aquapri
handpicked luxury seafood

Biostability in RAS

How to monitor unspecific bacteria and control it

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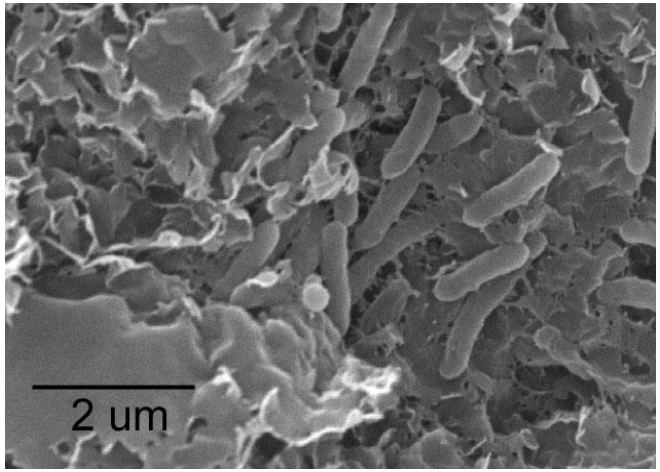
Nordic Ras
Oslo, November 2018

Clay



Agenda

- Aquapri and Pike perch
- Biostability
  - Monitering methods
  - Insights from monitoring
  - Better biocontrol

AquaPri

Danish family owned company that has been in the seafood industry for over 100 years.

Main production

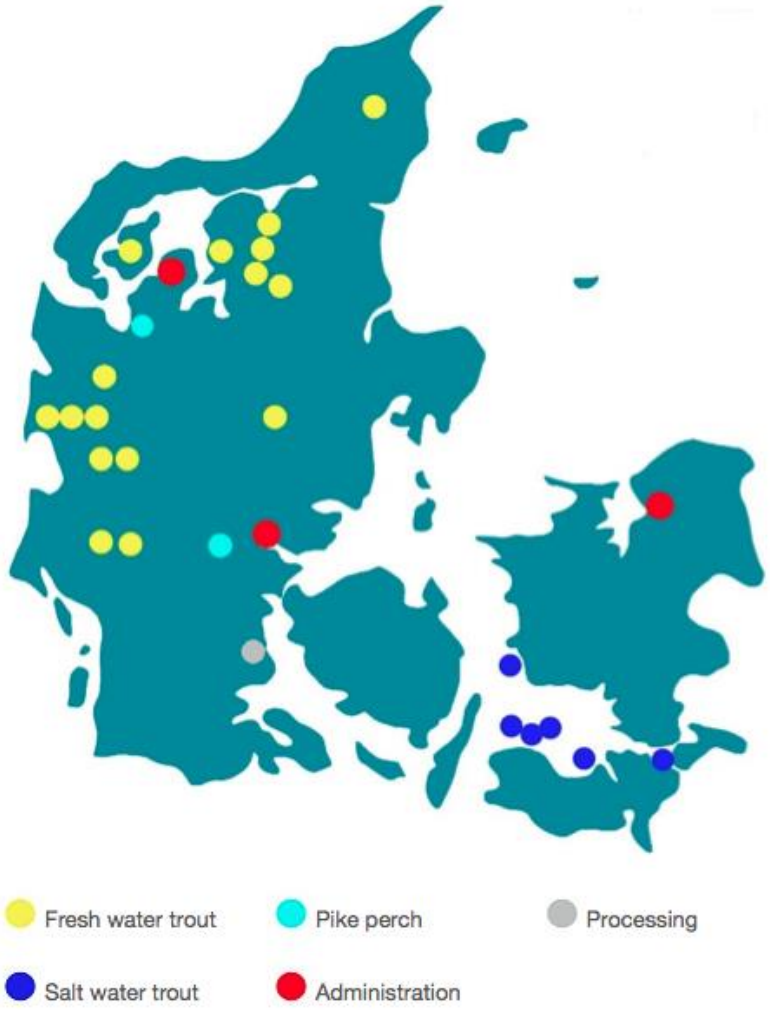
Rainbow trout (6000 t),
Trout roe
Pikeperch (500t).

Facilities

17 land based farms
6 sea cage sites
Slaughter house
Transport facilities for live fish.

Employees

70 people full time
70-80 seasonal workers



What is a **Pike perch?**

A freshwater, carnivorous fish found in lakes and river systems of europe, north Africa and west Asia as well as the Caspian Sea and Baltic Sea (brackish water).

Perceived as one of Europe's most valuable food fishes.

Pikeperch has a **white flesh** which is described as having a delicate taste and juicy consistency, as well as being **relatively boneless** compared to other freshwater white fleshed fish species.

Pike perch farm, RAS 100

Phase 1:

600 tons production pr year of
1 kg pike perch for consume

Phase 2:

Utilize 1. floor for integrated
Broodstock and
Fingerling production

Pike perch farm, RAS 100

- Groundwater
- 50-150 l/kg feed
- 150 M3/day
- Temp. 21-23 C

- Ground area 6.200 M2
- 1. Floor 2.300 M2

Pike perch farm, RAS 100

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RAS microbiology

Monitering of bacteria in RAS

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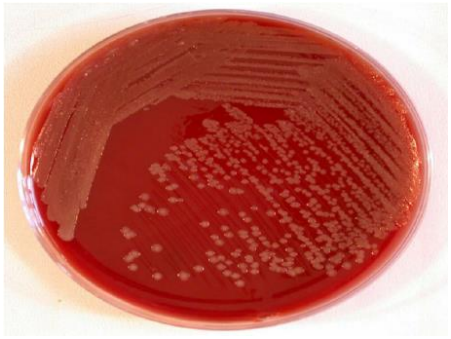
Methods overview

- Colony-forming unit, CFU
- Microscope
- DAPI
- BAQTIQUANT
- Bacmon
- BACTcontrol
- Secchi depth



Monitering of bacteria in RAS

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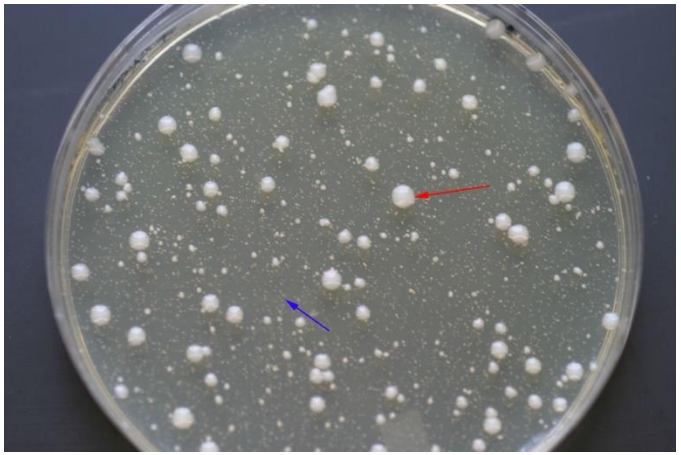
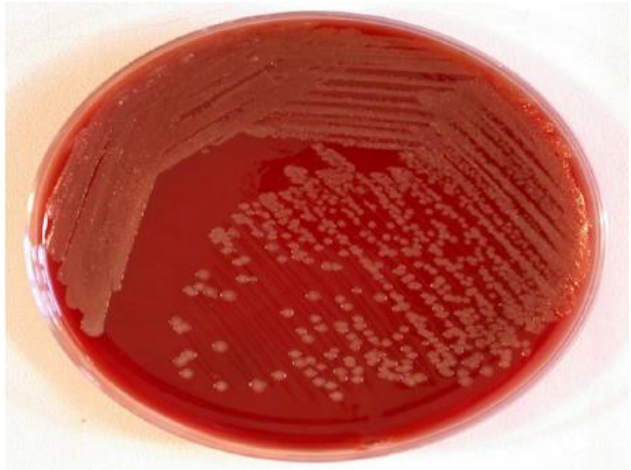
Method: **Colony-forming unit, CFU/ml**





Plus	Minus
• Simple • Low cost • Reveals part of diversity in actual microbiology	• Manual procedure • Experience needed • App. Only 1% of bacteria present • Hopeless slowly (days)

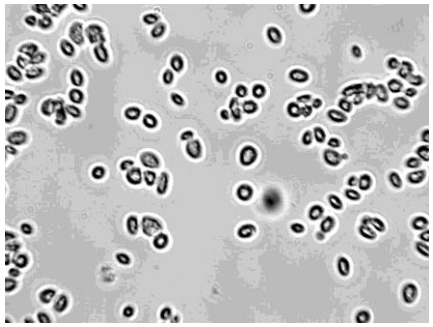
Principle:
Growing bacteria and counting colonies

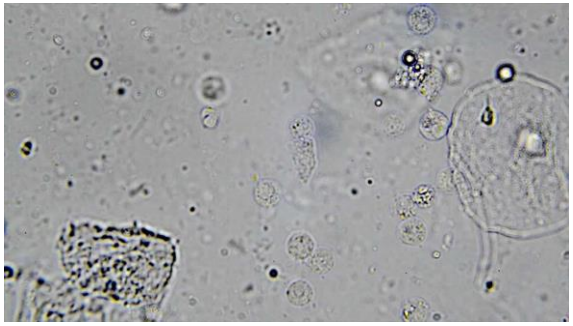
Monitering of bacteria in RAS

Method: **Microscope**

Plus	Minus
• Fast and simple • Low cost • Reveals diversity in actual microbiology	• Manual procedure • Experience needed • Relative numbers; few or many

Principle:
Simple microscopy.





Monitering of bacteria in RAS

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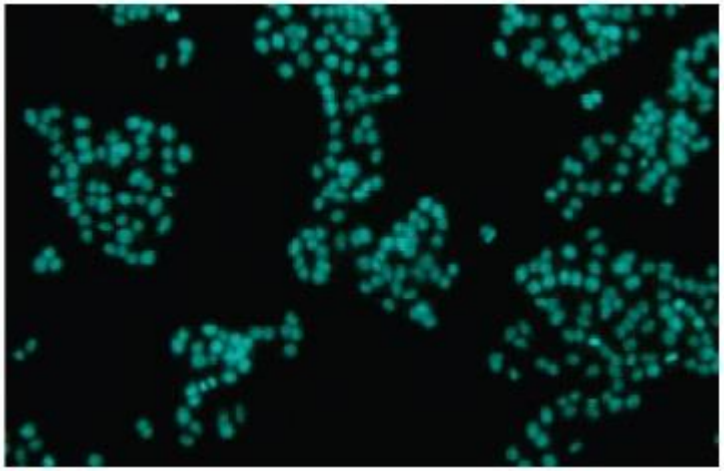
Method: **DNA staining**



Plus	Minus
• Direct counting • Reliable	• Manual procedure • Time consuming • Initial costs • Unspecific

Principle:
Staining DNA and fluorescence microscopy or flow cytometri

Monitering of bacteria in RAS

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Method: **BAQTIQUANT**

Plus	Minus
• Fast results (30 min) • Works well in dirty water • Transportable • Good for comparing several samples	• Manual procedure • Costs per test • Unspecific

Principle:
Measure baqterial enzyme activity

Monitering of bacteria in RAS

Method: **BACTcontrol** **(Have not been tested by AquaPri – yet)**

Plus	Minus
• Automatic • Online data • Reveals fluctuations in system	• Unspecific • ??

Principle:
Automatic sampling and measure of baqterial enzyme activity

Monitering of bacteria in RAS

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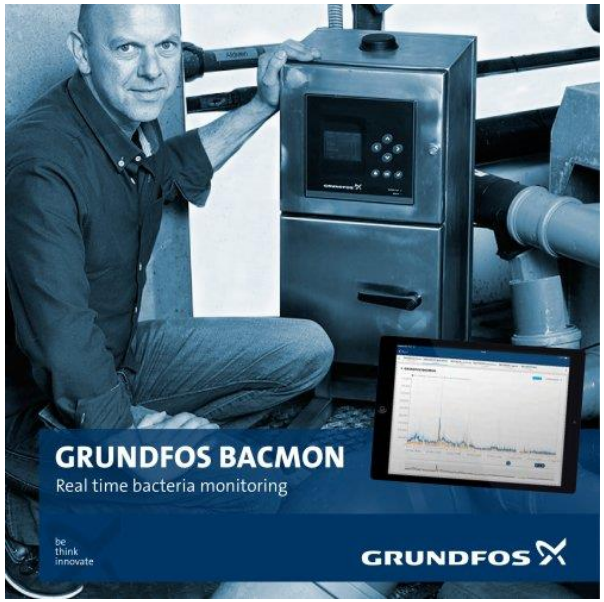
Method: **Bacmon**



Plus	Minus
• Automatic • Every 12 minutes • Online data • Reveals fluctuations in system • Additional data on temp. And particle distribution	• Needs relative clean water • Stability • Unspecific

Principle:
Optical counting of small particels and algorythm to distinguish type of particle.

Monitering of bacteria in RAS

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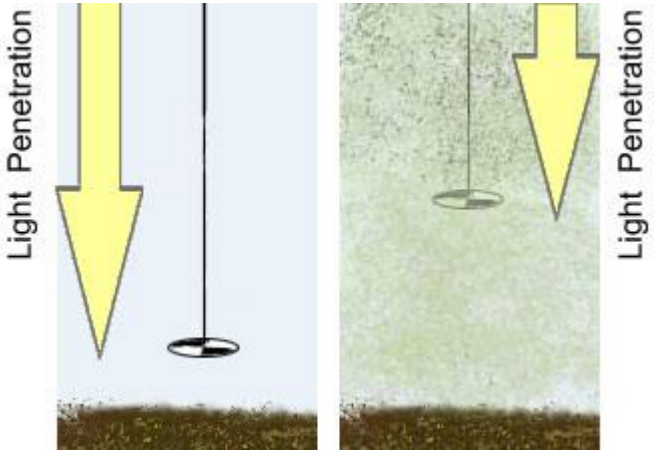
Method: **Secchi depht**



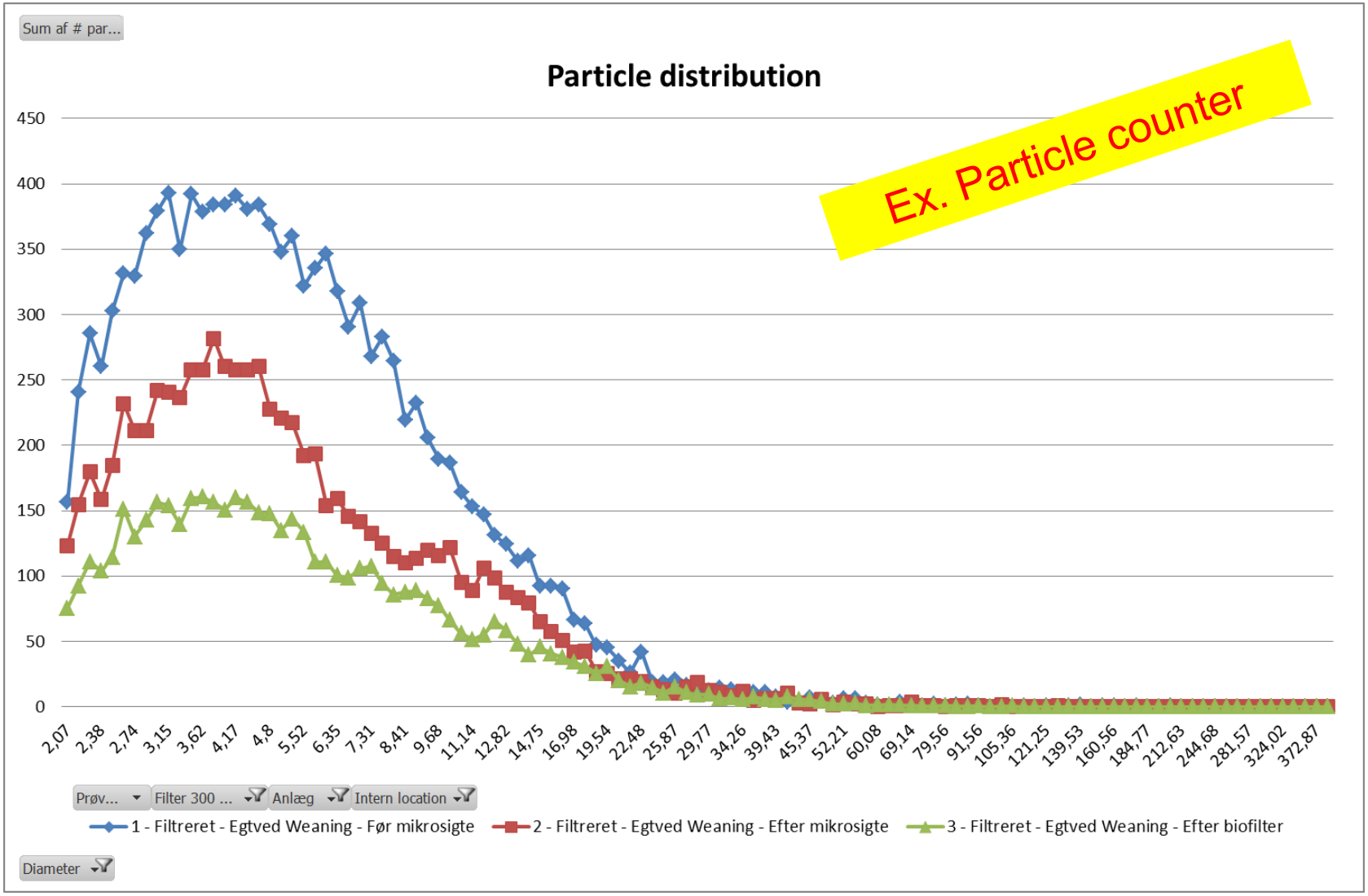
Plus	Minus
• **Simple, fast and no cost!** • **Good for daily use** 	• Good correlation between bacteria numbers and clarity of water is needed • Sensitive to non bac. particles • Unspecific

Principle:
Light penetration

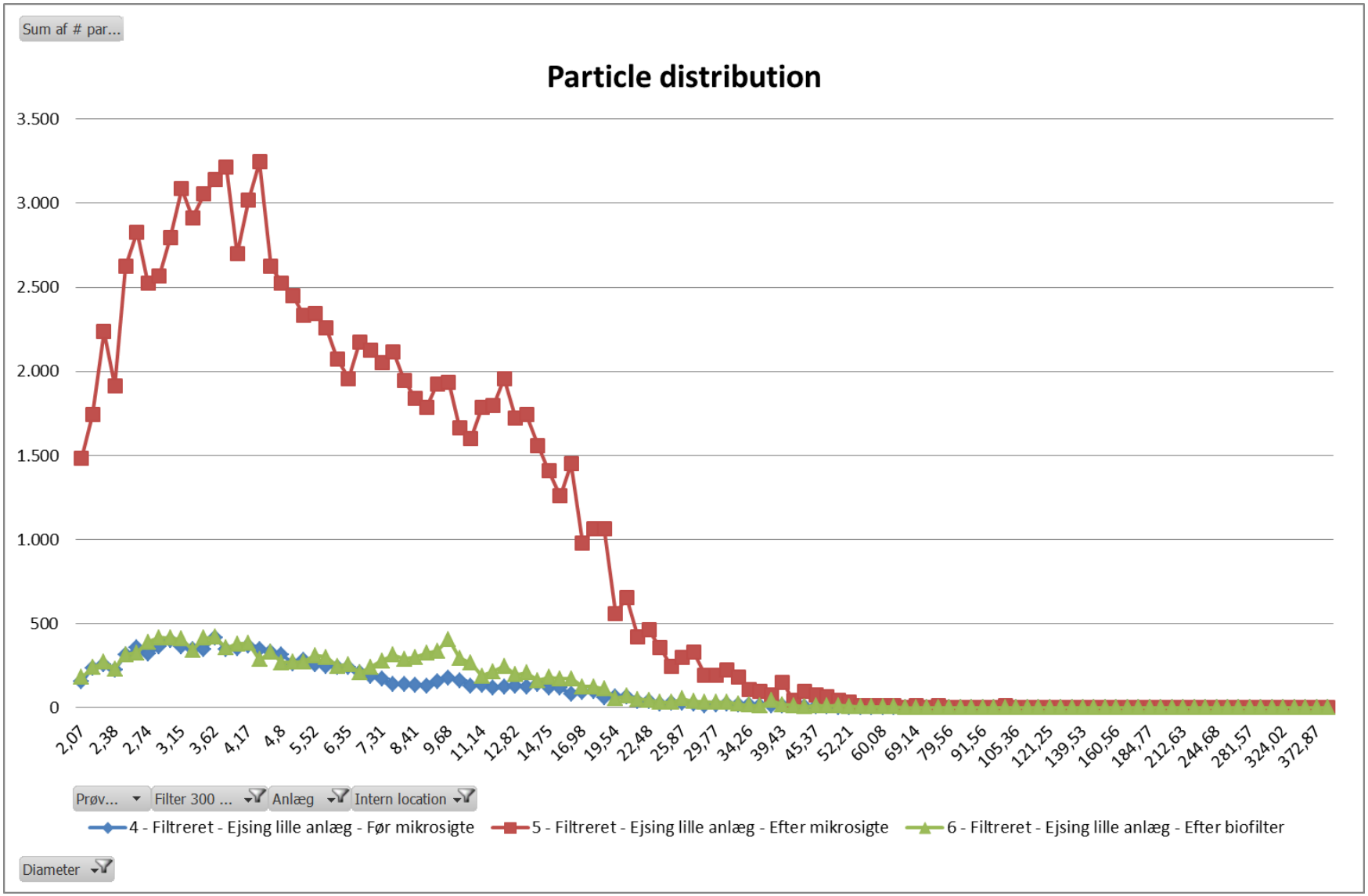
A few insigths from monitoring bacterial load

- Drumfilters, headloss/pressure screens
- Drumfilters, mess size
- Effects of water desinfection
- UV light
- Cleaning procedures

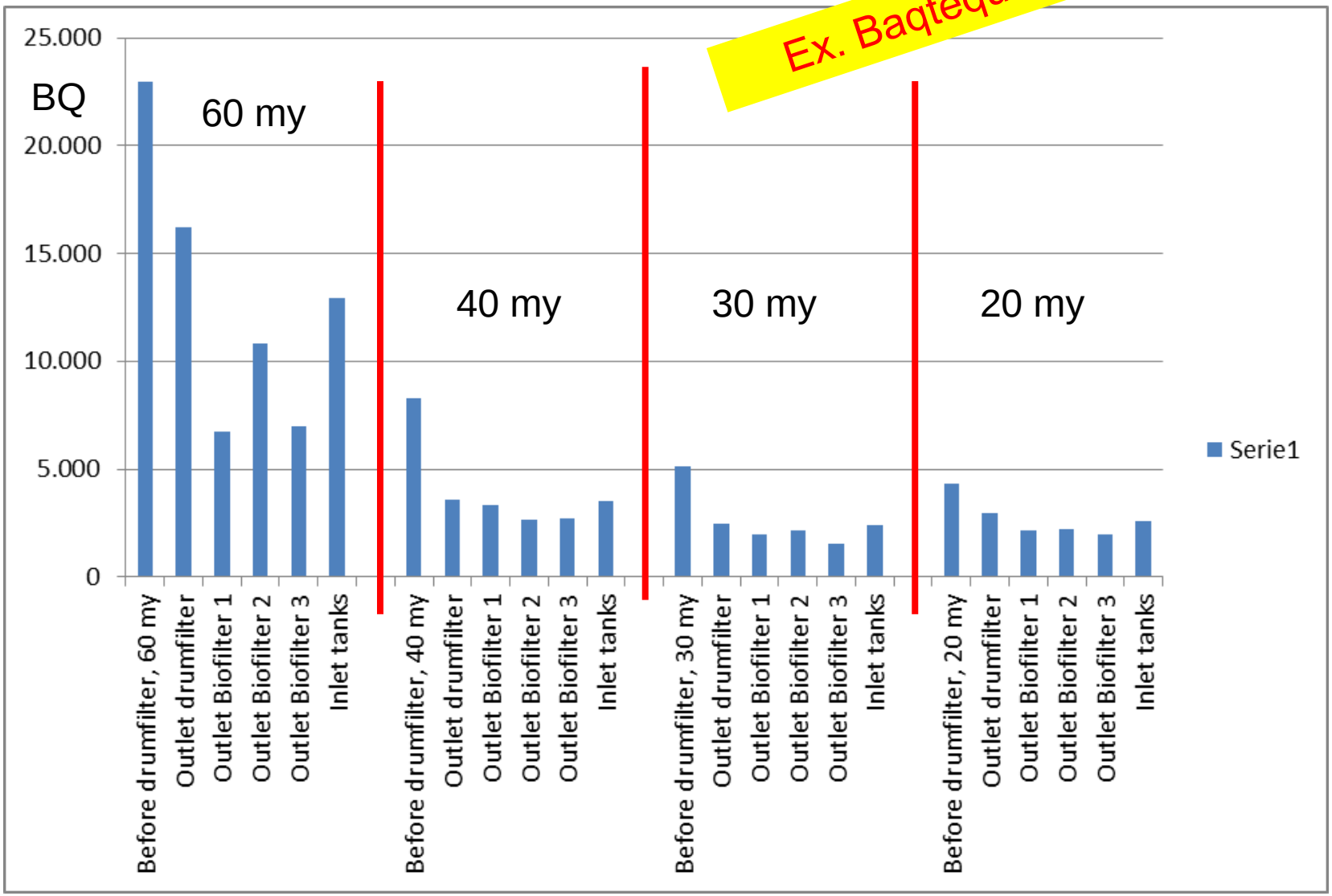
Drumfilters, Particle distribution expected



Drumfilters, Particle distribution not expected



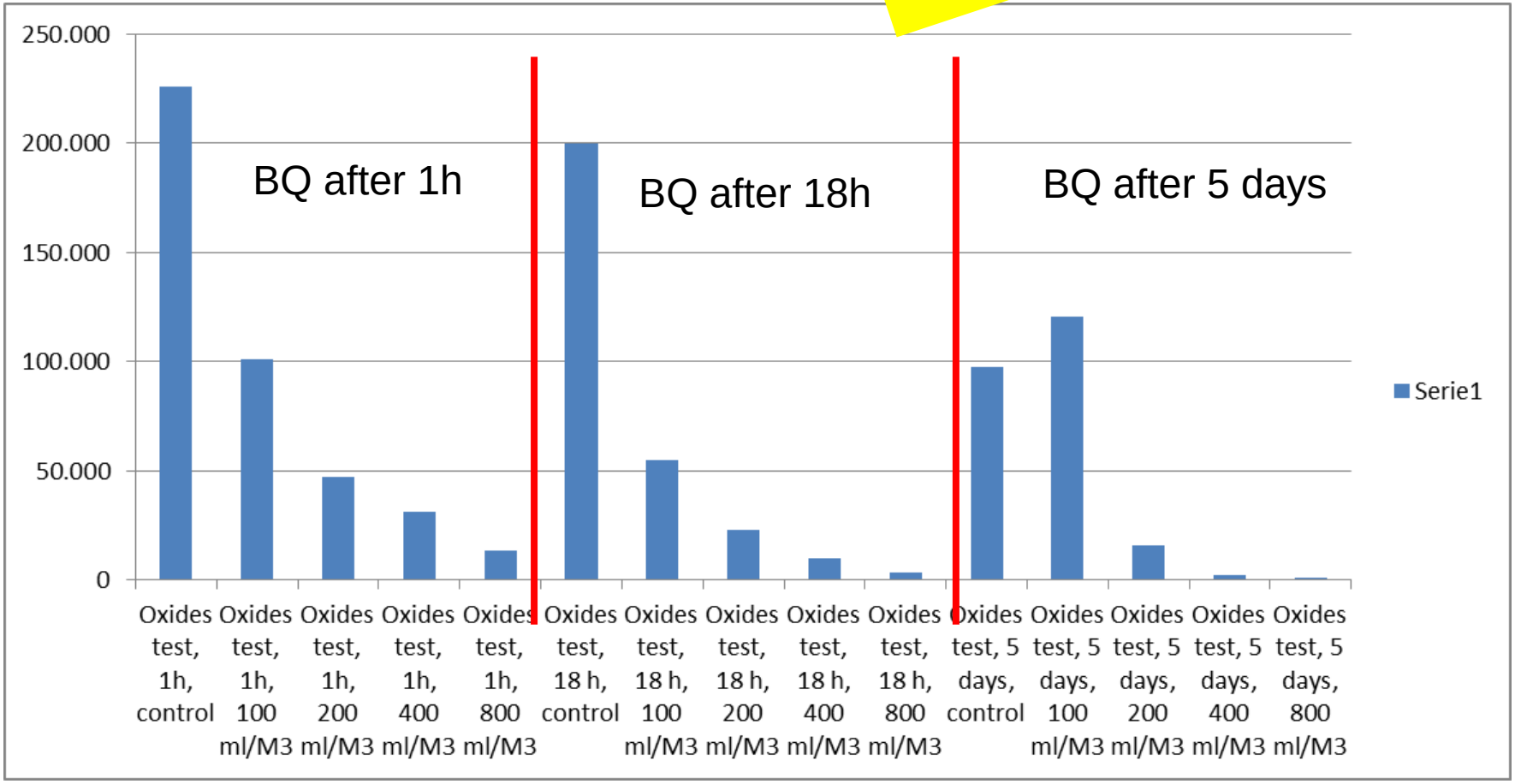
Test of mess size drumfilters



Test of treatment with Peracid acetic

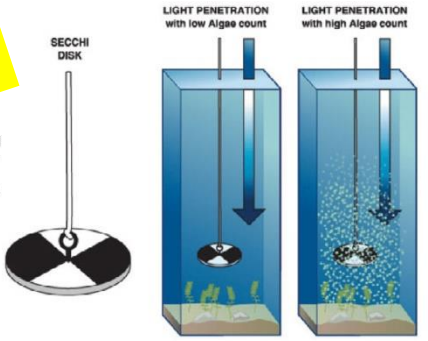
Refernce values:	Drinking water 10-20
	Egtved firstfeed 2-8.0000
	Egtved Weaning 5-15.000
	Ejsing in problem mode 3-500.000

Ex. Baqtequant, BQ



UV light, 10kw/1000 l/sec

Secchi disc



Sum af UV, treatment in... Sum af Sechi dep...

UV and Sechi depht

250
200
150
100
50
0

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

26 27 28 29 30 31 31 32 33 34 35

July August

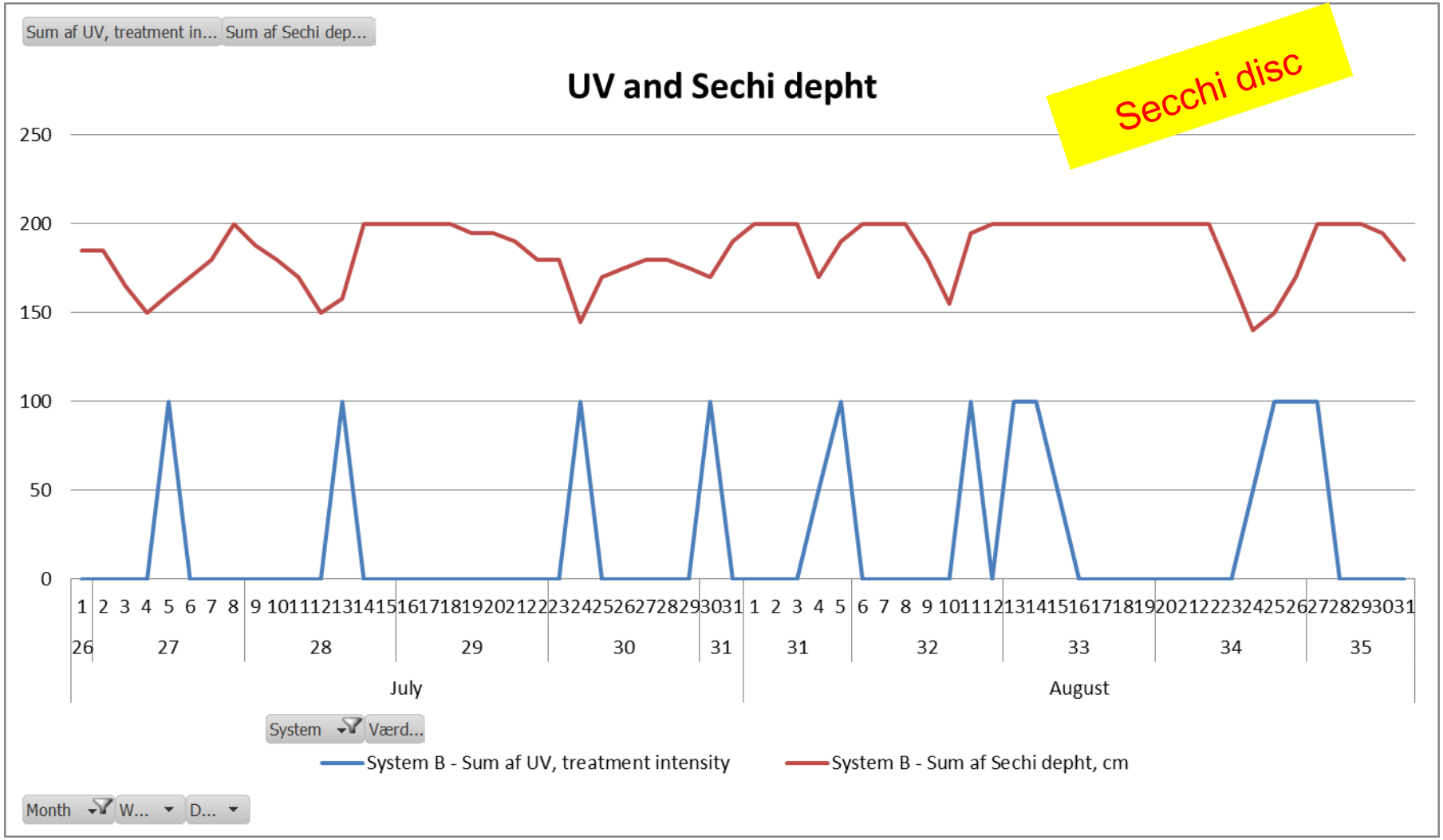
System Vær...

System A - Sum af UV, treatment intensity

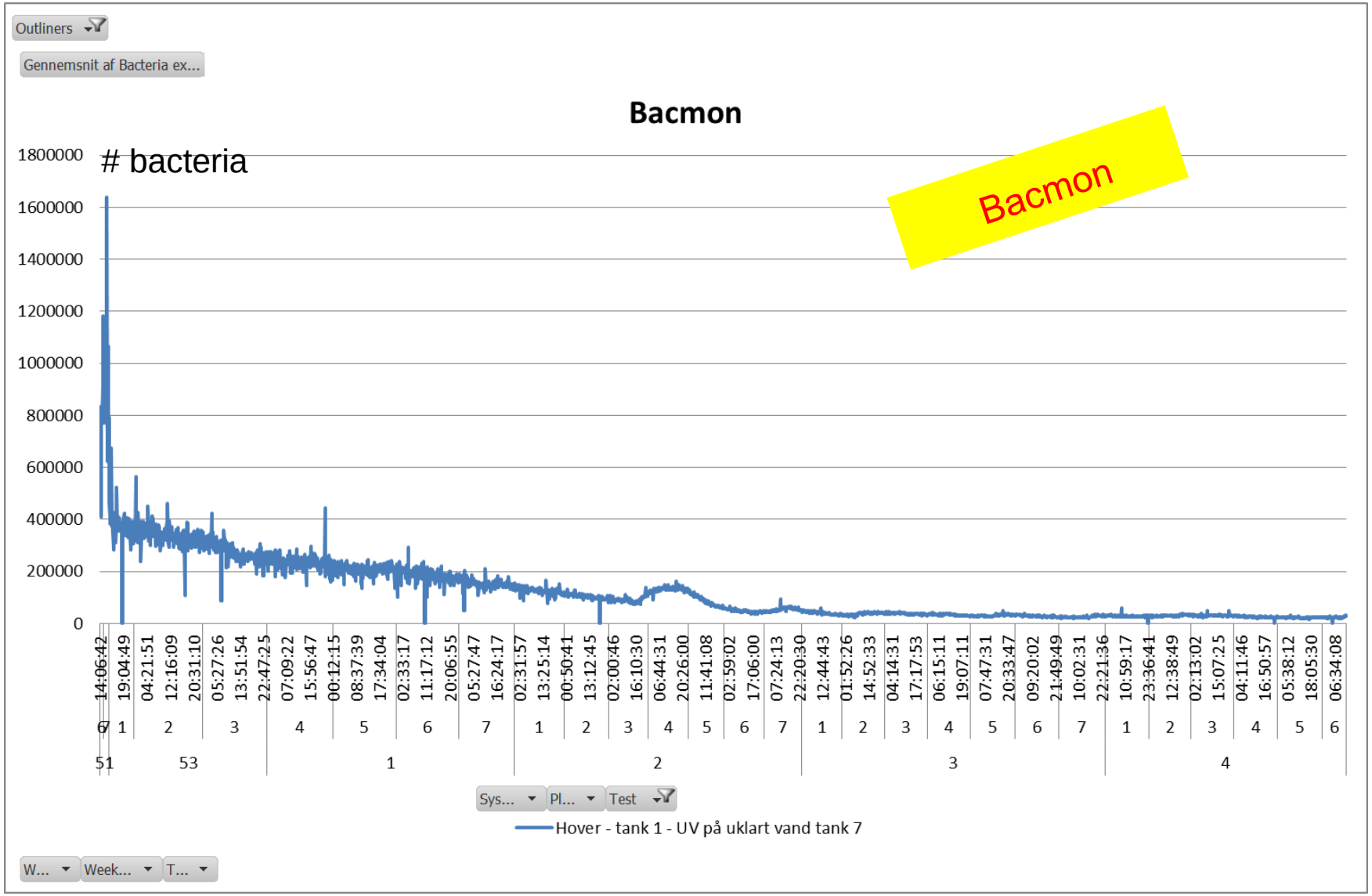
System A - Sum af Sechi depht, cm

Month W... D...

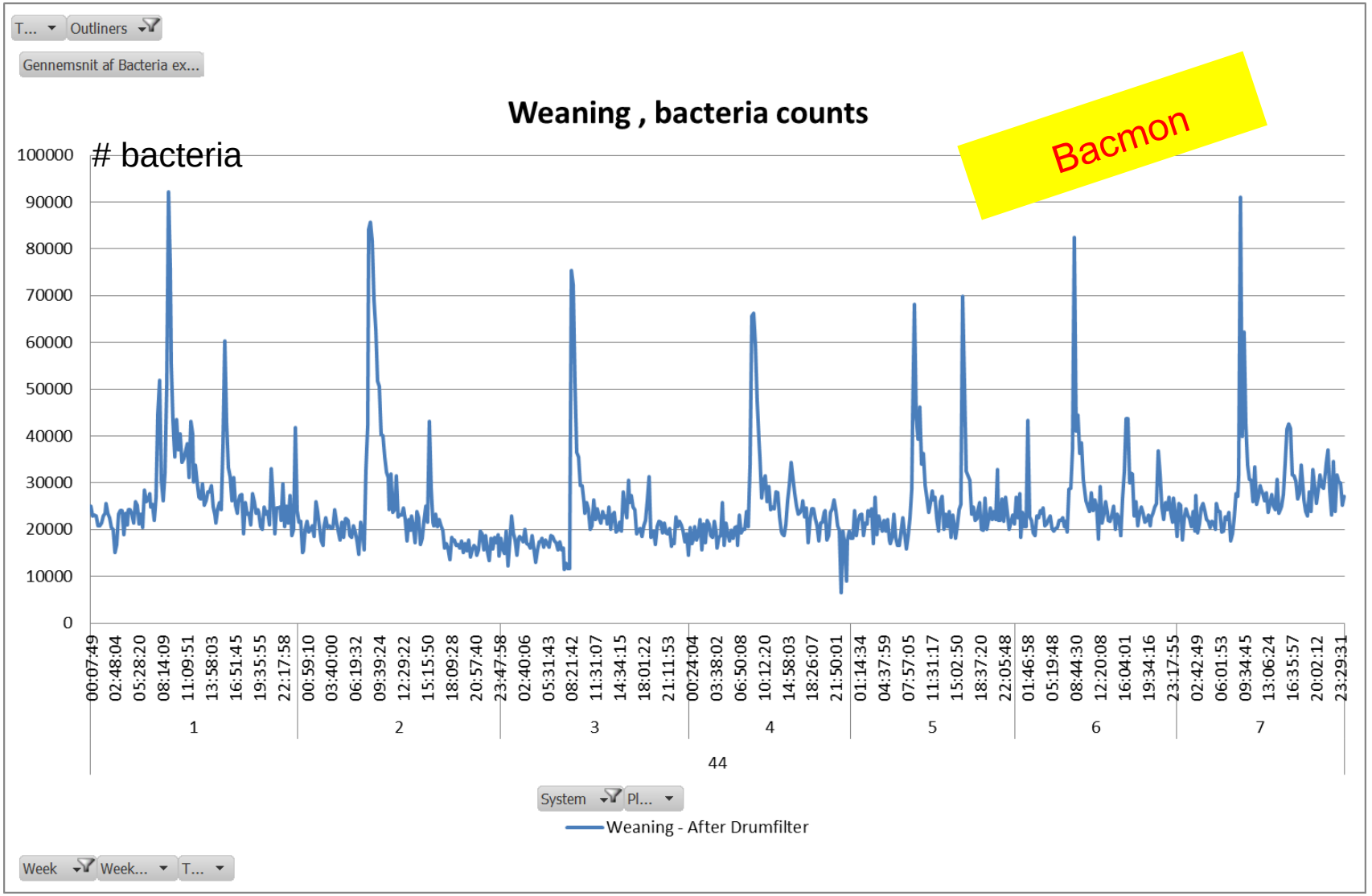
UV light, 37kw/1000 l/sec



UV light on dirty water, bacteria counts



Effects of cleaning tanks, bacteria counts



Insigths from monitoring bacterial load

- Optimice removal of organic particles / reduce carrying capacity
  - Measure before and after drumfilters, biofilters, inlet/outlet tanks
  - Visual test with clay (10-25 g/M3)
- Monitor bacterial load
  - Establish simple correlations
  - Daily monitering of sechi depth or turbidity
- Learn
- Manage and control

Philosophy is like being in a dark room and looking for a black cat.

Metaphysics is like being in a dark room and looking for a black cat that isn't there.

Theology is like being in a dark room and looking for a black cat that isn't there, and shouting "I found it!"

Science is like being in a dark room and looking for a black cat using a fucking flashlight.

Thank you for your attention

The Oatmeal