Wastewater Treatment and Reuse by Submerged Membrane Bioreactor (SMBR)

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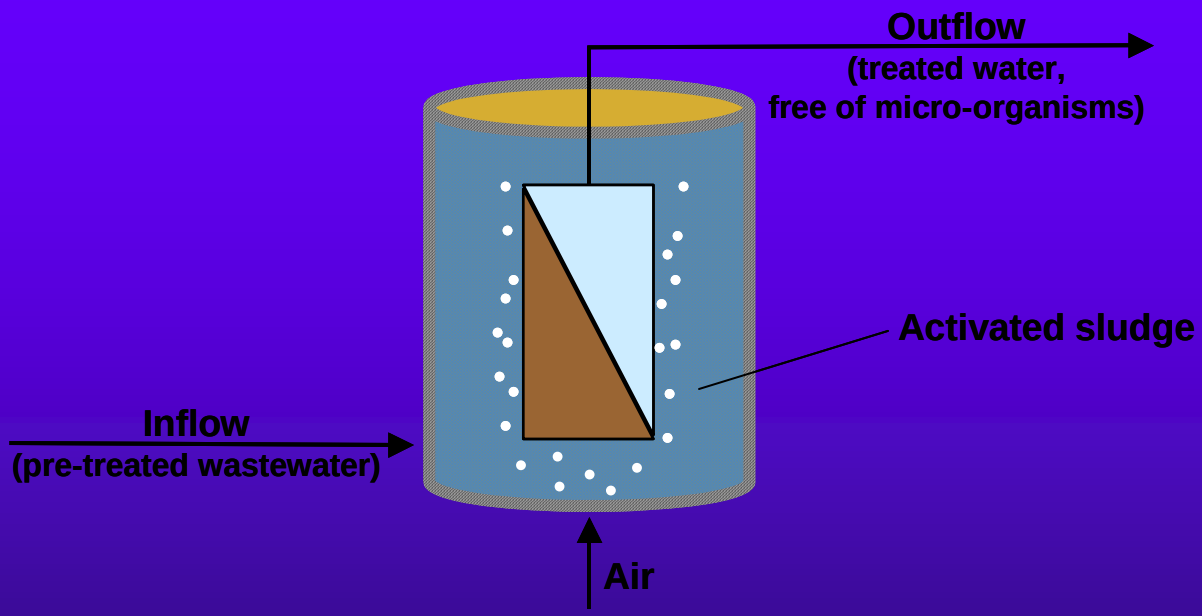
Principle of MBR Technology



MBR plants need little space and allow compact construction. Due to the direct retention of the micro-organisms, high efficiency is possible and excess sludge can be reduced compared to conventional plants

Performance of SMBR for Treatment of Textile Wastewater

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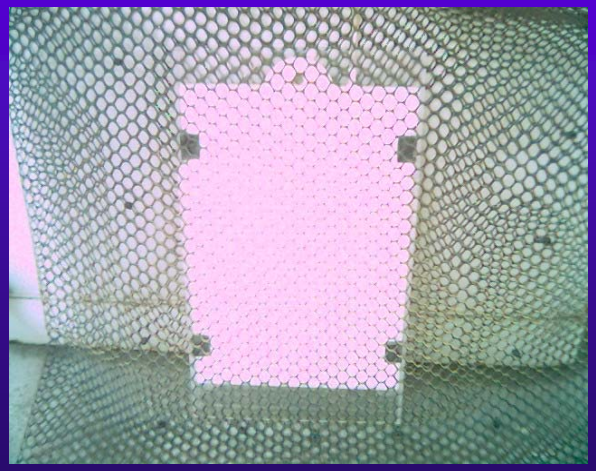
Pilot-scale MBR in Textile Industry

FLAT SHEET MF MEMBRANE

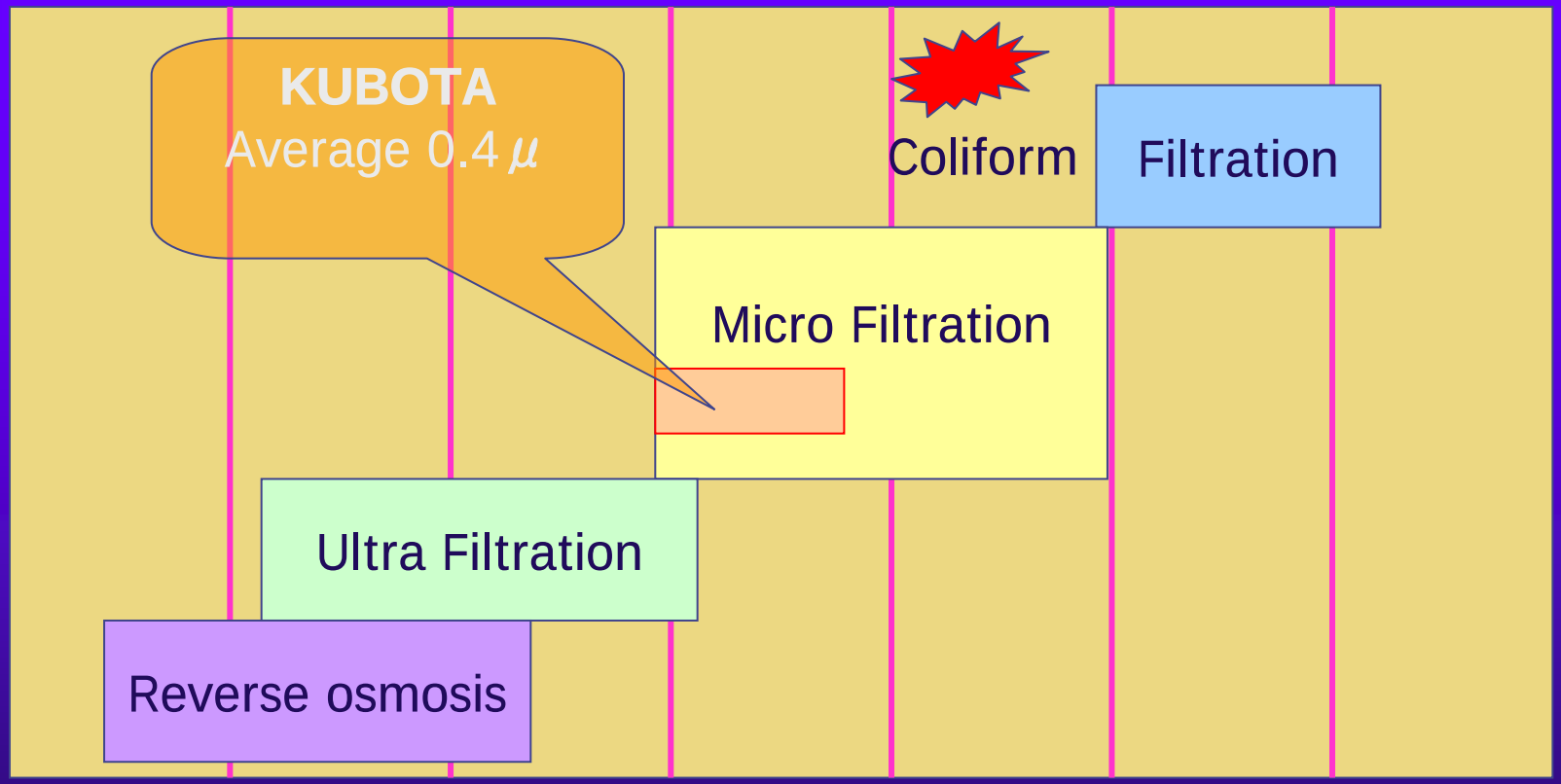


203 Type

(0.1m²)

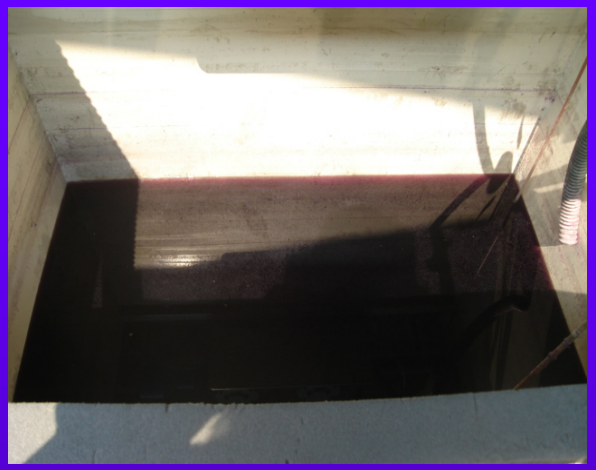
200mm × 300mm

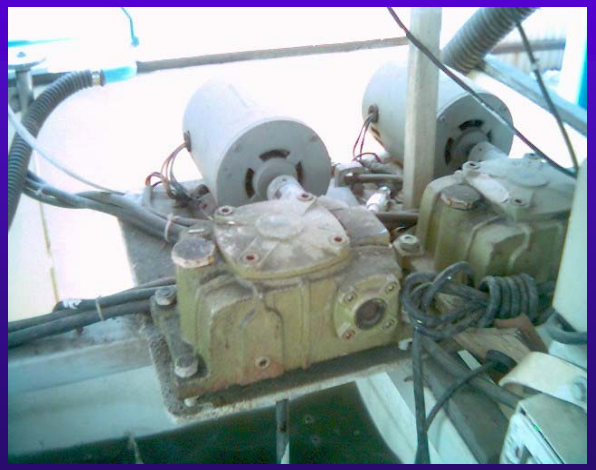
Pore size of Membrane used in this study



1A 10A 100A 1000A 1 μ 10 μ 100 μ 1mm

Membrane Bioreactor





Implemented membrane rack inside the MBR tank

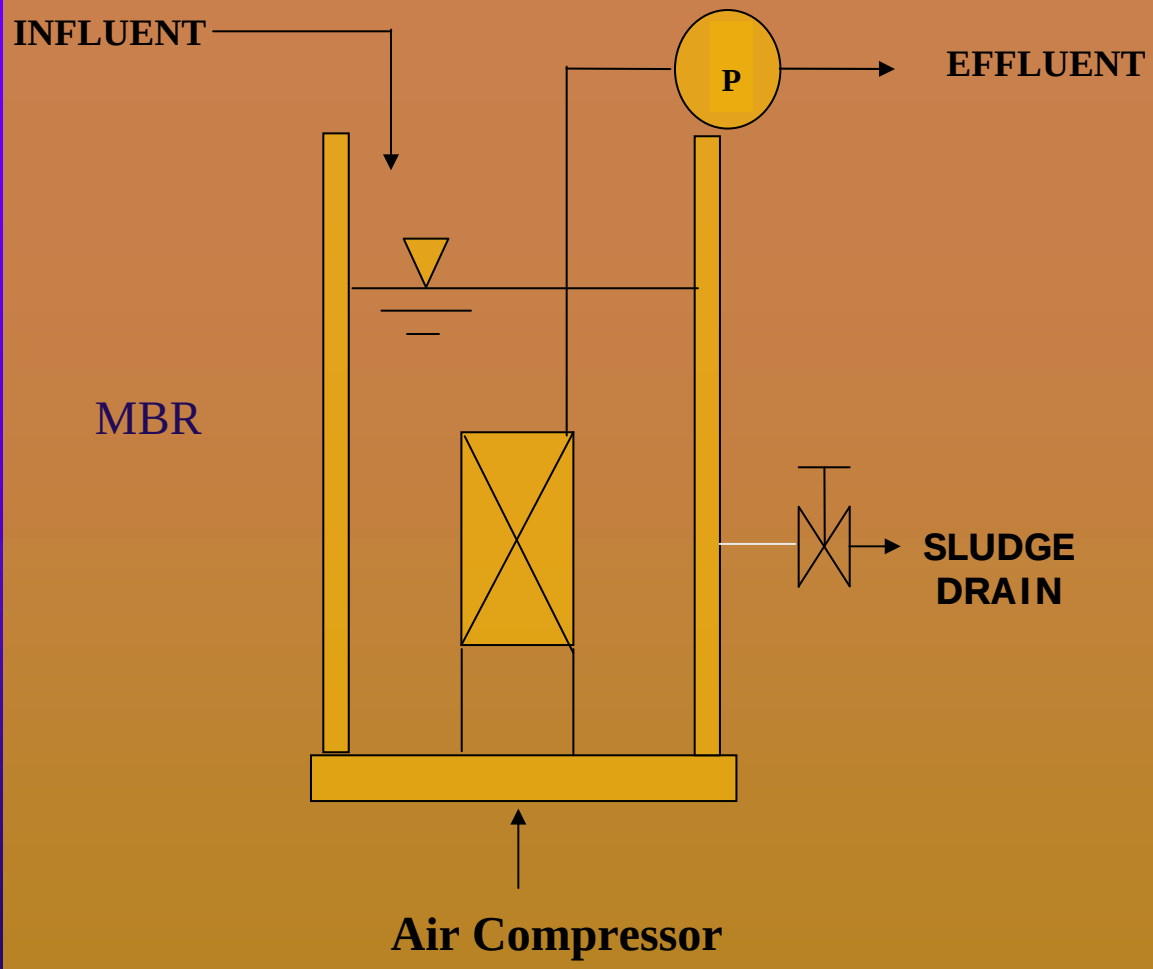
Investigation Condition

- Flat sheet MF membrane with pore size of 0.4 micron, submerged in MBR
- Raw wastewater from Textile Industry in eastern part of Thailand. The raw wastewater has been neutralized and then sent to pilot MBR plant.
- Investigate on effects of sludge age and intermittent aeration time on MBR performance for treatment of textile wastewater

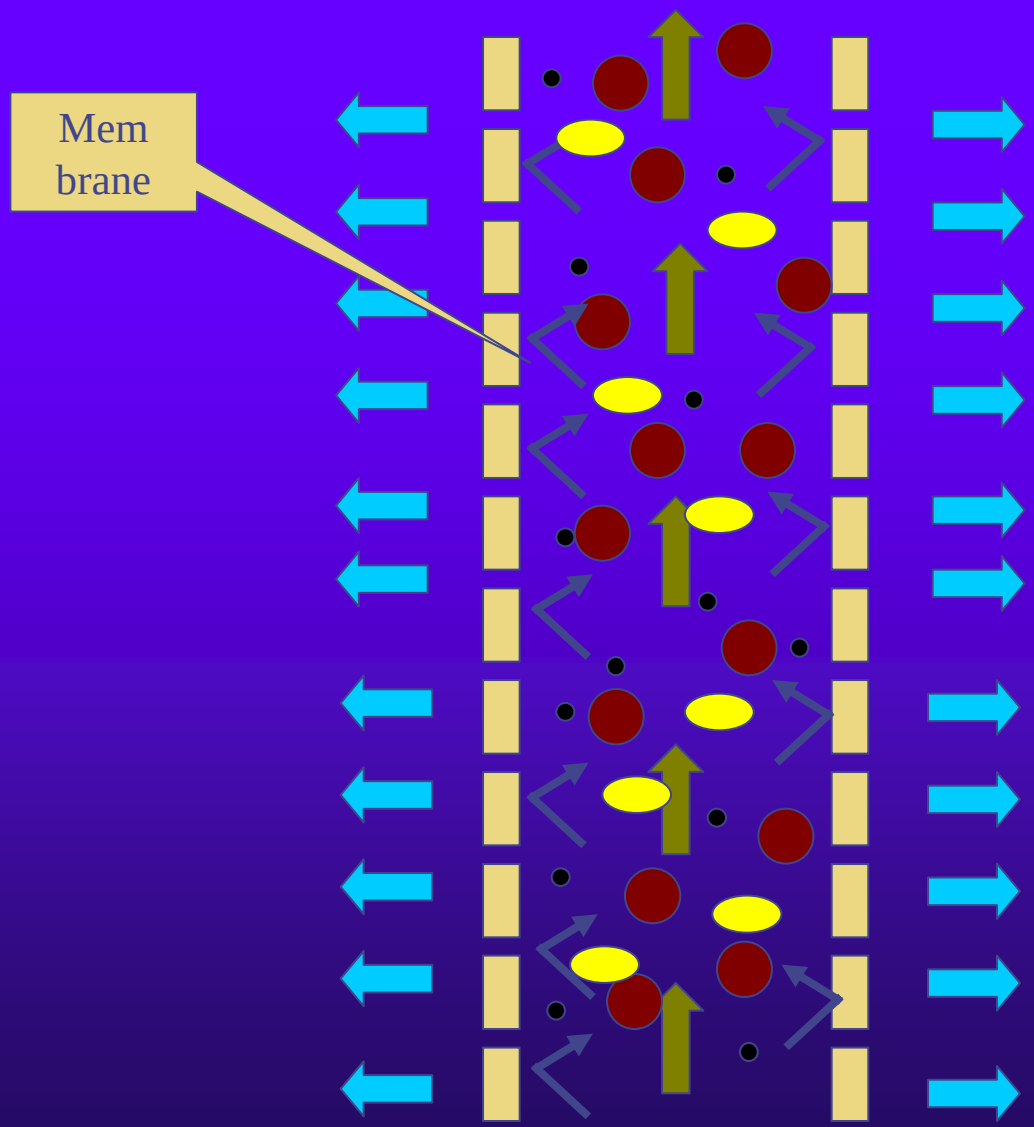
Wastewater characteristics of Textile wastewater

PARAMETERS	UNIT	VALUE
BOD_5	mg/l	98.4
COD	mg/l	349.9
Color	SU	66.06
TKN	mg / l as NH_3	10.35
EC	µS / cm	1432
pH	-	10.2
SS	mg/l	44.5

Schematic diagram in Membrane bioreactor



Membrane backwashing



INVESTIGATION CONDITION

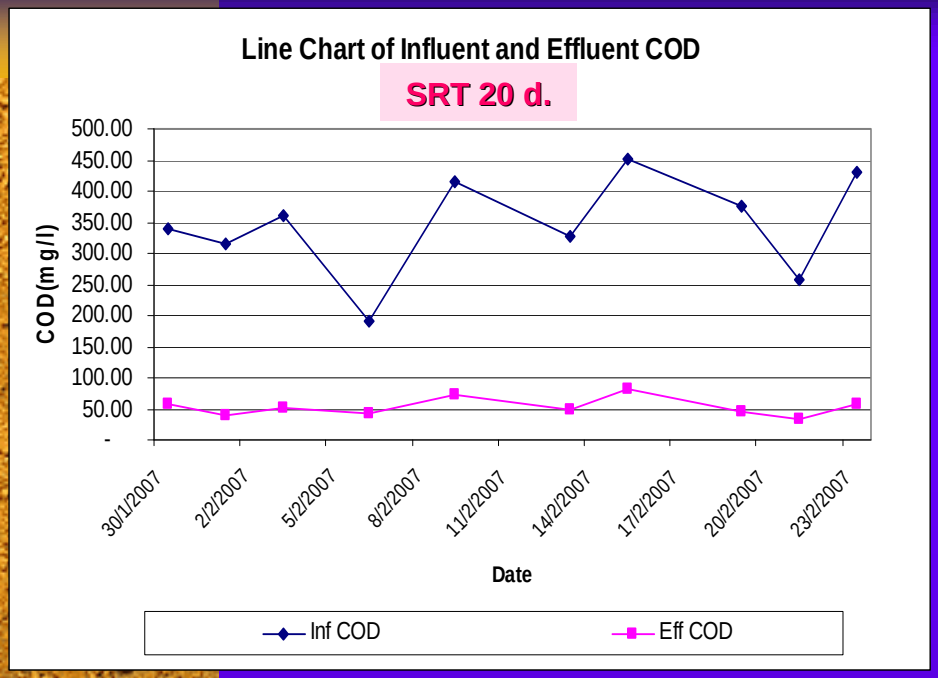
Compare: 1. SLUDGE AGE 20 DAYS

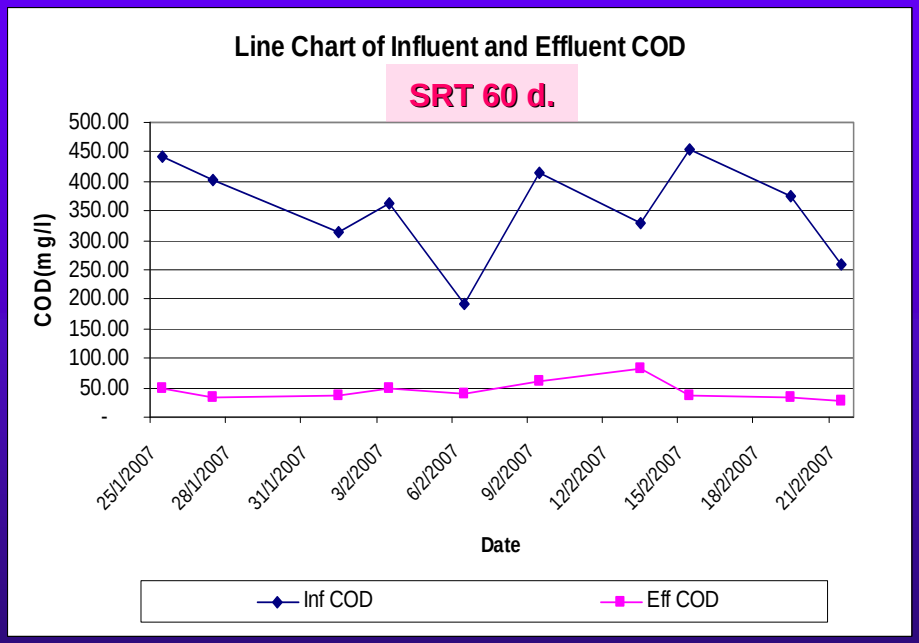
- 2. SLUDGE AGE 30 DAYS
- 3. SLUDGE AGE 60 DAYS

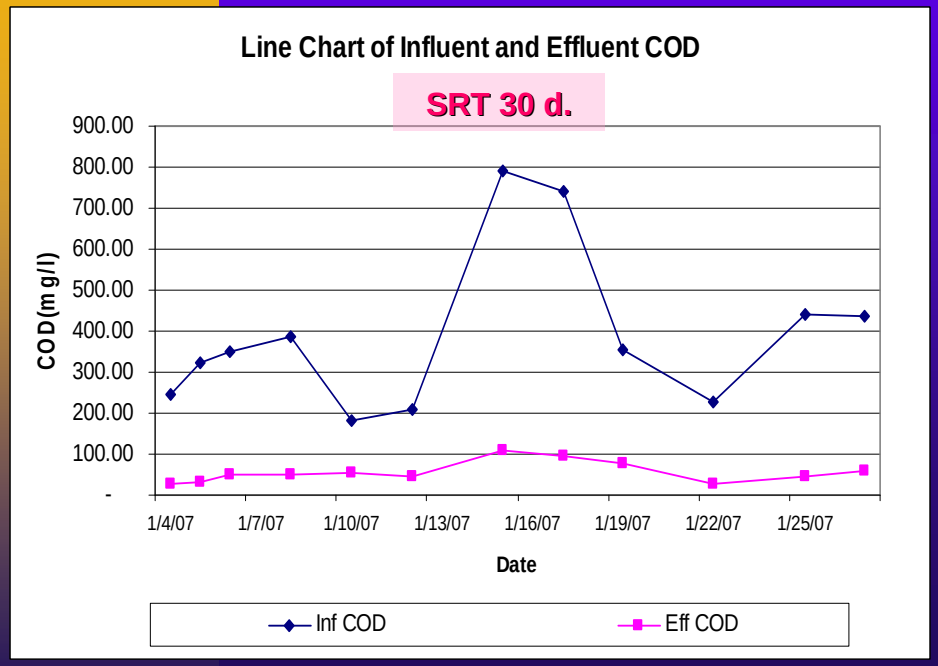
➔Compare Continuous aeration mode and intermittent aeration mode at 30/30, 45/45, 60/60 minutes

➔ DO in aeration tank is maintained higher than 4.0 mg/l during aeration period

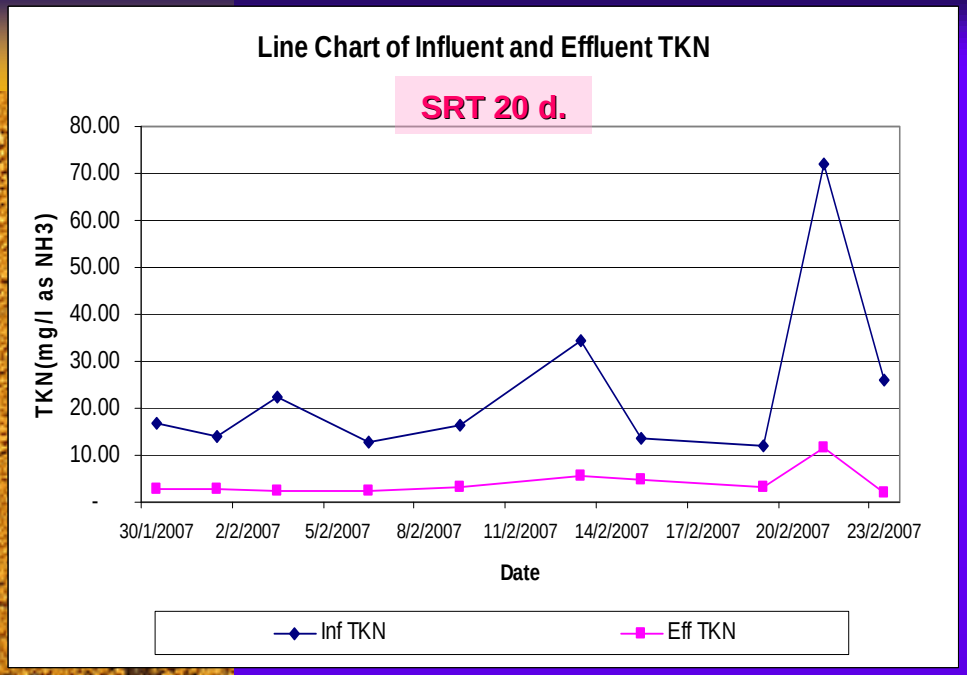
PERFORMANCE OF MBR FOR COD REMOVAL

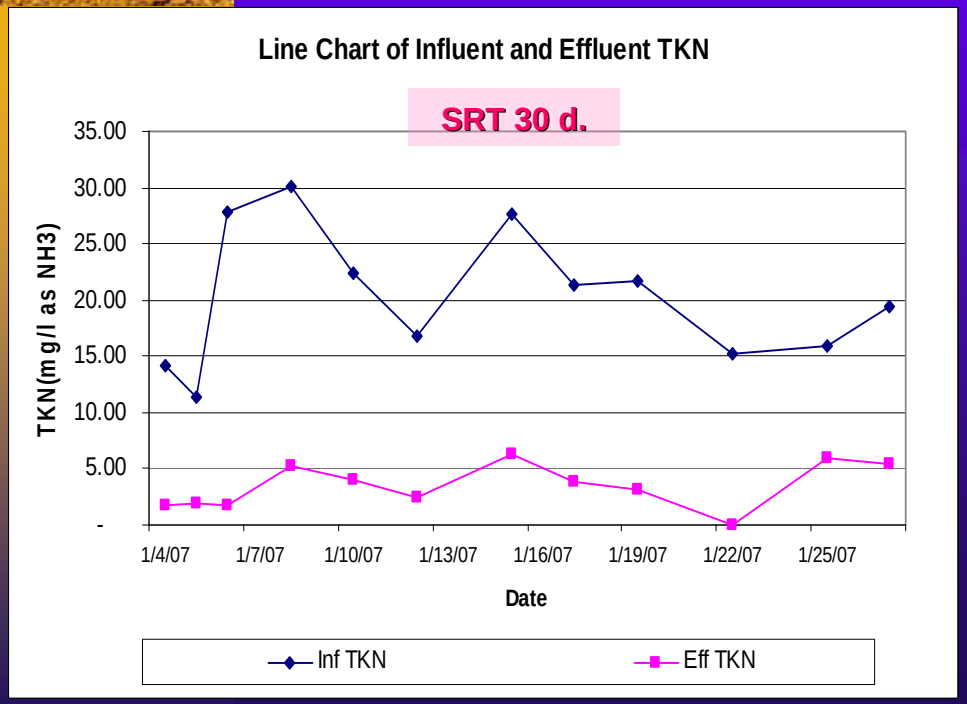


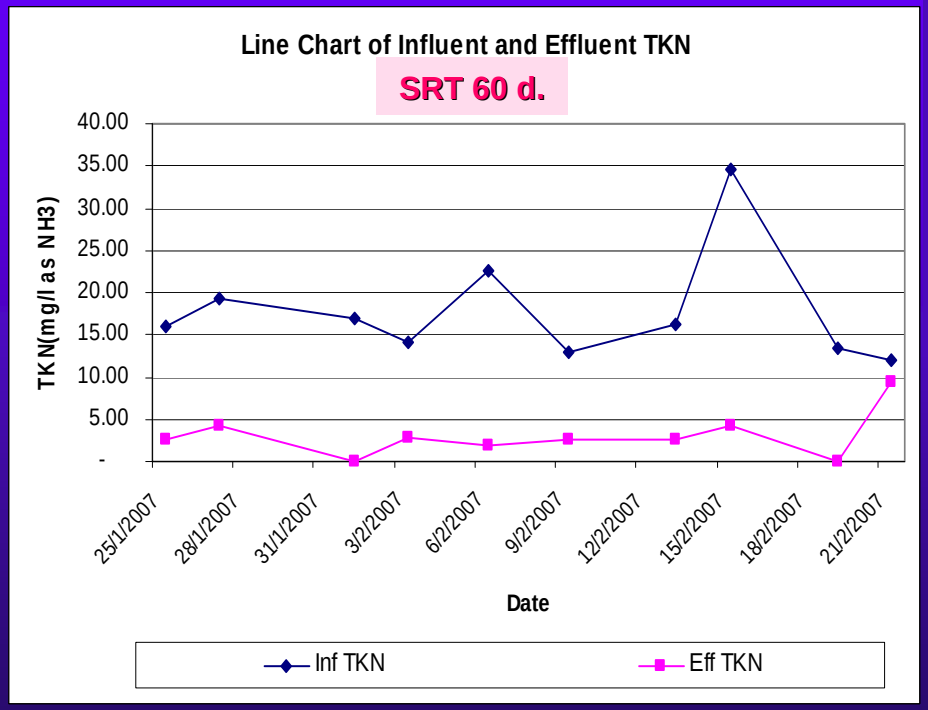




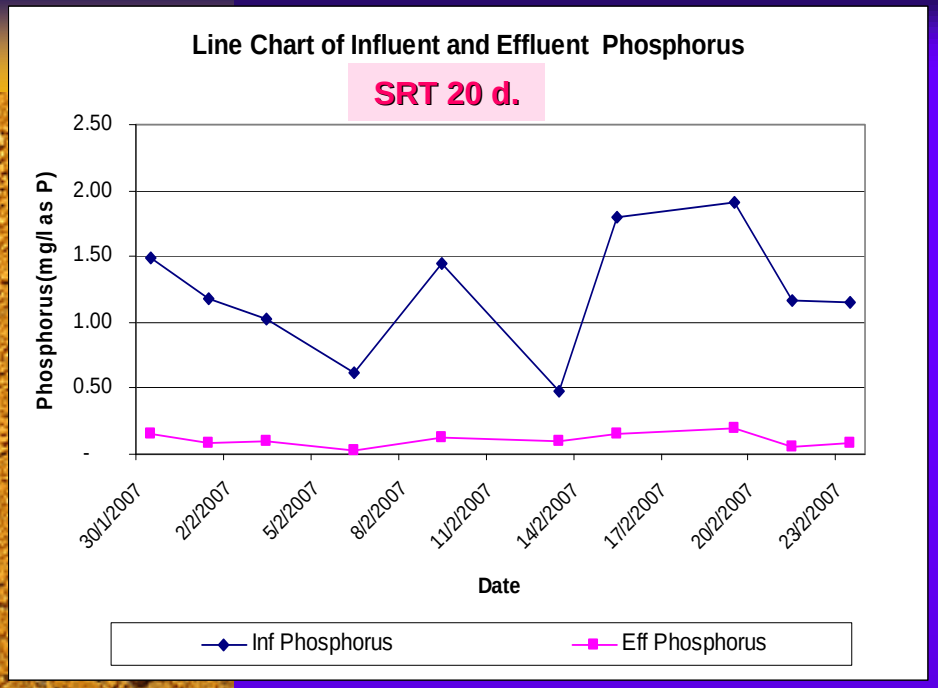
Performance of MBR for TKN Removal

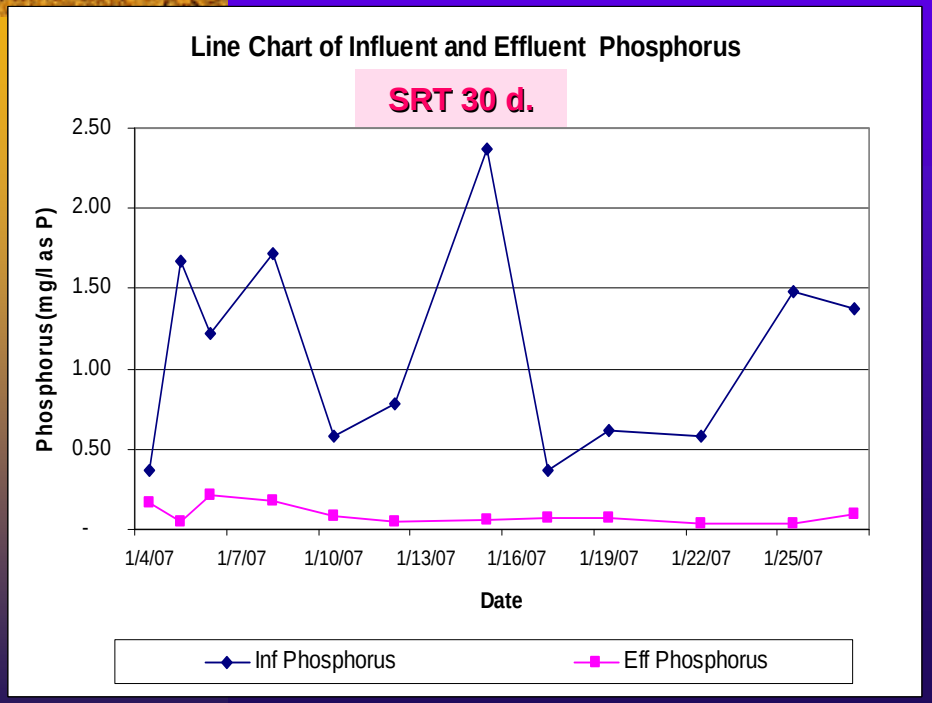


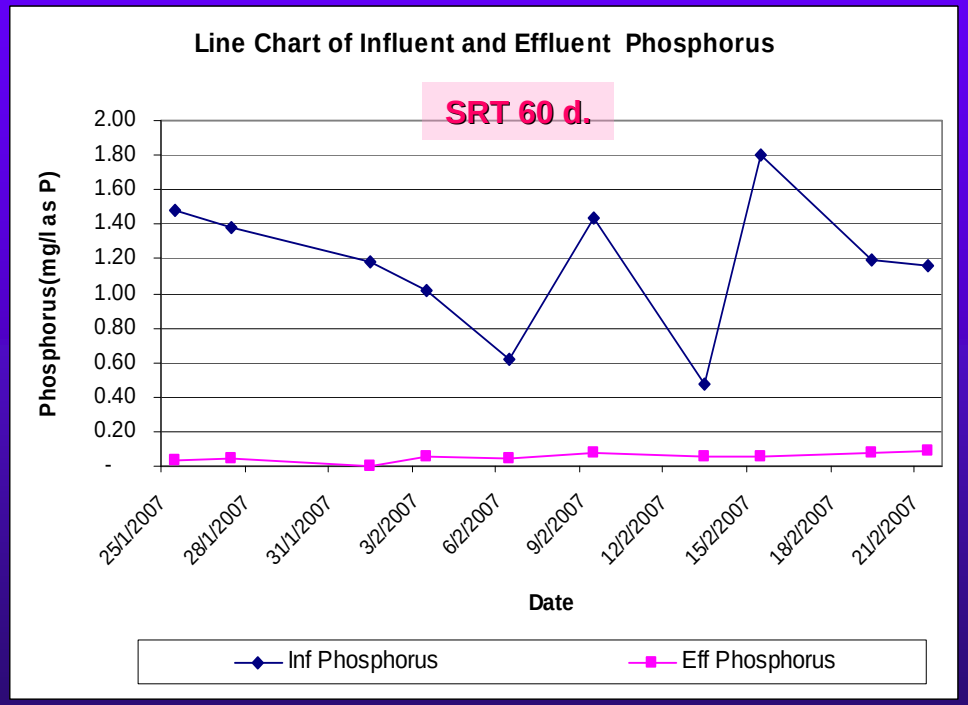




Performance of MBR for Phosphorus Removal





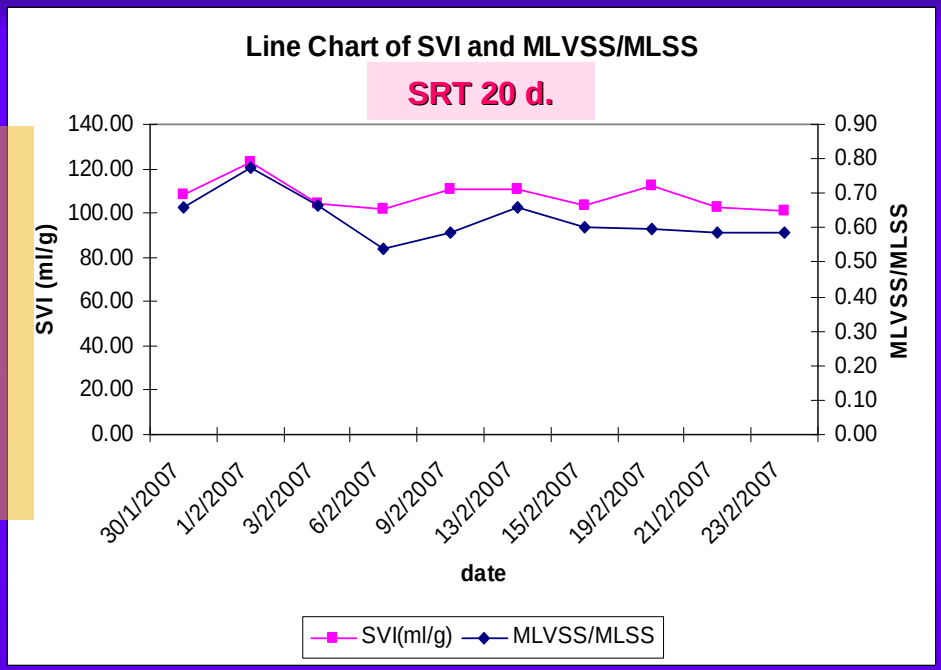


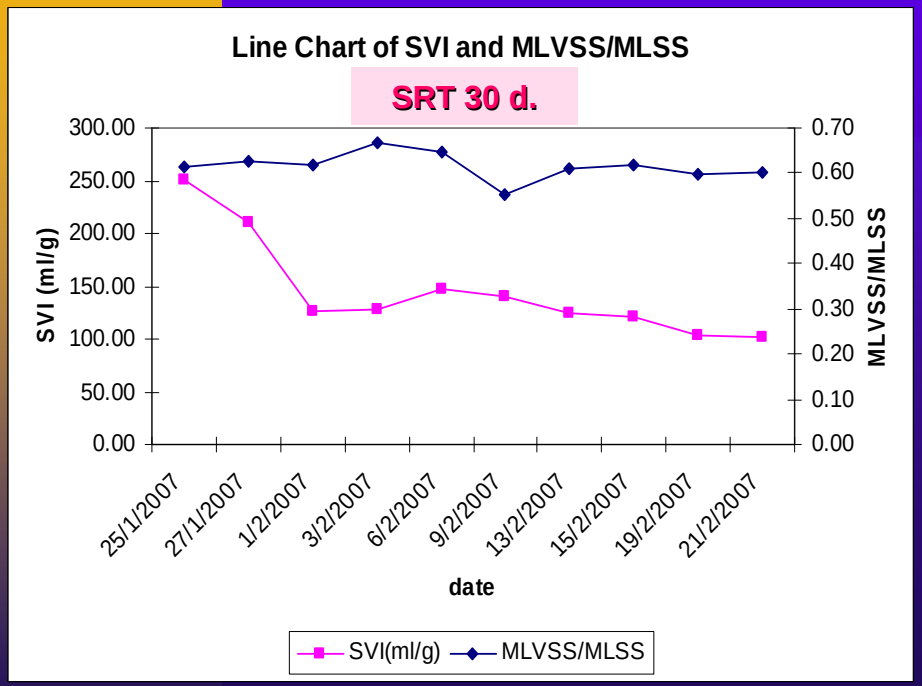
Color Removal

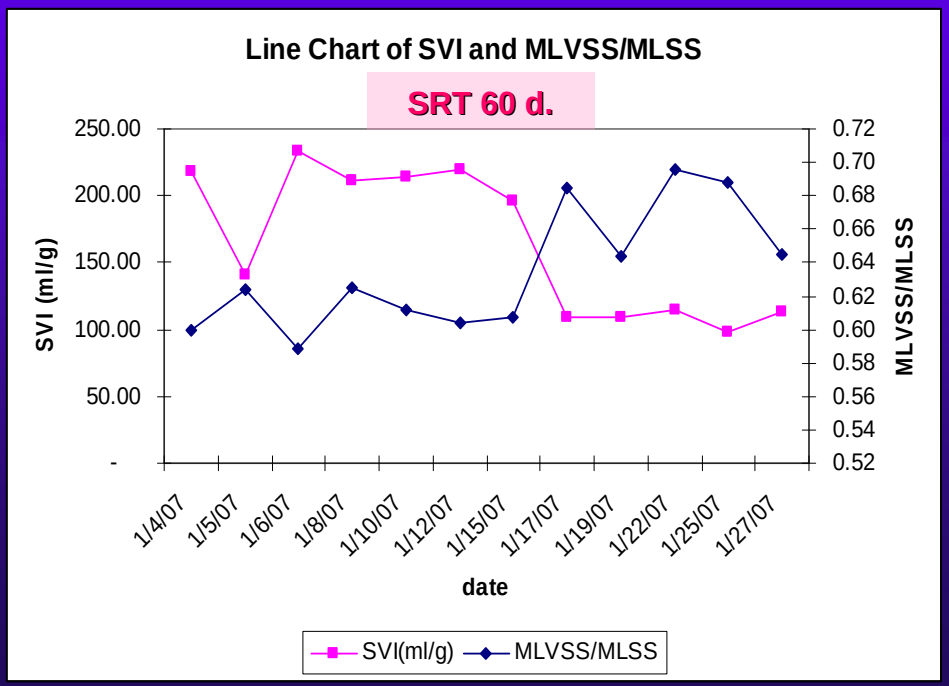
Before

After

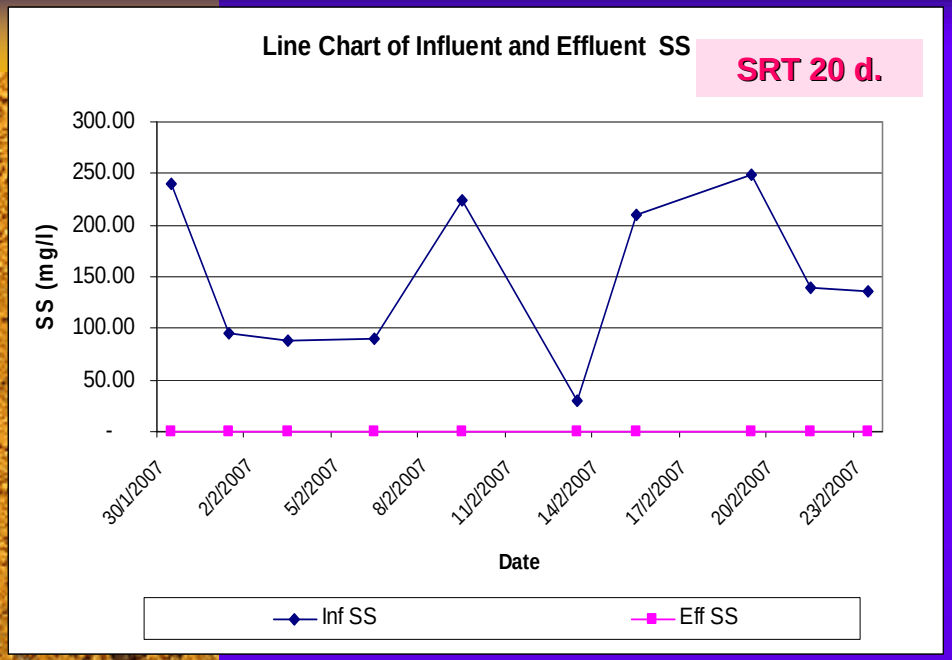
SVI and MLSS/MLVSS inside MBR system

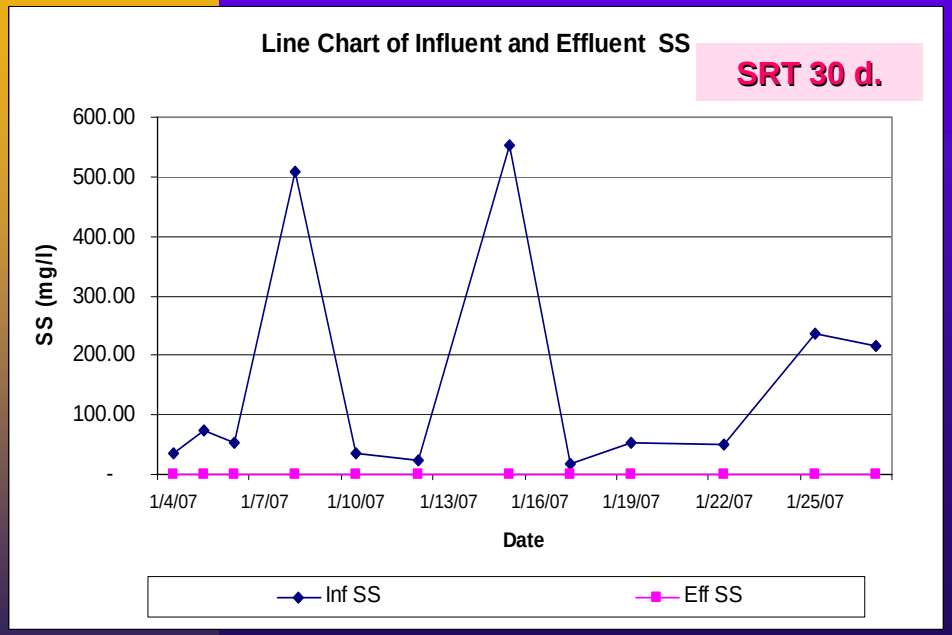


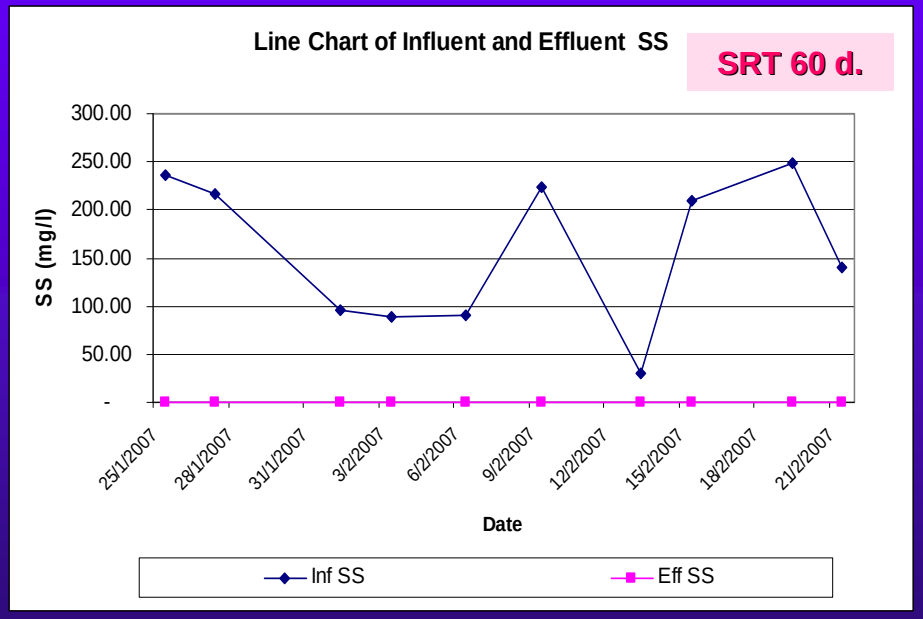




Performance of MBR for SS Removal







Effect of sludge age on removal percentage of textile wastewater treatment using SMBR

SRT (days)	COD (%)	BOD (%)	TKN (%)	NH4 (%)	TP (%)	Color (%)
20	84.6	91.0	92.8	91.9	91.1	74.4
30	85.6	94.5	93.0	97.6	91.6	86.8
45	85.0	93.5	93.5	90.4	94.1	65.0
60	87.3	94.9	93.1	94.2	95.5	85.1

Effect of Intermittent aeration time on removal percentage of SMBR for textile wastewater

Intermittent time (mins)	COD (%)	BOD (%)	TKN (%)	NH4 (%)	TP (%)	Color (%)
30/30	83.1	97.1	91.0	93.6	92.1	81.6
60/60	83.7	98.5	95.9	93.3	95.0	81.6
90/90	88.7	98.2	88.5	85.0	91.0	71.1
Continuous aeration	85.6	94.5	90.0	97.6	91.6	87.0

Conclusion

- MBR system with sludge age 60 days and intermittent aeration mode at 30/30 minutes was selected here for the system with less sludge wastage and high performance of wastewater treatment
- MBR system has better performance than the traditional AS system, used in this factory.
- ➔ Better effluent quality could be obtained with space saving MBR unit.

Case study 2: Decolorization of with nanofiltration system

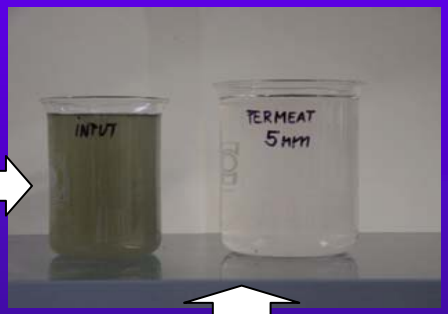
Decolourisation of dyeing wastewater with NF system

WATER

DYING PROCESS

RINSING PROCESS

WASTEWATER



WASTE

FILLING

NANOFILTRATION MODULES

DECOLOURED WASTE

Decolorization with NF system

Advantage of MBR Technology

Minimum space required for plant
Modular assembly (easy to upgrade for higher capacity)

Increasing of micro-organism concentration possible, specialised and well adapted micro-organisms help to degrade problematic pollutants

Water for reuse (irrigation, rinsing water etc.)
= > better retention of micro-organisms
= > saving costs for freshwater
= > saving water resources (protecting the environment)

Maximum health protection (closed system)
No smell
Possible same running costs compared to conventional technologies


Thank you
for
attentention