

EFFISLUDGE WEBINAR, NOVEMBER 12TH 2020

How to reduce carbon emission within industrial wastewater treatment

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1. AFRY at a glance
2. Pulp and paper industry trends
3. How to reduce carbon emission
4. Anaerobic digestion
5. Conclusion



AFRY at a glance

INDUSTRIAL & DIGITAL SOLUTIONS

Advanced Automation
Automotive R&D
Connected Products
Experience Design
Food & Pharma
IT Solutions
Specialized Tech Services
Systems Management

ENERGY

Renewable Energy
& Thermal Power
Hydro
Transmission & Distribution
Nuclear
Contracting

MANAGEMENT CONSULTING

Energy Sector
Bioindustry Sector
Market Analysis
Strategic Advice
Operational Excellence
M&A and Transactions

PROCESS INDUSTRIES

Bioindustries
Chemicals
Pulp, board, paper & tissue
Mining & Metals
Smart solutions:
- Health & Safety
- **Sustainability**
- AFRY Smart Site & digitalisation

INFRASTRUCTURE

Transportation
Buildings
Project Management
Water
Environment
Architecture & Design

Locally present in
>40
countries

Revenue
2 bn
EUR in 2019

Projects
>100
countries

We have
17,000
employees

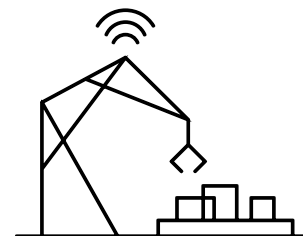
5 Growth Drivers



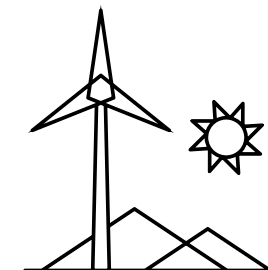
Future mobility



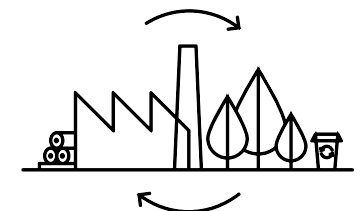
Smart cities and infrastructure



Industrial digitalisation



Changing energy markets

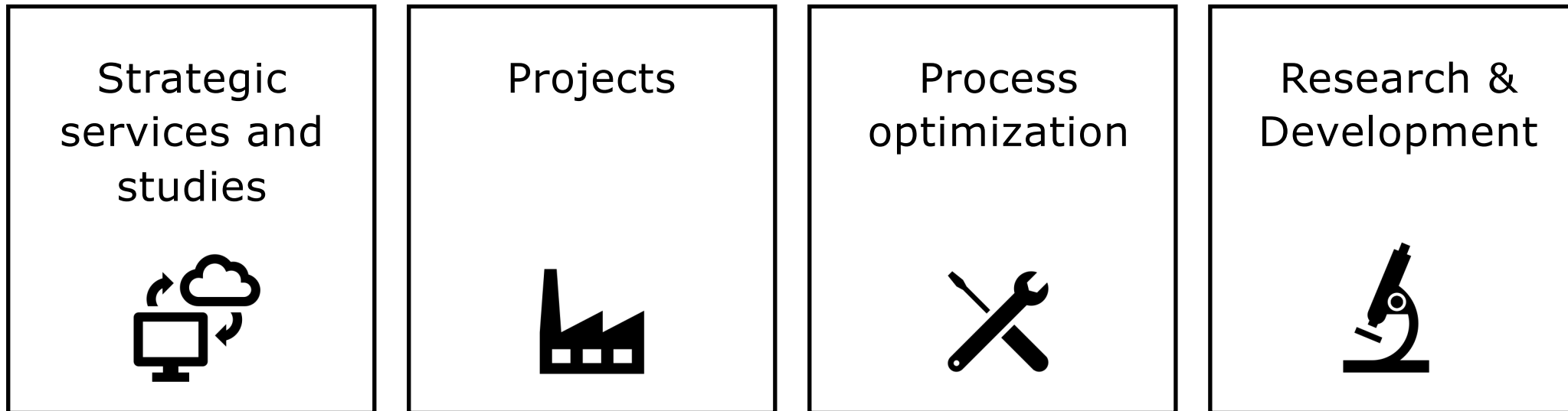


Transition to bioeconomy

The AFRY Sustainability Group, Sweden

Process experts in industrial waste water treatment mainly in pulp and paper, but also in metal & mining and food and pharmaceutical sector.

In Sweden and globally.



Global pulp and paper industry trends



Growing packaging sector

The growing demand for consumer packaging as well as transport and industrial packaging.



Positively developing tissue paper consumption

Partly due to Increased middle class population



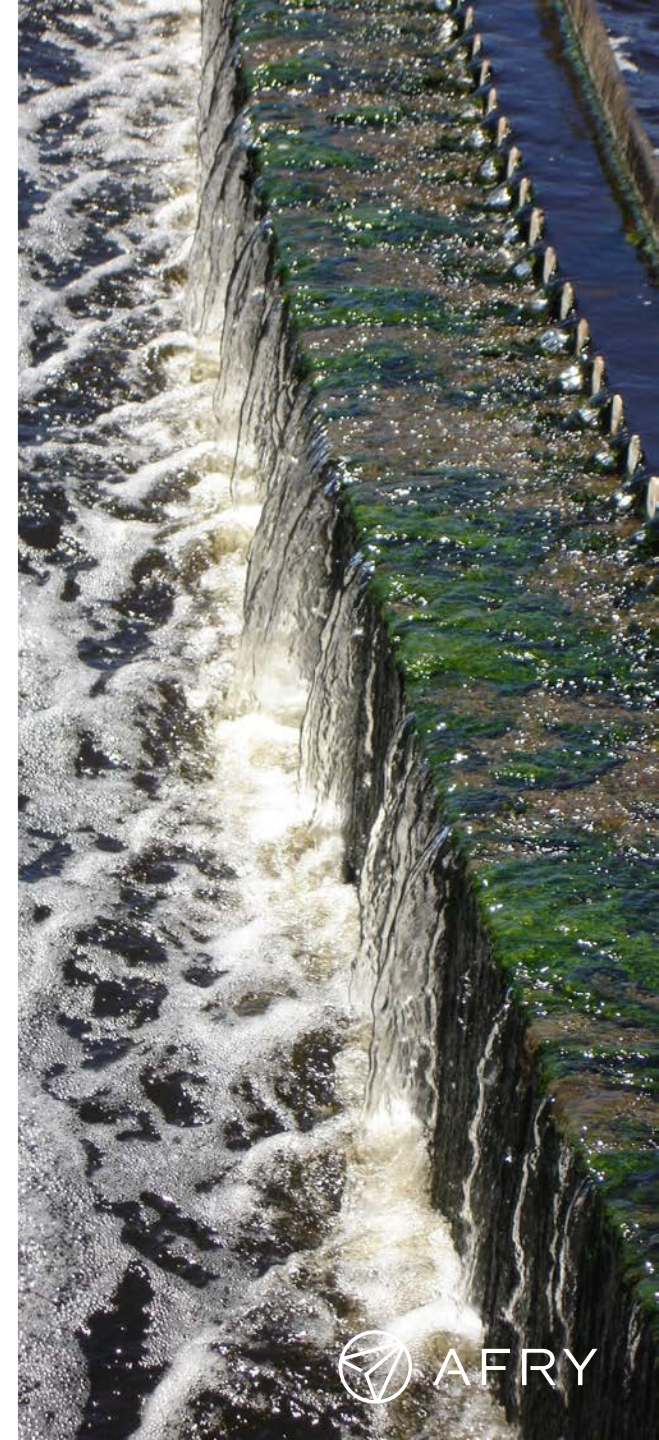
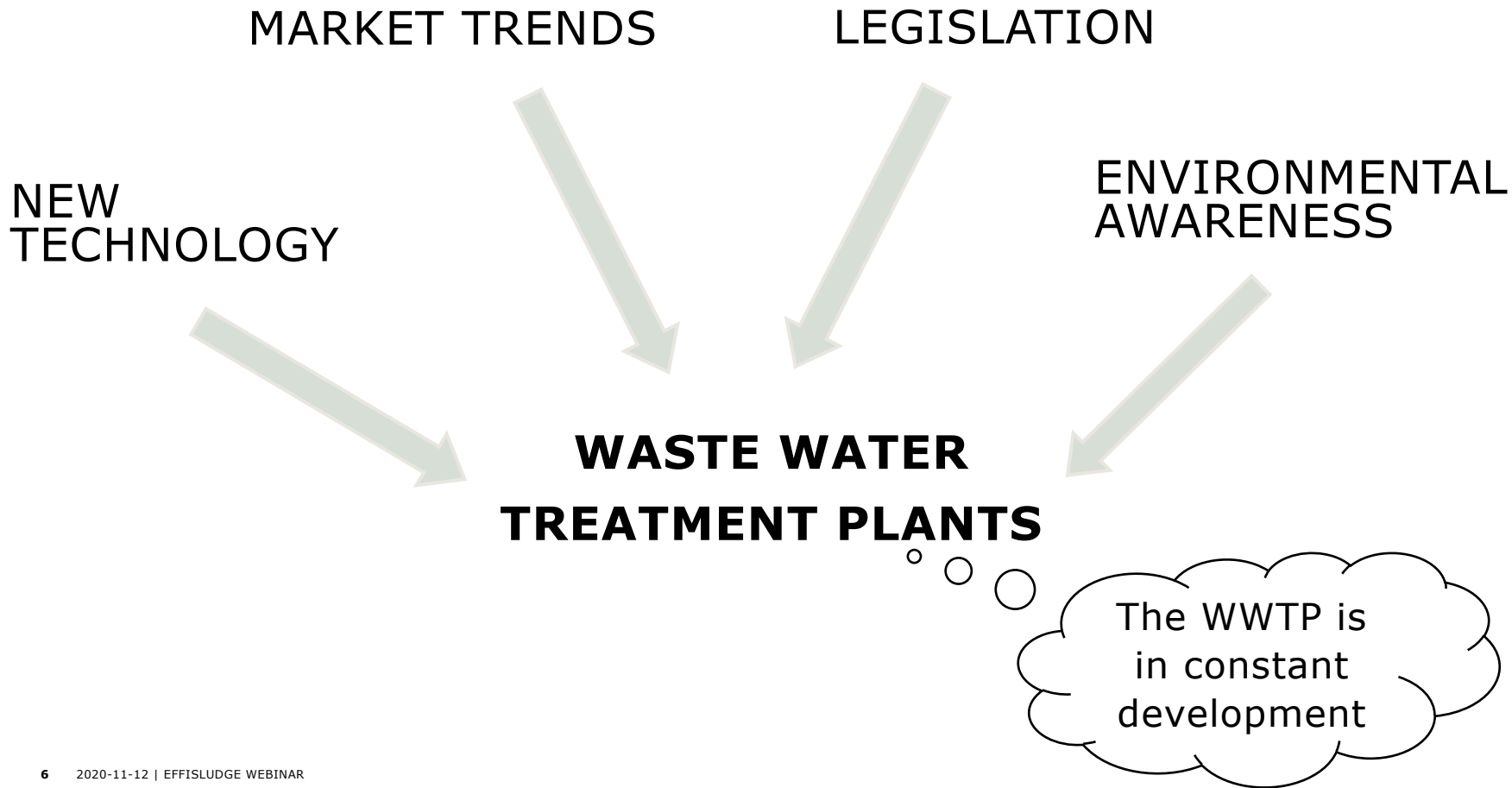
Declining graphic paper market

Paper market is expected to continue to decline in the future due to digitalization.



MARKET TRENDS

Global pulp and paper industry trends



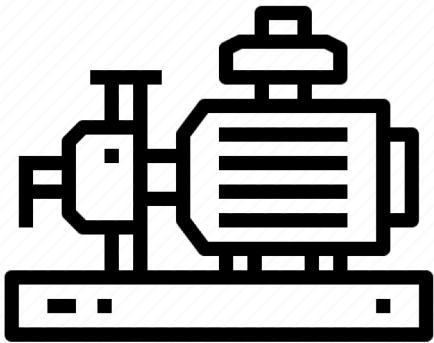
Reducing carbon emission

Environmental awareness has led to focus on **carbon emission**.

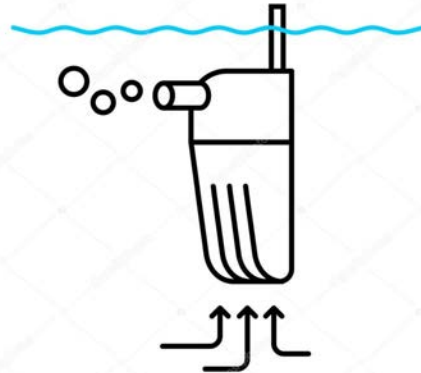
Energy management is one of many ways to reduce carbon emission

There are a number of ways to **reduce energy consumption** in the pulp and paper wastewater treatment plant

Highest energy consumption in these processes:



Pumping
(10-15%)



Aeration system
(Up to 80%)



Sludge treatment
(5-10%)

Measures to reduce carbon emission?

Mill site
upstream

Reduce, reuse and recover
the wastewater. Reduce
COD

Optimize
operation

Digitalization

More efficient
equipment

Aeration system, heat
exchangers, diffusers,
better solids removal

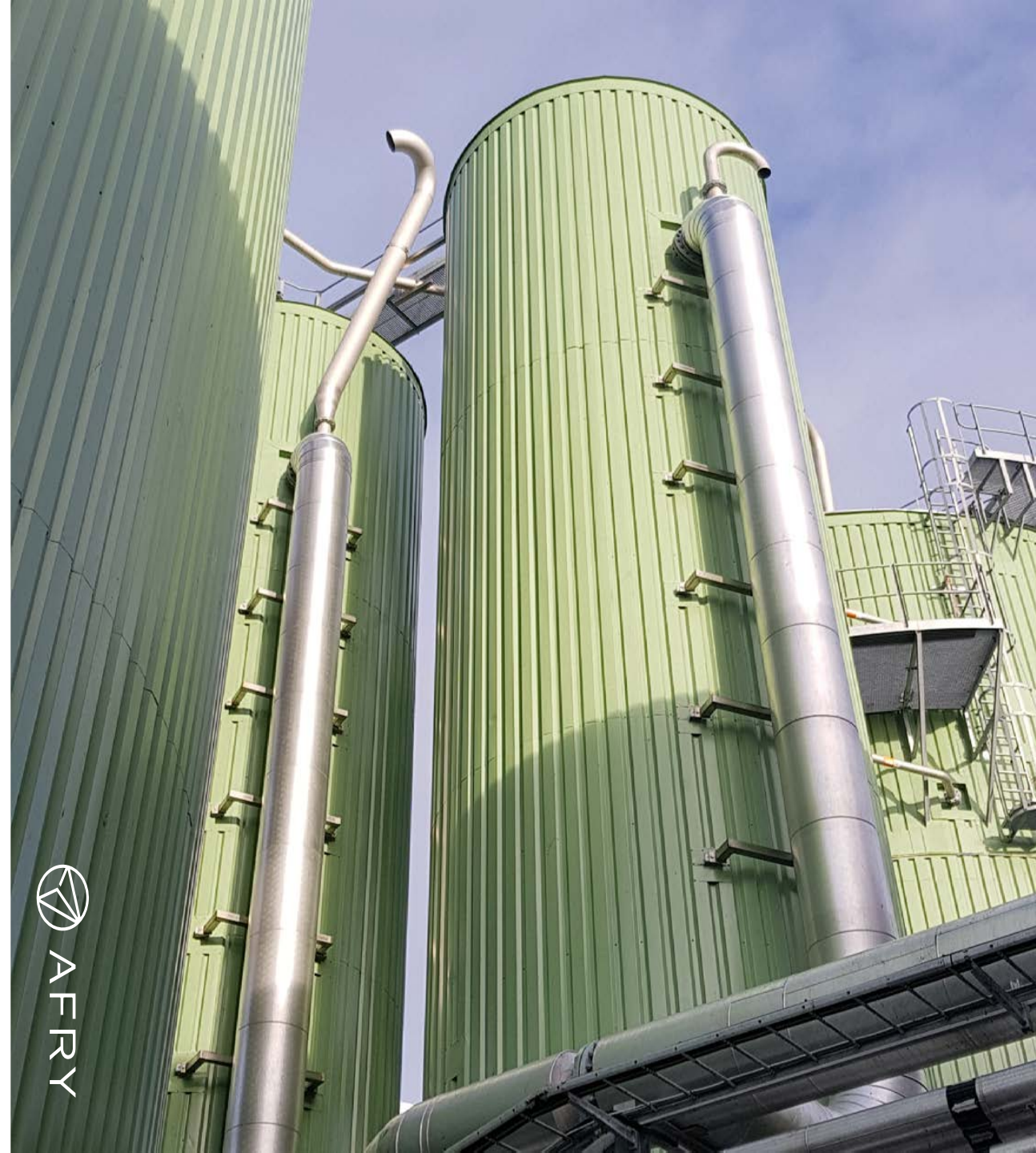
Treatment
process

MBBR, aerated lagoons,
activated sludge, anaerobic
digestion, MBR

ANAEROBIC DIGESTION

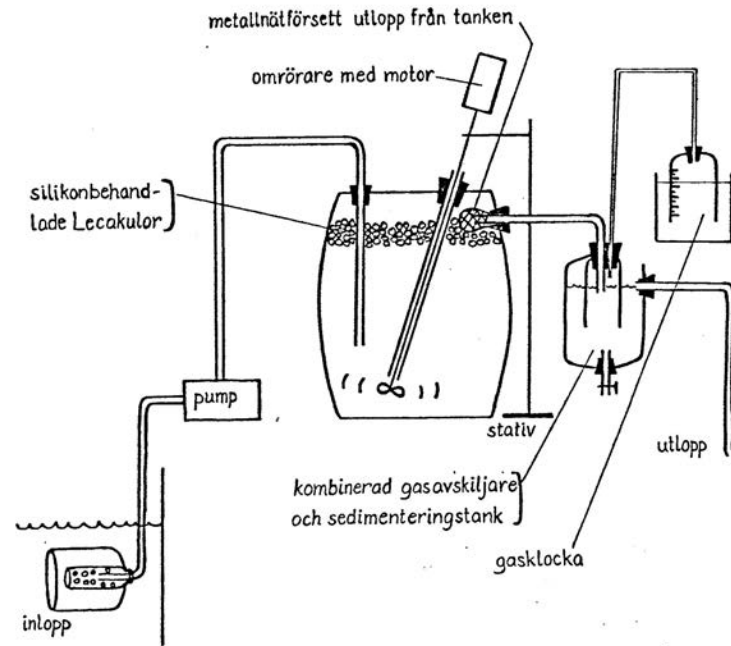
Anaerobic digestion

- Background
- Development over the years
- Potential for carbon emission reduction
- Challenges from the industry point of view

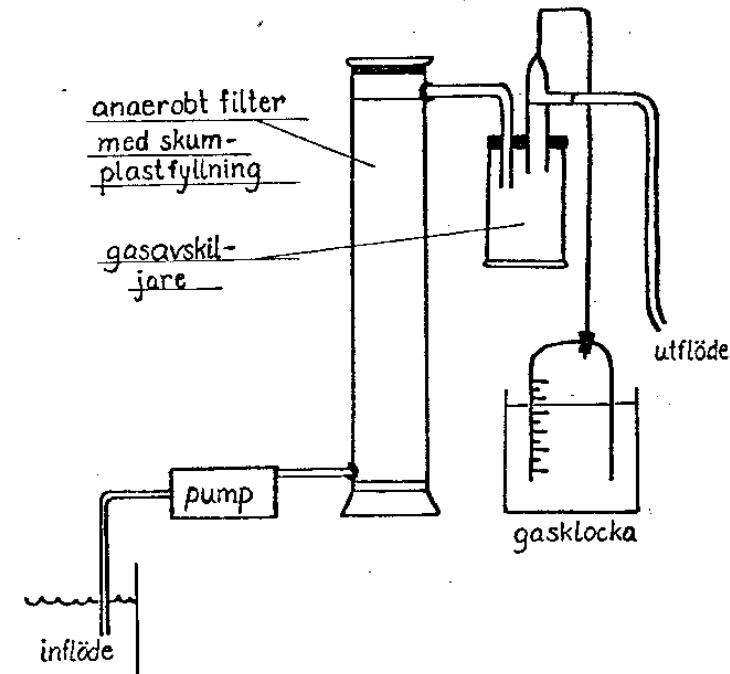


Master Thesis in 1982:

Anaerobic treatment of municipal effluent



Agitated reactor with silicon treated leca carriers



Anaerobic filter

Headlines

1980-1985:

"First with anaerobic treatment"

Svensk Papperstidning, 1984, about the new effluent treatment at Hylte Mill, Sweden

"Anaerobic treatment of industrial wastewaters"

Chemical Engineering, November 1982

"Inland Container saves money with anaerobic-aerobic treatment plant"

Tappi Journal, November 1981

2015-2020:

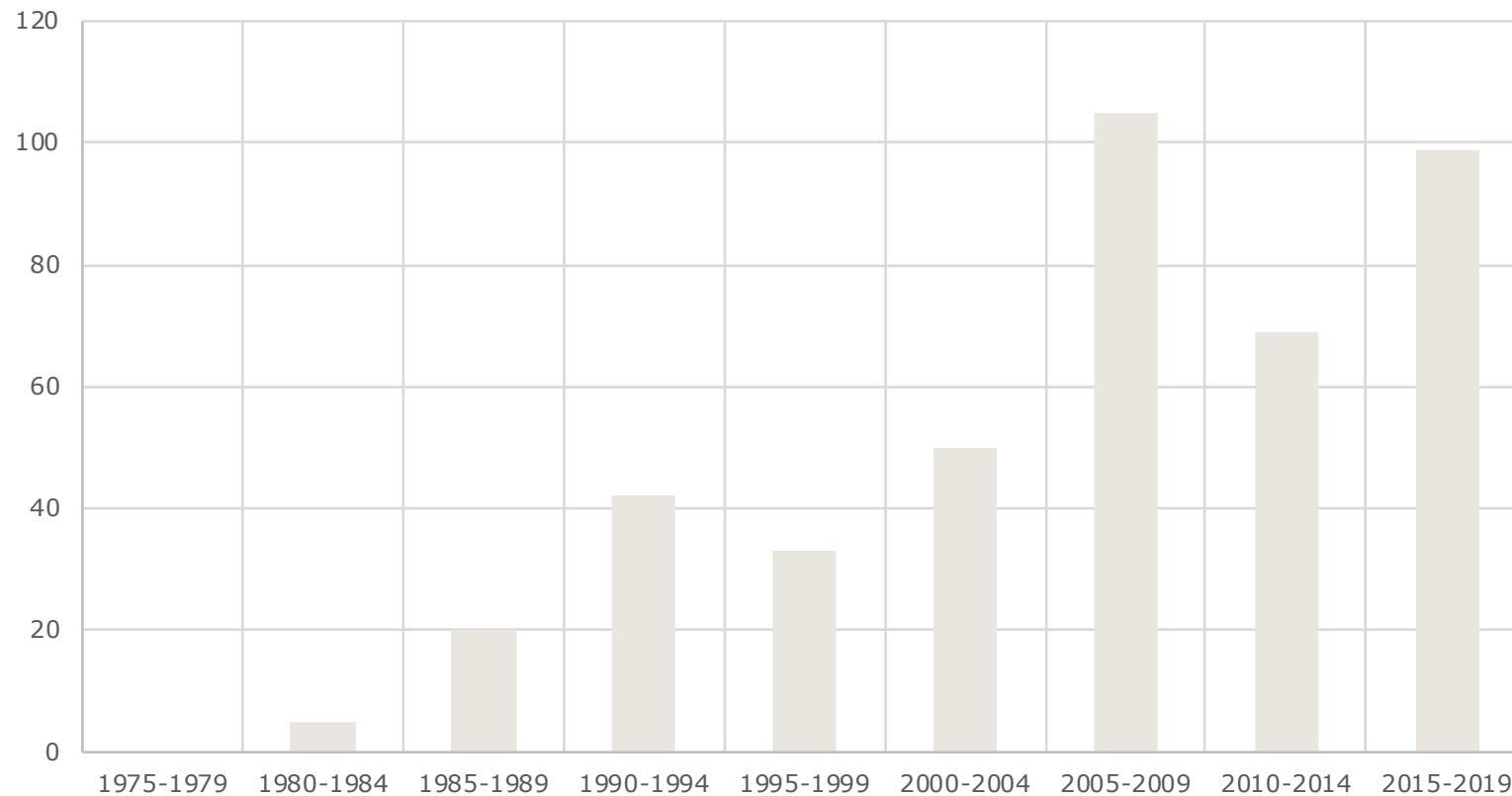


Anaerobic Digestion Process Used on Effluent from a Ben & Jerry's (Unilever) Ice Cream Factory

Cleaner paper production in DS Smith Kemsley Paper Mill thanks to 1500th Paques BIOPAQ® reactor

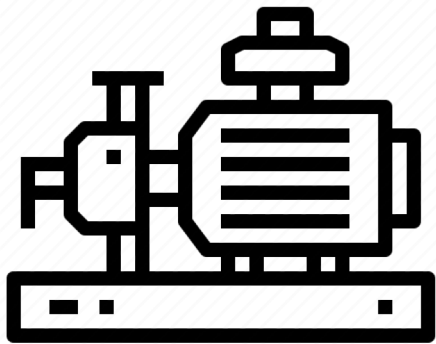
Development in anaerobic installation

AD installations in Pulp and Paper

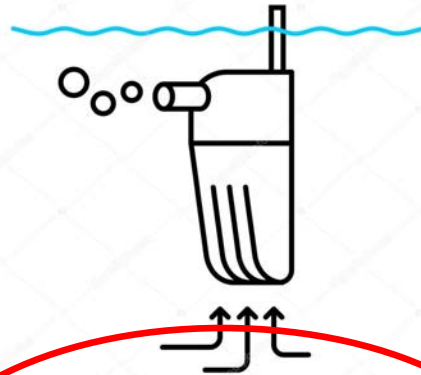


Positive development throughout the years.

Potential for carbon emission reduction



Pumping



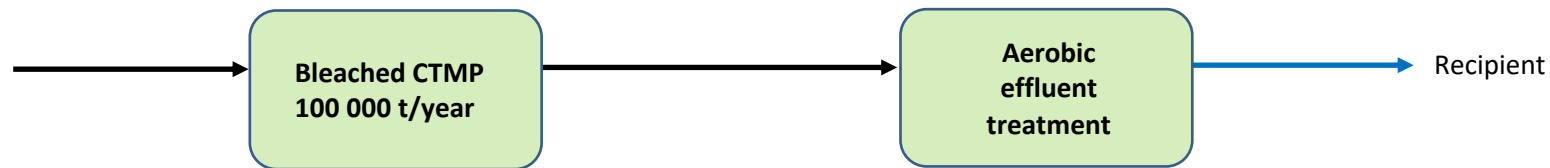
Aeration system



Sludge treatment

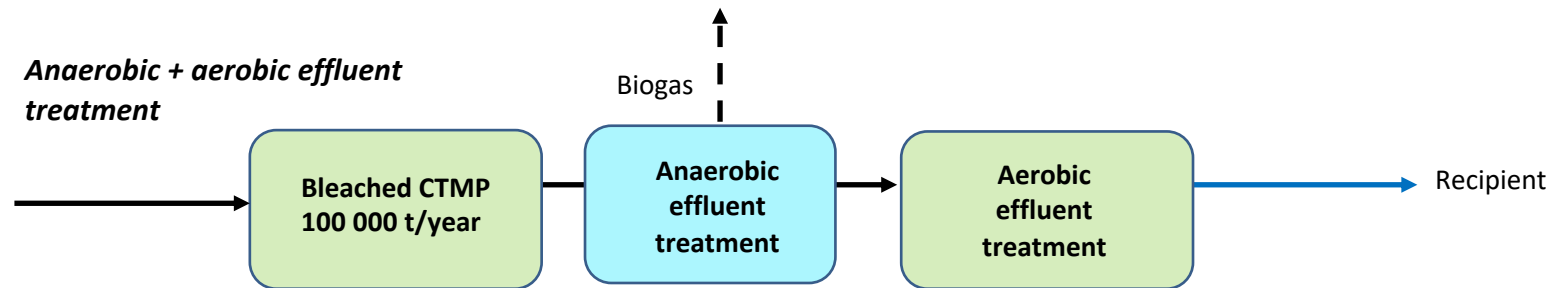
Energy reduction potential

Aerobic effluent treatment



Electricity consumption
30 MWh/d

Anaerobic + aerobic effluent treatment



Electricity consumption
10 MWh/d

Biogas production
30 MWh/d

Sivard & Ericsson, Process integration of water effluent treatment . Reduction of energy and resources use in pulp and paper industry, Project for the Swedish Energy Agency, 2011

Challenges from the industry point of view

Challenges from the industry point of view

- Waste water suitability
- Toxic and inhibiting substances
- High levels Sulphur
- Post treatment still needed
- Higher investment costs compared to other technologies
- Competing technologies
- Issues related to Health-Safety-Environment



Summary and conclusion

Changes in the pulp and paper market is one of the drivers that a mill's wastewater treatment needs to adapt to.

Environmental awareness has led to focus on carbon emission and a mill can reduce its carbon emission by **reducing its energy consumption**. There are many ways of tools and strategies to achieve that.

Anerobic digestion (AD) is a biological treatment process and a great alternative for reducing carbon emission in the wastewater treatment.

AD has a huge **implementation market** and offers many advantages but there are a number of **challenges** it needs to overcome before it can reach its full potential.



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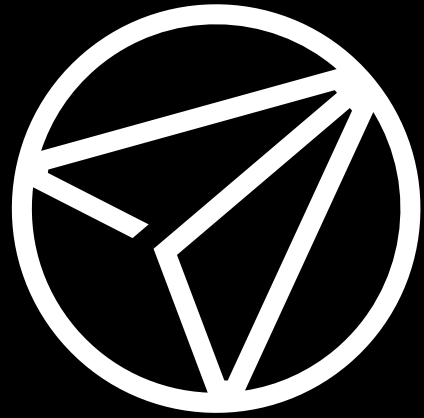
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