



DUBAI SPORTS CITY

**SEWAGE TREATMENT PLANT
2009**



DUBAI
SPORTS
CITY



**SEWAGE TREATMENT PLANT
3D DEMO.**



PROJECT PARTIES



➤ CLIENT:

- DUBAI SPORTS CITY

➤ CONSULTANT:

- HYDER CONSULTING ME

➤ MAIN CONTRACTOR:

- EAGLE ELECTROMECHANICAL CO. LLC

- MBRTECHNOLOGY : GE / ZENON

- CIVIL CONTRACTOR: WADE ADAMS CO. LLC

PROJECT HIGHLIGHTS



Milestones:

START DATE: JUNE 2006

COMPLETION DATE: APRIL 2009

Built-up area:

97,000 square feet / 9000 m²

Connected power load:

2.6 Megawatt

PROJECT TARGETS



- ❖ Treatment plant and ancillary works to...
 - ❖ receive and treat raw sewage collected by Development sewerage network.
 - ❖ treat rejected canal filtration plant backwash waste stream
 - ❖ polish Dubai Municipality TSE supplied to the Development
 - ❖ Supply TSE to irrigation systems within the Development (25000 m³/day max)
 - ❖ Supply TSE for fire fighting network within the Development
 - ❖ Supply of high quality RO product to top-up canal (800 m³/day)

SEWAGE TREATMENT CAPACITY



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- ❖ **Stream 1:** 8300 m³/day
- ❖ **Stream 2:** 8300 m³/day
- ❖ **Stream 3:** 8300 m³/day

ULTIMATE CAPACITY

25000 m³/day (average daily flow rate)

STORAGE CAPACITY



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- ❖ Irrigation Water: 24,000 m³



ADVANTAGES OF MBR PROCESS IN COMPARISON WITH CONVENTIONAL TREATMENTS SYSTEMS



➤ Compact Footprint

- No Secondary Clarifiers and Tertiary Filters required
- Smaller Bioreactor

➤ Assured Nitrification / Denitrification

- High MLSS 8 - 10 g/L
- Extended SRT >10 days

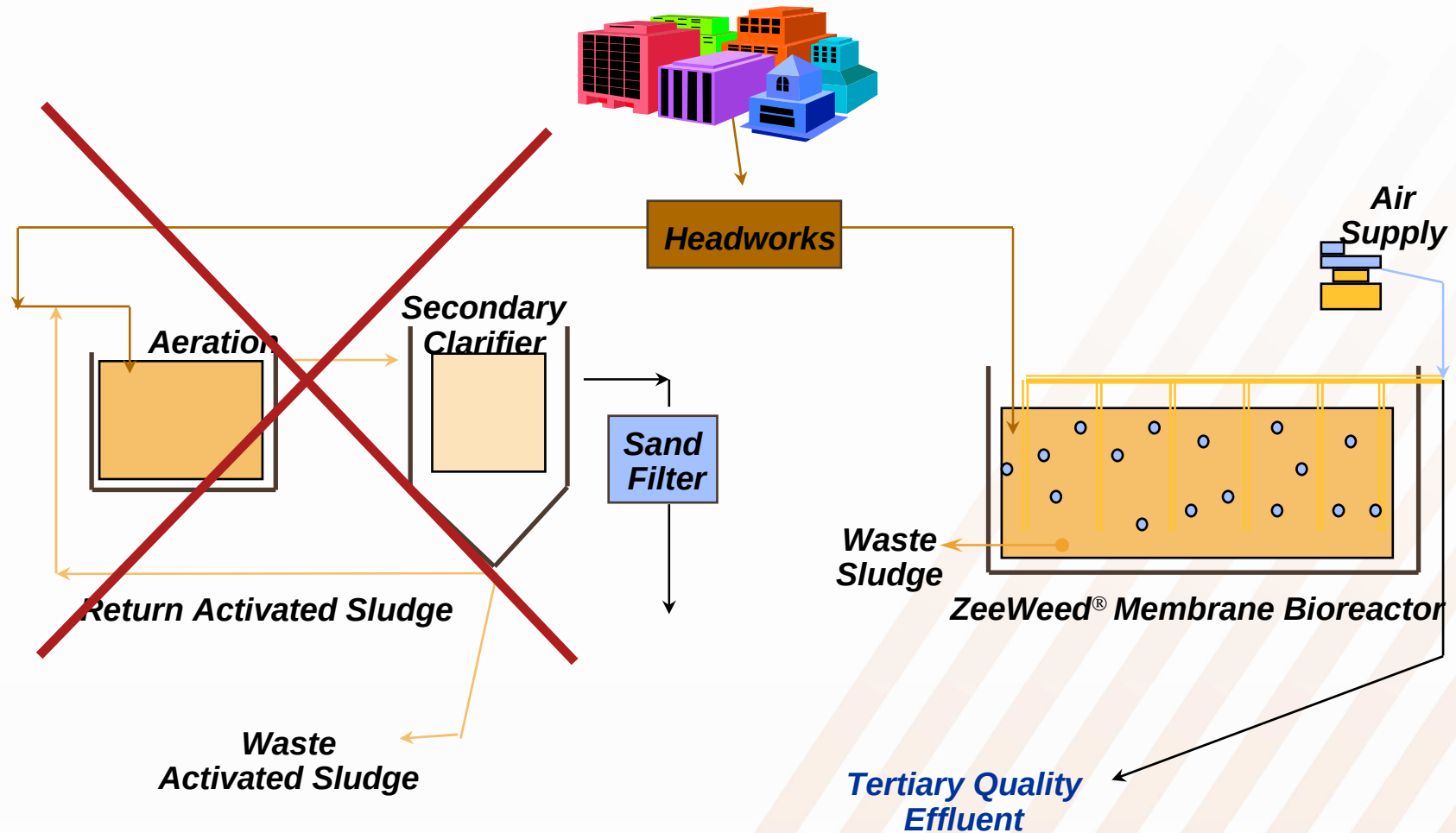
➤ Excellent Effluent Quality

- BOD < 5 mg/L (typically non-detectable)
- TSS < 5 mg/L (typically non-detectable)
- NH₃-N < 1 mg/L (typically <0.5 mg/L)
- TN < 10 mg/L (3 mg/L achievable in warm climate)
- TP < 0.5 (0.1 mg/L achievable)



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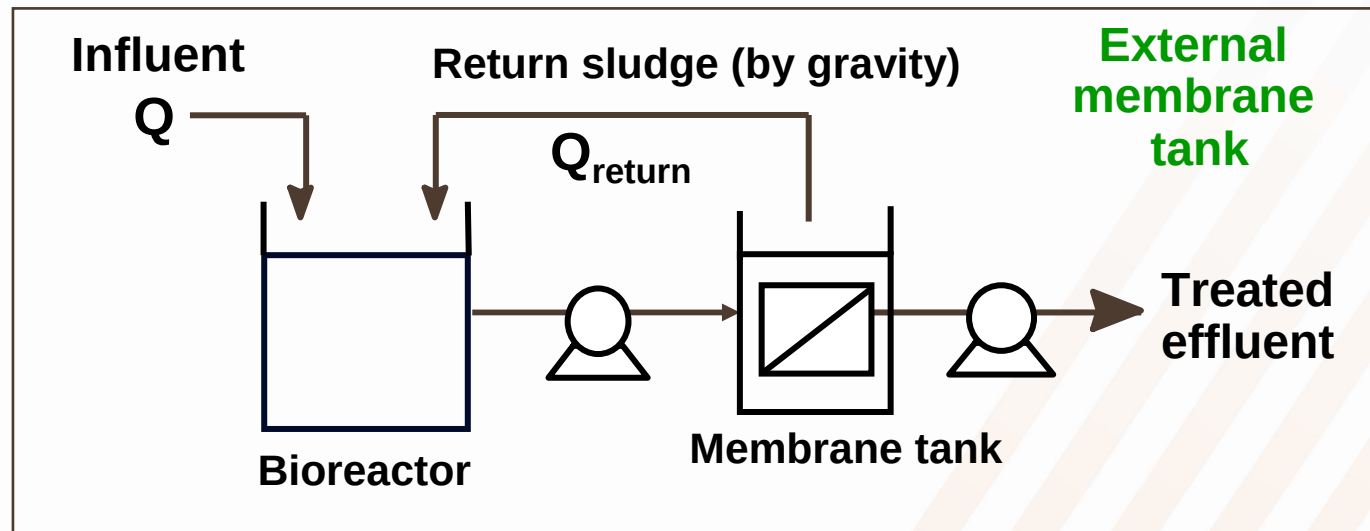
MBR SYSTEM / ZW[®] BIOREACTOR VS. CONVENTIONAL PROCESS



IMMERSED MEMBRANE BIOREACTORS



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PLANT MAJOR COMPONENTS



The major components of the system are :

- (1) Coarse Screening
- (2) Grit Classifier
- (3) Fine Screening
- (4) Anoxic Tanks – 3 Nos.
- (5) Oxidic Tanks – 3 Nos.
- (6) Balancing Tank
- (7) Membrane Tanks – 6 Nos.
- (8) Effluent Tank
- (9) Reverse Osmosis unit
- (10) Sludge Aerobic Digestion Tank
- (11) Sludge Dewatering unit (Decanting System)
- (12) Power MV/LV Substation

PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(1) Coarse Screening

The raw sewage from Sports city area is transferred into the inlet area, where two step screens are provided. According to the set points of level sensor, when the sewage reached a certain water level, the step screen starts working, which will take away the large waste particles, like plastic sheets, metals etc to the screw conveyor, where it is transferred to the compactor. Compactor works removes the liquid discharge to the drain system & dried discharge to the discharge bin. Soda Ash dosing is done in the inlet channel according to the pH set points for maintaining correct pH level.



PLANT COMPONENTS' FUNCTIONAL DESCRIPTION



(2) Grit Removal

- The screened sewage from the inlet channel is passed through the grit removal tank. In the grit removal tank the agitator works constantly, and due to the action of the agitator the sand particles moves downwards, which is removed by the pumps provided in the bottom of the tank, and the sand is transferred to the sand classifier.





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PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(3) Fine Screens

- The screened liquid passes to the fine screen area. Here 4 fine screens are provided, in which 3 is duty and 1 is standby.



PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(4) Fine Screen Chamber

- The screened sewage is transferred to the fine screen chamber (sewage lifting chamber), where 3 pumps are provided . When the water level reaches 1st start level of float switch first pump starts pumping and for the II level, the second pump starts pumping, and three more float switches provided for dry run protection .The screened sewage is passed to the inlet chamber where it is distributed to the three phases of anoxic tanks.





PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(5) Anoxic Tanks

- The liquid sewage from inlet channel is transferred to 3 anoxic tanks, which is provided with 3 mixers for proper mixing of incoming screened sewage. The anoxic zones provide biological de-nitrification.
- Each pre-anoxic compartment is equipped with submersible mixers to ensure adequate mixing in each compartment.



(6) Oxidic Tanks (Aeration Tanks)

- The mixed liquid sewage is passed to oxidic tank, in which fine bubble diffusers are provided. Aeration is provided in the aerobic lanes by fine bubble diffused aeration grids to achieve nitrification and oxidation of organic matter (BOD_5



(7) Air Blowers

This group of blowers provides air to the fine bubble diffuser grids in the aeration tanks. All blowers discharge into one common process aeration manifold. This manifold delivers air to the drop legs/ diffusers installed in the aeration tanks. Adequate oxygen is required for the proper growth of bacteria in oxic tank. The treated sewage then pass to the post anoxic compartment/ balancing tank through overflow opening.



(8) Balancing Tank

- The treated sewage passed to the Balancing Tank is equipped with submersible mixers to ensure adequate mixing. The mixed liquid sewage then passes to the membrane distribution channel with the aid of balancing transfer pumps.



(9) Balancing Transfer Pumps

These pumps transfer mixed liquor from the Balancing Tank to the membrane distribution channel, from where it is passed to membrane tank. This arrangement allows the biological trains and membrane trains to operate independently.



(9) Balancing Transfer Pumps

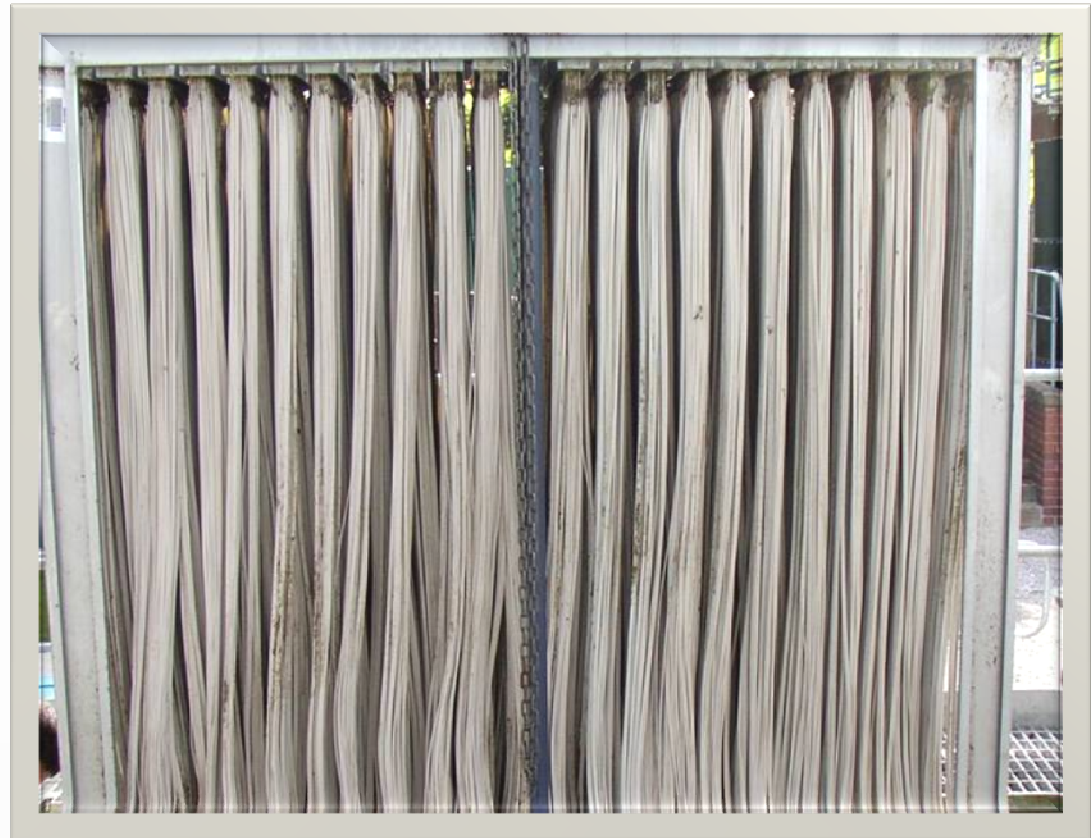


- The balancing transfer pumps are submersible type and installed in the Balancing tank, pumping to the membrane feed channel. Four pumps are provided in the balancing tank. The mixed liquid from recirculation channel then passes to the membrane tank for further treatment.

PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(10) Membranes System (MBR units)

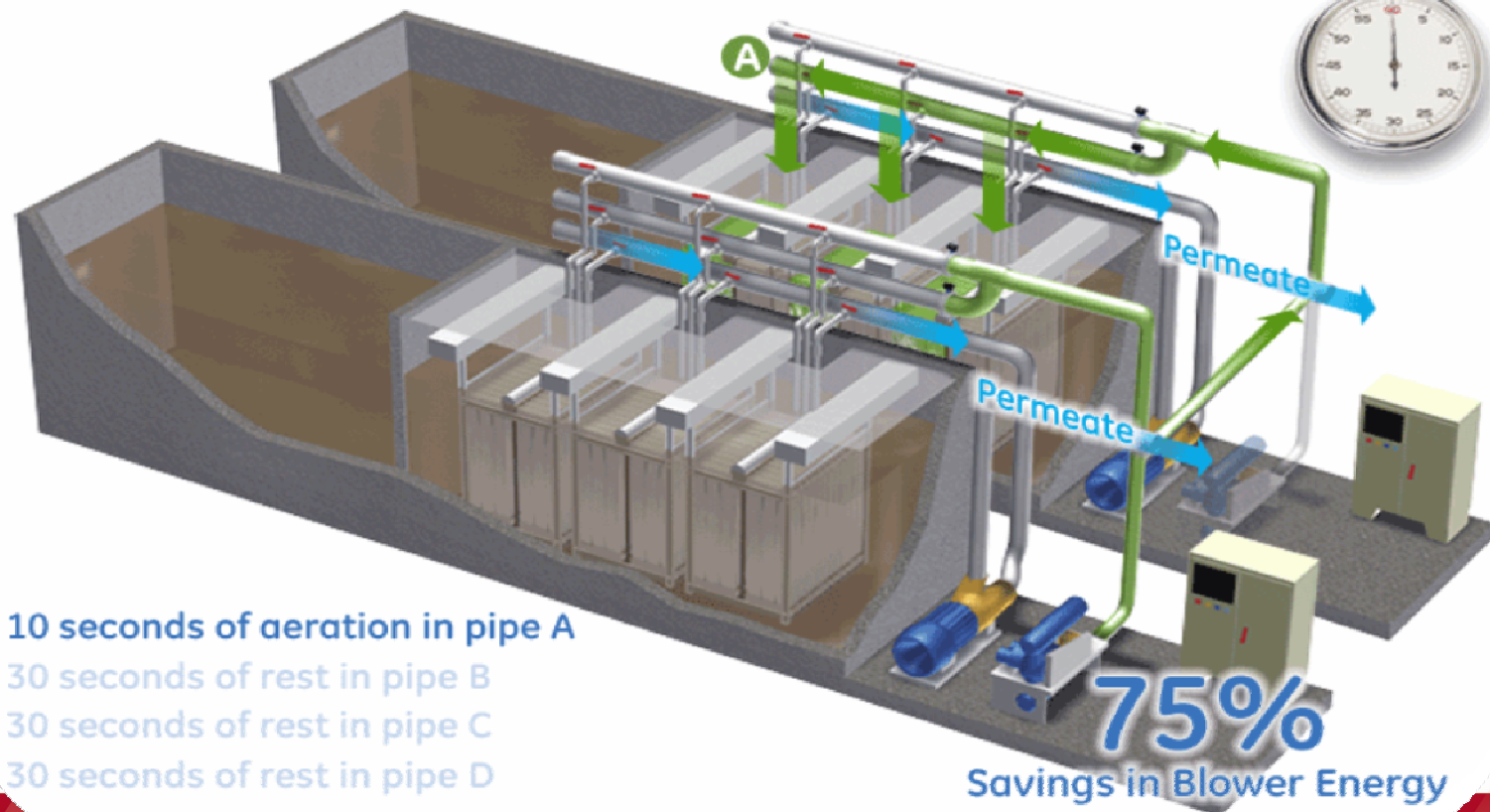
- The mixed liquid from membrane distribution channel will pass to membrane trains (30 cassettes, 5 membranes cassette per tank) A membrane train is a treatment unit consisting of multiple “cassettes” that are manifold together and connected to a common permeate pump.



(11) RAS (Returned Activated Sludge) Chamber

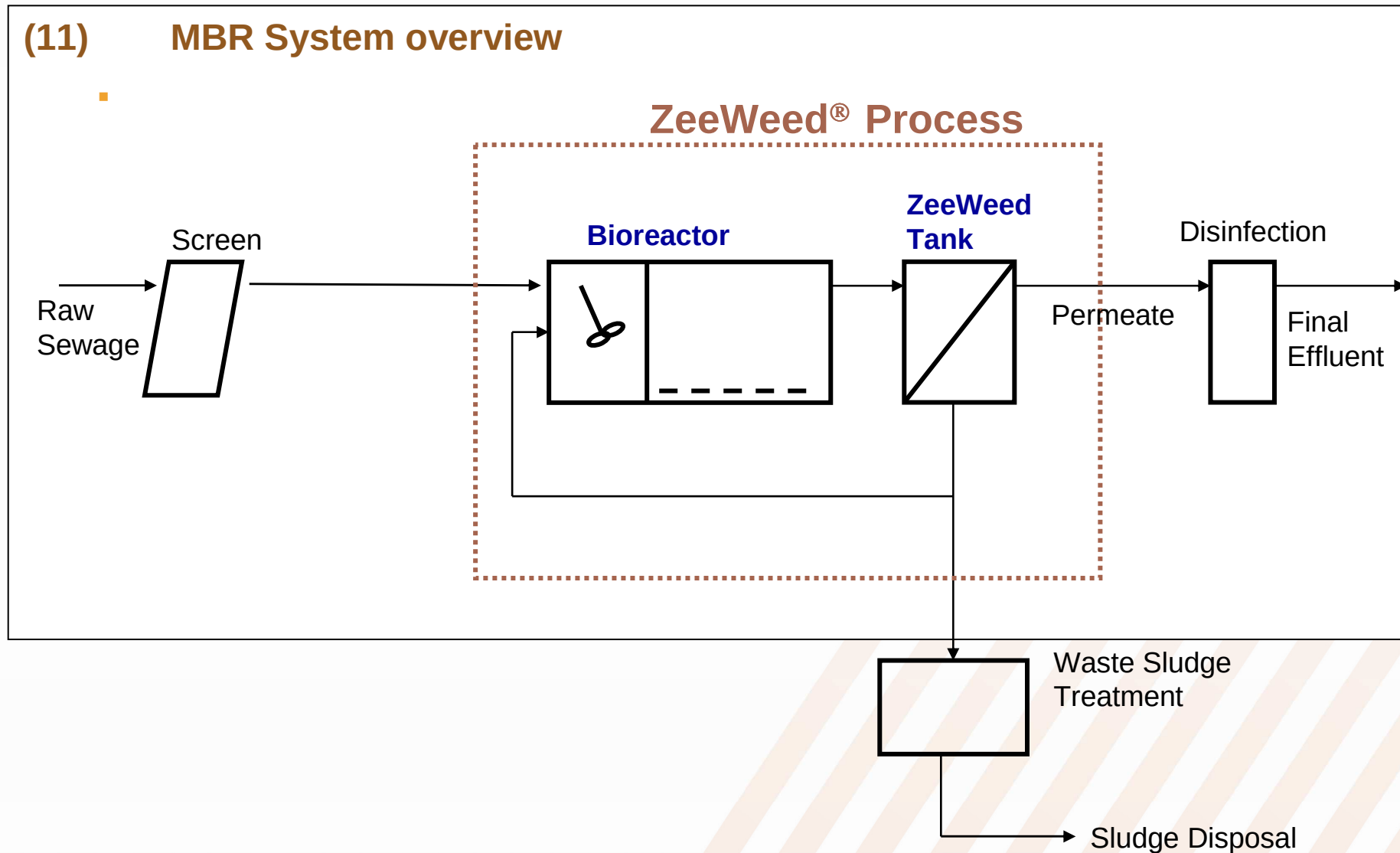
- Mixed liquor from each membrane tank overflows a full-width weir at the end of the tank into a mixed liquor recirculation.

10/30 Eco-aeration Cycle



PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(11) MBR System overview



(12) Sludge Digestion Tanks

- In the sludge digestion tank two Decanting arms are provided, and aeration for the tanks is provided with the aid of Coarse bubble diffusers provided at the bottom of the tanks. Two overflow pipes provided which remove the overflow liquid back to coarse screen. Sludge will settled in the bottom of the tanks, where it is pumped to sludge decanting centrifuge system.



(13) Sludge Decanter Centrifuges



- Separation takes place in a horizontal cylindrical bowl equipped with a screw conveyor. The feed enters the bowl through a stationary inlet tube and is accelerated smoothly by an inlet distributor. The centrifugal force that stems from the rotation then causes sedimentation of the solids on the wall of the bowl. The cake leaves the bowl into the casing and the solid discharge is transferred to discharge bin.

PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(14) Permeate Pumps

- The permeate from the membrane tanks will be transferred to irrigation tank, with the aid of 6 permeate pumps. There is a back pulse mode of operation for the membrane, in which the membranes are flushed from the inside out for 30-60 seconds for every 10-15 minutes. The water used to back pulse the membranes is permeate stored in the back pulse tank.

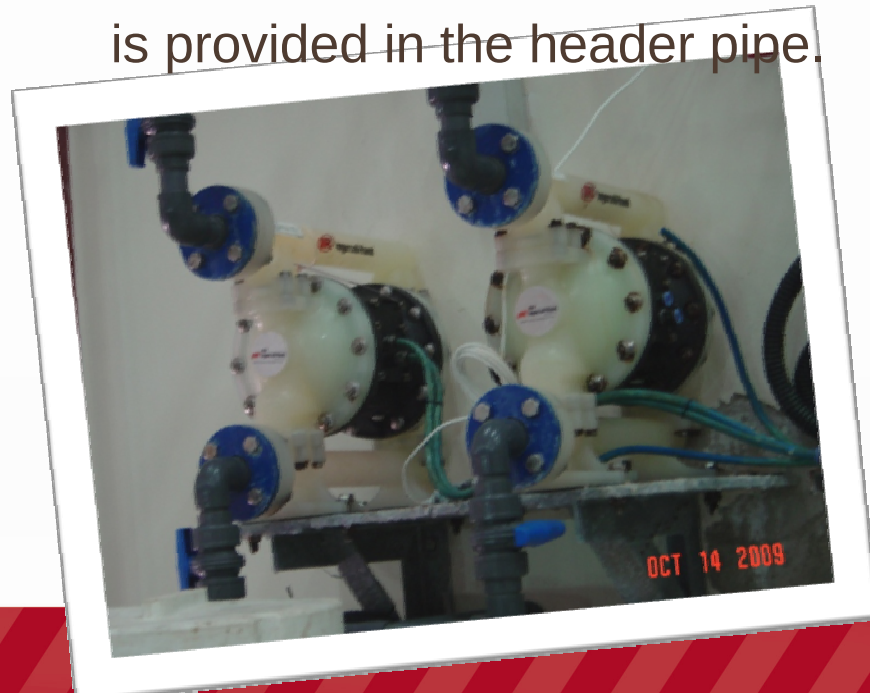




PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(14) Chlorination System

- While the permeate is transferred to irrigation tank, chlorine dosing will be done in the main header for the disinfection of the permeate. The chlorine is properly mixed with the aid of static mixer which is provided in the header pipe.





(15) Pump Room

- In Pump room, there are 4 irrigation pumps, two fire pumps, two jockey pumps and two booster pumps. the irrigation pumps, start and stops based on the flow and pressure set points of the PLC. The pumps start at the predetermined time for irrigation cycle.

PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(16) RO System

- The treated water in the back pulse tank is again treated with the aid of reverse osmosis in order to remove salts and other impurities. Reverse Osmosis, also known as hyper filtration, is used to purify water for Canal top up. Manual and Auto operation is achieved through PLC.



PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(17) MCC Panel / Control System

- Electrical power for all drives and equipments in the STP will be provided by MCC panels. The panels will also control the functionality of the components via programmed PLC system. All operational activities within the STP is monitored and logged by SCADA system.





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PLANT COMPONENTS' FUNCTIONAL DESCRIPTION

(17) MCC Panel / Control System

- All operational activities within the STP are controlled by PLCs monitored and logged by SCADA system.



MUNICIPAL MBR EFFLUENT QUALITY



Effluent Parameters	Units	Guaranteed Limits	Achievable Levels ¹
BOD	mg/L	<5	<1
TSS	mg/L	<5	<1
NH3-N	mg/L	<1	<0.2
TN	mg/L	<10	<3
TP	mg/L	<1	<0.2
Turbidity	NTU	<1	<0.2

¹Achievable levels will normally required more complex process configurations and higher levels of pre-treatment

Let's have a greener environment...



...Thank You!