm	16 mm	350 m2/m3
CF 500	25 mm	9 mm	500 m2/m3

7. FLOW CHART


SEWAGE TREATMENT PLANT
MOVING BED BIO REACTOR + TERTIARY TREATMENT (DISC FILTER & DUEL MEDIA FILTER)
Living Waterline Technologies (Pvt) Limited
KITCHEN WASTE
OIL & GREASE TRAP QUANTITY 8 NOS.
AIR BLOWERS
AIR BLOWERS
OVERFLOW
CLARIFIER
SLUDGE LINE
SLUDGE TRANSFER PUMP
MOVING BED BIO REACTOR
SLUDGE HOLDING TANK
COLLECTION TANK
DEWATERING SLUDGE HANDLING EQUIPMENT
CLARIFIED WATER TANK
FILTER FEED PUMP
CHLORINE DIOXIDE DOSING
DISC FILTER
DUEL MEDIA FILTER
TO EQUALIZATION TANK
TO COLLECTION TANK
TREATED WATER LINE
TREATED WATER TANK
LEGEND
- BF - BUTTERFLY VALVE
- BV - BALL VALVE
- NRV - NON RETURN VALVE
- MPV - MULTIPORT VALVE
- RM - ROTOMETER
- P - PUMPS
- B - BLOWERS

8. APPLICATION

a. Municipal

b. Industrial

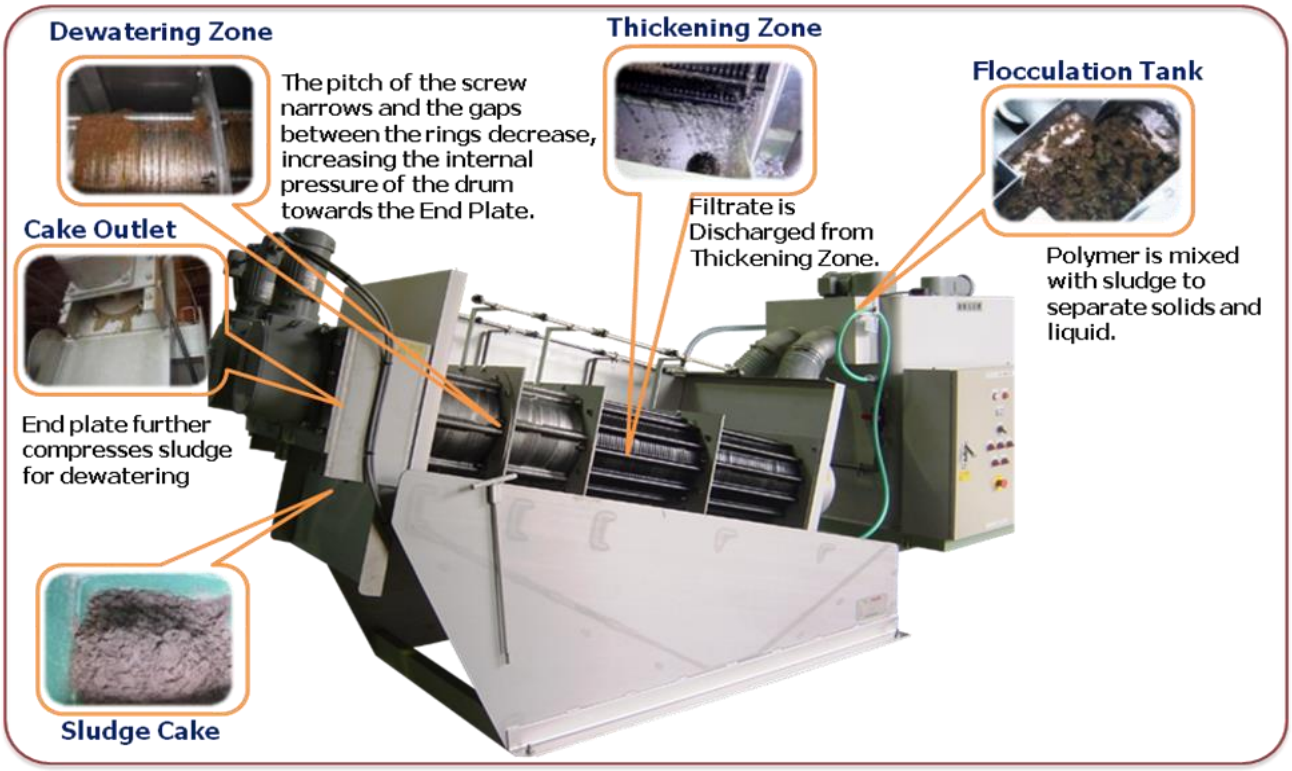
c. Marine

d. Food and Beverage

e. Pulp and Paper

9. SLUDGE DEWATERING UNIT

Volute is a dewatering unit for convenient sludge dewatering. IT works 24X7 auto operational and clog-free design. Volute is highly efficient machine which can dewater biological and chemical sludge on wide range of incoming solid concentration from 2000mg/l to 70000mg/l. Machine is available for dry sludge (DS) output of 1.0kg/hr to 750kg/hr. It is proposed to dewater the Sludge from 70% moisture content to 10%



Salient Features:

- 4th generation sludge dewatering mechanism
- Lowest energy consumption
  (0.8-6.0 kwh)
- Low Noise/ Low Vibration
- Low moisture content
- Continuous & non-stop operation
- Highly Efficient for Oily Sludge & Biological Sludge
- Application for most ETP Sludge
- Easy operation/ Easy maintenance
- Continuous- Non-stop operation
- Small Footprint
- Complete SS 304 construction
- Fully Automatic

Application Industries:

- Pharmaceutical, Bulk Drugs & Biotech
- Food & Food Processing: Meat Processing, Slaughter house, Dairy & Dairy products, Edible Oil, Brewery, Winery, Confectionery,
- Chemical Plants: Cosmetic Industry, Textile Industry, Chemical Plants, Pain Industry
- Oil, Refinery & Petrochemicals
- Paper & Pulp
- Municipal Treatment Plants: CETP
- Residential & Commercial Apartments
- IT & Infrastructure Parks
- Hotels & Hospitals

Environment Impact Assessment Study

General

The Ministry of Environment and Forest, Government of India (GoI) publisheda draft notification under sub rule (3) of Rule 5 of the Environment(Protections) Rules 1986 for imposing certain restrictions and prohibitions onnew projects or activities or on the expansion or Rehabilitationsmodernizations of existing projects or activities based on their potentialenvironmental impacts on projects being under taken in the country. Theenvironment (Protection) Act 1986 provides listing of activities needed priorenvironmental clearance from GoI or State Level Environment ImpactAssessment Authority (SEIAA) to be constituted by GoI. But water supply &Sewerage sector projects are not included in that schedule. But by taking intoconsideration larger interest of society an exercise was done as illustrated infollowing paragraphs.

The benefits expected out of this study is summarized and given below.

- Facilitates informed decision making by providing clear, well structureddispassionate analysis of the effect and consequences of proposedprojects
- Pre-emption or early withdrawal of unsound proposals
- Assists in the selection of alternatives, including the selection of the bestpracticable and most environmentally friendly option
- Influences both project selection and design by screening outenvironmentally unsound projects, as well as modifying feasible projects
- Mitigation of negative environmental and social impactsconditions of project implementation and follow-up
- Results in best practice prediction and mitigation of adverse effects of projects

• Serves as an adaptive, organizational learning process, in which thelessons of experience are feedback into policy, institutional and projectdesign - Enhancement of positive aspects
• Incorporates stakeholder analysis
• Mitigation of negative environmental and social impacts

Summary of EIA

Background

The EIA report assesses the environmental and social implications ofrehabilitation and up gradation of existing sanitation infrastructure underAMRUTH Project including construction of a STP of capacity 5mld.The proposed project seeks to rehabilitate the existing sewerage system whichis not delivering its function optimally owing to inherent short comings andhence currently impose very serious socio economic and public healthconstraints particularly to the poor sections in the lower strata of the society.Such areas are closely associated with high incidence of water borne and waterrelated diseases. On environmental andpublic health grounds there is little dispute that the provision of safe sanitationpractices will bring clear benefits to an urban population of less than a millionconsiderably reducing the burden on expenses of public health services inaddition to productivity loss in man days to the individuals. The govt. with afar sight in the issue initiated important legislative reforms and through theformation of Kerala Water Authority, has provided for the integration of watersupply and sewerage under a single Authority in the year 1984.

Project Objectives

The Central Objective is to undertake rehabilitation of existing seweragesystem &to provide an STP to treat the wastewater generated in the medical college and to reuse the effluent for agricultural and landscaping purpose.The present project under AMRUTH will definitely lead tosignificant long term improvements in conditions of the medical college at thecapital city.

Rehabilitation & Resettlement

Not a single family is under threat of eviction by a proper and judicious selection of alignment along valleys most of which are wetlands, fastly getting converted to cultivable land. This completely eliminates the scope for provision of resettlement in the current project. The priority to be given forprojectimplementationis freezing up of lands identified to eliminate further development of land. This can be achieved by minimizing the time lag between planning phase and implementation phase.

Specialised procured service for

DESIGN, INDEPENDENTSUPERVISIONAND QUALITY ASSURANCE

Design

For design KWA is having in its credit an array of specialists and technically sound manpower. No outsourcing is required to carry out the project as per present plan. The technological expertise availablein store made the Government to think of a consultancy wing for KWA to assist the agencies who are in need of outsourcing technical expertise in the field of Environmental Engineering Services.

Independent Supervision

KWA holds thedistinction of havingengaged in Investigation Planning and Design of water supply and sewerage schemes from the year of Kerala State formation in 1957. This monopoly in the field of Public Health Engineering help to gather experience in execution of work with professionally chosen contracting firms capable of timely execution through competitive tendering system on a lump sum rate basis. All the major Water Supply and Sewerage Schemes are executed on targeted periods with a few exemptions, obviously for reasons beyond the control of KWA.

Quality Assurance

As KWA being an engineering department is executing schemes with quality it demands, outsourcing is not required for quality assurance. Quality assurance, which forms part of execution, shall be entrusted with KWA.

OTHER INFORMATION

Survey and Investigation

The basic data acquired for the design depends on the topo sheets prepared for the JBIC assisted water supply project for TMC. However Verifications and fly level checkings are envisaged in the planning phase of the project prior to commencement of sewer layingworks. As the preliminary topo sheets are compiled together to reduce the number of sheets from 94 to 12, further investigations need not be found essential in implementing the project. Since LS tendering is planned, the agency executing the work should also get convinced to their satisfactionpriortocommencement ofworkandwillbe included as a precondition to award the work.

Assessment of utility shifting

Identification and permanent shifting of utilities very often pose a hurdle in achieving the progress of project. The lessons learned from the projects which are in progress made us to adopt sufficient early planningto ensure that this item willnot hamper the progress targeted. The sewage flow by gravity and hence the sewers will have to be laid to greater depths and thus the other utilities such as cables, both power and communication, water supply pipes, electric posts etc. coming across the alignment will have to be conveniently shifted for which a co-ordination committee with officials from PWD, BSNL, KSEB, KWAissuggested under the Chairmanship of District Administration with coordinator from TMC establishment.

Clearance Procedure

It is preferable to have a single window clearance from the committee explained in pre-paragraph to avoid running pillar to post in search of grabbing clearances.

Considerabletime of project related staff will be wasted in these exercises and an arrangement for single window is highly essential for the success of this project.

For the rehabilitation works and laying of sewers prior sanction to cut open well surfaced roads with cement concrete and bitumen are necessary from the agencies maintaining the stretch of roads along which sewers are planned. Hence cooperation of PWD/Municipal Corporation/Rural Development/LSG Institutions will havetobe ensured through Government orders,wellinadvanceofproject launching.

The UG cables and poles of power transmission and communication maintained by KSEB & BSNL, if needed, will have to be permanently shifted to avoid crossing at Manholelocations. Permissionof respective line departmenthastobeobtainedwithouttechnical objections expected in a bureaucratic setup.

The clearance of Police Department is required for diversion of traffic to enableclosing of roads from vehicular traffic. The traffic safety plans are to be formulated in consultation with all stake holders and PIP should adequately take care of these matters.

DisasterManagement Plan

The components proposed under this project do not require major disaster resistant structures during the current phase. It is not wise to pen down all disasters in advance, but it is important that we should know how to overco me them before they occur.

During construction phase emphasis will be given for safety awareness to all concerned with construction activities and measures to comply with the safety provisions will be insisted in this project.

Warning signals and detours are designed in such a way to fullfill general requirements. Awareness of safety measures and precautions on the part of the construction workers will go along way in increasing safety in sewer components construction. Despite all precautions, disasters are likely to occur and in the most unlikely event of disaster occurrence mitigation plans also have to be developed before entering the implementation phase.