



GRUNDFOS 

**Rent vand
– nemt og simpelt!**

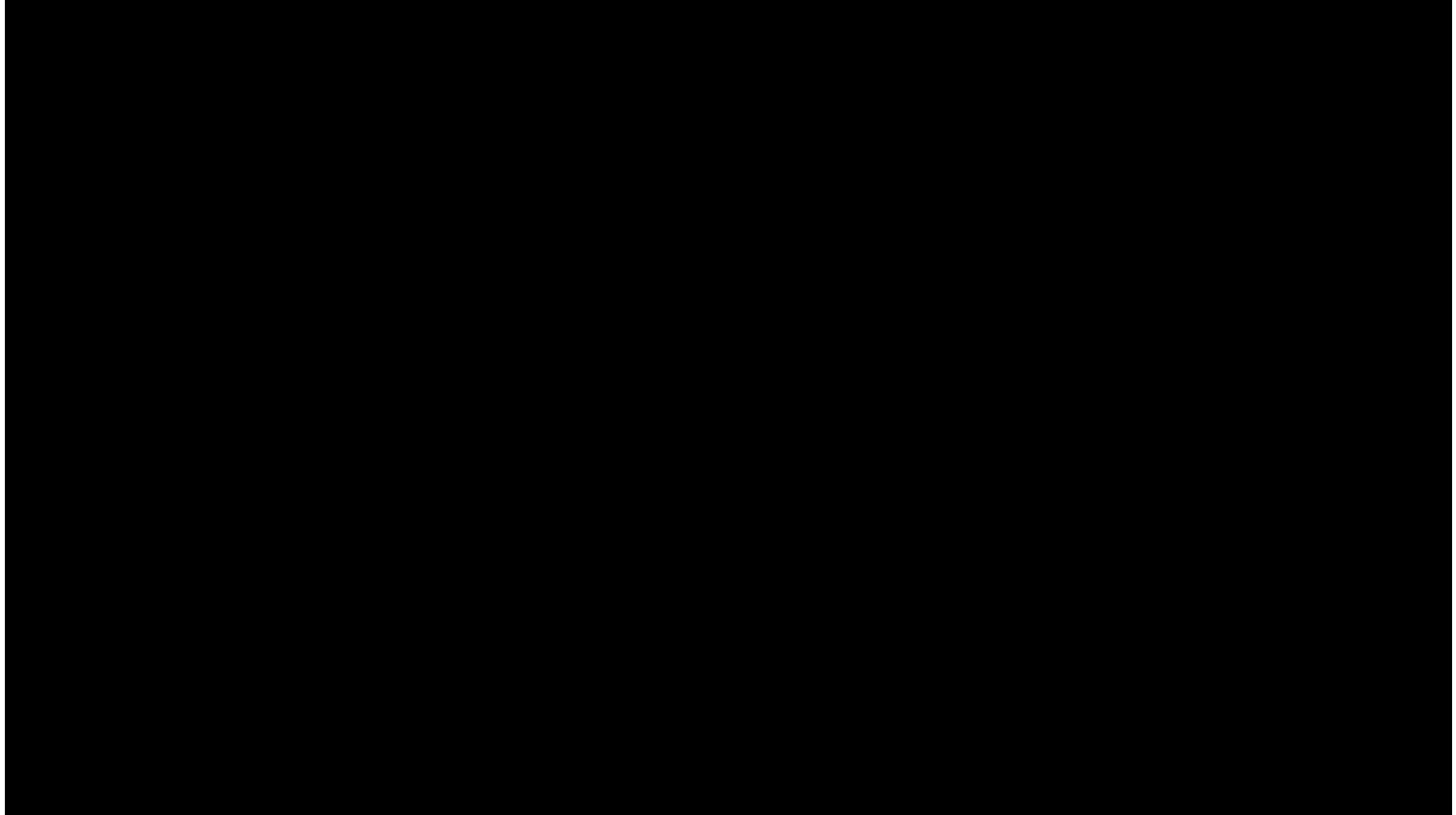
be
think
innovate

GRUNDFOS 

Agenda

- Grundfos & Grundfos BioBooster (GBB)
- Water – What is and will be the Challenges?
- What is a decentralized BioBooster solution
 - Concept
 - Membrane technology
 - How does it perform
- Opportunities with treated effluent
 - Practical example
 - Economy
- Summery

Joint co-operation to solve the water issues





Founded in
1945 by Poul
Due Jensen

Turnover
of EUR 3.3
billion in
2015

Grundfos in brief

World largest
pump
manufacturer

More than
18,000
employees
worldwide

The Grundfos Purpose & Values

Grundfos is a global leader in advanced pump solutions and a trendsetter in water technology.

We contribute to global sustainability by pioneering technologies that improve quality of life for people and care for the planet.



SUSTAINABLE



**OPEN AND
TRUSTWORTHY**



**FOCUSED
ON PEOPLE**



INDEPENDENT

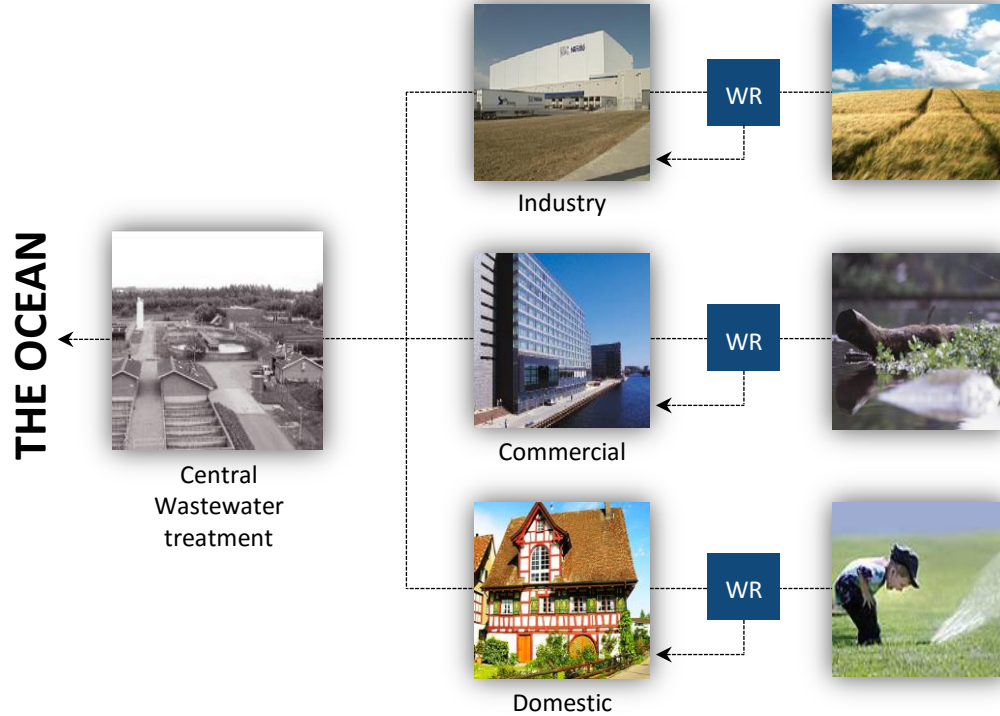


PARTNERSHIP



**RELENTLESSLY
AMBITIOUS**

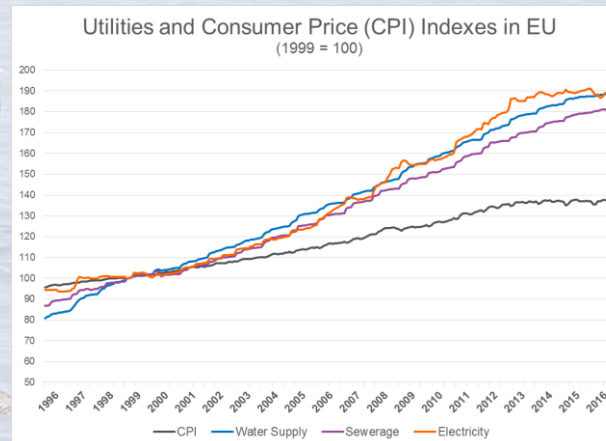
Water Sustainability



Water issues are local and volatile



“Deficit of 40% in Global water supply by 2030”



The implications for industry in Northern Europe

Increase pressure on preserving our environment

- Strick requirements
- Constrains on production capacity

High cost for

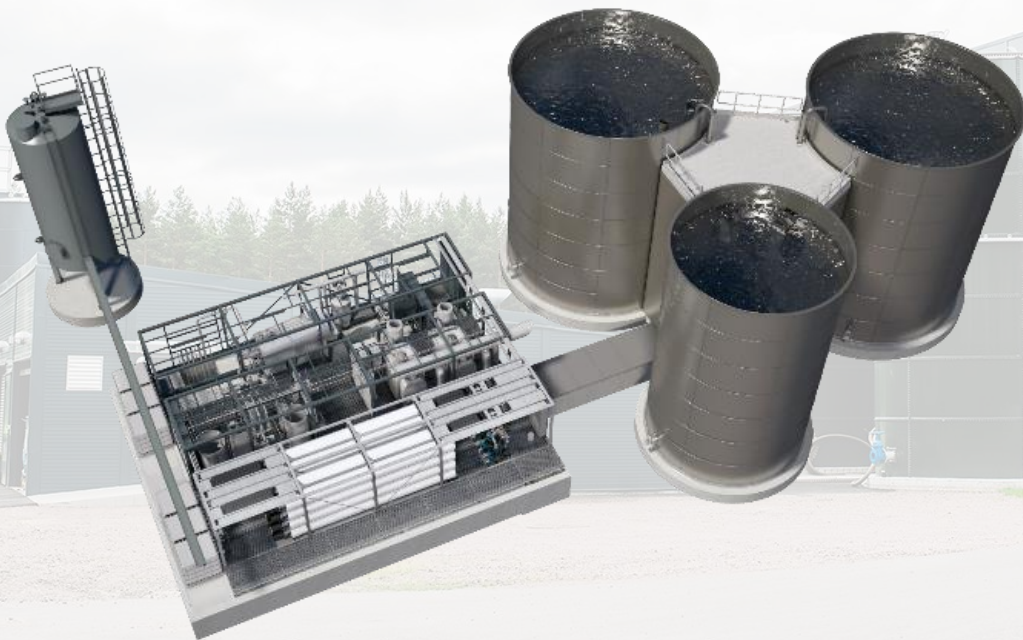
- Water
- Wastewater discharge

Pressure from stakeholders

- Owners
- Costumers
- Retail
- Consumers

The Grundfos BioBooster

Modular, Plug & Play, Easy to operate



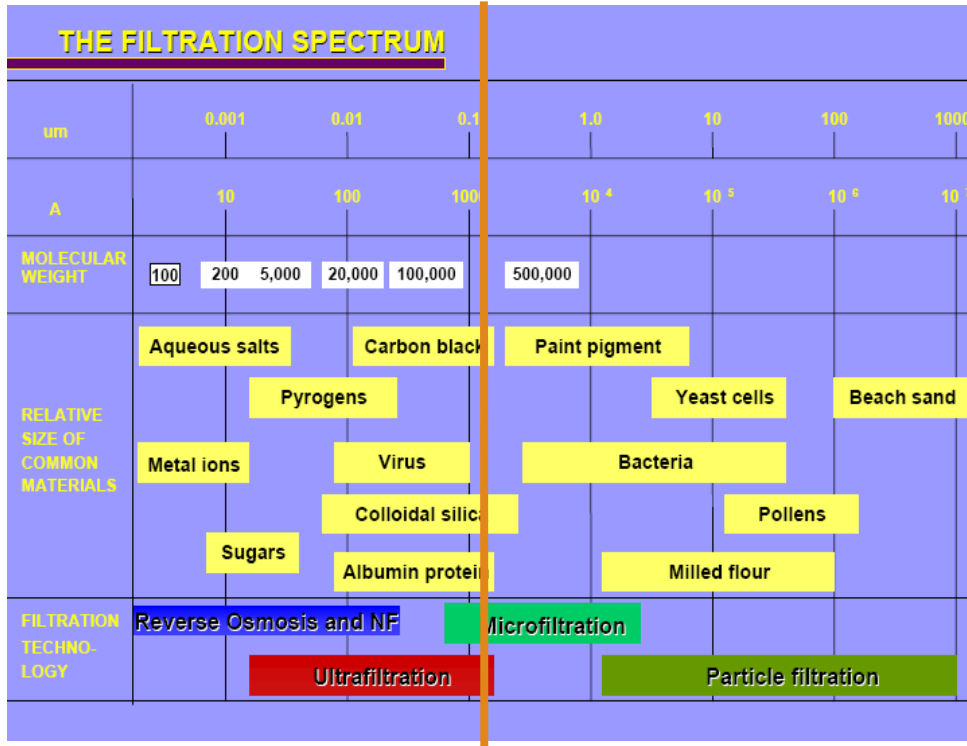
“ I just want to say that Grundfos does a fantastic job with the treatment plant! You are always committed and respond immediately.

At Vimmerby we say, 'Imagine if all suppliers had the same service as Grundfos BioBooster.' In other words: We are very grateful to have you as our partner! ”

*Pär Bragsjö, Facility Manager
Arla Foods Vimmerby, Sweden*



Ultra filtration

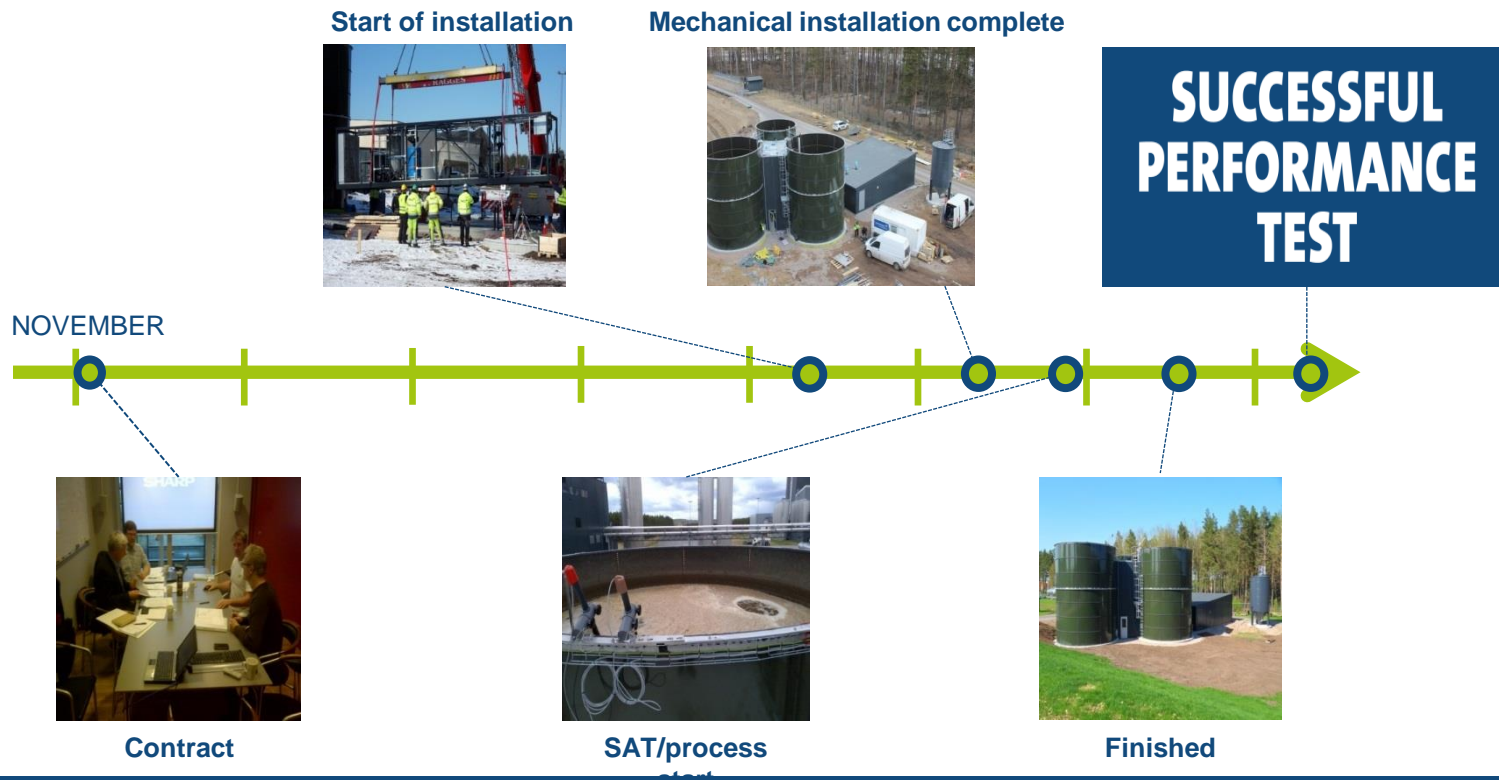


Advantages of MBR

- Improved effluent quality
- Stable quality
- Disinfection
- Water recycling

Plug & Play

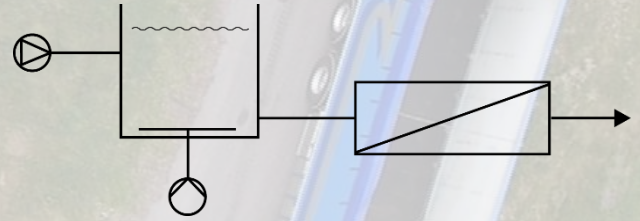
From contract to commissioning in just 7 months



Easy to operate – Ease in mind

Advanced automated Membrane Biological Reactor (MBR) plant

- Automatic process control
- AUTOADAPT membrane operation
- Structured production feedback
- Redundancy: Biological, flow, ...

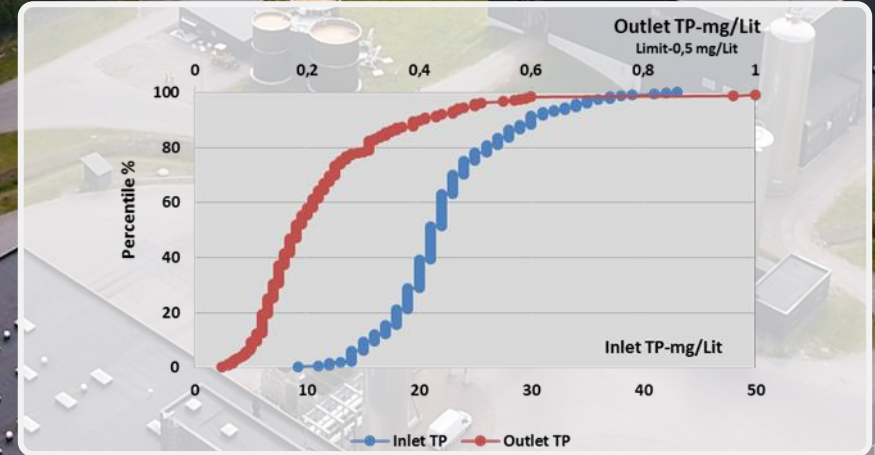
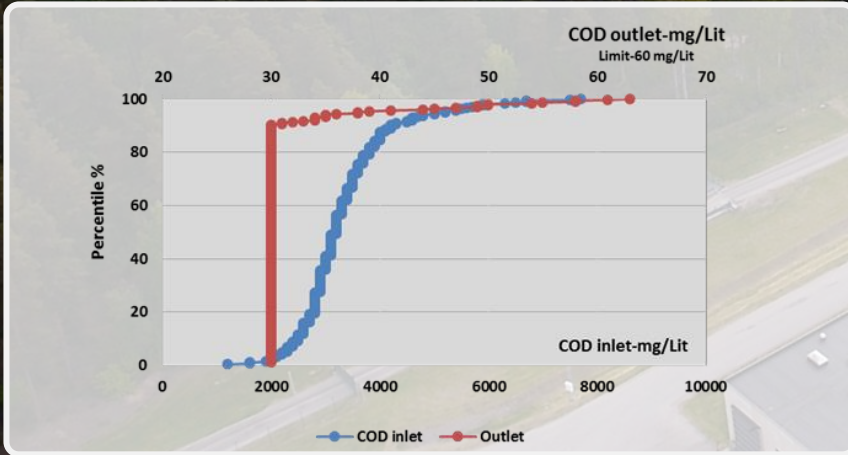
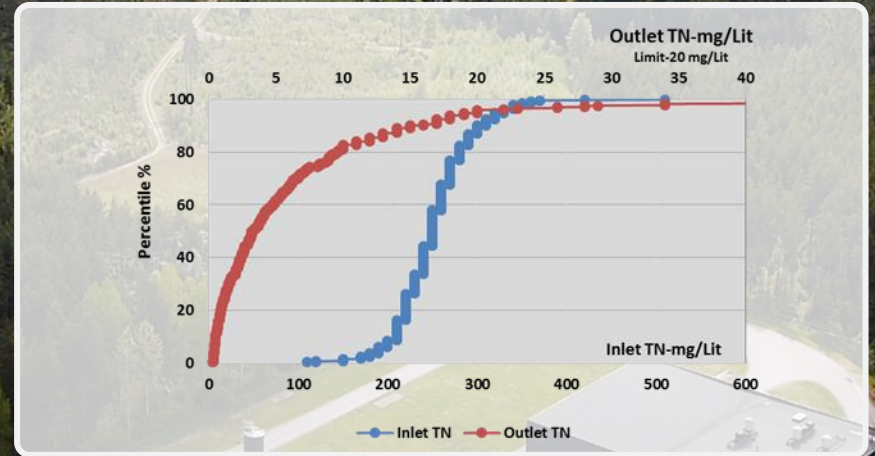


**24/7 SURVEILLANCE
FULL SERVICE PACKAGE**

Arla Foods, Vimmerby

Treatment results

Parameter	Avg. inlet	Avg. outlet	Discharge limit
Total COD, mg/Lit	3200	30	60
Total nitrogen , mg/L	250	3,3	20
Total phosphorus, mg/L	21	0,18	0,5



Why not re-use the water?

- Water re-use must be without comprising product quality
- In all case a risk assessment is performed
- Technical water opportunities:
 - Cooling towers
 - Boiler make-up water
 - External cleaning
 - Cleaning of product equipment
 - Lawns
 - Neighboring industry

Arla Foods, Rødkærsbro

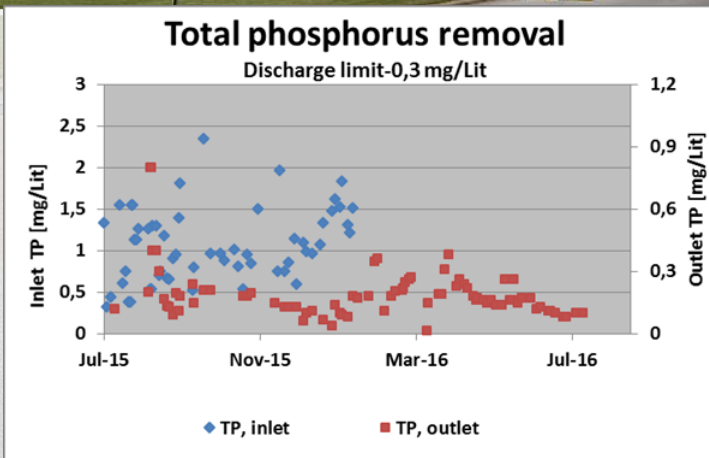
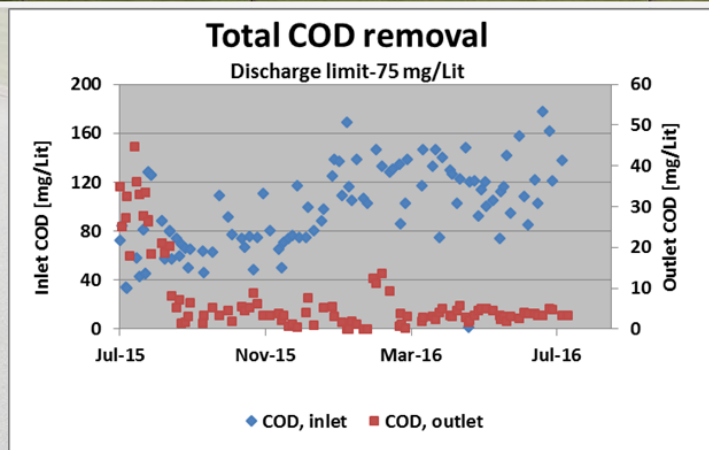
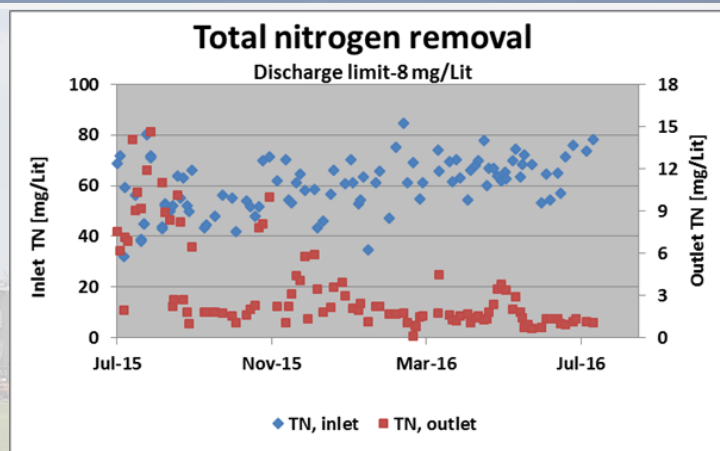
The solution



Arla Foods, Rødkærsbro

Treatment results

Parameter	Avg. inlet	Avg. outlet	Discharge limit
Total COD, mg/L	120	6,4	75
Total nitrogen , mg/L	65	2,1	8
Total phosphorus, mg/L	1,3	0,17	0,3

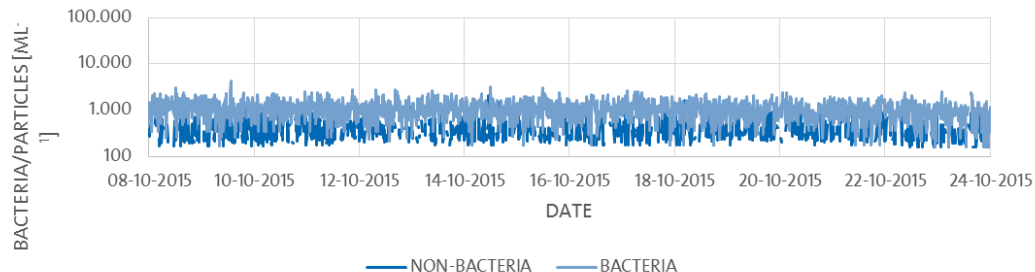


High quality treated water- Reuse opportunities

Parameters	Avg. value	Unit
Suspended solid	< 1	mg/Lit
pH	6,9	pH
Conductivity	561	μS/cm
Total Hardness	0,6	dH
Total Alkalinity	3,8	m mol/Lit
Water Color	4	mg Pt/Lit

Parameters	Avg. value	Unit
Bacterial count , 37 °	35	CFU/ml
Bacterial count , 22 °	48	CFU/ml
E Coli	< 1	CFU/ 100 ml
Coliform	< 1	CFU/ 100 ml

- **Meet the drinking water quality requirement**
- **Low conductivity and hardness -ideal for water reuse**
- **No pathogenic bacteria –high hygiene level**
- **Continuously measurement of bacteria using Grundfos BACMON**



Arla Foods, Rødkærsbro

The business case



Alternatives:

- Discharge to municipal WWTP
- Separate treatment of RO Water allowing for discharge to river or re-use in dairy

Alternative	Municipal	GBB	GBB w. re-use
CAPEX, mill DKK	0	13.5	14
OPEX, mill DKK/year	5.533	0.630	0.630
IRR, %		54%	75%
NPV (10Y), mill DKK		29.7	40.6

Summery

- Water issues are local and solutions must be evaluate in this context
- It is demonstrated that can be
 - Easy to install
 - Flexible
 - Robust to operate
 - Cost effective
 - Superior in water quality and allowing for water re-use
- So why not take advantage of this opportunity?