Advanced water and wastewater treatment technologies in Thailand

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Typical Industrial Wastewater treatment systems in Thailand

- 1.Aerated Lagoon 14.38%:
  ➔ Dye and breaching industry, Pulp and mill industry, and Food industry Dairy, Canned seafood, Cassava starch industry, and Slaughterhouse

2. Activated Sludge 11.92%:
  ➔ Brewery industry, Palm Oil industry, Food industry

3. Anaerobic Pond + Aerated Lagoon 10.57%:
  ➔ Canned seafood industry, Cassava starch industry, Instant noodle industry, Food additive industry, and Slaughterhouse

Aerated Lagoon

Membrane Technology in Thailand

Koh Sichang (Sichang Island,Chonburi)

Koh Sichang Waterworks was established in 2000, which was considered the first waterworks in Thailand that had a capacity of producing fresh water from seawater.

It currently has a production capacity of 250 cubic meters/day to provide quality tap water to a community of approximately 1,600 households of Koh Sichang Municipality at Koh Sichang District, Chonburi Province.

Membrane Technology in Thailand

Koh Samui Waterworks

Currently, Koh Samui Waterworks is considered the biggest RO plant in Thailand, which converts freshwater from seawater. Established in 2005 with a production capacity of 2,500 cubic meters/day and plans to increase production to 3,000 cubic meters/day within 2007.

The increased production of fresh water will distribute to the people and various tourist outlets on the island all year round.

Some Pilot-scale Projects on membrane technology by Dr.Chavalit R., Chula

Case study 1:

TOWARDS SAFE DRINKING WATER PRODUCTION WITH PILOT-SCALE NANOFILTRATION

- The pilot-scale nanofiltration(NF) system, using microfiltration (MF) as a pre-treatment system was set-up under MWA (Municipal Waterwork Authority) research project

  ➔ in order to investigate removal performance for THM precursors, a preventive approach, in water treatment plant.

- In most of surface water, concentrations of the mentioned precursors highly present ranging from 1 to 20 mg/L as TOC (Total Organic Carbon), which made them important precursors.

MEMBRANE SYSTEM

NANOFILTRATION SYSTEM

MICROFILTRATION SYSTEM

Membrane specification:

- NF membrane:

- ESNA1-4040 manufacturered by Nitto Denko Corp.
- Spiral wound module with effective surface area of 7.9 m2

MF membrane:

- Pore size: 0.1 micron
- Membrane surface area: 8 m2
- Hollow fiber MF, manufactured by Mitsubishi Rayon

Solids Contact Clarifier at Bangkhen WTP

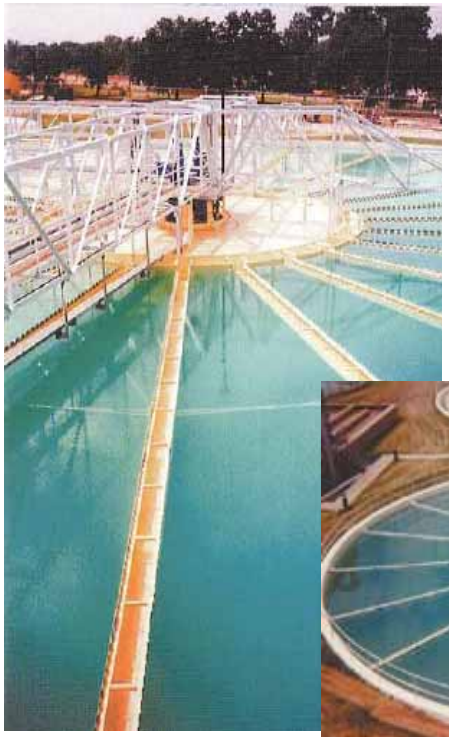


Table 1 Characteristics of treated water from full-scale solid-contact clarifier and high-rate sand filter, Bangkhen WTP

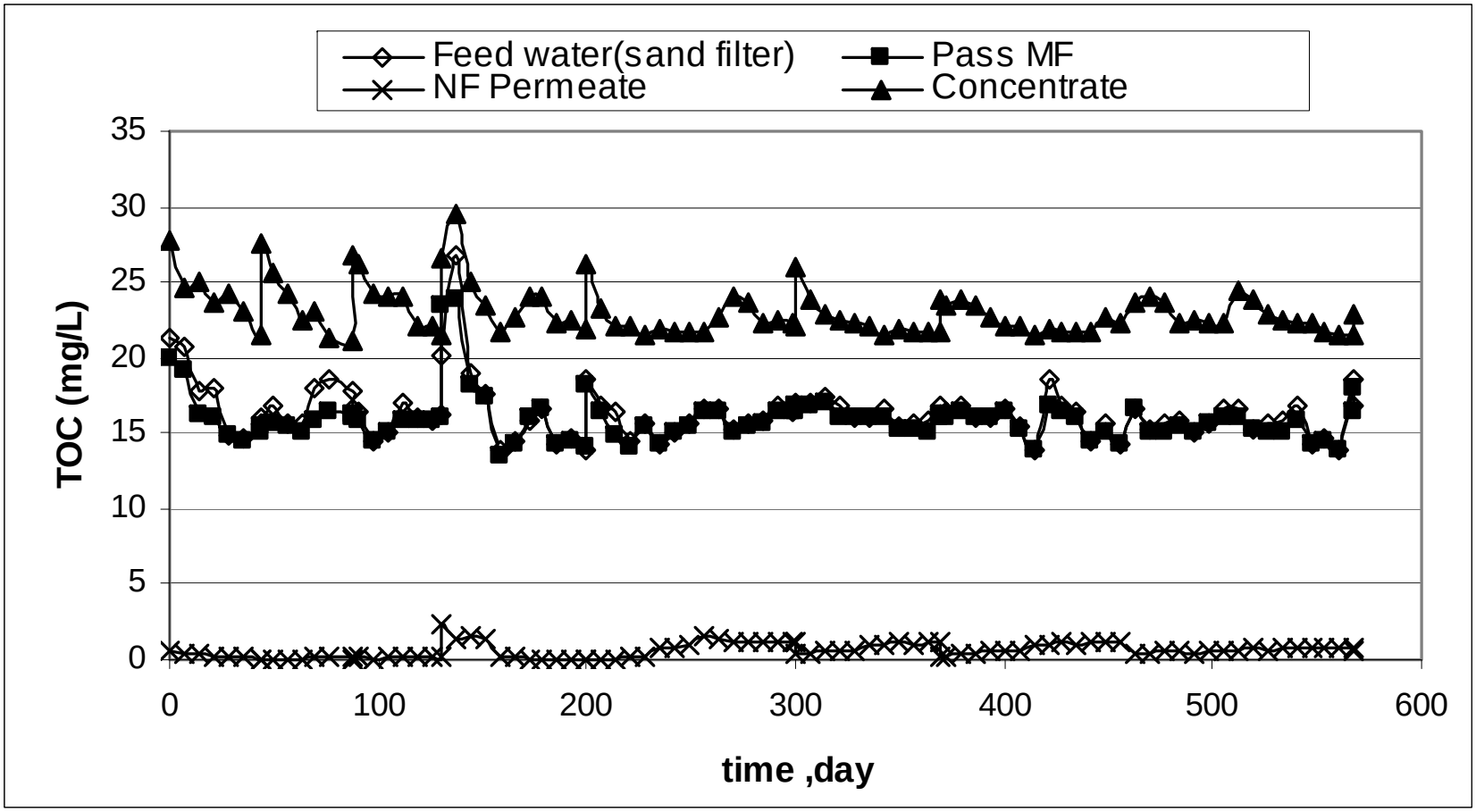
Parameter	Range of values
Temparature (C°)	28-32
pH	6.9-7.5
Turbidity (NTU)	5-7.8
Hardness ($mgCaCO_3/L$)	60-100
TOC (mg/L)	12-22
UV254 (cm^{-1})	0.05-0.12
Conductivity (μs/cm)	200-350

- Microfiltration (MF), was used as pre-treatment system for NF system.

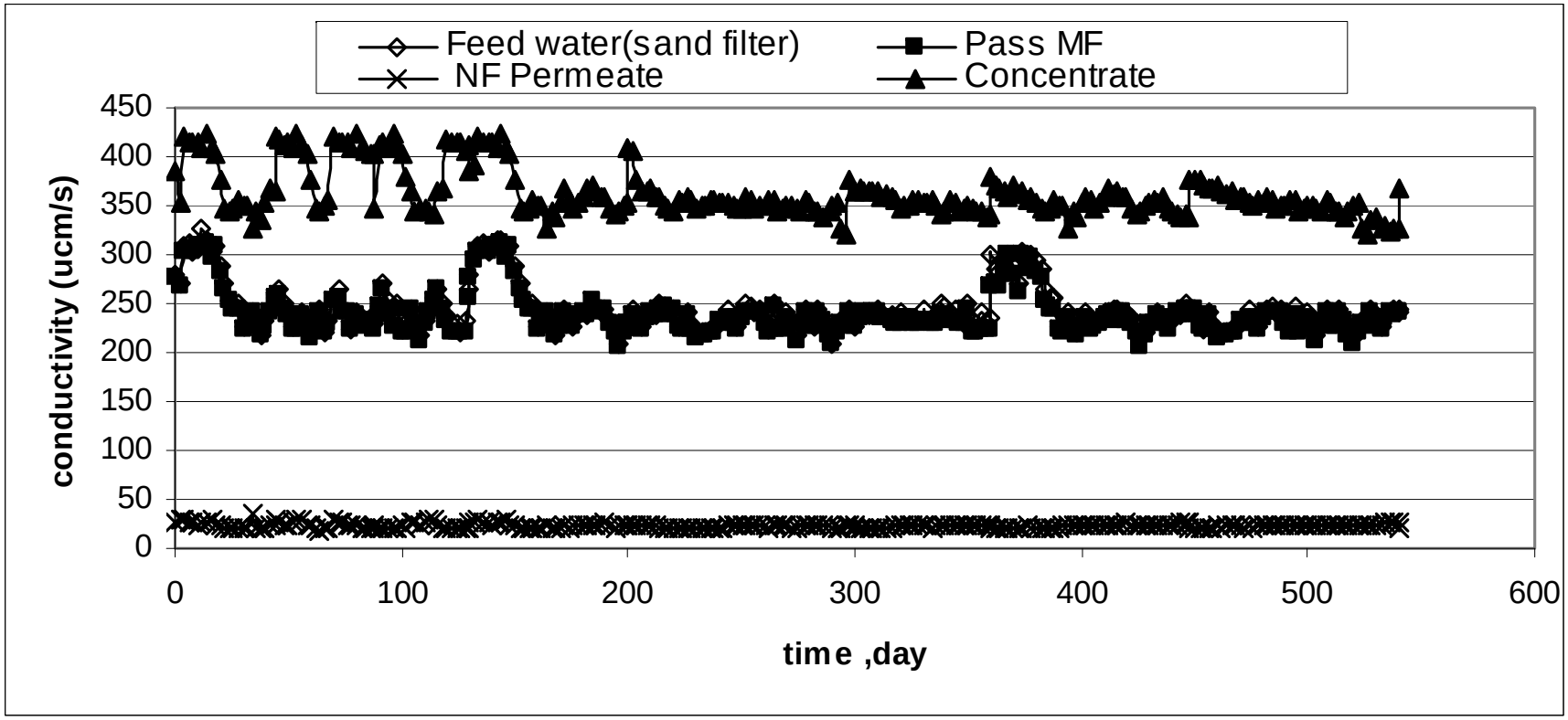
- The membrane filtration system had been long-run operated for more than 550 days in order to investigate stability of the system.

- The operating pressure of NF was at 4 bars and recovery percentage at 70%.

Long run operation of pilot-scale nanofiltration membrane system for safe water supply production



SALT(CONDUCTIVITY) REMOVAL



RESEARCH INVESTIGATION

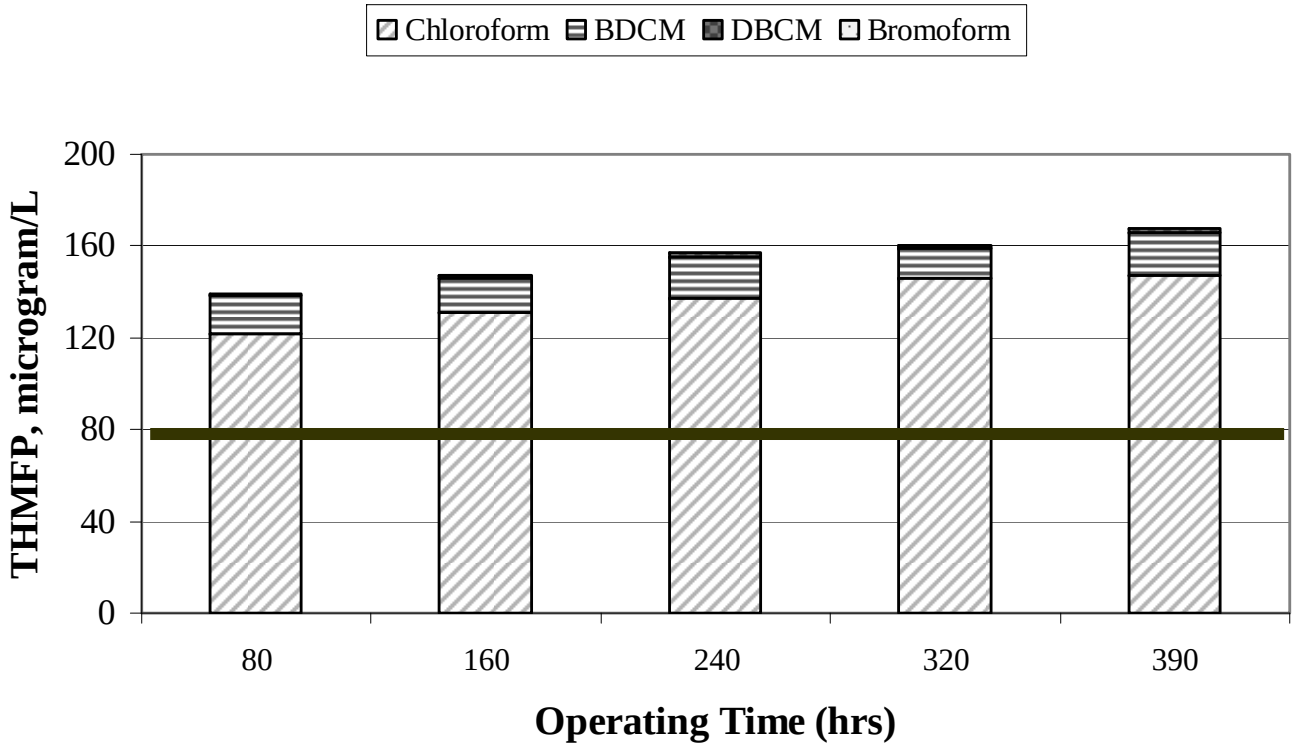
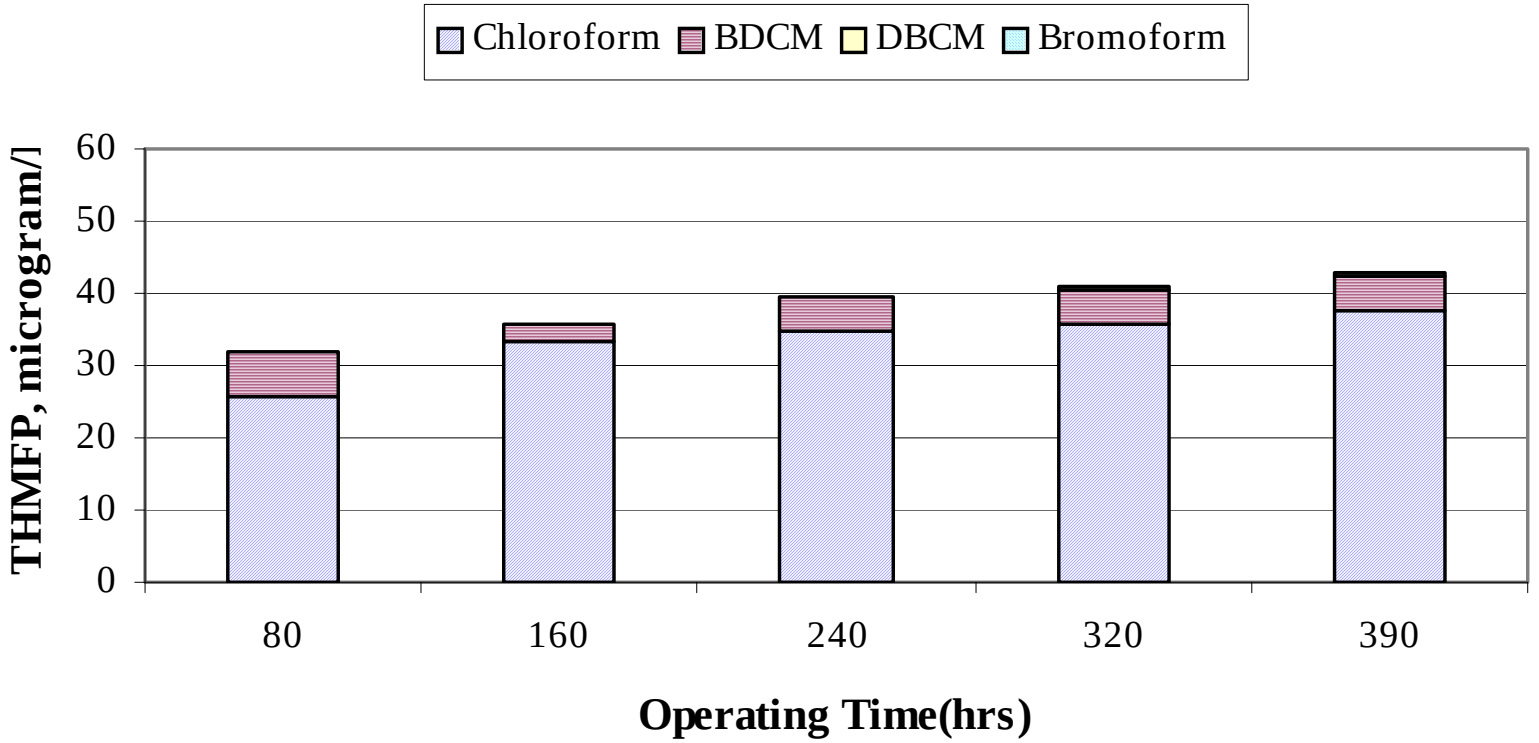


Fig.3 Characteristics of THMFP in feed water before NF membrane process

NF SYSTEM PERFORMANCE

- AFTER NF TREATMENT



Wastewater reuse

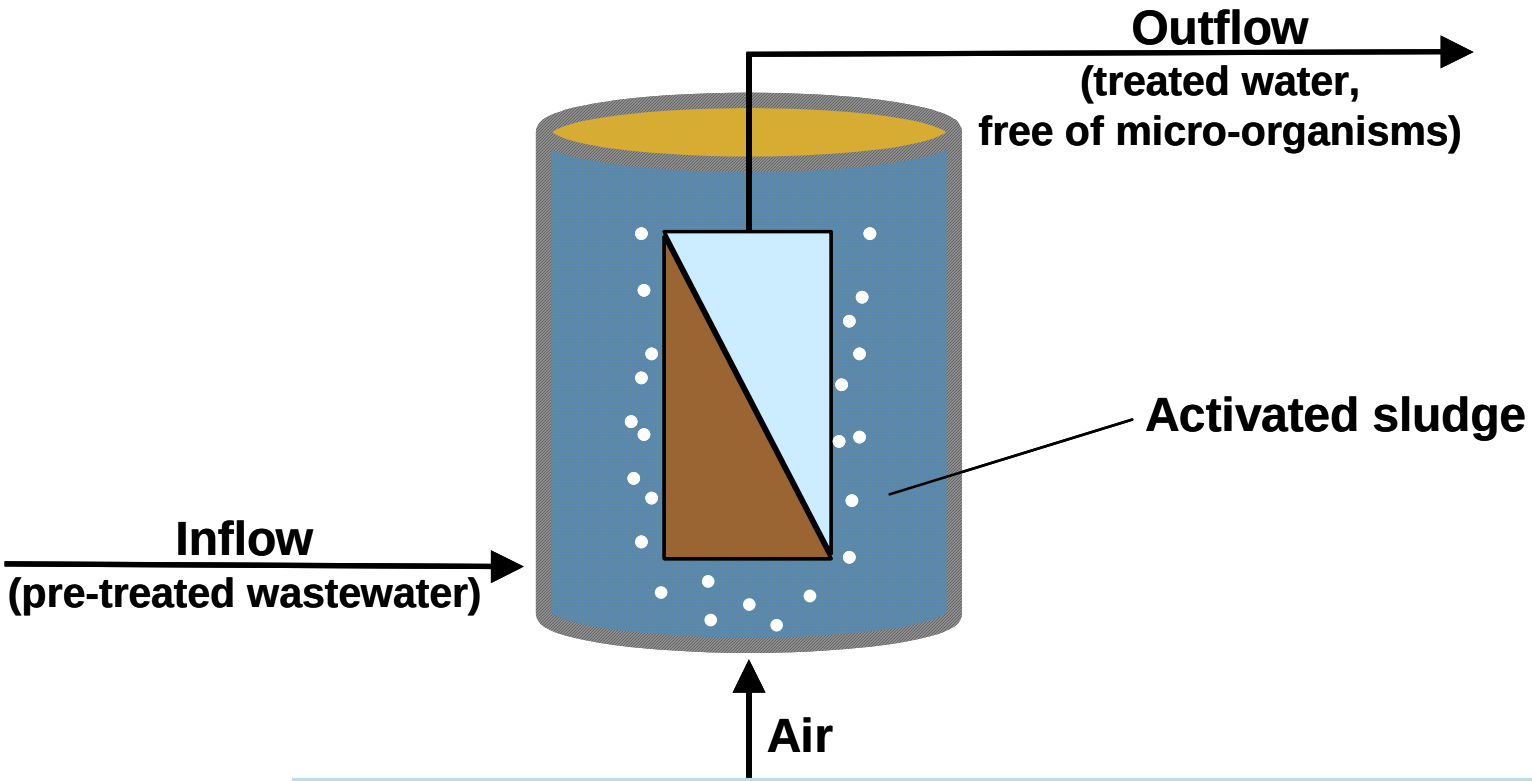
- In Thailand, wastewater reuse practice is recognized recently due to previous water scarcity problem in many parts of Thailand.

- Common practices are wastewater reuse for agricultural application and wash water for various purposes.

Case study 2

- DEPARTMENTSTORE WASTEWATER REUSE BY AN ON-SITE PILOT-SCALE SUBMERSIBLE MEMBRANE BIOREACTOR (SMBR)

SMBR 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.

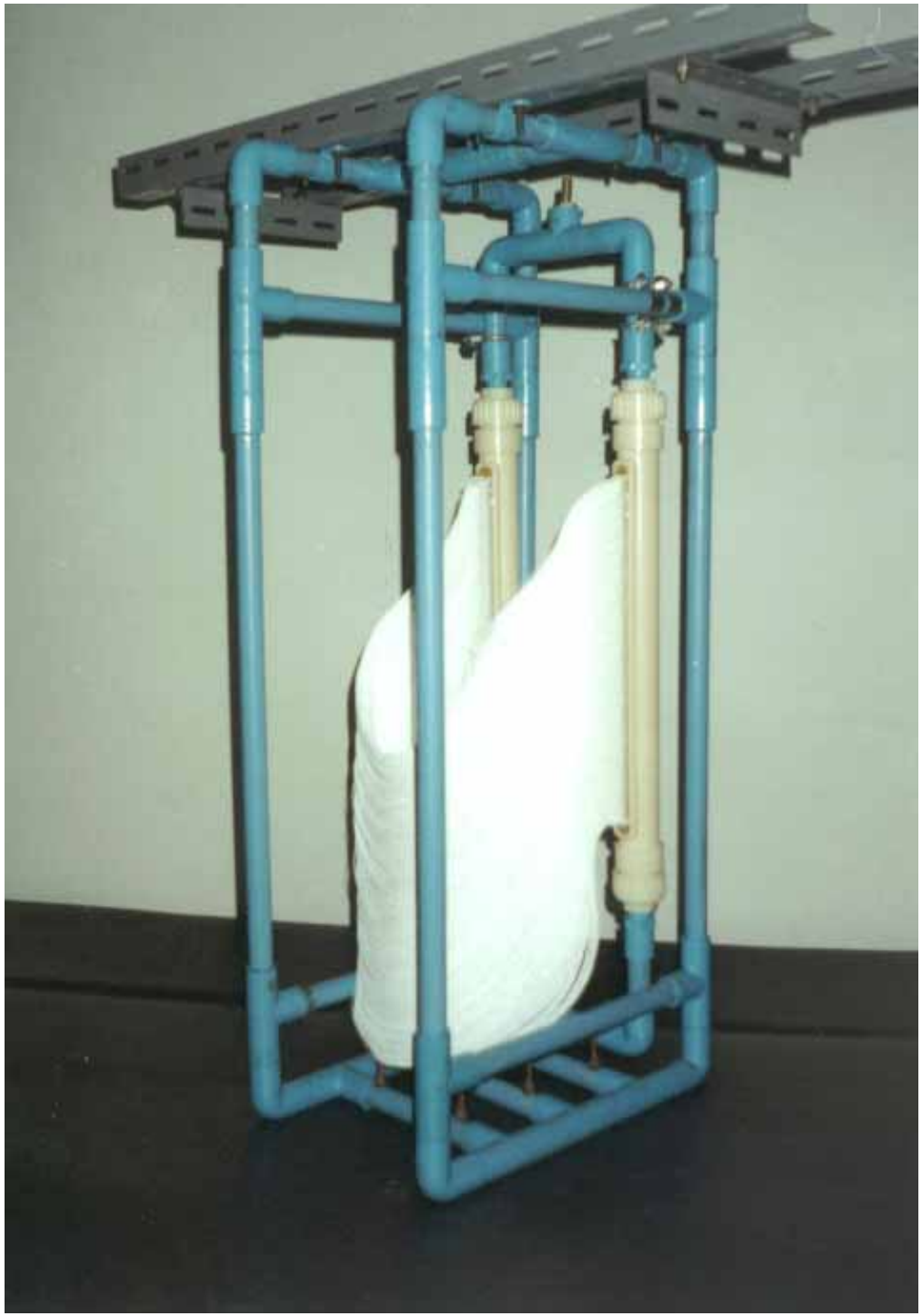


Table 2 Wastewater characteristics from Departmentstore A

Parameters	Max. Conc.	Min.Conc.	Avg.Conc.	SD
pH	7.4	6.8	7.0	0.14
Turbidity (NTU)	130	60	104	16
Suspended Solids (mg/l)	1,160	100	295	181
COD(mg/l)	1,181	167	601	189
TKN (mgN/l)	110	22	56	15
Nitrite Nitrogen (mgN/l)	0.37	0.00	0.01	0.01
Nitrate Nitrogen (mgN/l)	3.10	0.48	1.39	0.86

Membrane permeate flux and transmembrane pressure

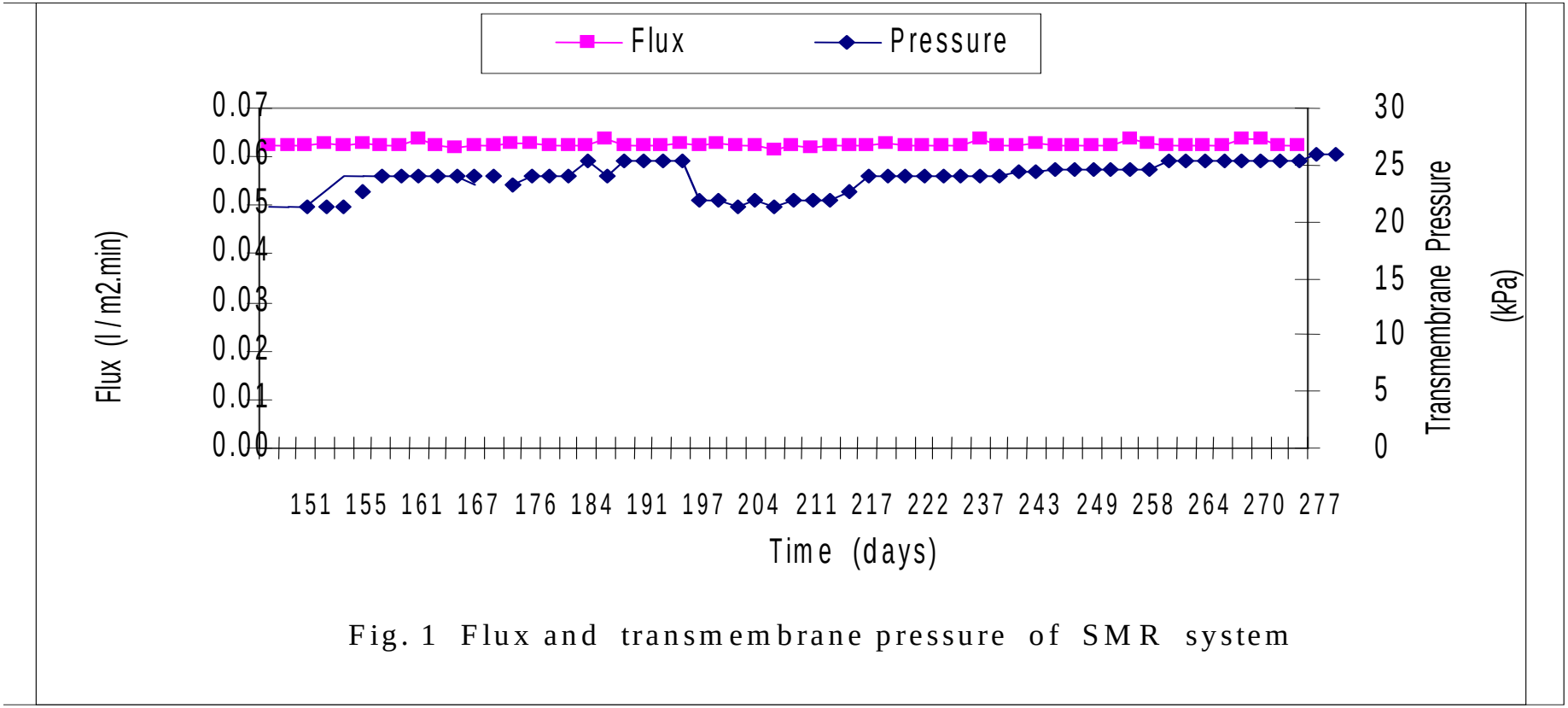


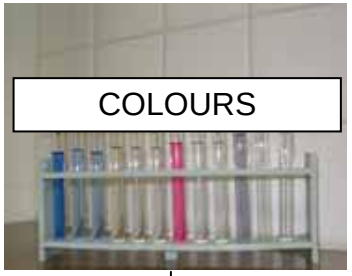
Fig. 1 Flux and transmembrane pressure of SMR system

Table3 Comparison of effluent quality from SMBR system with The building wastewater reuse guideline for toilet-flushing purpose

Parameters	Effluent quality	Wastewater reuse guideline (For toilet flushing)
PH	7.2	5.8-9.0
Turbidity (NTU)	0.1	≤ 5
Suspended Solid (mg./l.)	0.2	≤ 5
COD (mg./l.)	16	≤ 40
TKN (mg./l.	1.4	≤ 5 (NH_4)
BOD (mg./l.)	6	≤ 10
Color (SU)	0.9	≤ 10
Fecal Coliform	Not detectable	not detectable

Case study 3: Decolorization of Dyeing wastewater with nanofiltration system

Decolourisation of dyeing wastewater with NF system



WATER

DYING PROCESS

RINSING PROCESS

WASTEWATER

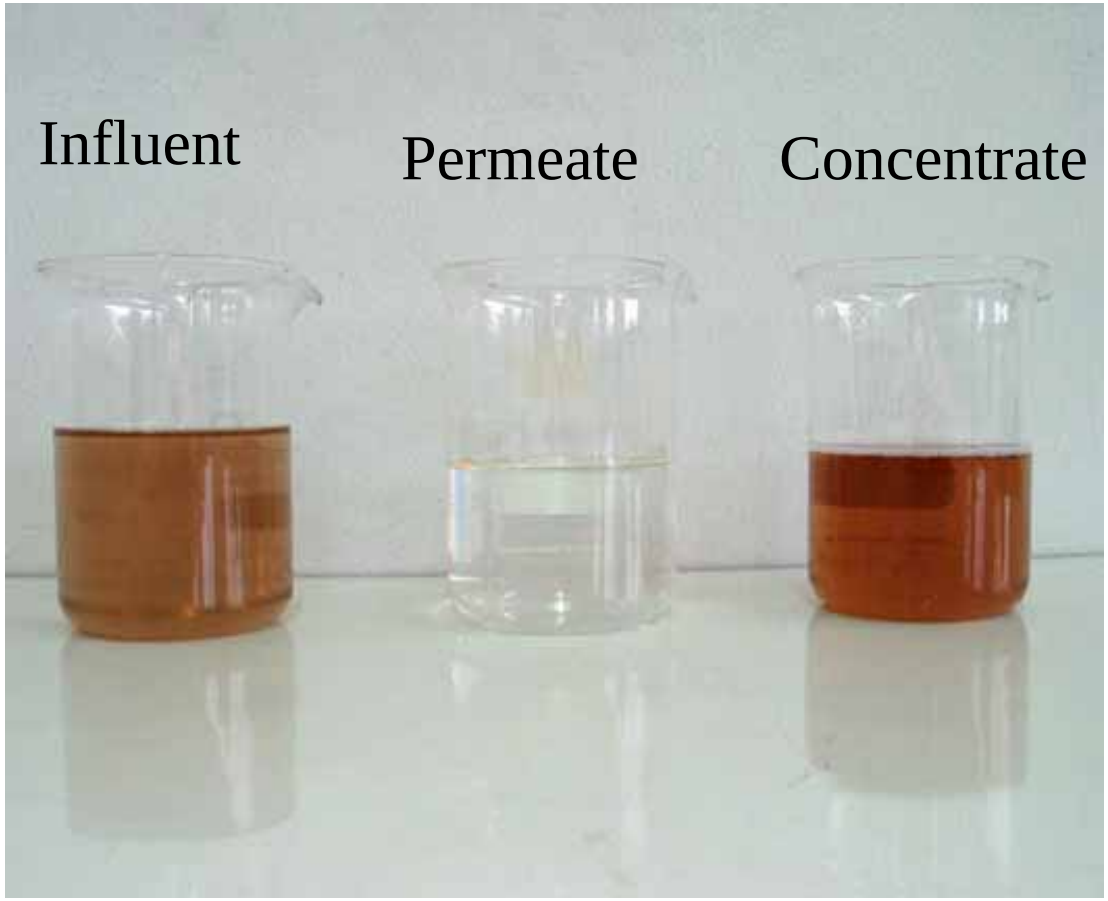
DECOLOURED WASTE

WASTE

FILLING

NANOFILTRATION MODULES

Decolorization with NF system



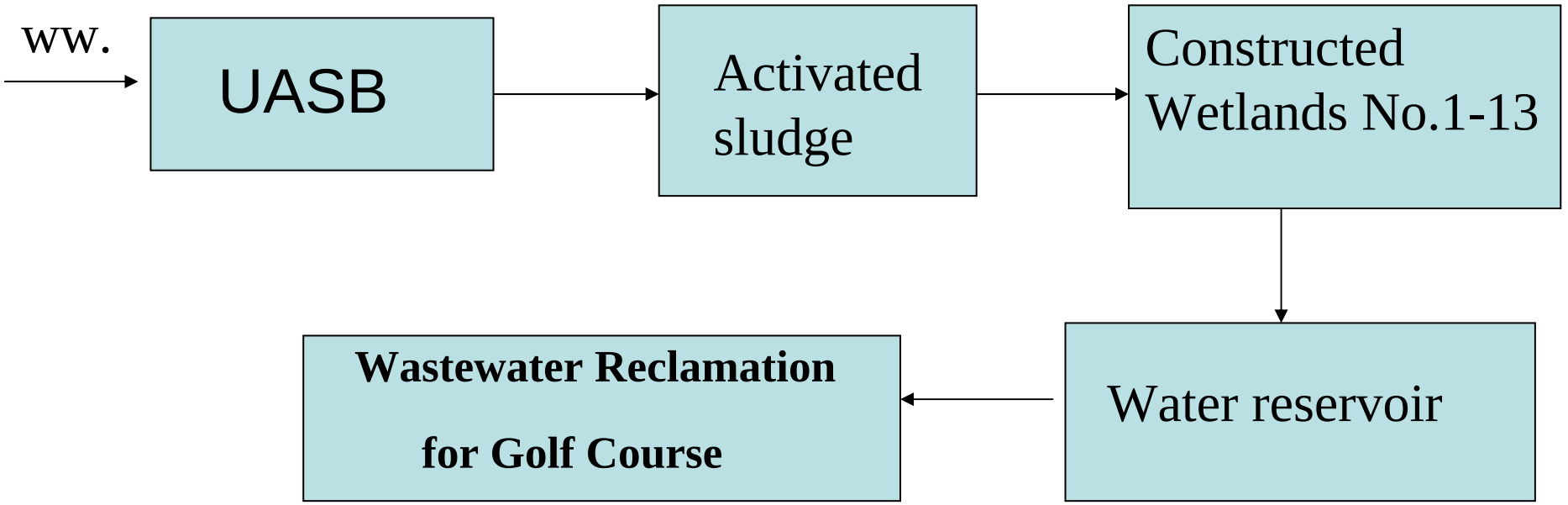
Case study 4: Other wastewater reclamation technology

- ➔ Biological ww. treatment + Constructed wetlands
- ➔ Depends on wastewater reclamation purposes

- ➔ Golf courses normally use high amount of water supply, then wastewater reclamation can serve this purpose

Textile Wastewater reclamation project (Dr.Chavalit's project year 2006-2007)

- Reclaimed water used for golf course (3,000 m^3/d)



Further research needs

➔ New membrane technology with lower cost of investment and low fouling is still needed to be more practical in Thailand.

➔ Wastewater reuse and reclamation aspects become highly concerned due to climate change and drought problems. Then practical methods are still needed to achieve these targets.


Thank you
for
attention