R.V. EDUCATIONAL INSTITUTIONS
Rashtreeya Sikshana Samithi Trust

Date: 19.01.2018

Ref: RSST/ SSMRV/STP Unit/2018-

To,

M/s. EnviroWisers Pvt. Ltd.,
42, 15th Main, Muneshwara Block,
Bangalore – 560 026
(Ph: 7022316153)
Sir,

Kind Atten: Mr. Murali

Sub: Supply and Installation of STP Unit (20 KLD) at SSMRV College Campus, 4th 'T' Block, Jayanagar, Bangalore.

Ref: 1. Your Quotation No. EWPL-STP-SSMRV-01R3 dated: 30.10.2017
2. Your negotiation/Approvals on dated: 27.12.2017

Dear Sir,

Reference to above, We are pleased to inform you that your negotiated offer has been accepted and this **Purchase Order** is placed on you on the following terms and conditions.

1. Scope of Work:
   - **Supply, Installation and commissioning of 20KLD STP Unit (MBR System) as per the requirements/ finalization.**
   - **Your final accepted offer is Rs. 11,00,000/= + GST**
   - **Warranty will be for a period of 1 Year including maintenance as per quote.**
2. You will coordinate with our representative at site during the execution and in consultation.(Mr. Subbarayappa. Campus Engineer: Ph:9845181348)
3. You will station your own competent Engineer / personnel at the site to oversee the project management, documentation, Guarantee certificate, timely completion, quality of works, safety for your materials/ equipments, security of your items/ materials used in the project till commissioning and hand over, men (both yours and others) and all statutory requirements.
4. **Completion time will be 15 Days after completion of Civil Works as per your requirements.**
5. You are eligible for Mobilization advance of 50% subjected to the production of Bank Guarantee and 40% after completion of installation and commissioning and balance 10% after the production of the satisfactory Report.

This work order shall form a part of the agreement along with all other general and special conditions as per the specifications.

This letter is being issued to you in duplicate. Please return the duplicate duly signed as a token of your acceptance.

Wishing the very best for successful speedy completion.

With Regards,

Yours faithfully,

(Vasavachar.V)

Engg. Manager/RSST

Copy: 1. The Principal, SSMRV College, 4th 'T' Block, Jayanagar, Bangalore.

RASHTREEYA SIKSHANA SAMITHI TRUST BANGALORE

Received.
A. Muralimohan
19/01/2018
(FOR EWPL, Bangalore).

eWPL

EnviroWisers Pvt. Ltd

42, 15th Main, Muneshwara Block,
Bengaluru - 560 026. Karnataka, India
Ph : 9513171316, 99006 89519
Email : info@envirowisers.com
Web : www.envirowisers.com

Date: 2nd Aug 2018

To,
Mr.Vasavachar
Engg. Manager/RSST
R V Educational Institutions
RSST, Bangalore.
Phone : 9845192013
Email : vasavachar@rediffmail.com

Subject : Handover Letter for 20 KLD MBR STP Project as per Purchase Order Dt.19-01-2018

Dear Sir,

Thank you for giving us an opportunity to install 20 KLD MBR-STP at SSMRV College, Jayanagar, Bangalore.

This is to certify that EnviroWisers Pvt Ltd has successfully completed the project for supply, installation and commissioning of 20 KLD MBR STP at your premises: SSMRV College, No.17, 26th main, 36th cross, Jayanagar 4th T block, Bengaluru – 560 041. The project has been fully completed as agreed according to your Purchase Order Dt.19-01-2018 and below details:

Comissioned On	: May 1st 2018
AMC	: 'Visit Package AMC'(as per annexure provided in our offer) upto 1 year from date of commissioning.
Warranty	: Equipments – 1 Yr (against any manufacturing defects) Electrical components – 1 Yr (manufacturer warranty)

It is hereby clear from both the parties that there is no pending supply, installation or other activities from eWPL related to the subject mentioned purchase order. All the invoices pertaining to this project has been submitted to RV Educational Institutions, RSST and they shall clear all due payments as per agreed terms.

For any queries or resolutions related to the subject project, you can contact:

ENVIROWISERS PVT LTD, No.42, 15th Main, Muneshwara Block, Bangalore – 560 026
Mr.Murali Mohan A : Ph - 95 1317 1316, email - mm@envirowisers.com
Dr.Suresh Kumbar : Ph - 99006 89519, email - suresh@envirowisers.com

Further to this, if any services from eWPL are required whether related to same project or other project shall be treated as new requirement.

We wish all the best to RV Educational Institutions, RSST and SSMRV Team.

For EnviroWisers Pvt Ltd
A. Murali Mohan
Director

EnviroWisers Pvt Ltd eWPL Bengaluru-26

EnviroWisers Pvt. Ltd

42, 15th Main, Muneshwara Block,
Bengaluru - 560 026. Karnataka, India

Ph : 9513171316, 99006 89519
Email :suresh@envirowisers.com
Web : www.envirowisers.com

TECHNO COMMERCIAL OFFER

EWPL_QUOTE REF: EWPL_STP_SSMRV **Date: 14/10/2017**

To,

Mr.Vasavachar.V, *Engineering Manager*
R. V. Educational Institutions,
R. V. Teachers College Building, 2nd Block,
Jayanagar, Bengaluru - 560064

Office No: 26562386,
Mobile No: +919845192013
E-mail: vasavachar@rediffmail.com

Sub: Techno-Commercial Proposal for Sewage Treatment Plant (STP) - 20 KLD

Dear Sir,

Further to our discussion at your office on 13th Oct 2017, we have mutually agreed to go for a 20 KLD MBR STP at your SSMRV premises. Accordingly we are pleased to submit the following detailed proposal for your perusal and approval.

Introduction

Treatment of Sewage has become a mandatory requirement in today's world of densely populated regions. However, putting up working sewage treatment plants to handle the volumes of sewage generated by huge commercial complex is challenging.

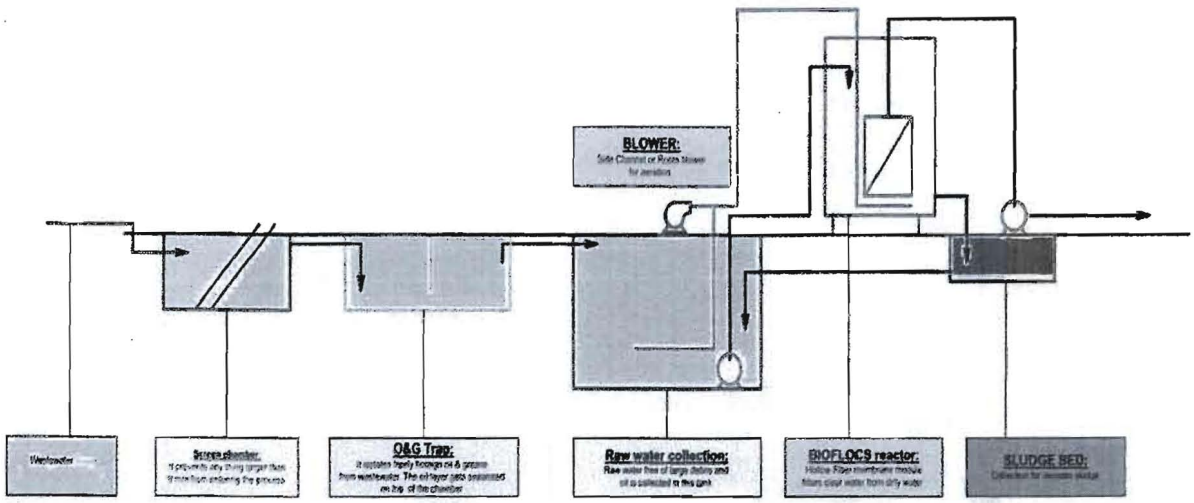
Conventional systems require Huge Space, Dedicated Manpower, Constant Maintenance, on top of this getting quality output water is still not assured.

Now, with advanced technology, EWPL proudly presents MBR Systems for sewage treatment. MBR Systems utilize micron filtration combined with microbial degradation to maximize the efficiency. These systems can handle volumes of sewage in extremely compact spaces. Micron filtration ensures that treated water is clean and even e-coli are removed.

MBR systems are preferred over conventional systems because MBR Systems are Very Compact, Almost No Manpower is required, Minimal Monitoring, Consistent Output round the clock, No Odours, Easy and Quick Installations, Portability, Simple Maintenance and Cost effective.

With advances in technology, we have the Membrane Bio Reactor or MBR technology for sewage water treatment. This technology is basically filtration at micron levels combined with bio degradation. Through this, we can completely avoid clarifiers, unnecessary tanks and collection sumps, addition of some chemicals, sand filter and carbon filters etc.

The water coming out of MBR will be filtered up to pathogen levels and will be free from E-Coli, colour and odour. This water can be directly used for irrigation, general washing, ground water recharge etc.



Typical Schematic for STP with MBR

Technical Details

MBR is an technology developed to meet stringent treated water quality for sewage and industrial wastewater. **MBR** is a membrane reactor based design for biological treatment of effluent.

MBR operates on the principle of biological/bacterial treatment. Raw untreated wastewater is sent to **MBR** reactor using a pre filter screen to prevent any larger debris, plastics etc. clogging the reactor. **MBR** module is a bioreactor fitted with necessary components like air diffuser and filtration membrane with a pore size ranging from 0.1 micron to 0.01 micron. Residence time of waste water within the reactor is controlled by drawing rate from the membrane module. Treated water is drawn from the reactor using suitable pump. As the pore size of the membrane is too small to allow any bacteria or other contaminants to pass through, the treated water at the outlet of the membrane is clean with reduced organic content. This water can be thereafter dosed with necessary chlorine and sent for eventual reuse or discharge.

Design Parameters

The plant is designed to treat sewage generated having following characteristics

Nature of waste water	Sewage
Flow	9.0KLD
Operating period	24 hrs

Performance Parameters					
Sl	Parameter Description	UOM	KSPCB Limit	Raw Sewage	Treated Water
1	PH Value	No	6.5 to 9.00	6.5 to 8.5	6.5 to 8.5
2	Total Suspended Solids (TSS)	mg/Litre	< 20	500 to 1000	< 20
3	Biological Oxygen Demand (BOD)	mg/Litre	< 10	200 to 350	< 10
4	Chemical Oxygen Demand (COD)	mg/Litre	< 50	400 to 700	< 50
5	Total Nitrogen (N)	mg/Litre	< 10	70 - 200	< 10
6	Ammonia Nitrogen (NH4-N)	mg/Litre	< 5	50 - 350	< 5
7	Faecal Coliform	MPN/100ml	< 100	1000 - 2000	< 100

Note: Above treated water parameters are for disposal of treated water for Flushing, Floor Washing, Inland Gardening and Agricultural purposes.

Assumptions:

1. The plant is designed to operate at +/- 10 % variation in raw wastewater parameter.
2. No other parameters other than mentioned above is present in the raw waste water which is beyond Pollution Control Norms and hazardous to micro-organisms.
3. Treated water quality will be achieved if the inlet raw water quality is as per the raw water quality mentioned as well as no other pollutant than the mentioned, is present or exceeds the limits or which is hazardous in nature, which otherwise may affect the biological treatment process.

System Requirements:

A) **Mechanical and Electrical Components**

No	Component	Details	No of pcs
1	Bar screens	• MSEP bar screens. As per required design 8 mm and 10 mm mesh size	1 pcs each
2	Feed pump	• Non clog submersible • Open impeller • CI body • CNP / Shimge / Kirloskar make	1W +1S
3	Filter pump	• SS - Centrifugal pump • SS - impeller and casing • CNP / Shimge / Jhonson make	1W +1S
4	Back wash pump	• SS - Centrifugal pump • SS - impeller and casing • CNP / Shimge / Jhonson make	1W + 1S
5	Blowers	• Twin lobe root blowers • Kay / Everest / Equivalent • CI body	1W +1S
6	Diffusers	• Fine bubble diffusers along with diffuser grid Silicon / EPDM - MOC	As required according to tank dimensions
7	Membranes	• Submerged Hollow fiber membrane • 10 Sqm filtration area per module • 2.5 KLD per module per day flow rate • MOC of membrane - HS PVDF • MOC for frame of Membrane module - SS - 304	8 Pcs
8	Pipes and Fittings	• MOC - UPVC • Make - Ashirwad/Astral/Finolex/Sumolex • Schedule - 80	On Skid Piping Only
9	Valves	• MOC - UPVC • Make - Ashirwad/Astral/Finolex/Sumolex	On Skid Piping Only
10	Flow Meters	• Type: Online turbine type flow meter which works as a totalizer and hourly flow displayer	As required
11	Rotameters	• MOC - Acrylic • Make - Aster /equivalent • Type - online	As required
12	Membrane Tank	• MOC - MSEP • Fabricated as per requirement	6 KL

B) Instrumentation

No	Description	Quantity
1	Control Panel with required automation for running the plant. Automation includes: • *Feed Pump - Permeate Pump - Backwash Automation* • *Manual Overrides* • *HMI - based PLC for manual and auto operation* • *Over load tripping lights for all pumps and blowers* • *Over load relays for setting the ampere for all pumps and blowers* • *Single phase preventer to prevent any phase reversing*	1

C) Civil Components

No	Description	Quantity
1	Bar Screen, Oil and Grease Trap - Working Volume of 2 KL	1
2	Sewage Collection Tank - Working Volume of 15 KL	1
3	Treated Water Tank - Volume of 6 KL	1
4	Sludge Drying Bed, as per design	1
5	Platform and Shed to place our Pump and Control Panel Cluster	1
6	Interconnecting Piping and Electric Work in between above mentioned structures - Upto 3 mtrs from the structure only	1

Note:

- Pump & blower capacities and ratings are as per typical STP setup. If the site demands a different rating of blower, pump, piping, pipe-fitting, electrical or instrumentation then the additional expense would fall under client's scope.
- Hydraulic, electrical and mechanical Battery limit of supplier would be within 5 ft radius of the control panel. Any work of hydraulic, electrical or mechanical nature outside this would be under client's scope.

eWPL

Exclusions from supplier's scope

- NOC / Approval from Pollution Control Board.
- Safe storage of equipment supplied by us, at your site.
- Construction of approach roads with fencing
- Utilities at site. e. g. Water, Chemicals, Electricity etc.
- Emergency power supply and plant illumination system.
- All piping, cabling etc. beyond the termination points as mentioned in our offer.
- Fire fighting system including appliances.
- Lightening protection.
- Any other item not specifically mentioned in our scope.

Price schedule:

No	Description	Option - 1
1	MBR - Sewage Treatment Plant - 60 KLD (As per Table A & B)	12,00,000.00
3	Optional : AMC - Comprehensive - 5 yrs (per yr) (as per annexure 3)	3,75,000.00

11,00,000 — Eleven Lakhs only

— Murli Mohan (EWPL) 28/10/2017

Taxes : GST - Extra @ 18%

Freight : At actual from Bangalore.

Payment terms and conditions - for STP

- 60 % advance along with purchase order
- 30 % immediately after installation and before commissioning
- 10% along with taxes after establishment of performance

Payment terms and conditions - for AMC

- 50 % advance along with purchase order.
- 50 % at the commencement of 7th month.

Approved for Rs 11 lacs + GST

27/12/2017

Erection, Commissioning & Supervision: Included in the Quoted value.

Delivery: 6 weeks from date of receipt of PO and Advance, whichever is later.

Validity: 15 days from the date of offer.

Power Requirement - ?

Note:

- Post-delivery it would take 7-14 days for supplier's team to reach the site for installation. During this time client is advised to complete work in its scope.
- Typical installation of above system takes 5 working days. Post 5 working days, expense @ INR 5000/day would be charged for installation and commissioning.
- It takes 2 weeks for plant to get stabilized. During this time the plant would be gradually taken to its full capacity. On site condition can speed up or delay the same. During this time the responsibility of running the plant would be under client. Supplier would provide all necessary technical assistance as and when required.

Commercial Terms and Conditions

OUR DELIVERABLES AND YOUR FINANCIAL COMMITMENTS ARE INTERDEPENDENT. LAPSE IN YOUR FINANCIAL COMMITMENTS WILL MAKE IT DIFFICULT TO ACHIEVE OUR DELIVERABLES.

Variation/Addition in scope of work

The scope of supply is restricted to supply of equipment as specified in the proposal. Any subsequent, additions or alterations will be acceptable to us provided it is convenient to do so and the prices and delivery period are suitably revised. EWPL have right to change specification of any component for better efficiency of system without prior notice

Delay in completion

If the completion of work is delayed beyond the contractual date for reasons under your control as listed out hereunder but not limited to them, we shall be entitled to suitable re-adjustment in the period of completion by mutual consent and the contract will stand amended to that extent.

1. Delay in approval of final drawings beyond a period of 10 days from the date of submission by us.
2. Delay in inspection beyond the appointed date or delay in approval of test certificates, whenever required, beyond a period of 7 days from the date of submission by us.
3. Delay in release of dispatch clearance or hold up of work due to your specific instructions or lack of instruction.
4. Delay in release of advance or progress payments due to us beyond 7 days from the due date.
5. Delay attributable to Force Majeure conditions, more particularly detailed under appropriate clause hereunder.

Commissioning

It will be responsibility of the Purchaser to make all arrangements and provide all facilities and materials for carrying out pre-commissioning tests before the date of readiness for such tests as intimated by us. In the event of delay on the other part of purchaser in making these arrangements and consequent delay in commissioning of equipment, the purchaser will release all such payment, which could have been due to us on commissioning of equipment. Lodging and Boarding will be in client scope for agreed period of time

Operating personnel

The purchaser will ensure that his operating personnel is made available before pre- commissioning to enable them witness all commissioning tests and satisfy themselves about all guarantee parameters.

Acceptance of Treatment Plant

In case the plant is not commissioned after the supply within a period of 30 days due to the non-availability of effluent or any other reason whatsoever, the plant will be deemed as successfully commissioned

Warranty of Equipment

All our equipment is thoroughly inspected before dispatch and therefore can be depended upon for long and trouble free service. Our liability in respect of any defect or failure in the equipment supplied and commissioned by us or any loss, injury or damage attributable therefore shall be limited to making good by replacement or repairs, provided the equipment is operated and maintained in accordance with our instructions and arise totally from proven faulty design material or workmanship. This warranty shall be valid for a period of 12 months from the date of commissioning of the equipment or 12 months from the date of last invoiced dispatch, whichever is earlier. Our liability in no case shall exceed the invoiced value of the equipment supplied by us and we shall not be liable for any consequential damage or loss such as loss of profits, loss of business opportunities, damage to good will or business reputation or any other contractual liability or loss suffered by the Purchaser to third parties. All warranties other than title either express or implied whether arising under law or equity including warranties of merchantability and fitness for a particular purpose are excluded from the contract. This is the essence of the contract.

This warranty is valid subject to the following conditions:

1. Bought out components are guaranteed by us only to the extent of guarantees given to us by our suppliers. Electrical components such as heaters, motors, contactors, etc., rubber components and instruments such as pressure gauges, etc. are however not covered under this warranty.
2. In respect of the equipment where dispatch after readiness is delayed due to specific instructions or lack of instructions from you, the warranty will be limited to 12 months from the date of readiness for dispatch of equipment as notified by us. No repairs or replacements, unless authorized by us in writing, will be carried out by any other party on our equipment during the warranty period.
3. The warranty period does not cover the following:

I. Normal wear and tear
II. Damages/defects arising out of mal-operation of the plant by the purchaser and accidents.
III. The equipment or part there of being subject to the accident, alteration, abuse or misuse.
IV. The equipment not being operated & maintained as per Operation and Maintenance instructions.

Warehousing charges

Should dispatches be delayed on our purchaser's instructions or any other reason attributable to Purchaser, warehousing expenses shall be payable by the purchaser @2% of the consignment value per month or part thereof.

Excess Materials

Since we shall be sending to site a number of items in spare for smooth and uninterrupted erection and commissioning, such items, which remain unused, will be our property and will be removed by us.

Force Majeure

We shall be under no liability for delay in delivery/completion of work if we or our subcontractors/ suppliers are prevented from discharging our respective obligations under the contract for causes beyond our reasonable control including but not limited to war(whether declared or not), invasion, acts of enemies, hostilities, riots, civil commotion, labour disturbance, strikes, lockout, layoffs, mutiny, insurrection, rebellion, revolution, epidemics, accidents, sabotage, fire, earthquake, floods, government orders and restrictions, legal enactment, delay or inability to obtain materials due to change in Import policy or other statutory restrictions, lack of transport facilities, interruptions / restrictions in power supply, damage to or breakdown of plant, machinery and equipment etc.

Consequential Damages

Neither party shall at any time be liable to the other for any loss or profits or any similar indirect damages, however, described, incurred or suffered by either party in respect of the project.

General

Any condition or other matters pertaining to this offer not expressly stipulated will be a matter of mutual discussions and agreement at the time of accepting the order.

Annexure -1

PROJECT REFERENCES

No	Name and location of project	Present status	Capacity
1	STP - Mahadevpura - Bangalore	Installed since Nov - 2016	20 KLD - Packaged Plant
2	STP - Apoorva Resorts - Davanagere	Under Installation	20 KLD - Packaged Plant
1	STP - White field - Bangalore	Installed since May - 2017.	100 KLD - Packaged Plant
2	ETP - Vimal agro, Bardoli - Surat	Installed since Aug - 2017 and commissioning going on	200 KLD -Civil based Retrofitting into their existing ETP.
3	STP - Harihar Hospital, Ahmedabad	Supplied on July - 2017	200 KLD - Civil based STP plant
4	STP - Reethi Resort, Male	Supplied on July - 2017	200 KLD - Civil based STP plant
5	STP - Essence Apt - Mount Reality Builders, Kolkatta	Order received	100 KLD - Civil based STP plants

MBR is a proven technology in Sewage Treatment and there are hundreds of STPs running on MBR technology in India as well as abroad.

Some examples to establish reliability of MBR technology:

1. In Cubbon Park, Bangalore 1.5 MLD MBR STP has been installed and running successfully from over 5 years.
2. Our own team has installed over 20 MBR STPs across India and these can be visited by our clients for validation. Above, we have mentioned a few of our prestigious projects for your reference.
3. One of the brands known for extremely reliable technologies, GE, has done numerous installations of MBR STPs across India and abroad.

Annexure -2

IMPLEMENTATION METHODOLOGY

1. EWPL shall conduct a preliminary survey to identify and suggest suitable locations for installation of MBR - STP.
2. MBR -STP components will be manufactured, partially assembled and dispatched according to fulfillment of commercial obligations from BGC and as terms accepted by EWPL.
3. EWPL shall provide details for civil constructions to be done. EWPL engineer shall regularly monitor the progress and report to BGC of the status or if there are any deviations/corrections.
4. Once the Civil work is completed and ready for usage, MBR STP components will be installed.
5. Installing MBR modules, creating the diffuser grid at bottom, setting up of internal membrane piping and on site wiring and bringing it to full running condition will require a window of 4 days to get the system running.
6. Stabilizing the system will take another 10 - 15 days.
7. During project implementation EWPL will be supervising the whole process of
   - Monitoring civil works to ensure it is as per design
   - Delivery of our equipments
   - Preparation of MBR systems prior to installation
   - Installation of MBR Systems
   - Commissioning, Stabilizing and Optimizing MBR sewage treatment plant
   - Provide 3rd party test report to establish performance of MBR system.

Annexure - 3

Annual Maintenance Contract

1) AMC - 1 yrs (per yr) : Operations and Maintenance inclusive of chemicals

Contract Period ***: 1 Yr***
Renewable ***: Yes. To be renegotiated and renewed every year.***

Services ***:***

Inclusive of

- *Operations and maintenance.*
- *Day to day activities, maintaining of logs, regular maintenance activities.*
- *Chemicals required for running and cleaning the plant.*
- *NABL accredited lab testing of treated water once in 3 months.*

Exclusive of

- *Replacement of membranes*
- *Replacement of pumps and motors*
- *All spares and parts replacement*
- *Any cost of repairs*
- *Any other costs to external agencies*

2) AMC - Comprehensive - 5 yrs (per yr)

Contract Period ***: 5 Yr***
Renewable ***: Yes. To be renegotiated and renewed only after 5 years.***

Services ***:***

Inclusive of

- *Complete operations and maintenance by EWPL to ensure MBR STP is running at optimum conditions.*
- *Day to day activities, maintaining of logs, regular maintenance activities.*
- *Complete replacement of one set of membranes (65 KLD) - Maximum once in 5 yrs.*
- *Complete replacement of all pumps and motors - Maximum once in 5 yrs.*
- *All spares and parts replacement by EWPL.*
- *All Chemicals required for running and cleaning the plant.*
- *NABL accredited lab testing of treated water once in every month.*

Above replacements will be done upon fair judgment by EWPL while ensuring that the plant is running at optimum conditions all the time. These replacements may not be done if it is deemed not required as per plant performance.

Manpower and Services

1. Manpower will be deputed at your facility by EWPL to operate your system in general shift.
2. He shall maintain the day to day activities, log books and output water quality parameters regularly. He will also carry out regular maintenance activities as scheduled.
3. Our engineer will visit to BGC in order to check the plant and its operation. If any changes and service is required he will support to do that changes and service.
4. In case of any critical requirements, our technical team will be available at the site within 24 hrs of intimation
5. After completion of this AMC, it can be continued with mutual agreement between BGC and EWPL or discontinued. If discontinued, EWPL services will still be available to BGC on chargeable basis.

Repair and Spares

1. All our bought out equipments that carry manufacturer warranty will be sent for repairs as per warranty terms.
2. Spares shall be maintained at BGC premises by EWPL as per the inventory list.
3. Membranes carry warranty against manufacturing defect and are valid until 1 yr of installation.
4. Any unwarranted repair or maintenance activities will be acted upon case to case basis.

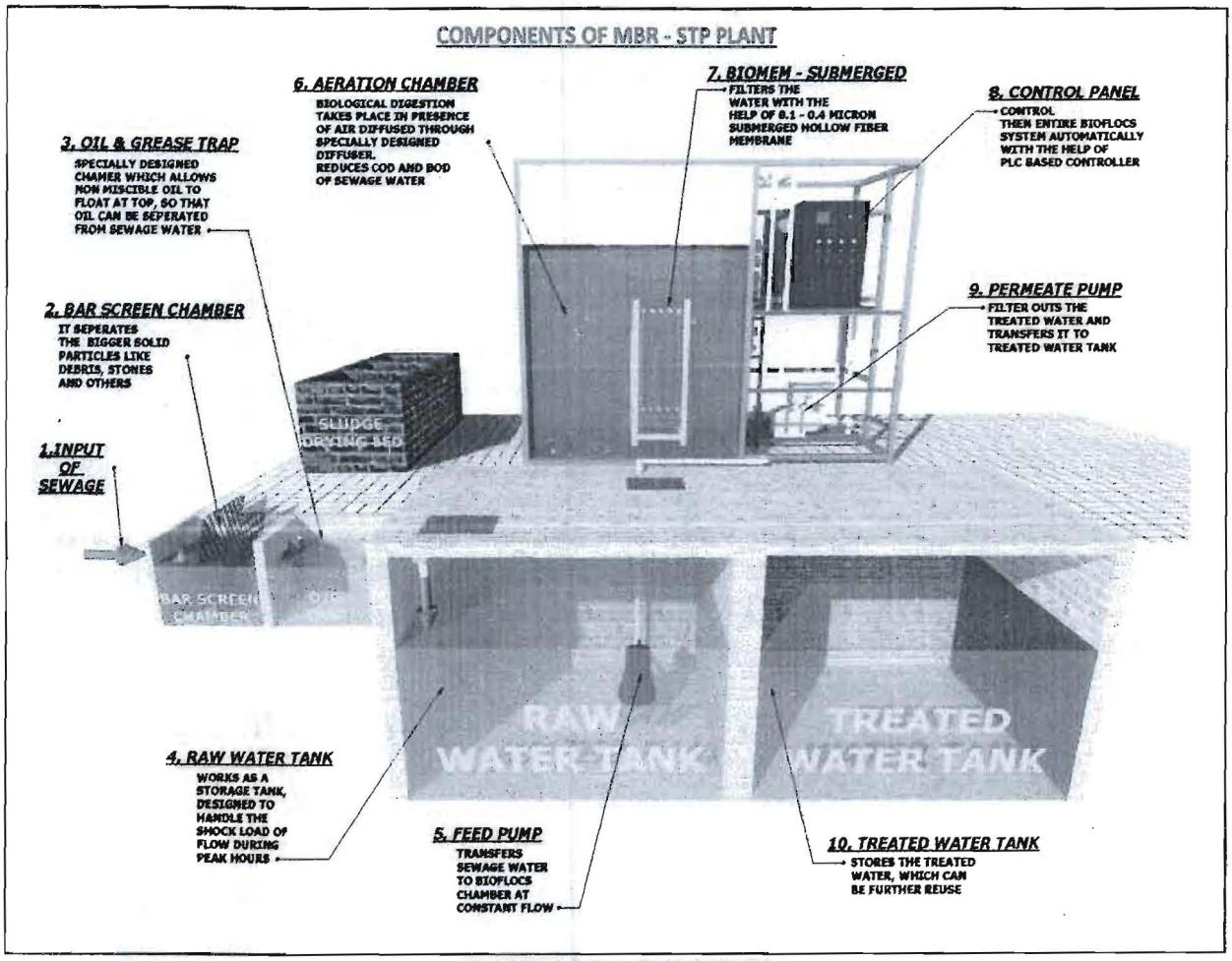
Major Maintenance Activities

Sl	Maintenance Activities	Schedule
1	Membrane Washing with fresh water	Once in 15 days
2	Membrane washing with Chlorine Solution soaking	Once in 90 days
3	Cleaning of Flow Meters	Once in 30 days / as required
4	Replacement of membranes as per requirements	Once in 4-5 yrs

Annexure - 4

MBR STP COMPONENTS

Details of MBR - STP Components



Annexure - 5

OTHER QUERIES AND RESOLUTIONS

1. **Can RVCE Team Members visit to any recently installed site?**

   Yes. BGC team can visit any of our installations mentioned in Annexure - 1.
   EWPL can arrange a visit if intimated earlier.

2. **How much space is required for Shed, MBR system and other tanks?**

   We require a maximum of 100 sqft above ground to place our complete system of 20 KLD. Apart from this we only need one collection tank of 15 KL and treated water tank of 6 KL.

3. **Can the system be scaled when required?**

   Yes. It can be scaled up for another 10% without any major modifications. When it has to be scaled, we only need to add extra membrane cassettes to the module. This can be taken up under EWPL supervision and guidance.
   It can be easily scaled even beyond 10%, but, with slight modifications to the system. It is recommended to consult with EWPL before any scaling up/down activities.

4. **What is the quality of sludge and do we need any Filter Press to handle it?**

   Sludge generation itself will be reduced to a great extent (~30-40 % lesser compared to other conventional systems). Further sludge can be directly taken to sludge drying beds for sun drying and utilised in inland gardening.

5. **Whether any Odour Control Measures are planned either in the proposal or separately.**

   Our systems have very less odour issues. In our systems odours are significantly lesser than conventional systems. This is primarily due to the fact that we do not have open air tanks in our process and digestion process is much more efficient.

6. **What is the time frame to install and run the system?**

   Delivery of the MBR at your premises, from the date of PO and advance amount receipt : 4 weeks
   Civil works by RSST Team : 3 weeks
   Installation of MBR systems : 5 days
   Loading of MBR systems : 1-2 days
   Stabilising and Optimising MBR sewage treatment plant : 20 days

   Within a total of 6 weeks from your decision, your MBR systems will be up and running, delivering expected results.

7. How can you compare MBR systems with SBR systems?

MBR	SBR
Very compact and less space requirement	*Bigger and needs more space*
Semi-skilled Labour can manage the system	*Needs skilled operators to monitor the system always*
No recurring costs of chemicals and consumables	*Recurring monthly costs of chemicals, consumables and AMC*
System can sustain higher MLSS in the range of 5000 to 12000 ppm, which results in lower sludge volume and better BOD/COD removal	*Ability to sustain MLSS is limited in the range of 3000 ppm to 5000 ppm leading to higher sludge volume*
System is suitable for easy future upgrades	*Future upgrades to higher volume treatment takes up extra space and extra tanks*
Looks aesthetic and can be placed almost anywhere in the premises	*Looks are not aesthetic and has to be placed out of people's view*
Negligent odour issues due to closed tanks and efficient digestion	*Might cause odour issues due to open tanks*
Capex is high - Opex is low *Life cycle cost is almost same as SBR*	*Capex is Low - Opex is High* *Lifecycle cost is almost same as MBR*
Its latest technology to meet most toughest of environmental norms	*It's a basic technology which can pose challenges when we aim to meet new environmental norms.*

SBR TECHNOLOGY VS MBR TECHNOLOGY:

While there are similarities between MBR and SBR (both are forms of the activated sludge process), there is one fundamental difference – the method of separating the liquid from the solid waste. SBR technology relies on gravity settling (or phase separation), while MBR technology uses membranes as a physical barrier for separation. On the surface this may seem like a subtle difference, however, by using a physical barrier for separation, MBR technology provides numerous advantages.

1) Reduced Footprint

One of the benefits of MBR technology over SBR is that an MBR plant can be set up about one-third the land area required for an SBR. So if an SBR plant needs 500 sqft of land, an MBR plant will only 150 sqft. So when comparing the cost of the two technologies it is very important to consider the extra cost of the land needed for an SBR. Given that land is at a premium, we need to consider this important variable into our final costing. The compact design of an MBR system greatly minimizes land and construction costs.

The reason for an MBR having a smaller footprint is its ability to operate at high biomass concentrations (MLSS). A typical MBR design will operate at an MLSS of 9,000 mg/l, while a typical SBR design will have an MLSS in the range of 3,000 mg/l. This difference in biomass concentration leads to much smaller process basins for MBR technology, and results in the MBR system having an overall plant footprint 50 – 70% smaller than an SBR system.

Further, because it relies on phase separation, *the SBR cannot operate at elevated biomass concentrations, as the sludge loses its ability to settle into distinct layers once the MLSS gets above 6,000 – 8,000 mg/l. Settling characteristics are not relevant with MBR technology because it utilizes a physical barrier for separation.* This is the reason why SBR's do not work efficiently during the winter months when MLSS levels are elevated and the amount of sewage treated is significantly lower in the winter months. MBR technology is unaffected by the weather and can process the same amount of sewage in summer and winter.

2) Superior Effluent Quality

One of the objectives is to reuse the water for horticulture purposes. This objective will NOT be achieved by an SBR plant alone. To achieve reuse quality water, the SBR system will need to be followed by a tertiary filtration system. *Without this tertiary treatment the water will not be reusable because it would still have a lot of biological matter and bacteria and would emit very foul odors*.

To meet the requirements of the Pollution Board, a polymer system will also need to be added to dose the secondary effluent from the SBR prior to the filters. This adds additional mechanical equipment (capital, O&M) as well as the need to supply, store, and handle polymer. Finally, the addition of polymer will be variable based on the quality (suspended solids) of the SBR's secondary effluent.

By comparison, MBR technology does not require tertiary filtration, polymer addition, or any further treatment processes to provide excellent quality effluent which can be reused directly for horticulture purposes. The effluent from an MBR plant meets all globally accepted standards for suspended solids and turbidity. This is achieved because MBR technology uses membranes with effective openings of less than 0.1µm. The membrane achieves 6-log removal of bacteria and 3-log removal of virus without disinfection. Effluent turbidity is < 0.2 NTU. *SBR technology, even when followed by tertiary filtration, won't achieve values this low. The typical opening for most tertiary filters is on the order of 10µm, 100x larger than the membrane.*

3) Ease of Operation

Ease of operation is often the least appreciated aspect of MBR technology. Put simply, eliminating phase separation (sludge settling) from the process greatly reduces the operator oversight required to keep the system running efficiently. *Most operators of SBR plants will tell you they spend the majority of their time focused on the settling characteristics of the sludge at their plant*. There are many factors that impact settling characteristics and these can change from one day to the next. Weather and temperature play a very important role in settling characteristics. *Not only does this require time spent in the lab analyzing sludge samples, but also subsequent adjustments to the plant (i.e. adjusting process cycles in an SBR) to maintain good settling characteristics.*

With an MBR system the settling of sludge is NOT an issue and greatly reduces the amount of lab work and time spent in plant adjustment work. This reduction in the number of unit processes further improves system reliability and reduces process oversight by the operator. Further indicating the ease of operation, many of MBR installations (with the right systems) can even be monitored and maintained from a remote location.

SBR plants require constant operator assistance and much more skilled supervision for them to run efficiently. Most of the STPs do NOT have the skilled operators required to maintain and run an SBR plant. If a private company were running the plant things could be different. It is not uncommon for interested parties to fudge the lab results to avoid regulatory discipline, and it is likely that many of the O&M companies may be doing so too. The bottom line is that the plant might not do what it was built to do—process sewage and produce an acceptable quality effluent.

4) Reduced Sludge Production

An MBR system will produce about 30% less waste sludge than an SBR system. The reason for this is the MBR's ability to operate at much longer sludge retention times (SRT). Again, the reason an SBR can't operate at longer SRTs is the negative impact on the settling of sludge.

We don't know how you plan to deal with the sludge that is produced at these plants, and what the environmental impact of that is. ***But certainly, a technology that provides reduced sludge is preferable to a technology that does not.***

Without a long-range cost benefit analysis one may be comparing apples with oranges and getting completely inaccurate cost comparisons of alternative technologies.
For example, on the surface SBR technology may have the lowest cost, but if a comprehensive long-range cost-benefit analysis is done and the cost of the extra land used, higher up front expenditure on civil works, and the opportunity cost of the water that cannot be recycled from this technology is considered, the present value of these future costs are alarmingly high.

INNOVATIVE SOLAR SOLUTIONS
1/4,Balagangadhara Nagar, Behind Kanyakumari School,
Mallathahalli, BANGALORE 560 056,INDIA

PH:080 2321 4776
+91 93412 27829
Email:info@innovativesolarsolution

Innovative

INSTALLATION REPORT

CUSTOMER :
SSMRV Degree College
17, 26th Main, 36th Cross, Jayanagar, 4th T Block, Bangalore - 560041

DATE OF INSTALLATION 12/7/14

ORDER No.	RSST/SSMRV-UGC, Solar Innovative/June14/1263/14-15
SYSTEM CAPACITY	5 Kw
SPV MODULES	INNOVATIVE SOLAR (250W x 20 Nos.)
INVERTER	SOLAR INVERTER - GRID TIE Sl. No. 0263072014 (POWER-ONE)
MOUNTING	MS POWDER COATED
FOUNDATION	PEDASTAL 300 x 300 x 300mm - 9 Nos
OTHER	AJB

WARRANTY

MANUFACTURING DEFECTS : 1 YEAR
FREE MAINTENANCE : 5 YEARS

SPV PERFORMANCE UNDER STC**
Mdule O/P : 90% up to 10 years AND 80% upto 1S years

Sl.No.	DC PARAMETERS		AC PARAMETERS	
1	ARRAY VOLTAGE (Vmp)	300V	GRID INPUT VOLTAGE (V)	230V
2	ARRAY CURRENT (Imp)	8A	LOAD CURRENT (I)	9 A
3	BATTERY VOLTAGE	—	PUC / INVERTER OUTPUT VOLTAGE (V)	230V
4	DC Units (kWh)	5000W	EARTHING VOLTAGE (V)	SV

THE SOLAR SYSTEM INSTALLED IS WORKING SATISFACTORILY & WORKING
DEMO PROVIDED TO :

mr Vidhya Shankar
&
mr Ramanna

CUSTOMER COMMENTS

TECHNICIAN COMMENTS

CUSTOMER (CONTACT PERSON): Vidhya Shankar

TELEPHONE No. : 9611L 351 74

CUSTOMER NAME:

SIGNATURE & SEAL 14/7/14

TECHNICIAN NAME: Vikram Hegde

SIGNATURE & SEAL Vicky

** STC : STANDARD TESTING CONDITION (irradiance of 1000 W/m2, AM 1.5 spectrum, and a cell temperature of 25°C/77°F)

K.R. Vidya Shankar

Innovative Solar Solutions

Ref.: INV-PI/0621/2014-15 Date: June 21, 2014

To,
The Principal,
SSMRV Degree college, 17, 26th Main, 36th cross
4th T Block, Jayanagar, Bangalore

SSMRV COLLEGE
Jayanagar. Bangalore
No. 464
Date 24/6/2014

Dear Sir,
Thank you for the order confirmation of "Solar Power Pack (5kVA w/o battery) Grid-tie.

With reference to your order Ref.: RSST/SSMRV-UGC, Solar Innovative/June14/1263/14-15, we are hereby pleased to issue our "Performa Invoice (INV 2106)" as per the attachment.

You are requested to release the advance payment as agreed in the order, so that we are able to start our work as soon as possible.

Terms and conditions as per the order Ref.: RSST/SSMRV-UGC, Solar Innovative/June14/1263/14-15.

Thanking you,

Yours Faithfully,

For INNOVATIVE SOLAR SOLUTIONS

(Nagesh P N)
Ph: 9845754516

Vr. no. 03
26.6.14

UGC

To
Accepted
Pyne
24/6/14

i) Ch. No. 825845/26.06.2014
for Rs. 1,17,000/= 30%
Rs. 3,90,000/=
Balance Rs. 2,73,000/=

26.6.14

To,
Principal
SSMRV Degree College
17, 26th Main, 36th Cross, Jayanagar, 4th T Block
Bangalore

Innovative

INNOVATIVE SOLAR SOLUTIONS
1/4,Balagangadhara Nagar, Behind Kanyakumari School,
Mallathahalli, BANGALORE 560 056,INDIA
PH : 080 2321 4776
+91 93412 27829
Email: info@innovativesolarsolution
TIN NO : 29280606884

PROFORMA INVOICE

PI NO.	INV 2106
PI DATE	21-Jun-14
Order Ref.	RSST/SSMRV-UGC, Solar Innovative/June14/1263/14-15
BANK NAME	BANK OF INDIA
BRANCH	R T Nagar, Bangalore
ACC NO	841930110000050
IFSC CODE	BKID0008419
BENIFICIARY	INNOVATIVE SOLAR SOLUTIONS

S.N	DESCRIPTION	QTY	RATE	AMOUNT
1	**Solap Power Pack (5 kVA - w/o Battery) Grid tie** a) Solar Modules : 5000W b) Solar Inverter (Grid - Tie) : 1 NO c) Module Mounting structure ; 1 Set d) Cable & Accessories(15 mtr) : 1 Set	1	5,73,460	5,73,460
			VAT 5.5%	31,540
			TOTAL (A)	**6,05,000**
			Subsidy 30% (B)	1,81,500
			Special discount (C)	33,500
			GRAND TOTAL (After discounts and inclusive of VAT) A-B-C	**3,90,000**

TERMS AND CONDITIONS

1. Price : inclusive of taxes, Transportation and Installation.

2. Advance 30% (INR 1,17,000/-) to be paid to start the supply work. Balance amount against delivery of system components.

3.All other terms as per your order Ref. RSST/SSMRV-UGC, Solar Innovative/June14/1263/14-15

DELIVARY ADDRESS

SSMRV Degree College
17, 26th Main, 36th Cross, Jayanagar, 4th T Block
Bangalore

for **Innovative Solar solutions**

UGC 11
1) Advance @ 30% 1,17000/- paid vide Cheque no. 825848/26.6.14

K.S.Priya
Prepared By:

Authorised Signatory

26.6.14

RASHTREEYA SIKSHANA SAMITI TRUST

2nd Block, Jayanagar, Bangalore-560011

SSMRV COLLEGE
Jayanagar Bangalore
No. 406
Date 19/6/2014

Tel: (080) 26562386, 26561777

Fax: (080) 26568290

Date : 19th June 2014

Our Ref No: RSST/SSMRV-UGC, Solar innovative/Jun14 / 263/14-15

To,

M/s Innovative solar Solutions, ¼,BalaGangadhar Nagar, Behind Kanyakumari school, Mallathahalli,Bangalore-560056

(9341227829,23214776)

Kind Attn: Mr. S.T.Padmanabh

SUB: Supply, and installation of Invertor panel complete without batteries at SSMRV Degree college,17, 26th Mn, 36th Cross, Jayanagar,4th T Block,Bangalore

REF: Your quotation No. INV/0613/2014-15 Dt.13TH june 2014 and negotiation on 16/18th June 2014 at RSST Office

Dear sir,

1. Reference to above, we are pleased to inform that your negotiated revised offer has been accepted for the following.

- Supply and installation of Invertor Solar panel Pack 5KVA (W/O Battery) Solar UPS(Grid tie) with excess loads being taken automatically by BESCOM Connections , Solar module(5000wp-24Vdc/250wp 20 Nos)), load capacity of 4800w, 1 set mounting structure & accessories
- SPV Module 10 years performance warranty for 90% output further 15 years for 80% output
- Civil works, connectivity to college grid beyond 15m of the panel/inverter and shelter for UPS under the scope of the college.
- Delivery and commissioning before 10th july 2014
- The bills shall be raised on PRINCIPAL/SSMRV Degree college and coordinated at the college.
- The negotiated cost for the above is Rs.390000 incl taxes,freight and installation. 30% advance is payable and to submit the bills to Principal/SSMRV degree college.

2. This workorder is placed on you on the following terms and conditions.

2.1 You will coordinate and Schedules with

- Director/SSMRV College-Major Srinivasa murthy-9535002410) and Electrical contractor-,Mr.Ramanna-9343761659)

2.2 The workmanship, quality of supplies and presentation should be professional suitably taking into account even environmental and maintenance aspects .

2.3 Only first quality materials should be procured. If necessary, RSST reserve the right to check from source of suppliers on obtaining relevant documents/bills from you.

To
Acc- Scpd
Pyoc 20/6/14

2.4 All original manuals, guarantee certificates of equipments should be handed over to R completion of works

2.5 You will handover all the Statutory and approval certificates, if any.

2.6 You will keep all your items in your safe custody till handover.

2.7 You will take care of all statutory requirements of your personnel and will obsolve RSST of all their litigations and/or legal complications.

2.8 The above is inclusive of All taxes, transport, unloading,and storage

2.9 Equipment bill amount to be released against the supply of materials within 5 days.However Invoice can be given.Erection charges after completion of works commissioning, proving. And on completion of all works

2.10 You will ensure clearance of your materials,rubbish etc on the completion of works at the site.

2.11 In case of any delays in the execution and commissioning consequent to your delays, RSST reserves the right to get the work executed through any other agency debiting the cost including pecuniary losses incurred to RSST.

Yours Faithfully,

(R.Asoka)
Registrar/RSST
For HON. Secy/ RSST

Copy:

1. Principal/SSMRV Degree college,For necessary and immediate action debiting the same against UGC "Additional assistance to covered colleges(Plan) out of Rs.22,50,000.

6.2014

...llege-Solar Panel comparison and negotiation debitable against ... ditional assistance to covered colleges(Plan)" out of Rs.22,50,000

			Deepa Solar-Sudheendra-9972300953,23188480		Swelwct/Star trading-Sendhil.G-9901851597		Innovative solar Solutions-ST Padmanabh, 9341227829	
			90% usable power, solar module 24v/250Wpspv of 20 nos, 25yrswarranty, 5 yrs maintenance free, 10 yrs for Panels	3,90,000	85% usable power, solar module 24v/250Wpspv of 20 nos, 25yrswarranty, 2 yrs maintenance free, 10 yrs for Panels	483,658	90% usable power, solar module 24v/250Wpspv of 20 nos, 25yrswarranty, 5 yrs maintenance free, 10 yrs for Panels	390,000
2	Delivery		2-4 weeks		4 Weeks being a trader.		2-3 weeks	
3	Advance		30.0%		100.0%		30.0%	
4	VAT/CST Taxes		Included		Included		Included	
5	service tax		Included		extra 12.36%		Included	
6	Transportation		Included		extra		Included	
			L1		L2		L1	

1 In connection with the problem of power and saving of energy, UGC have authorised for procurement of generators,etc. Having the economy and alternative sources of energy, college have considered Solar panels of 5 kw and are negotiated above debiting the same against the UGC Grant.

2 For kind consideration for placement of orders on L1-M/s innovative solar solutions. The other L1-M/s Deepa solar will be considered for some other institutions so that the performance can be monitored in future.

Approved

Registrar/RSST

Hon Secy/RSST