



Training for Operators on Operation & Maintenance (O&M) of Activated Sludge Process (ASP) Treatment System

A REPORT

BY



Consortium for
DEWATS
Dissemination
Society

Contents

Background.....	2
About ADSIS.....	2
The Need for this Training	2
The Guests.....	3
The Training	3
Session 1: Introduction to Sewage and Activated Sludge Process	3
Session 2: Introduction to Standard Operating Procedures of Operations & Maintenance	5
Session 3: Practical Session	7
Conclusion.....	7
Annexure I: List of Participants	9
Annexure II: Agenda.....	10
Annexure III: Printed Module	11

Background

About ADSIS

Association for Decentralised Sanitation Infrastructure and Services (ADSIS) with its inception in the early 2015, is a platform for small and medium scale service providers engaged in installation, operation and maintenance of sewage treatment plants (STPs) to come together and collectively address the existing challenges through an institutionalized forum. The many challenges faced by the members are in the form of technical Challenges, operational challenges, financial concerns and legal concerns

The Need for this Training

The training was focused to address some of the operational challenges faced by the service providers. The aim of these training sessions was to create a cadre of operators of STPs who have a strong understanding of the basic principles behind what they do, which gives them a foundation to work on as they operate and maintain the ASP based STPs. ADSIS aims to address such issues collectively, and after deliberation, training these operators was the first step. The operators who are responsible for the maintenance and upkeep of the treatment systems need to be abreast of the correct protocol and the basics behind operations they do on a daily basis. The training programme is the first one of its kind under the banner of ADSIS, and a step towards creating a series of trainings for operators of STPs to increase their competence and build capacity. Furthermore these trainings, if certified, would be instrumental for operators who have just started their careers in operations and maintenance of STPs.

The Guests

Twenty nine operators and engineers from 12 service provider organisations had participated in this training. The chief guest of the programme was the Chairman of Karnataka State Pollution Control Board Sri. Lakshman (B.E, M.I.E) and Dr H.C. Sharath Chandra erstwhile chairman of KSPCB (2006-2009) accompanied him. The importance of the certification and



formalization of this training was again emphasized by the guests, who believed it imperative that there be such formal trainings which would benefit the operators and those who are getting their services also. Chairman quoted that operators are instrumental for the restoration of Bangalore's older glory of being known for its gardens and lakes, to a time when the water was abundant and the lakes aplenty.

The Training

Session 1: Introduction to Sewage and Activated Sludge Process

The training began with a welcome address to the operators and engineers from as many as 13 organisations who provide sewage treatment services. The first session intended to brief the operators about sewage and need for sewage treatment. The session covered three basic topics namely:

1. What is wastewater (sewage)?
2. How do we treat it?
3. Working principles of ASP.

Mr Ravi Kalal, CDD Society started the session by engaging the participants in a interactive discussion with the topic "where does the wastewater come into the treatment system" ? At the end of the interaction the participants were able to explain the sources of wastewater.

The participants were introduced to identify/categorise wastewater as black or gray water. Basic characteristics of wastewater were explained:

- Physical, biological and chemical characteristics of wastewater

Physical Characteristics

Determined with color, odour, solids and turbidity.

The color of wastewater determines the freshness of wastewater.

- If the wastewater is black or dark brown and has an anaerobic smell, it represents 'septic' wastewater.
- Wastewater also has solids which was demonstrated through an Imhoff cone setup.
- Turbidity, which also denotes the impurities present in the wastewater.

Chemical Characteristics

Determine the pH of the sewage and the fat and oil content.

The pH of the sewage could be acidic or basic depending on the predominance of consumption habits at the source of sewage. The operators were able to explain how to maintain the pH, such as adding lime if it is too acidic and caustic soda if the sewage is too basic.

It was explained that the fatty contents of sewage should be minimal, as it inhibits aeration, digestion of other organic matter by regular microbial flora in the sewage and also clogs the motors, blowers and channels by forming a scum layer.

Biological characteristics

The microorganisms such as coliforms, virus (rotavirus), parasites (hookworms) and protozoa present in the sewage are harmful to human beings. This was followed by introduction to STPs and how they function. Since the workshop was mainly for ASP, it was discussed at length. The operators were oriented on the concept of Mixed Liquor Suspended Solids (MLSS), which is critical to maintain and operate ASP. Animation and presentation elucidated clearly why MLSS should be measured with great care. If the sewage sample being treated taken from the aeration tank has MLSS is more than 4000 mg/l the solids from clarifier is directly sent to sludge holding tank (if available) or to the sludge drying bed or filter press (whichever is available). If it is less than 2000

mg/l, it is pumped back to the aeration tank from clarifier to maintain the food/microorganisms ratio (F/M ratio).

The operators were told that the treated water can be used for tertiary purposes such as flushing and landscaping. The operators were also made aware of the fact that reusing treated water reduces use of potable water

Session 2: Introduction to Standard Operating Procedures of Operations & Maintenance

The second session was conducted by Dr. Hemanth Kumar, an active ADSIS member and erstwhile professor at the University of Mysore who is himself working deeply in the sanitation sector. Dr. Hemanth started his session with an introduction of ASP, asking the operators the meaning of activated sludge process. Many operators in the training were familiar with Sequencing Batch Reactor (SBR) technology and its operations, they raised many questions related to various aspects of ASP. Questions comparing the two processes, the advantage and disadvantages such as the space required, expenses in maintenance etc. The ASP was explained in detail, with emphasis on the operations at each stage.

Screen Chamber: Screens should be cleaned regularly to ensure that no solid particles pass through which cause pumps to breakdown and affect the efficiency of sewage treatment.



Grease trap (GT): This module is to ensure that oil and grease from kitchen are trapped before entering the primary treatment module. The important activity at this stage is to check the pH of the influent, if pH is less (i.e. acidic) then operators should add caustic soda or if pH is more (i.e. alkaline) lime is to be added to neutralize the influent. He also mentioned that in the case of apartments, it is normal for the pH to vary on weekends which is when extra care is needed.

Aeration tank: The important task in this module is to check the MLSS. Dr. Hemanth explained the meaning of MLSS and its unit of measurement. He explained if complex organic compounds enters the aeration tank, it has to be broken down to simple organic matter for easy digestion by microbes/bacteria. The microbes after digestion excrete mucus which binds with inorganic matter in the wastewater and forms lumps in the aeration tank. This is measured to understand if the sewage has to be recycled or not.

Clarifier: He started explaining how a clarifier functions by raising questions on “Why the sludge has to be recycled to aeration tank from secondary tank?” Operators answered that it is done to maintain MLSS in the aeration tank. Regular problem in clarifier is sludge bulking. The sludge bulking is due to regular non removal of the sludge and this causes the over flow and mixing with the supernatant which would thereby create a blockage in the PSF & ACF filters. In other words, if MLSS is higher than 4000mg/L and not removed, sludge bulking happens.

Another major problem is foam formation in the aeration tank which is due to the variation of pH in the equalization tank. If pH is not controlled, formation of the foam takes place. It depends on the influents and there are higher chances of the foam formation if content of chemicals like detergents are high, which generally is the case during the weekends because of more than the regular instances of washing and cleaning.

The relationship between oil and bacteria is also something very critical. The bacteria isn't biologically equipped to breakdown oil and if higher oil content is present, it will reduce the oxygen level in the aeration tank. This will create problems in the aeration tank and also reduce the MLSS level in the aeration tank. An advice by Dr. Hemanth was to disinfect water using chlorine after waste water passes from Pressurised Sand Filter and before it goes to Activated Carbon Filter. He specified the chlorine to be 1 liter for every 500 liters of treated wastewater.

Mr. Santhosh Tapovan from CDD also pitched in and talked about the lack of any policy regarding maintenance of O&M of ASP. The major issues as told by the operators were that most of the treatment plants are under designed and this creates challenges for the operators to handle especially when the flow of the load increases. According to the operators, in many cases the clients who are members of the RWA or in/charge of upkeep of apartments/residential quarters ask the AMC service providers to maintain the operations costs unrealistically low which hampers the quality of the service provided. The lively discussion during the feedback session helped us

understand the angst these practiced operators have and the kind of challenges they face on a daily basis.

The session ended with distribution of certificates to each of the participants. The operators and other participants were also given a tour of the CASS exhibition where they got to know the status of sanitation in India, the history of sanitation and DEWATS approach. Lunch followed soon after which a group photo shoot was done to capture this take-off event.

Session 3: Practical Session

All the participants were taken for hands on experience to the sewage treatment plant in RV College of Engineering, in Rajarajeshwari Nagar. Assistant Professor of the Civil Engineering Department, Ms Lokeshwari, gave us a tour of the ASP based STP in the college. The plant has a capacity of 250 KLD and currently is catering to sewage generated by a part of the college campus. The working of different components involved in the ASP were shown to the operators. On the suggestion of the operators, the next ADSIS training will include more practical demonstrations of the tasks which were taught as a part of the standard operating procedures session. Some of the operators invited us to STPs operated by them for a practical session in the next training.

Conclusion

This training was the first of many such trainings which ADSIS will conduct to fulfill one of its main objectives, that is, to build capacity of STP operators. ADSIS aims to be a certifying agency for training courses related to sanitation; and network with like minded organisations for supporting such trainings and



certification. ADSIS would also make efforts to partner with KSPCB for accreditation for such meetings to make these trainings more lucrative for operators, such that these trainings are. To

further this, we had invited the Chairman for his suggestions and inputs to create a training programme which matches the expectations of KSPCB for it to accredit us.

The next step for ADSIS will be to seek inputs of KSPCB officials, structure this training programme better and create manuals and modules which can help operators assimilate what they learn in the trainings better. ADSIS would also need to ideate parameters to test the operators' proficiency after this training to measure the impact of these sessions on their awareness and capacity.

Annexure I: List of Participants

Sl No.	Participant Name	Organisation Name
1	Rajshekar Reddy	CDD Society
2	Nandeesh D	CDD Society
3	Ravikumar A G	CDD Society
4	Kumar N	CDD Society
5	Rajesh D S	CDD Society
6	Suresh	Daksha Greentech International
7	Mahadev	Daksha Greentech International
8	Varun N	RVCE
9	Ambarish	RVCE
10	Manohar A	Seamak
11	Manjunath	Seamak
12	Jagadish	Dexter Water Tech
13	Rajesh	Dexter Water Tech
14	J C Chennakeshava	Aquatech Enviro Engineers
15	Hanumantha Raj Urs	Aquatech Enviro Engineers
16	Venkatesh	Aquatech Enviro Engineers
17	Manikandan P	Environs Management Bangalore Pvt Ltd
18	Shivalinge Gowda	Environs Management Bangalore Pvt Ltd
19	Kumar T	Environs Management Bangalore Pvt Ltd
20	Ramesh	Environs Management Bangalore Pvt Ltd
21	Srinivas E	Environs Management Bangalore Pvt Ltd
22	Sadashiva D N	Environs Management Bangalore Pvt Ltd
23	Sudharshan Reddy	K Pack Systems
24	Arun Kumar	Rite-ways enviro Pvt ltd
25	Ayeesha Khanam S	Paradigm Environmental Strategies (P) Ltd.
26	Gopi H	Paradigm Environmental Strategies (P) Ltd.
27	Lokesh	Aqua Chem India Pvt. Ltd.
28	Siddaraju	Aqua Chem India Pvt. Ltd.
29	Maruthi	Indus EcoWater Pvt. Ltd.

Annexure II: Agenda



Training for Operators on Operation & Maintenance (O&M) of Activated Sludge Process (ASP) Treatment System

Wednesday, 25th May, 2016

TIME	SESSION TITLE	RESOURCE PERSON
08.30 AM - 09.30 AM	Welcome and Registration	CDD Staff
09.30 AM - 09.45 AM	Introduction to training	Mr. Ravi Kalal
09.45 AM - 10.30 AM	Introduction to Sewage Treatment Plant and Activated Sludge Process	Mr. Ravi Kalal
10:30 AM - 11.00 AM	Presentation by KSPCB/ Introducing KSPCB	Dr. H.C. Sharath Chandra
11.00 AM - 11.15 AM	Address by KSPCB Chairman	Shri Lakshman
11.15 AM - 11.30 AM	Tea break	
11.30 AM - 01.30 PM	Introduction to Standard Operating Procedures of Operations & Maintenance	Dr. Hemanth Kumar
01.30 PM - 02.00 PM	Lunch	
02.00 PM - 04.00 PM	Practical session	Mr. Ravi Kalal

Annexure III: Printed Module

Session No. 01

Introduction to Sewage and Activated Sludge Process

Training on Operation & Maintenance (O&M) of Activated
Sludge Process (ASP) Treatment System

ADSIS, Bangalore

25th May 2016

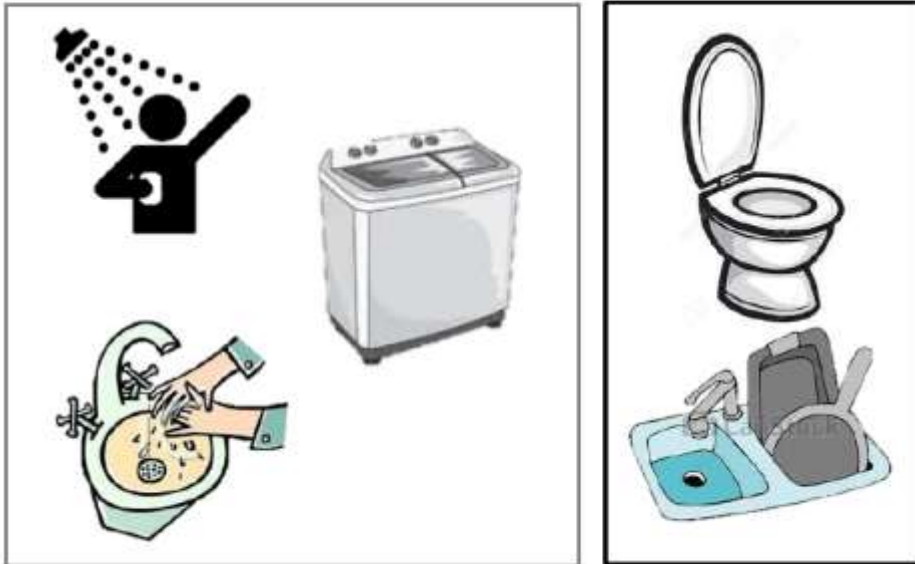
Content

What is Wastewater (Sewage)?

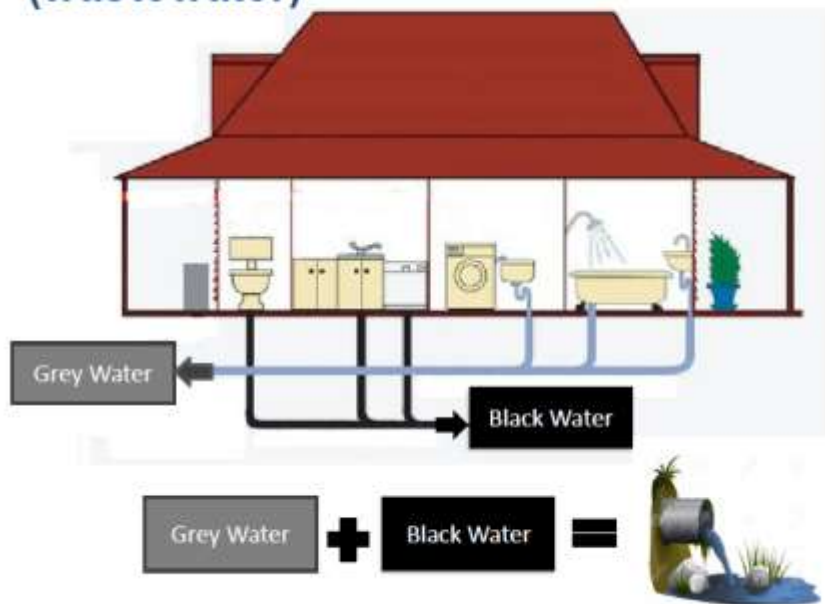
How do we treat it?

Working principles of ASP

Where does sewage come from?



Composition of sewage (wastewater)



Wastewater characteristics: Physical

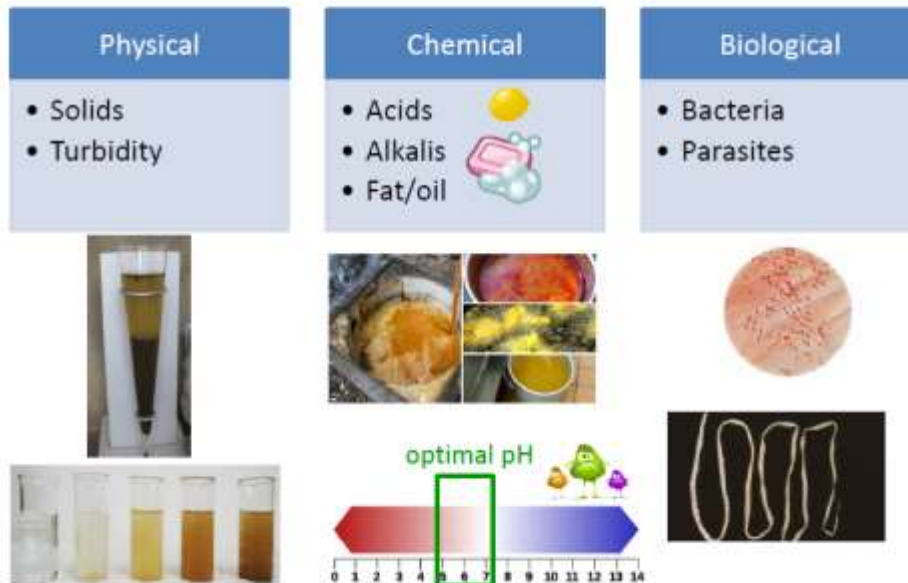


Colour

- Color of wastewater determines the freshness of wastewater
- If the wastewater is black or dark brown and has an anaerobic smell, it represents 'septic' wastewater
- Wastewater with degradable organic content starts smelling under anaerobic conditions



Wastewater characteristics



Wastewater characteristics: Physical

Solids



Imhoff Cone with settleable solids

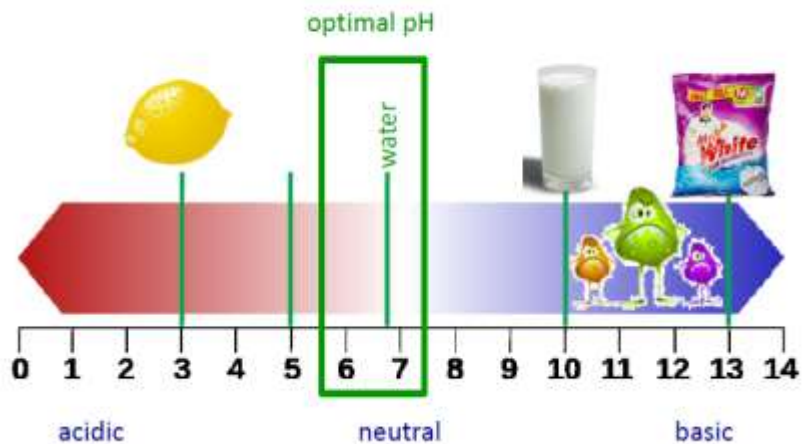
Turbidity



Wastewater characteristics: Chemical

pH

Microorganisms grow only under certain pH ranges



Wastewater characteristics: Chemical

Fatty Substances



9

Wastewater characteristics: Biological

Pathogens cause waterborne diseases like cholera, typhoid, dysentery, polio, hepatitis, etc



Total Coliform



Entamoeba



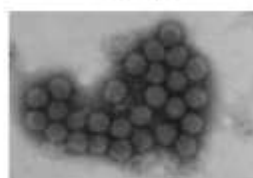
E.Coli



Protozoa

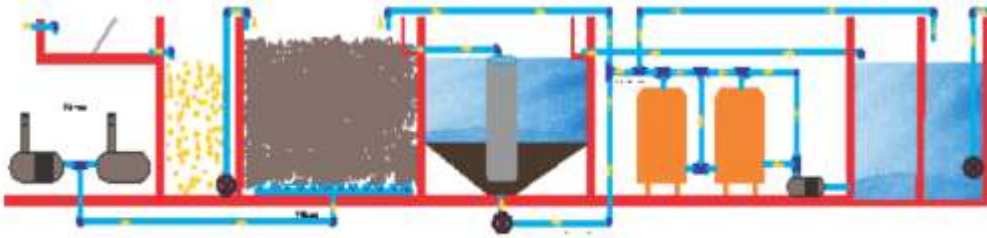


Hook worm

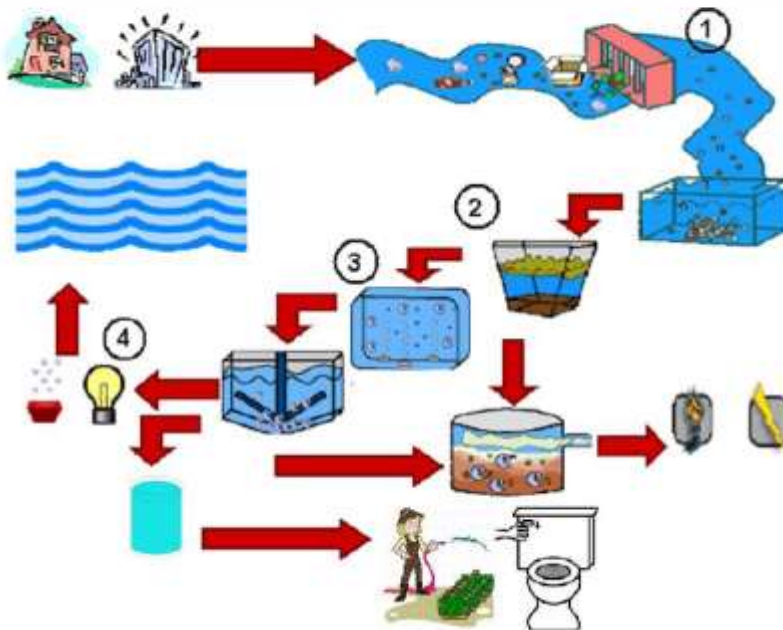


Rota Virus

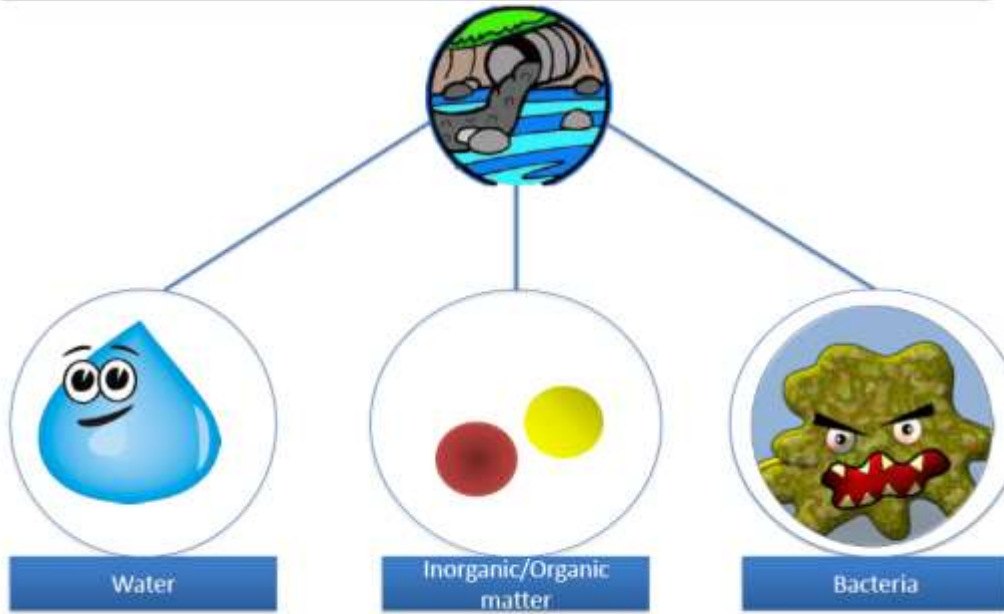
Typical Process in an STP



How it works



Wastewater

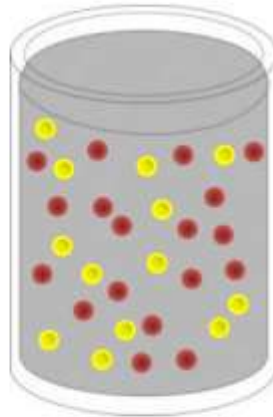


13

ASP



Fresh water



Wastewater

ASP



15

Reuse



Recording the Daily Log Sheet

SEWAGE TREATMENT PLANT (STP)													DATE:							
OPERATIONAL PART																				
SHIFTS		1 st SHIFT				2 nd SHIFT				3 rd SHIFT										
Name of the Operators																				
MLSS Level at Aeration Tank (mg/l) (Each Shift)																				
PSF/ACF Backwash													PSF		ACF		PSF		ACF	
Bar Screen Chamber Cleaning (Timing)																				
Name of the Motor & Pumps	STATUS	MONITORING & MAINTENANCE OF STP ELECTRO-MECHANICAL COMPONENTS																		
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF							
AIR BLOWERS (B1 & B2- ON/OFF) (2hrs each)	B1																			
	B2																			
RAW SEWAGE PUMPS (P1 & P2- ON/OFF) (2hrs each)	P1																			
	P2																			
SLUDGE RECIRCULATION PUMP	P1																			
FILTER FEED PUMPS (F1 & F2- ON/OFF) (2hrs each)	F1																			
	F2																			
FINAL PUMPS (P1 & P2- ON/OFF) (2hrs each)	P1																			
	P2																			
GARDEN PUMPS (P1 & P2- ON/OFF) (2hrs each)	P1																			
	P2																			
CHLORINE DOZING PUMP	P1																			
Service & Repair Works:	1st Shift:	2nd Shift:				3rd Shift:														
Remarks:	1st Shift:	2nd Shift:				3rd Shift:														
Checked By:	Operator:	Supervisor:				Client:														

Recap

- What is wastewater?
- What are its characteristics?
- Why treat it?
- What really happens in ASP?
- How do we ensure the STP works perfectly?
- What can be done with the recycled water?