

A man wearing a red and white plaid shirt, dark jeans, a brown hat, and glasses is standing on a wooden floor against a dark, textured wall. He is holding a glowing, swirling orb of light in his right hand. From this orb, a trail of light bulbs emerges, floating in the air and connected by wispy, smoke-like lines. The light bulbs are of various sizes and are all illuminated, creating a sense of movement and energy.

SERVOPHIL[®]

YOUR EXPERT PARTNER FOR
WORRY-FREE PROCESS WATER CYCLES

Solutions for demanding packaging paper production

- innovative multiple treatment approaches

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Joachim Hege

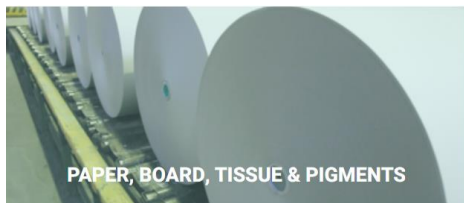
Servophil AG

- Servophil at a glance
- Processwater treatment challenges at packaging mills
- Actual solutions
- Examples for future treatment possibilities



Servophil at a glance

SERVOPHIL®



Company Profile

- established in 2005 - privately owned and managed SME
- Industry relevant innovations, service and added value, "Ind. 4.0"

Main focus

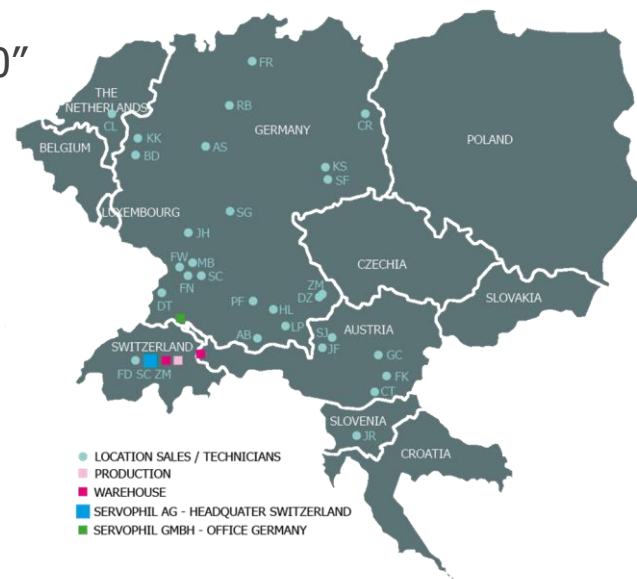
- Paper, board and pigment industry
- Process industry: industrial water- and process treatment

Our markets

- DE / AT / CH / SLO / CZ / BNLX / PL

Our strengths

- Helping our customers to increase their productivity
- Innovation
- Fast and pragmatic decision making
- Long-term view, objectives and relationships



... always close to our customers!

Our applications

SERVOPHIL®



**PRESERVATION
SLIME CONTROL
CONTROL OF MICROBIOLOGY**



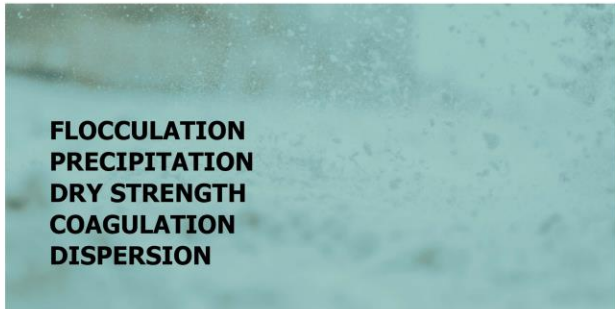
**SHUTDOWN CLEANING
ONLINE CLEANING
BIOLOGICAL CLEANING
PHYSICAL CLEANING**



**STICKY CONTROL
SCALE INHIBITION
PITCH CONTROL
DEPOSIT CONTROL
CORROSION INHIBITION**



**DEAFOMING
DEAERATING**



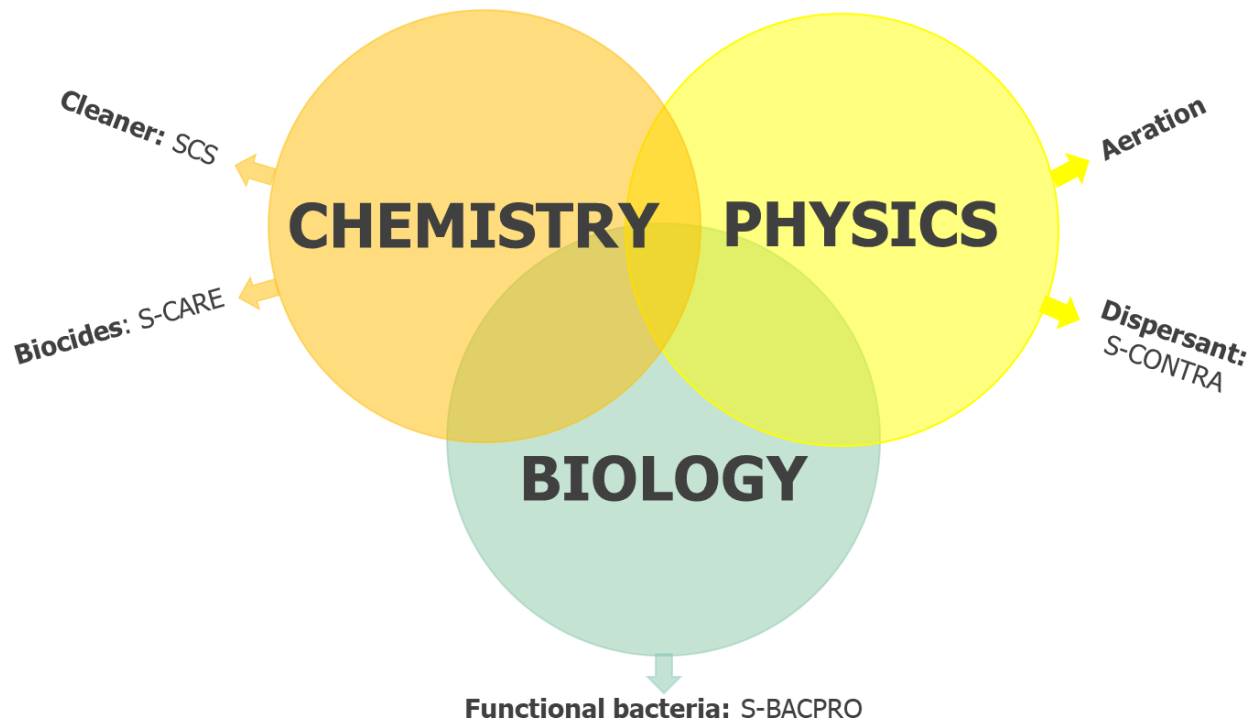
**FLOCCULATION
PRECIPITATION
DRY STRENGTH
COAGULATION
DISPERSION**



**CONSULTING & SERVICE
ANALYTICS
DOSING SYSTEMS & SENSORS
ONLINE MONITORING
SAFETY & REGULATIONS**

Our approach: Deposit & odour control inspired by nature!

SERVOPHIL®



**Improving deposit & odour control
by combining the best of chemical-, physical- and biological technologies**

1. Reduction of virgin fiber content in waste paper → Raw material quality
2. Closing of water loops → Increasing COD, bacterial activity, pH reduction, need for treatment possibilities
3. Reduction of emissions (odor, CO₂) → Need for treatment possibilities
4. Food contact regulations → Limitation of treatment possibilities
5. Environmental sustainability → Need for environmental friendly treatment possibilities

- Classic biocides, e.g.
 - 2-Bromo-2-nitropropane-1,3-diol (Bronopol)
 - 2,2-Dibromo-3-nitrilopropionamide (DBNPA)
 - 5-Chloro-2-methyl-4-isothiazoline-3-on (CMIT)
 - etc....
- Oxidising biocides, e.g.
 - Peracetic acid,
 - H_2O_2
 - 1-Bromo-3-chloro-5,5-dimethyl-2,4-imidazolidinedione (BCDMH)
 - etc...
- Currently very widespread → MCA systems



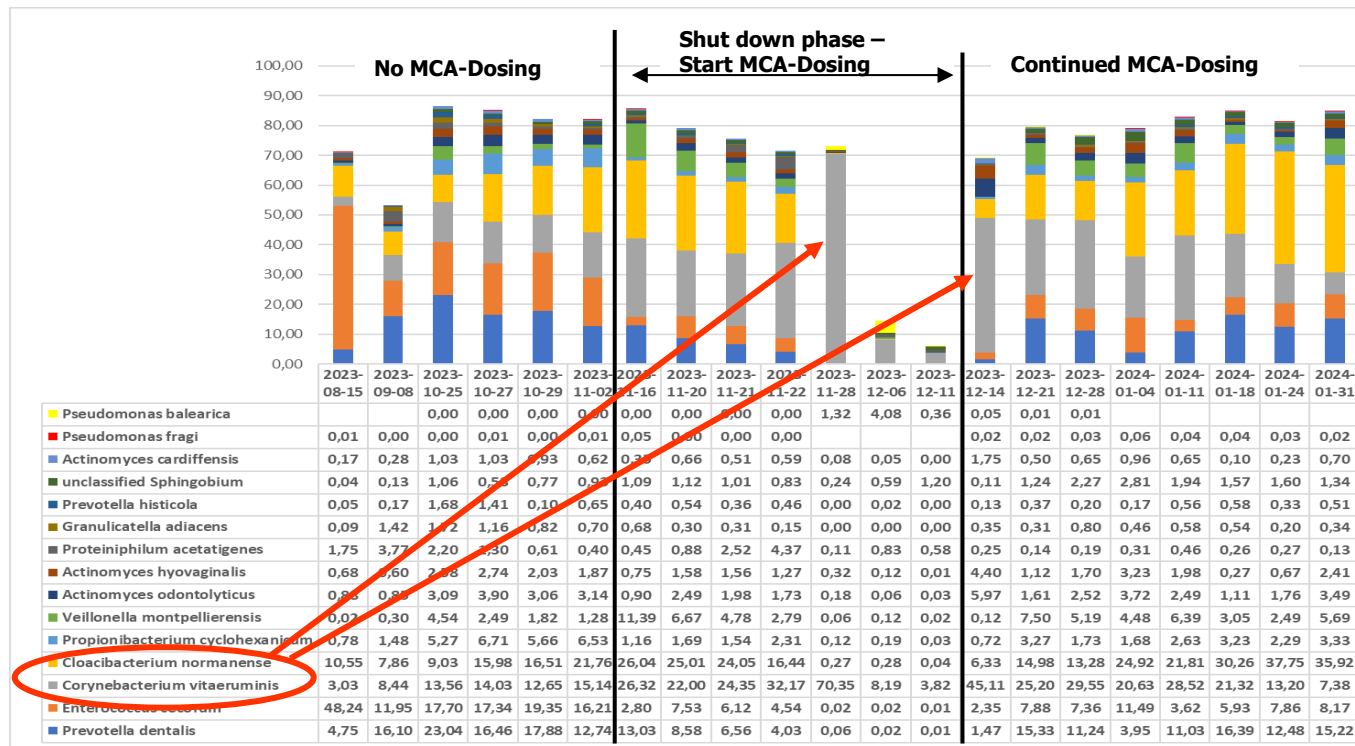
Advantages/disadvantages of MCA

Applies to all biocides: *bios* griech. **live** and *caedere* lat. **kill**

Advantages of MCA	Disadvantages of MCA
Highly effective – state of the art	No preservative effect – continuous dosing necessary
Biodegradable and has therefore no long-term impact on the environment	No specific effect (kills everything)
Measurement/control via chlorine content	AOX supplier
Well-functioning dosing technology available	Corrosive

MCA-Problem – No specific effect?

Customer example: Buffer tank treatment with MCA in a shut down phase!



With start MCA bacteria count went down, but Corynebacterium vitaeruminis (produces sulfide compounds) survived and increased in the start-up phase

→ **Continuous dosing of MCA needed to keep them down.**



Synergy Use Mode – Synergy through combination

Stabilisation of the pH value at a higher level through a tailored treatment programme. We optimise with the best, individual combinations from our innovative products.



Environment Modeling Mode – Eco-friendly optimisation of equilibrium

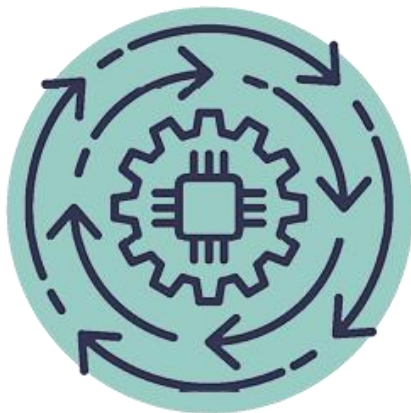
SCS (ServoCleanSystem) and S-BACPRO (functional bacteria) are environmentally friendly treatment methods for preventing deposits and stabilising pH values.



Predictive Operation Mode – Proactive treatment

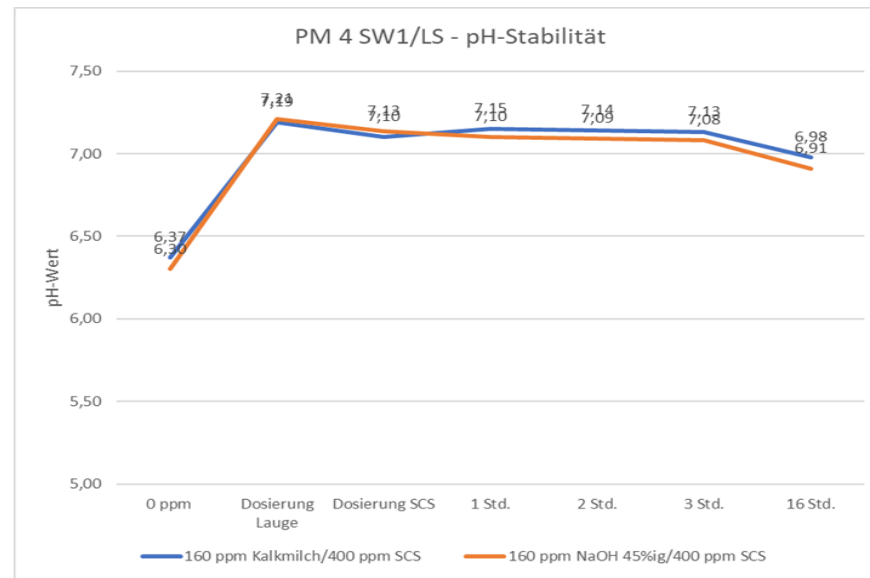
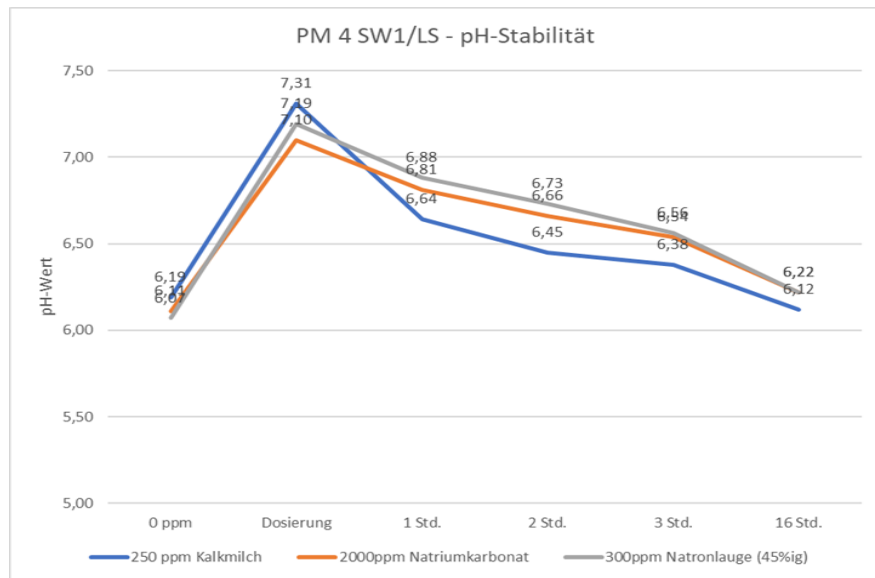
Integrating process parameters into a control strategy enables proactive treatment before problems such as deposit formation or acidification arise.



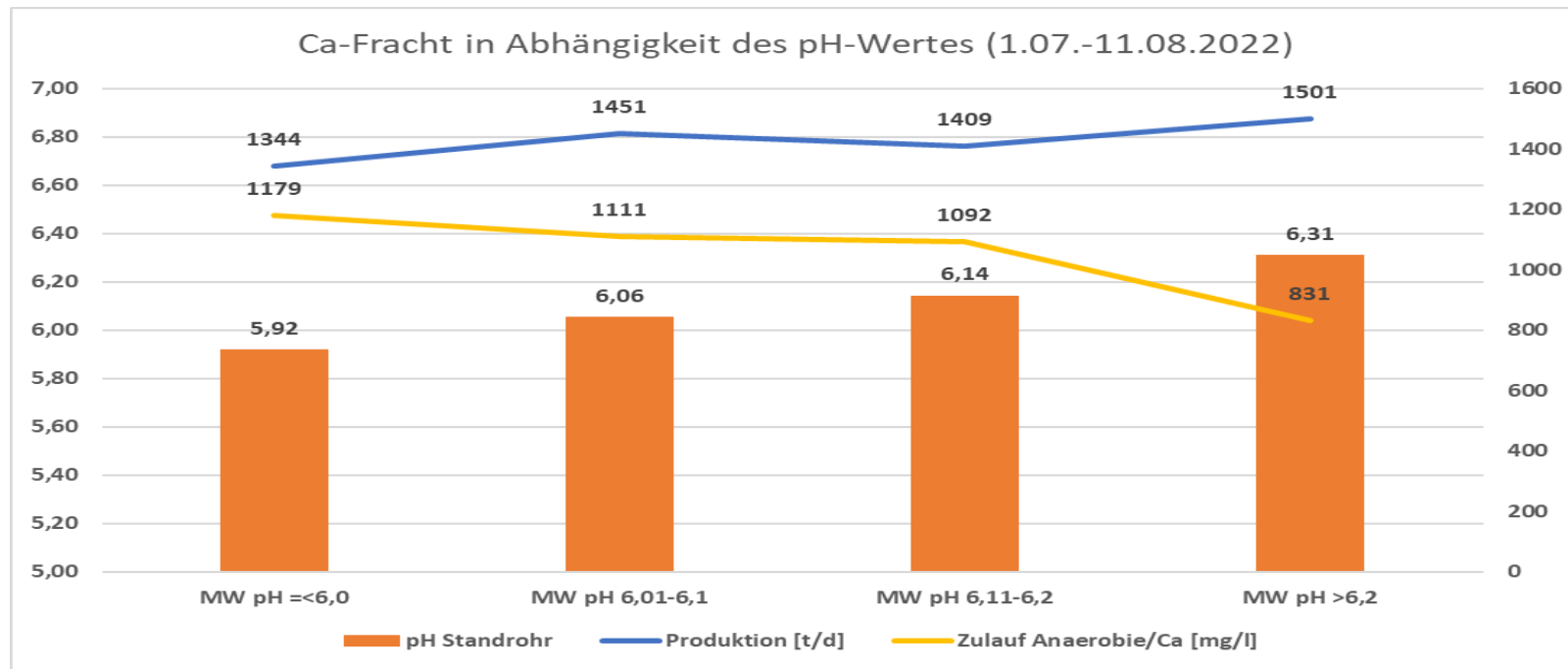


Synergy Use Mode

- Alkali (caustic soda, lime milk, sodium carbonate) increases the pH value, but it does not remain stable. The pH value drops again relatively quickly.
- Alkali in combination with SCS (ServoCleanSystem) stabilises the pH value.
- pH stabilisation leads to lower chemical consumption and a more stable process.



- Operational trials confirm the effect and impact
- By increasing and stabilising the pH value, the calcium load on the sewage treatment plant is reduced and anaerobic reactors are protected.





Environmental Modeling Mode

IN WHITE WATER SHORT CIRCUIT

SCS cleaning treatment with a combination of:

S-COMBI-TD+ (**D**ispersant)

- hardness stabilization,
- corrosion protection
- dispersion

+

S-COMBI-**R** (specially stabilised)

- oxidizing cleaner
- redox pot. regulation
- odour prevention
- alkaline

The aim of the oxidative component is to bring the wet end environment into the aerobic range. Raising the redox potential is sufficient to stabilise the pH value.

Approach: Functional Bacteria -> S-BACPRO

...Functional Bacteria – a new technology step replaces biocides

Functional „Probiotic“ Bacteria

Pro = for
Bio = life
Probiotic =
Promoting
life

Functional Bacteria in industrial water- and process treatment provide for **new environmentally friendly** way of maintaining **excellent control of organic deposits** in cooling- and process water systems!

The more Functional Bacteria are dosed and accumulate, the higher the number of desirable microorganisms.

Less negative side effects (e.g. unpleasant odours, organic acid, deposits) occur.

Two phenomena playing key roles...



... in Probiotic cleaning

1. Dominance principle

The regular and continuous use of Functional Bacteria creates and ensures a dominance of desirable bacteria in the system.

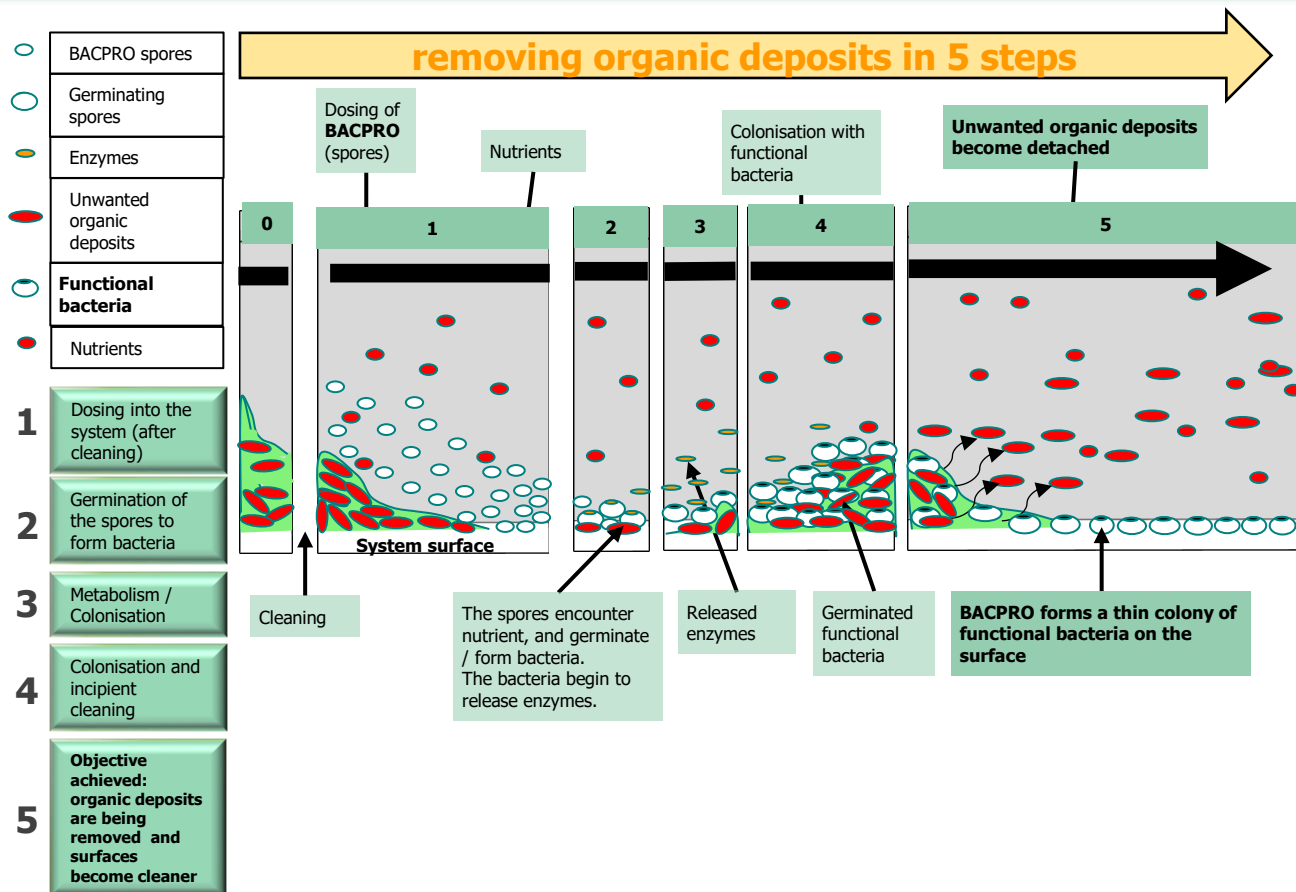
2. Change in Colonisation

Colonisation of surfaces is changed by continuous dosing of S-BACPRO resulting in reduced risk of negative side effects.

ProBiotic cleaning

Biological deposit control with Functional Bacteria

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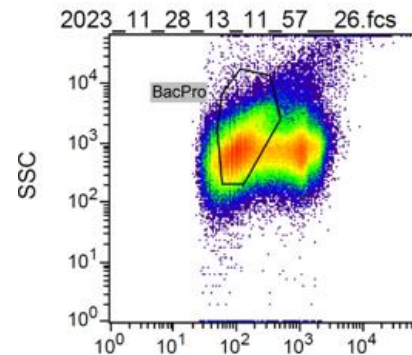
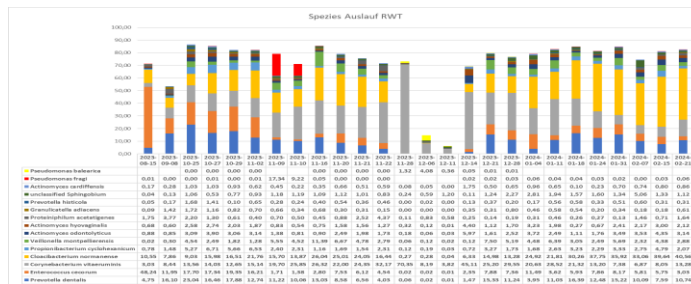
... thanks to our **5+ years pioneering experience** in the field of biological cleaning with Functional Bacteria

✓ **S-BACPRO special features:**

- unique mix of 6 *Bacillus* strains for enhanced efficiency
- highly concentrated solution for less CO2 footprint

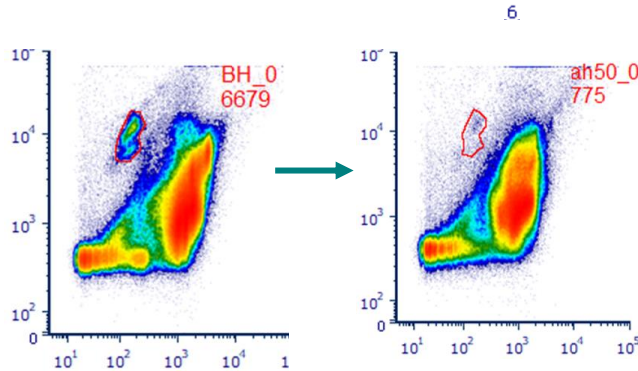
✓ **The best of Monitoring for optimised process reliability:**

- 16S Microbial profiling
- Online VOC monitoring
- Flow cytometry

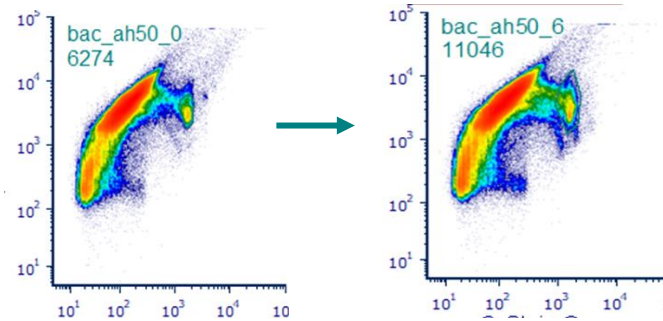


How do you proceed?

Preliminary germination tests: Check which functional bacteria work best in the process water → flow cytometry



Spore measurement



Live bacteria measurement

Then proceed as for SCS/NaOH

- ratio control
- determine influencing factors and then control proactively



Predictive Operation Mode

Until now, control strategies have been based on measured values such as pH, redox potential and chlorine content in the process water. However...

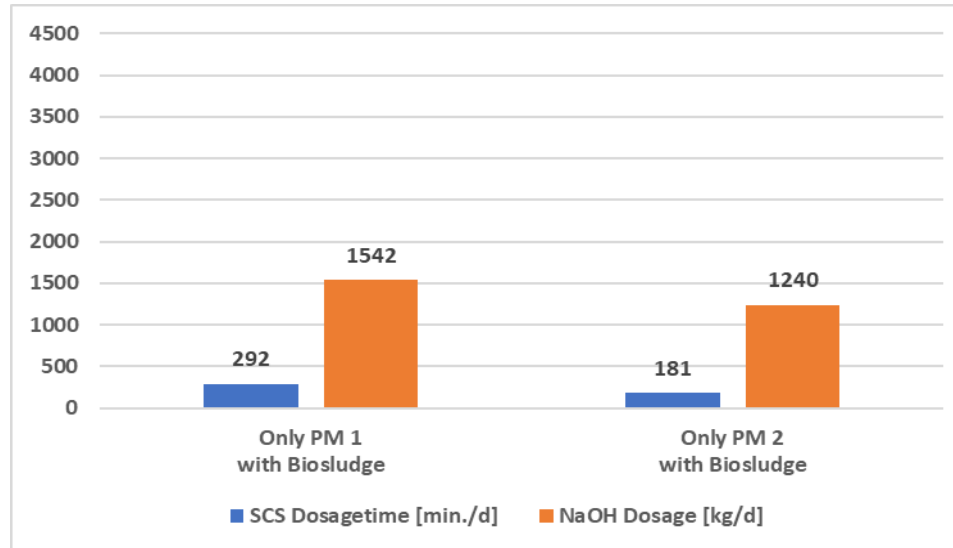
- If the pH value drops, the acidification process is already well advanced! The dissolution of calcium carbonate increases conductivity and also acts as a pH-buffer.
- Consequence: ***Chemicals had to be increased disproportionately to counteract the acidification process.***

With the predictive control, influencing factors (raw material quality, biosludge quantity, biowater quantity, fresh water quantity, etc.) are included in the control.

- **Recipe-dependent control for effective treatment.**

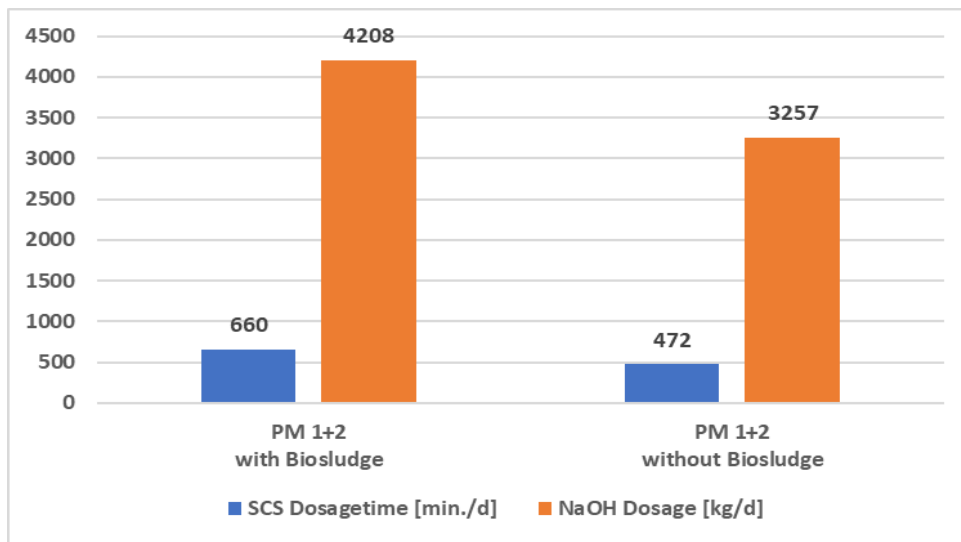
CS1: Factors of influence 1 – Water System **SERVOPHIL®**

- **KPI: Calcium freight to effluent plant below 1000 mg/l / Pre-acidification 25-35%**
- **PM 1 has higher tank volumes than PM 2**
 - more tendency for acidification
 - more SCS and NaOH needed!



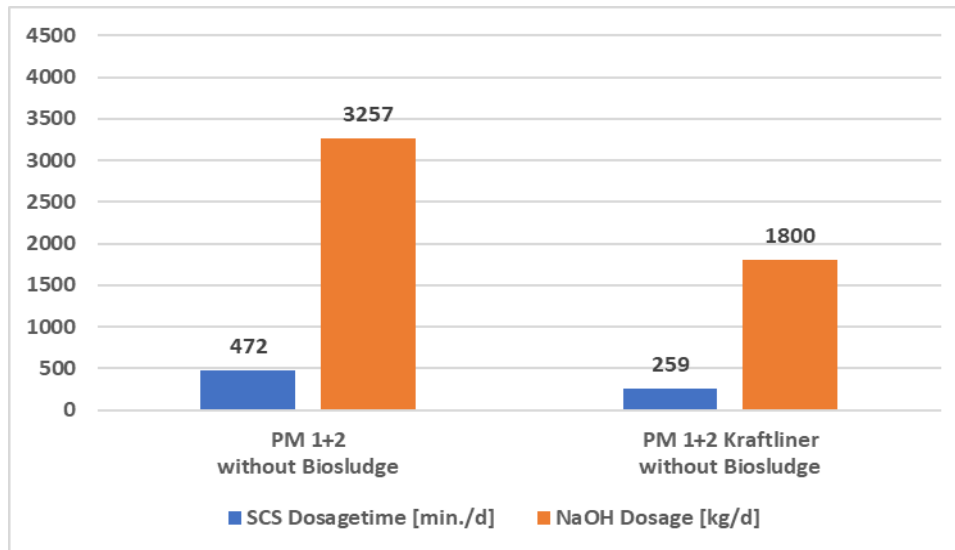
CS1: Factors of influence 2 – Biosludge

- **KPI: Calcium freight to effluent plant below 1000 mg/l / Pre-acidification 25-35%**
- **No surprise, with Biosludge more bacterial activity**
 - more tendency for acidification
 - more SCS and NaOH needed



CS1: Factors of influence 3 – Raw material

- **KPI: Calcium freight to effluent plant below 1000 mg/l / Pre-acidification 25-35%**
- **Less wastepaper portion (kraft pulp instead) reduces bacterial activity**
 - less tendency for acidification
 - less SCS and NaOH needed!



CS1: How to manage?

- Installation of Online-Measurements -> understand the system
- Establish defined programs for different operating states
- Dosage of SCS and NaOH in a specific ratio
- In principle possible AI-supported control



- Ca^{2+} measured by conductivity
- pH
- Redox potential



PLC-Data

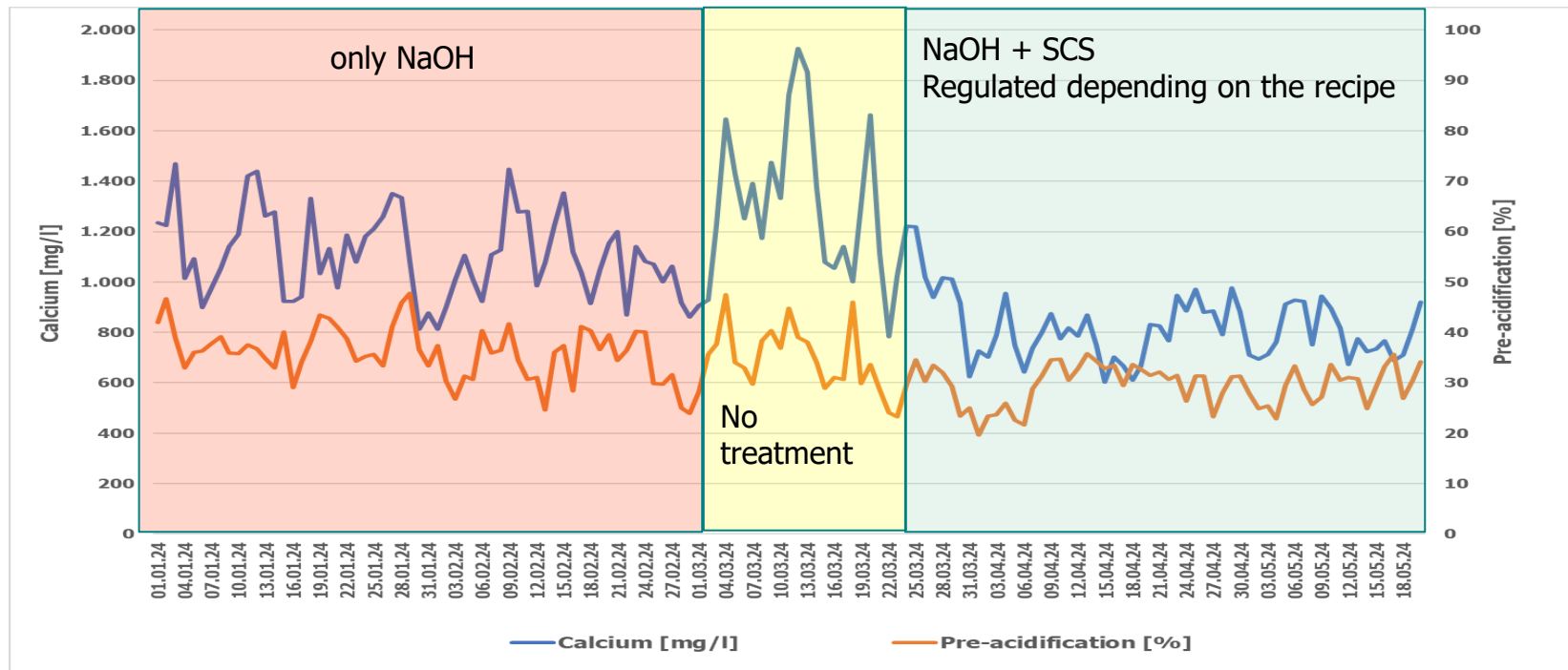
- Raw material
- Biological sludge volume
- Fresh water volume
- Bio-water volume
- ...



- Deposit measurement

Result: Stabilisation of the process

Through:  Synergy  Environmental  Predictive



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WE LOVE TO SERVE

