Measure against Algae Bloom in Bangkhen WTP

- Optimum chemical dosing rate

for Aulacoseira spp. removal -

Chaweepan S. (MWA)

Jantima L. (MWA)

Shinichi SASAKI (WaQuAC-NET)

การประปานครหลวง
METROPOLITAN WATERWORKS AUTHORITY

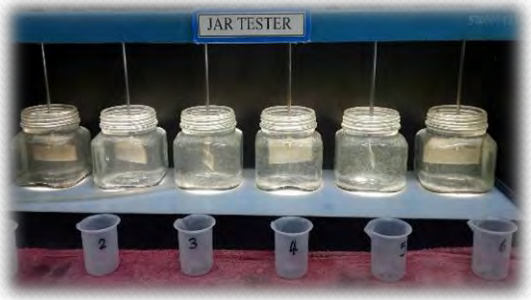
WaQuAC Net
Water Quality Asian Cooperation Network

Contents

1. Cooperation between MWA and WaQuAC-Net
2. Introduction
3. Objectives of the Experiment
4. Experimental Condition
5. Result of experiment
6. Conclusion

1. Cooperation between MWA and WaQuAC-Net

- 2012, Signed MOU for technical cooperation
- 2013, WaQuAC-Net and expert from YWWB held biological survey in Chao Phraya River
- 2014, Surveyed algal diversity in MWA's water sources at upper stream and reservoirs
- 2015, Surveyed algae in Chao Phraya River and West-side reservoirs.
- 2016, Focused to chemical treatment method in WTP by jar testing



2. Introduction

- May, 2015 **Serious filter clogging by *Aulacoseira spp.* caused Bangkhen WTP shut down for a few hours**

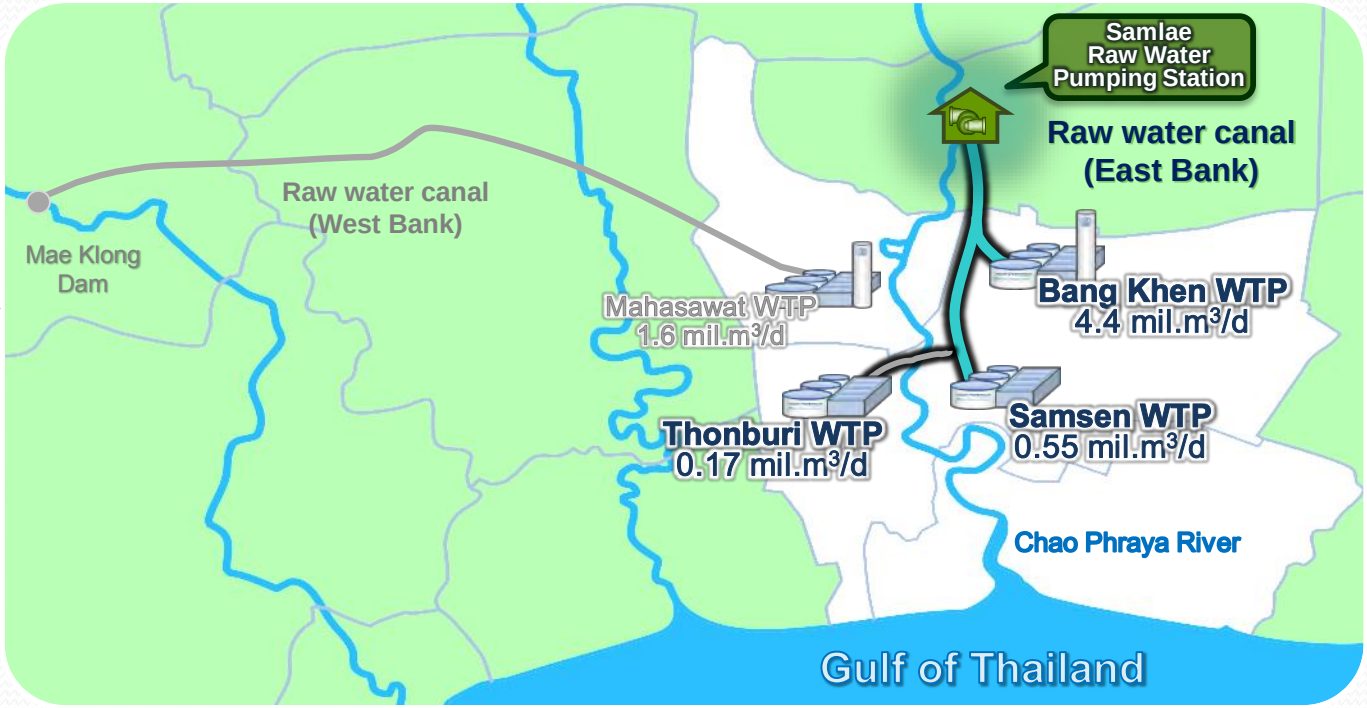
- May, 2016 Drought crisis led to low dilution effect in the river resulting in *Aulacoseira spp.* bloom and shorten filter run of 3 WTPs

Mitigation to reduce algae before entering WTPs

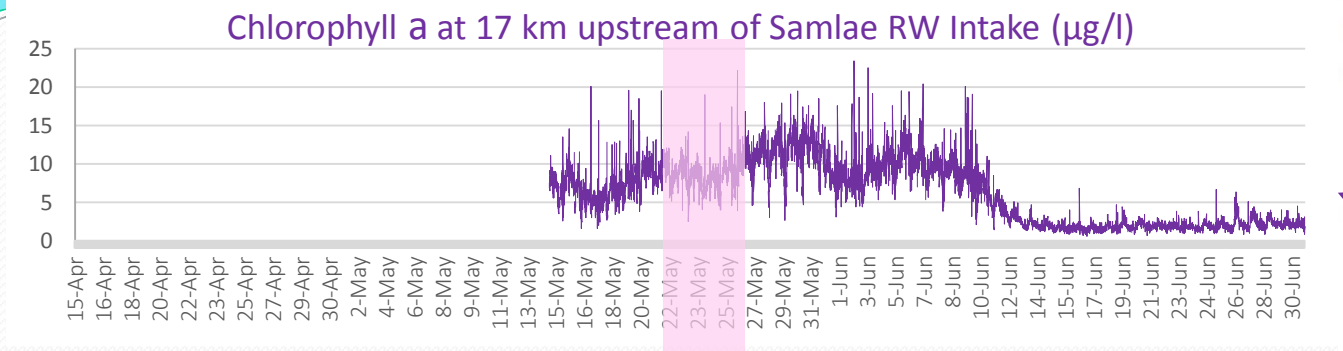
May 12, 2015 Filter surface were covered with Aulacoseira.

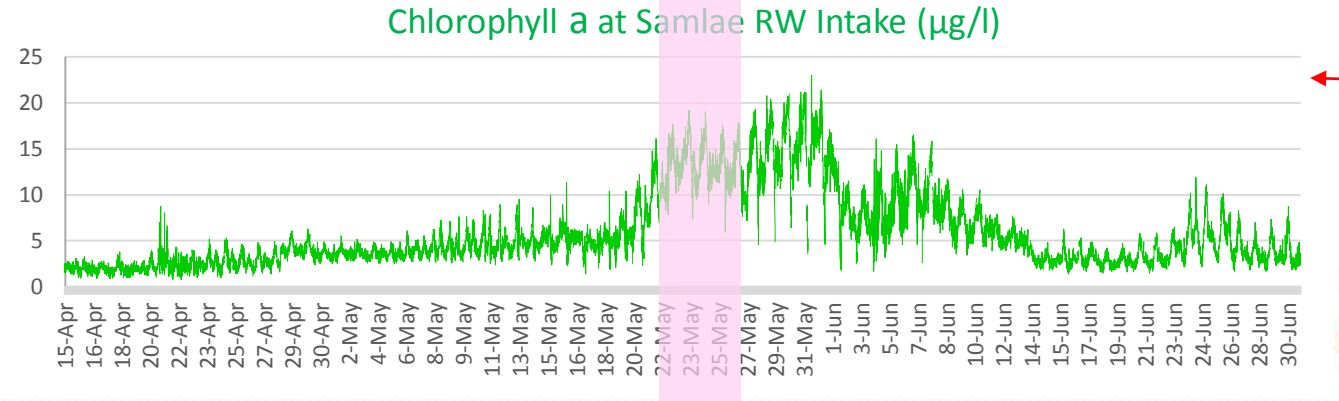
MWA's Water Sources and WTPs

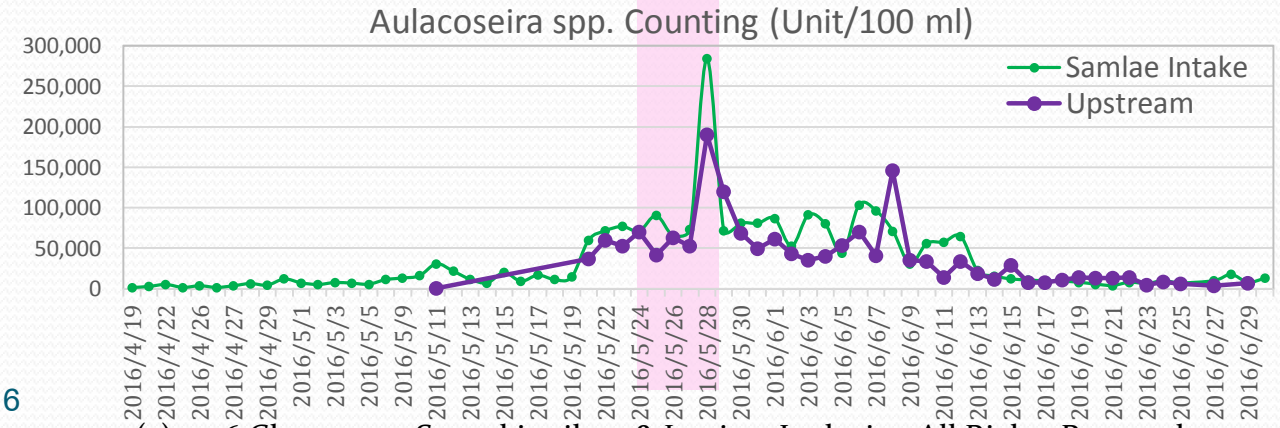
Algae problem occurred in Chao Phraya River and effected to 3 WTPs.

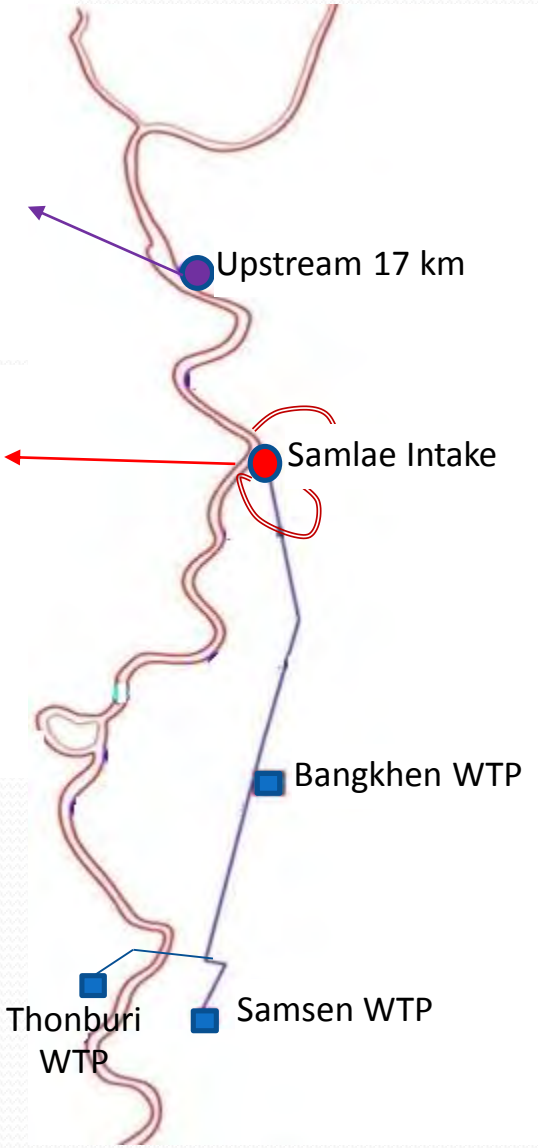


Algae Monitoring in MWA's Water Sources









MWA's Measure Against Algae Bloom

Samlae Intake

- Stop to abstract RW into canal when the peak of algae bloom reached intake
- Added $CuSO_4$ into RW canal at Samlae Intake

Bangkhen WTP

- Added chlorine into RW before clarifier (Pre-Cl_2) and before filter (Intermediate-Cl_2)
- Increased alum dosage
- Decreased production rate
- Stopped recycle supernatant water from sludge lagoon
- Backwashed filter more often and prolonged the period of air scouring and water washing

3. Objectives of the Experiment

1) To find the optimum dosing rate of $CuSO_4$ and Chlorine for getting the effect of on *Aulacoseira spp*.

How ? → Jar test and microscope investigation

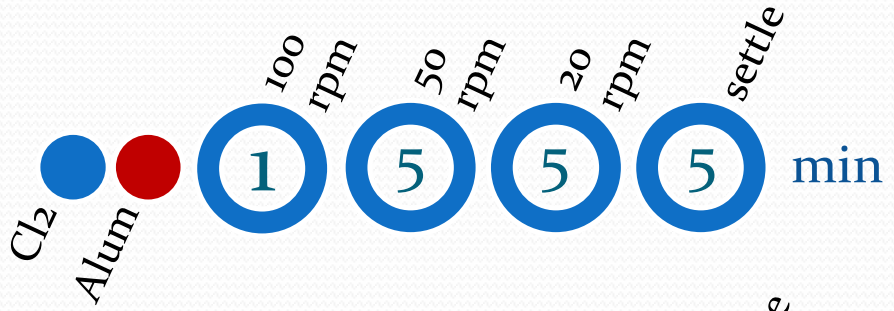
2) To verify the effect of countermeasure to the removal efficiency of Bangkhen-WTP

How ? → Check residual *Aulacoseira spp*. in RW, CW, FW !

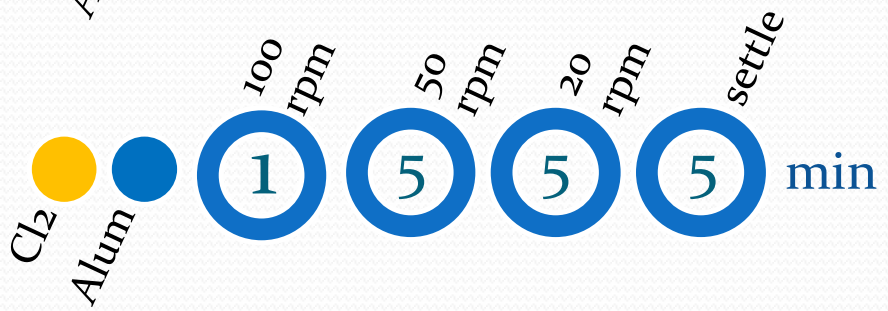
4. Experimental Condition

Jar test condition

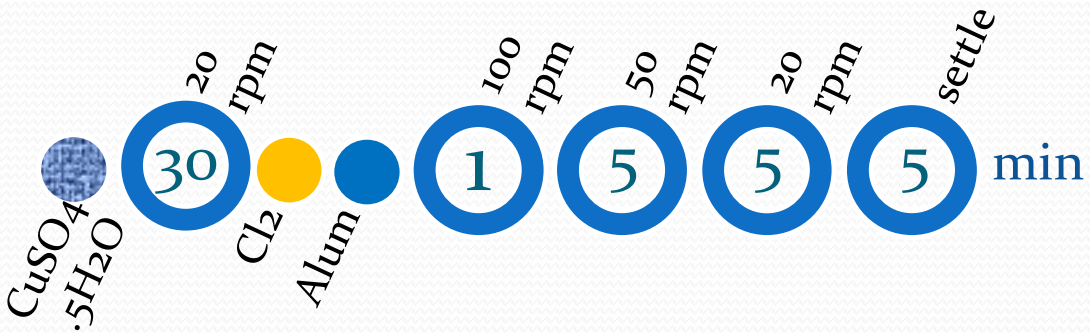
- 1st Experiment



- 2nd Experiment

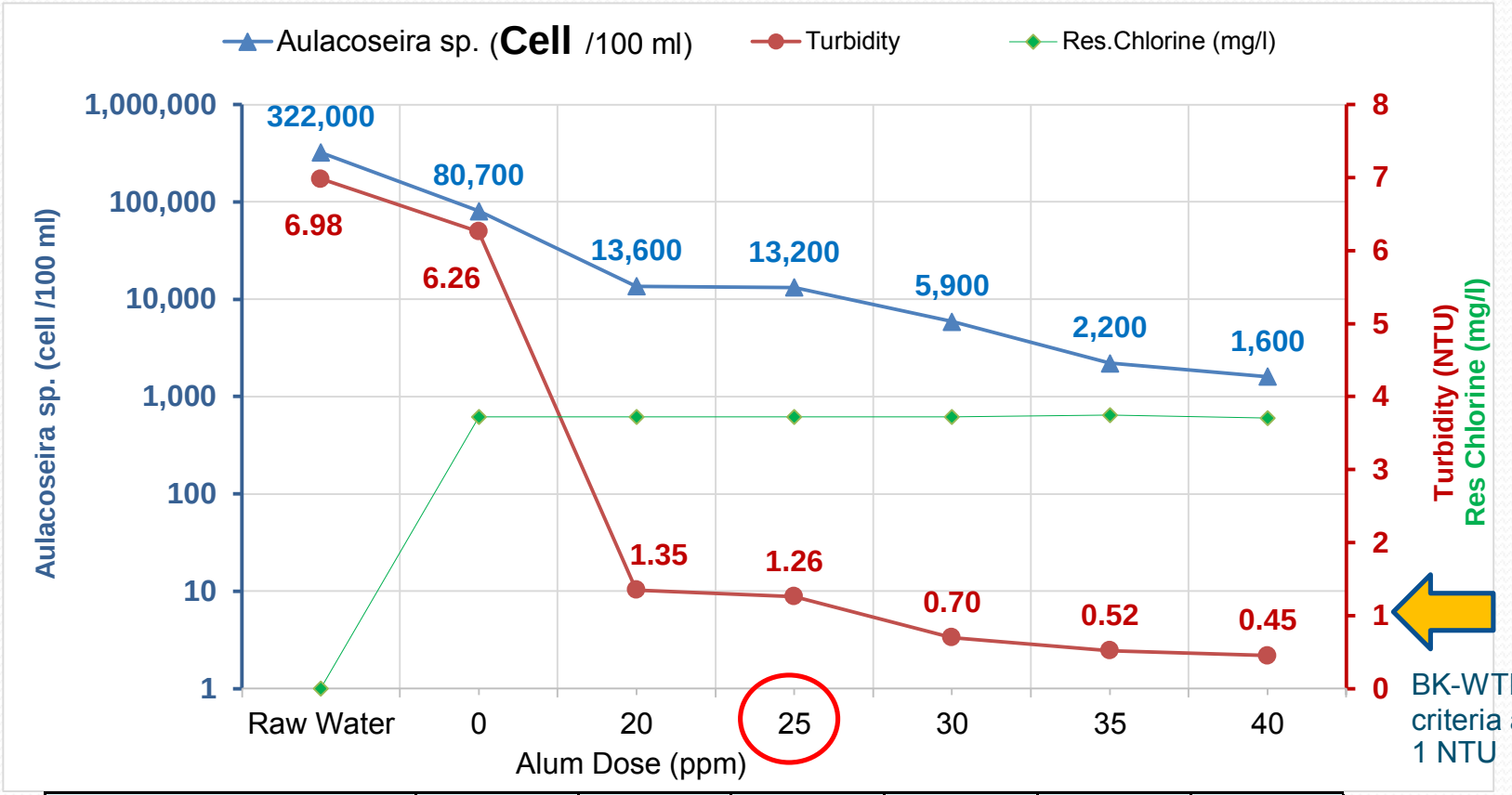


- 3rd Experiment



5. Result of experiment

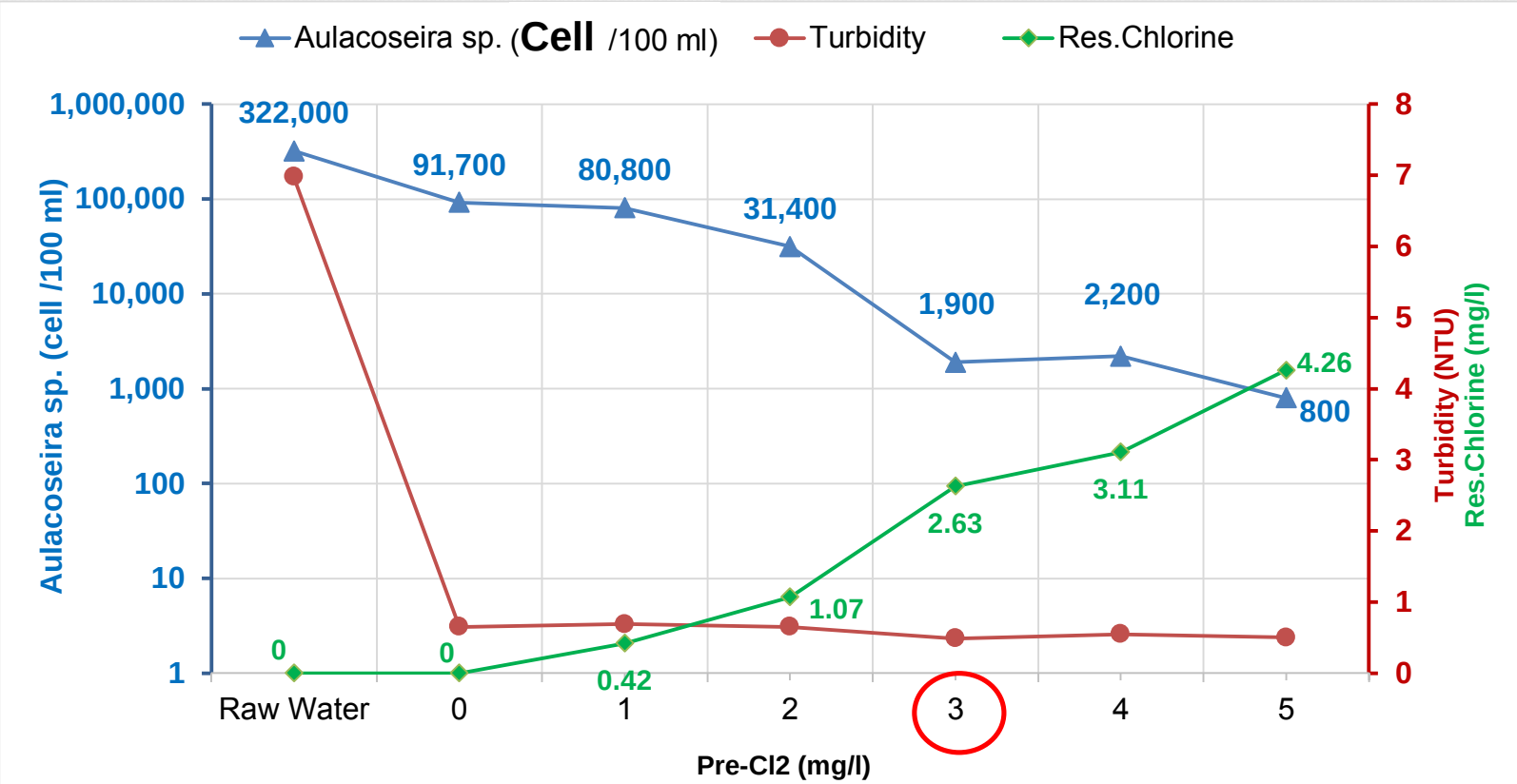
1st Experiment Vary Alum Dose in 5 ppm Pre-Cl_2



% Aulacoseira Removal	75	96	96	98	99	99.5

- Res.Cl2 is about 3.7 mg/l >>>> Not economical and customer complain
- Keep turbidity lower than 1 NTU >>>> Get more than 90% algae removal
- Higher alum dose can remove more algae.

2nd Experiment Vary Pre-Cl_2 with Alum 25 mg/l

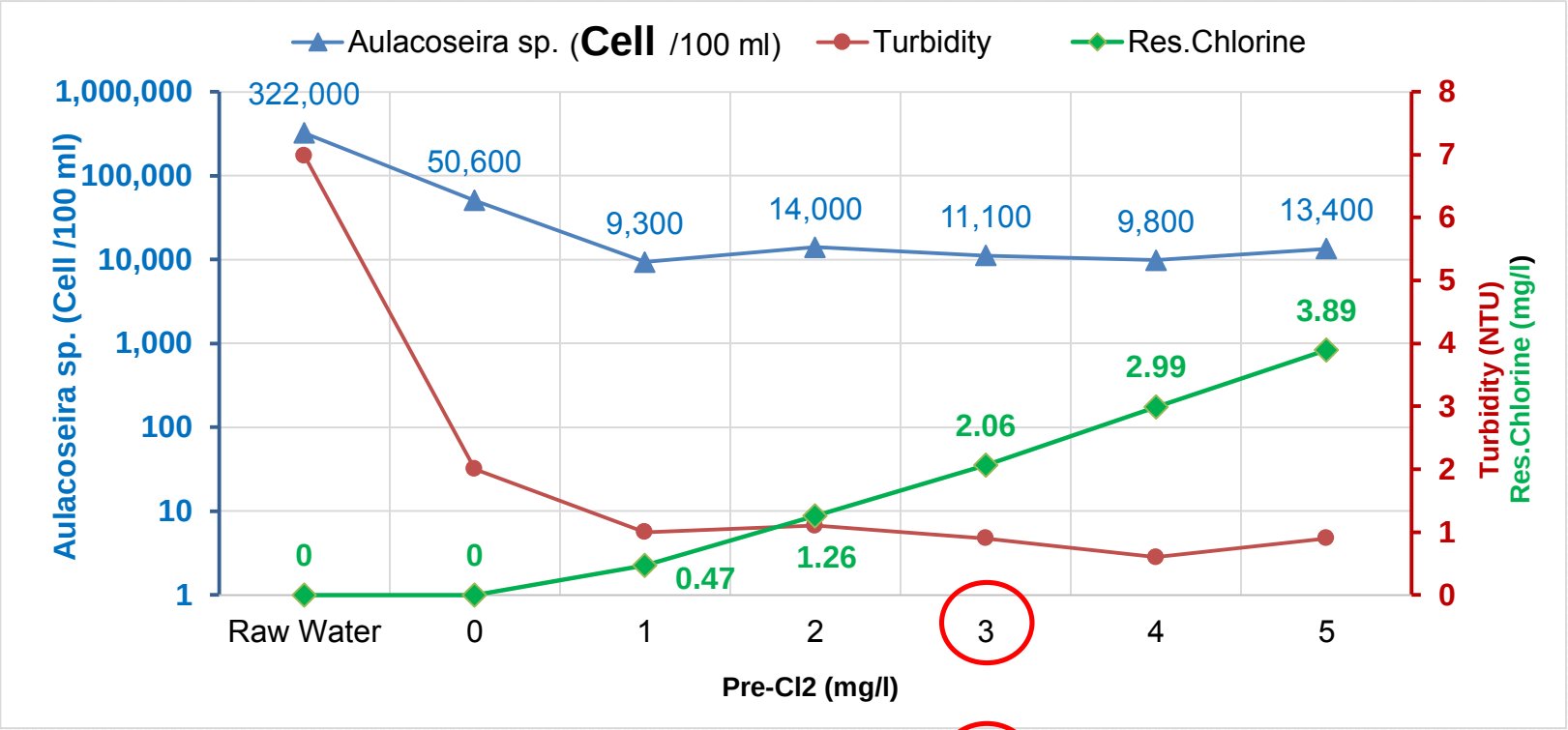


% Aulacoseira Removal	72	75	90	99	99	99.8

- Dosage of Cl_2 at 3 mg/l is enough to kill algae.

3rd Experiment Are there any synergistic effect?

- $CuSO_4$ 0.3 mg/l as $CuSO_4.5H_2O$
- Pre-Cl2 0 - 5 mg/l
- Alum 25 mg/l



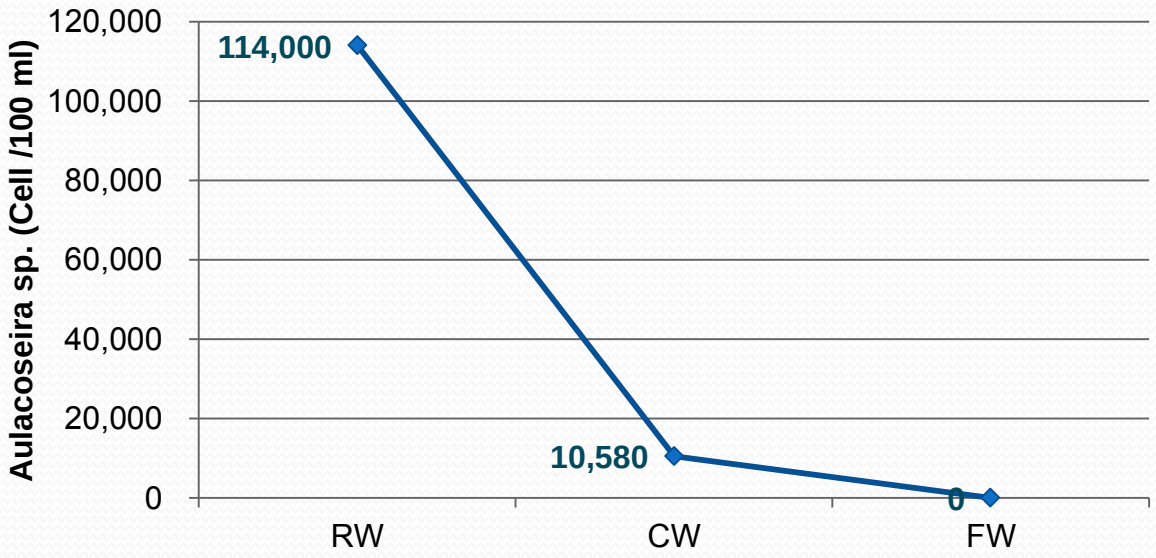
% Aulacoseira Removal	84	97	96	97	97	96

➢ Dosage of Copper sulfate is …..

Removal Efficiency of Bangkhen-WTP

Date : May 24th, 2016 time 11.00 O'clock

Process Line 1	*Aulacoseira sp* (Cell/100 ml)	Turbidity (NTU)	%removal
RW	114,000	10	-
CW	10,580	1.1	91
FW	0	0.35	100



6. Conclusion

- Actual treatment method performed very well. Especially, most of *Aulacoseria* was removed in the clarifier tank by enhancing coagulation capacity.
- Chlorine dosing is very effective for *Aulacoseira* removing. The optimum dosing rate of pre-chlorine is around 3 mg/L.
- The synergistic effect by dosing both chlorine and copper sulfate in jar test is not clearly effective.
- More experiments are necessary for selecting more effective and economic method. To cope with *Aulacoseira* problem, chemical dosing rate should be decided by counting *Aulacoseira* in jar test.

Thank you for your attention

การประปานครหลวง
METROPOLITAN WATERWORKS AUTHORITY

WaQuAC Net
Water Quality Asian Cooperation Network

MWA's Governor attained the seminar on experimental result and discussion.