weftec 2013
the water quality event

Improving particles separation after Moving Bed Biofilm Reactor (MBBR) systems by Media Clarifier

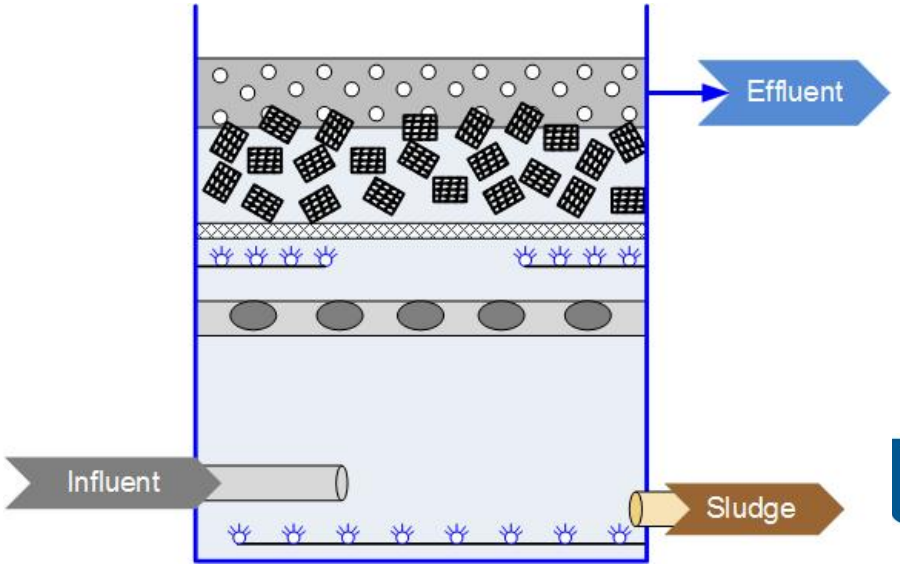
N. Assulin*, K. Nof*, Y. Galer*, R. César Garza Carreón*

* Aqwise – Wise Water Technologies Ltd., Israel

Aqwise
Clear and Simple

Introduction

- Motivation
- Operation principle
- Design Guidelines
- Results from Full-scale plant
- Summary



Aqwise
Clear and Simple

Motivation

- Separation of biomass from pure MBBRs is more challenging compared to Conventional Activated Sludge systems

- Conventional separation systems: gravity sedimentation, flotation and membrane separation:
  - Settling tanks: **high footprint**
  - Flotation and membrane systems: **high operation and maintenance costs**
  - **Coagulants and flocculants requirements**

Aqwise
Clear and Simple

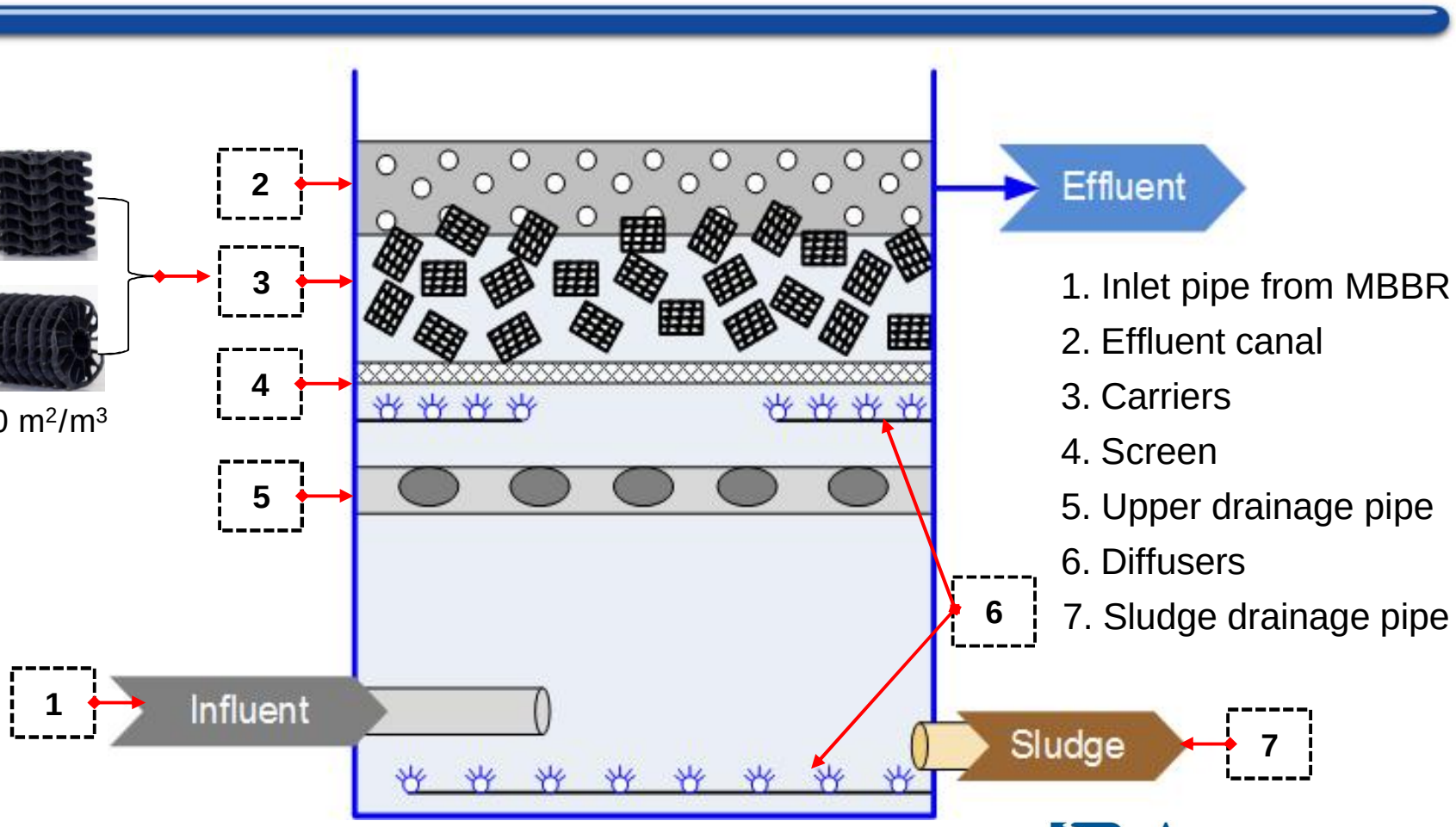
The Solution: Media Clarifier

- Media Clarifier (MC) as separation unit **after MBBRs**
- The MC integrates clarifier and a plastic media layer
- MC advantages:
  - Small foot-print compared to conventional clarifiers (save about 65%)
  - Simple operation
  - No coagulant and flocculants requirements
  - No scum problems
  - Lower energy consumption
  - Flat floor

Aqwise
Clear and Simple

Operation Principle (1)

S.A. 270 m^2/m^3



1. Inlet pipe from MBBR
2. Effluent canal
3. Carriers
4. Screen
5. Upper drainage pipe
6. Diffusers
7. Sludge drainage pipe

Aqwise
Clear and Simple

Operation Principle (2)

- Sedimentation and solids separation occurs in the same tank with an up-flow pattern
- Inlet flow – in the bottom of the tank
- Outlet flow – in the upper part
- The upper zone removing solids that didn’t settle within the lower zone:
  1) Separated by a coarse screen
  2) Filled with immobile layer of carriers

Operation Principle (3)

- The coarse solids settled at the lower zone are removed by a drainage valve which operates intermediately.

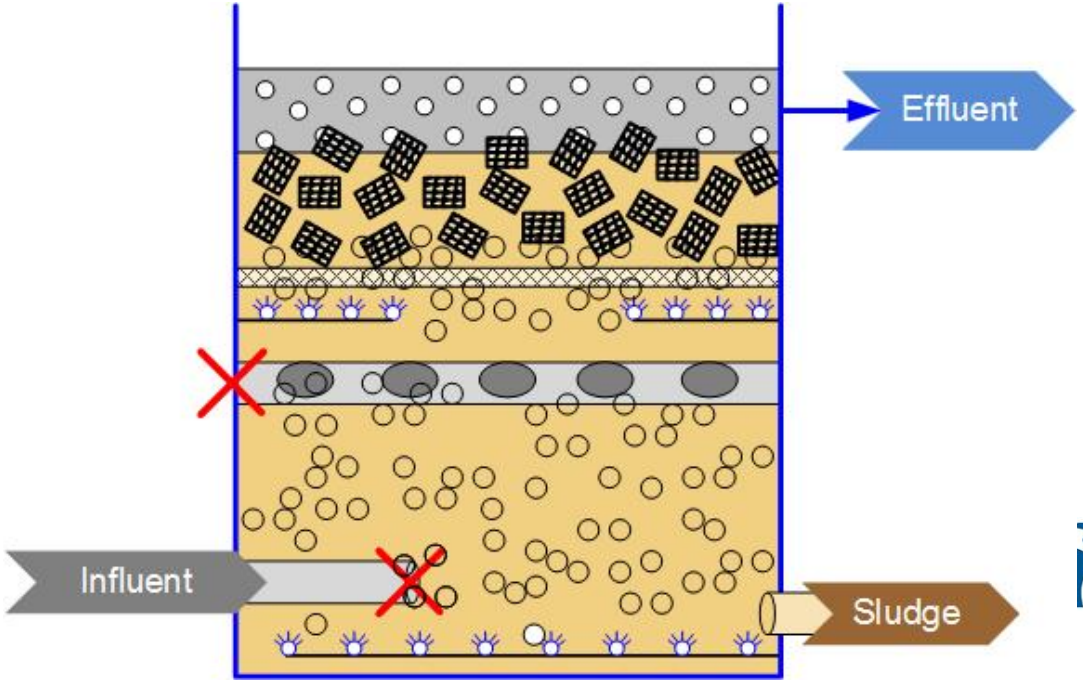
- The fine solids which have been entrapped within the carriers, require periodic removal to prevent clogging.

Periodical air-scour - next slide

Aqwise
Clear and Simple

Operation Principle (4)

- Periodical air-scour is performed by diffusers installed in two positions:
  - Below the screen and
  - On the bottom of the MC



Aqwise
Clear and Simple

Design Guidelines

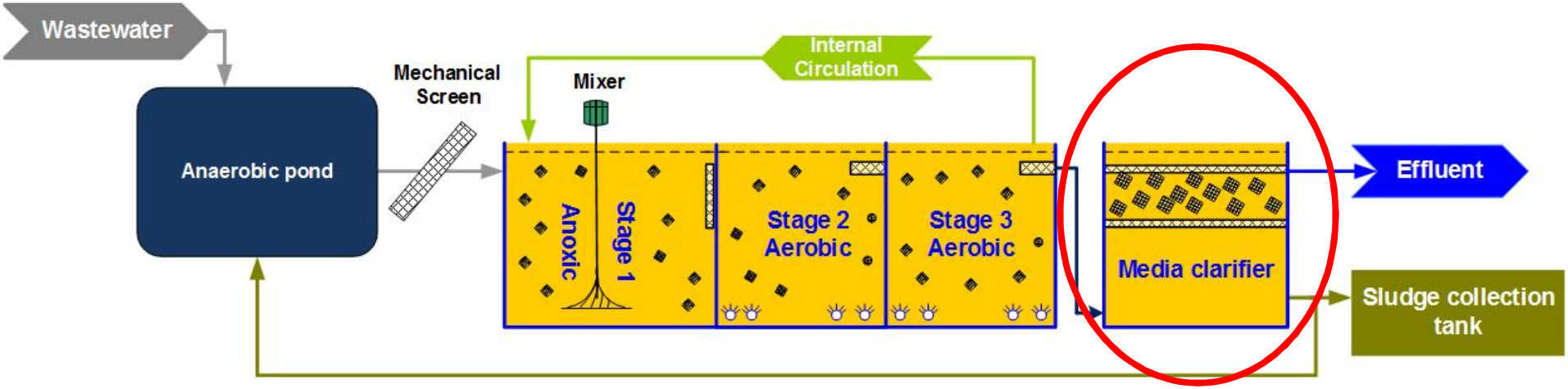
Hydraulic load:	1.4 $m^3/m^2/h$
Max. TSS inlet should be between:	700-800 mg/l.
Min. clarifier depth:	2.5m
Media depth:	0.8m (0.7m for small units and compact units)

Effluent TSS:	<30 mg/l, without polymers.
Sludge concentration out of the MC:	1-2%

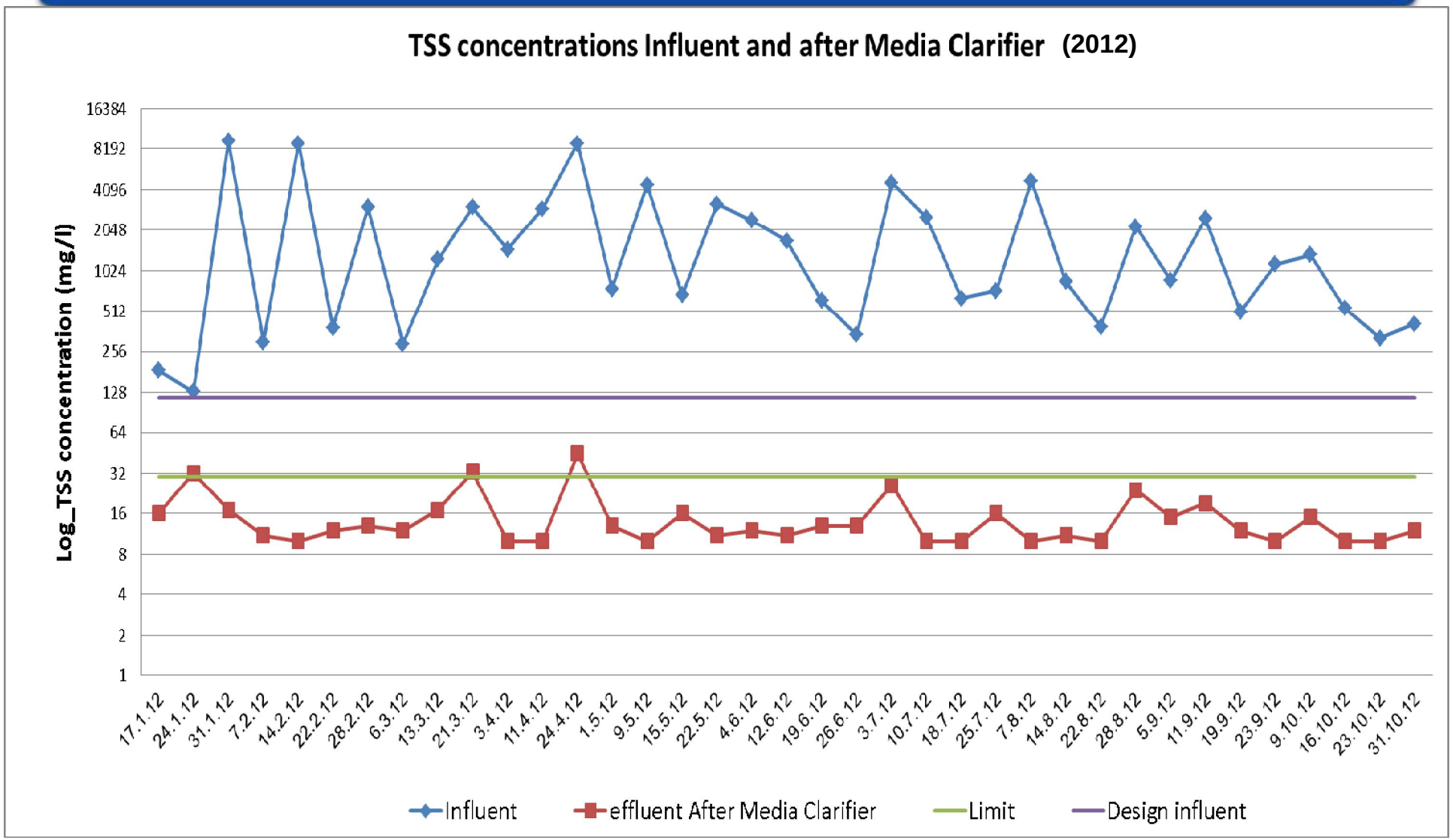
Aqwise
Clear and Simple

Full-Scale Plant in Israel (1)

- Plant location: Israel
- Design parameters:
  - Flow rate: 600 m^3/d
  - TSS concentration: 117 mg/l



Results (1)


TSS concentrations Influent and after Media Clarifier (2012)
Log_TSS concentration (mg/l)
16384
8192
4096
2048
1024
512
256
128
64
32
16
8
4
2
1
17.1.12
24.1.12
31.1.12
7.2.12
14.2.12
22.2.12
28.2.12
6.3.12
13.3.12
21.3.12
3.4.12
11.4.12
24.4.12
1.5.12
9.5.12
15.5.12
22.5.12
4.6.12
12.6.12
19.6.12
26.6.12
3.7.12
10.7.12
18.7.12
25.7.12
7.8.12
14.8.12
22.8.12
28.8.12
5.9.12
11.9.12
19.9.12
23.9.12
9.10.12
16.10.12
23.10.12
31.10.12
Influent
effluent After Media Clarifier
Limit
Design influent

Results (1)

- Although the influent SS concentrations are much higher than the designed values →
- The average effluent TSS concentration is ~ 10 mg/l without the use of coagulation/flocculation

Aqwise
Clear and Simple

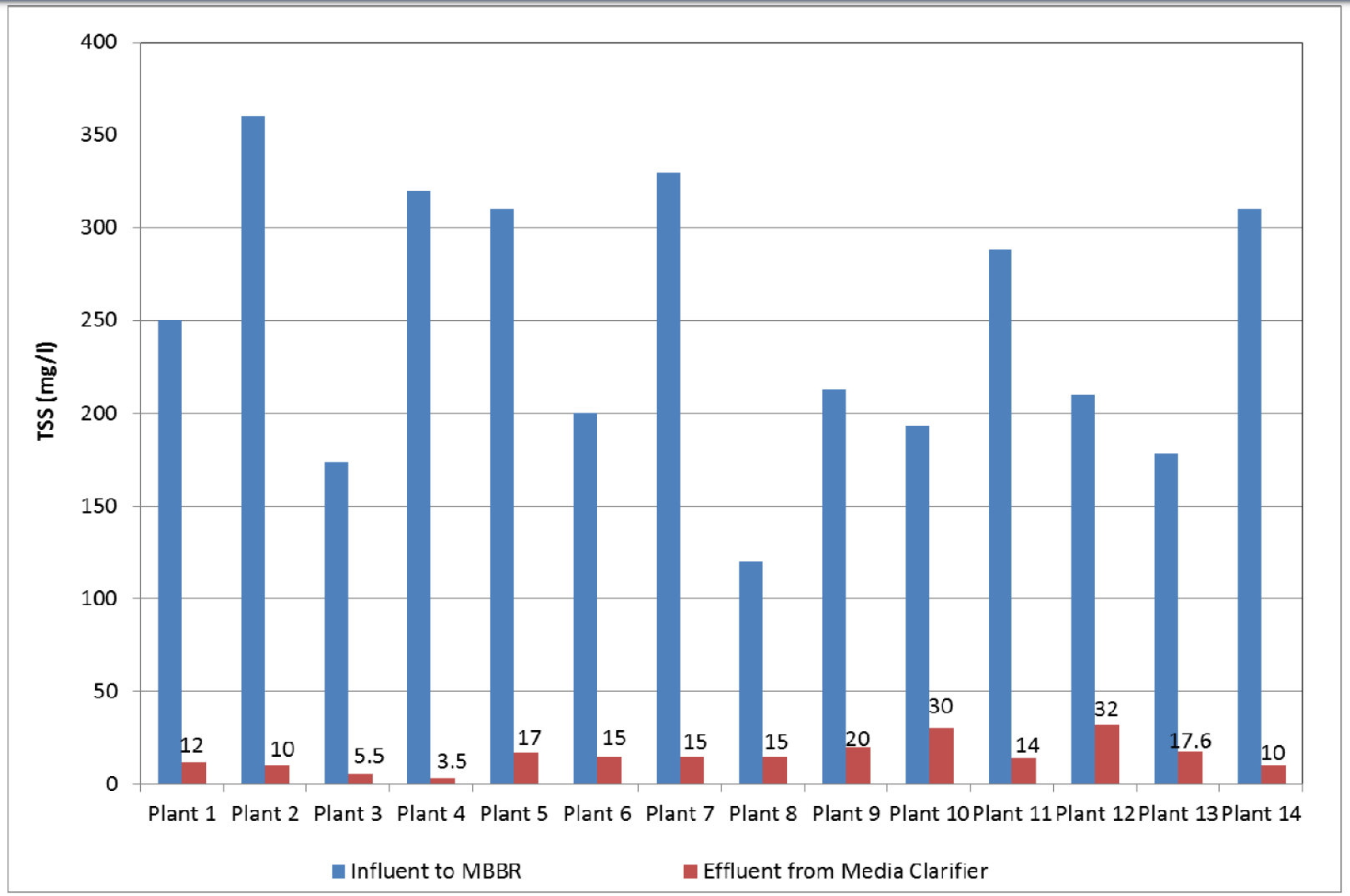
14 Small Plants in Mexico (2)

- Plants location: Mexico
- Design parameters:
  - Flow rate: up to 170 m^3/d

Honigwel or telmecs

Aqwise
Clear and Simple

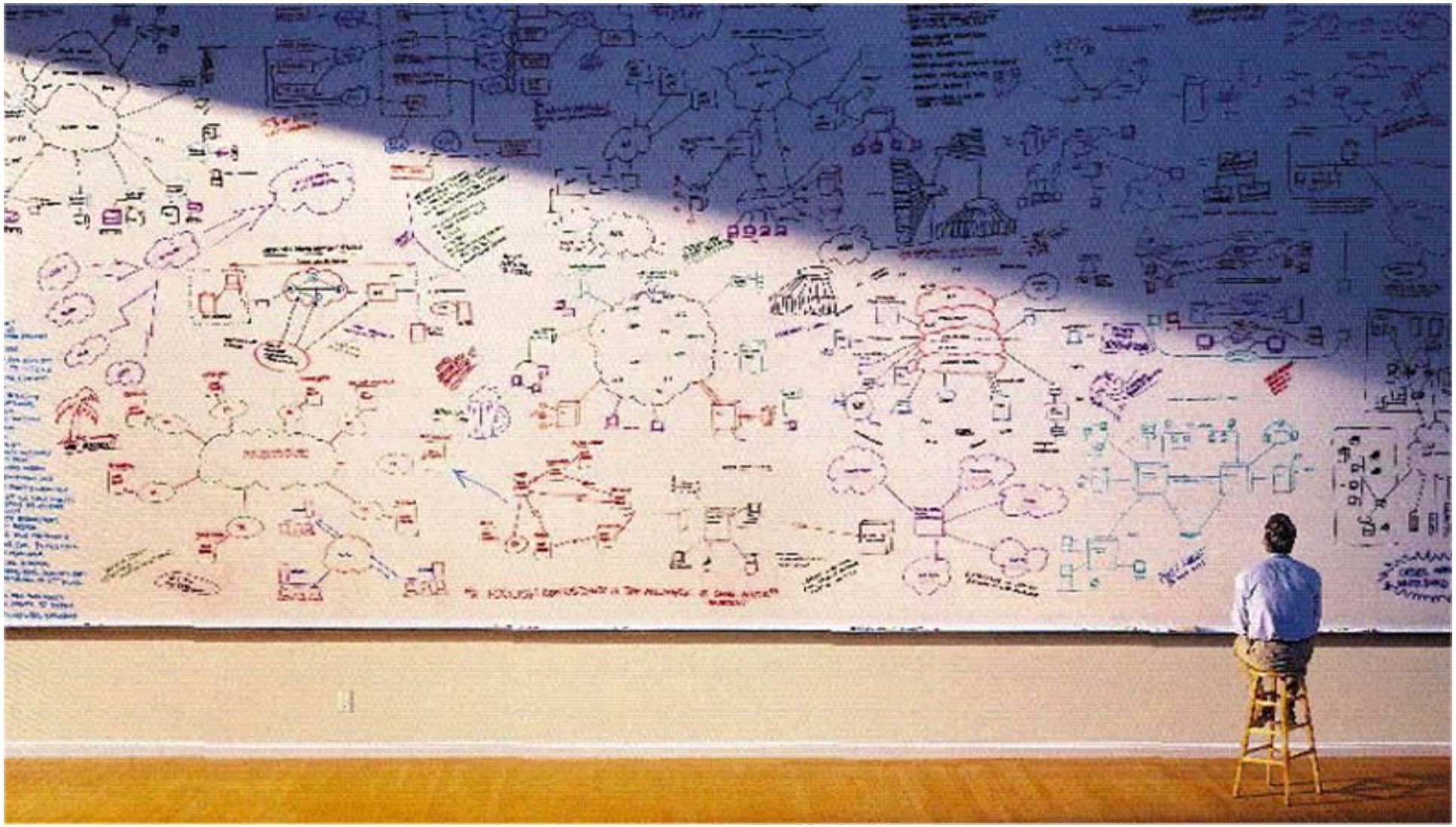
Results (2)


TSS (mg/l)
400
350
300
250
200
150
100
50
0
12
10
5.5
3.5
17
15
15
15
20
30
14
32
17.6
10
Plant 1
Plant 2
Plant 3
Plant 4
Plant 5
Plant 6
Plant 7
Plant 8
Plant 9
Plant 10
Plant 11
Plant 12
Plant 13
Plant 14
Influent to MBBR
Effluent from Media Clarifier

Results (2)

- The average effluent TSS concentration is ~ 15.5 mg/l without the use of coagulation/flocculation

Aqwise
Clear and Simple



Questions?

Aqwise
Clear and Simple