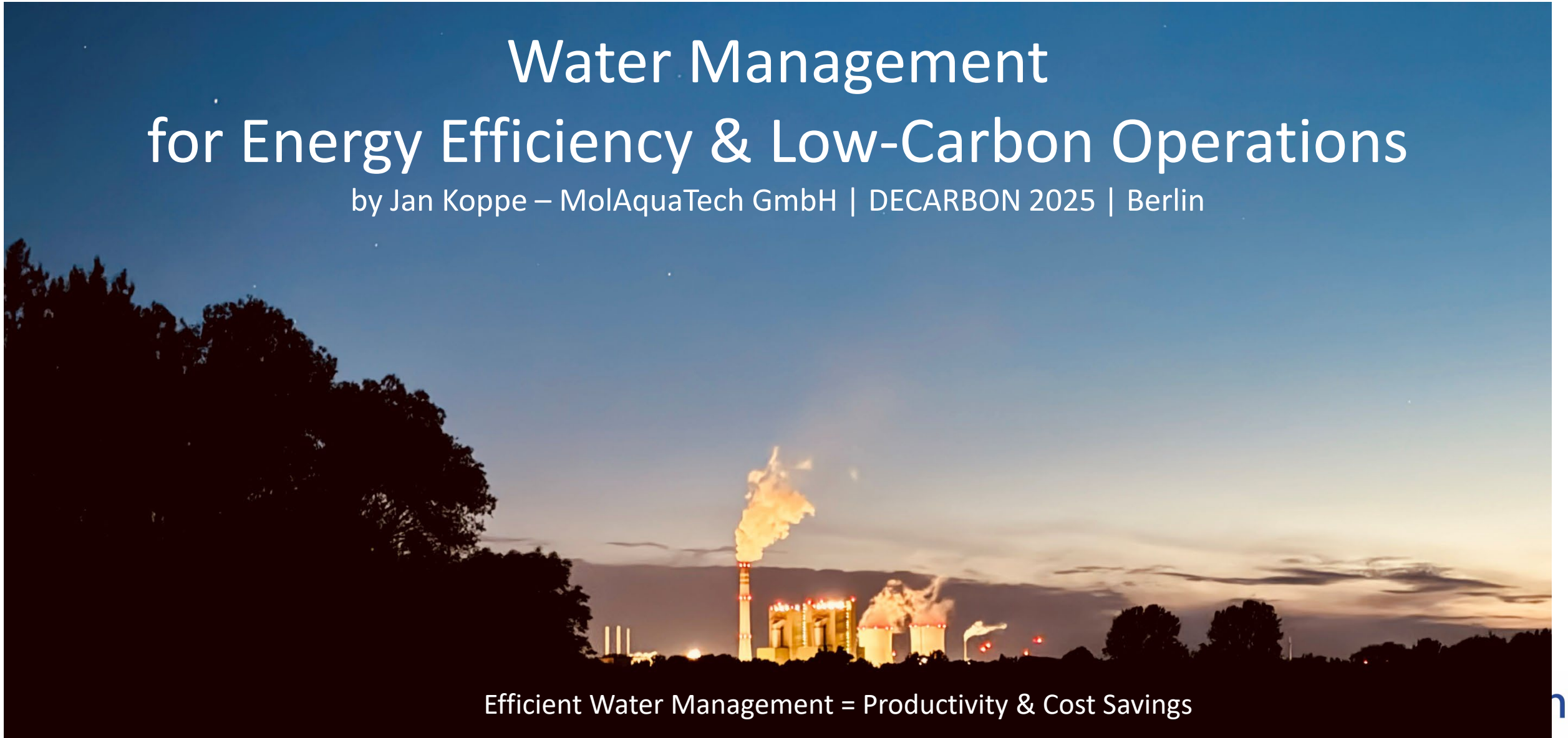
Water Management for Energy Efficiency & Low-Carbon Operations

by Jan Koppe – MolAquaTech GmbH | DECARBON 2025 | Berlin



Efficient Water Management = Productivity & Cost Savings

INTRODUCTION TO MAT

- **MAT (MolAquaTech GmbH)** was founded with a clear mission: to bring the long-term, proven success of the German-engineered **MATpure® concept** to a global market.
- **Led by Jan Koppe** with over 20 years of experience in the water management industry, MAT combines deep scientific expertise with a strong focus on customer benefits.
- **Our focus is on** optimizing water usage, increasing operational efficiency, and delivering economically viable, sustainable water management solutions for industries such as power generation, chemical manufacturing, and public infrastructure.

Water isn´t just a resource – it´s a cost & risk factor

OPTIMIZED WATER USE

= increased output, lower energy demand and decarbonisation

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BOTTLENECKS IN DOWNSTREAM WATER MANAGEMENT

1. **Cooling Water Inefficiencies**
   – Scaling, biofouling & excessive chiller workload

2. **Flocculation & Coagulation Issues**
   – Poor particle removal increases OPEX

3. **Filtration & Membrane Fouling** (Flux Instability)
   – Rising DP = Increased energy demand & downtime

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INDUSTRY CHALLENGES IN WATER MANAGEMENT

- **Struggles** with meeting stringent environmental guidelines using conventional water treatment methods.
- **High costs** from frequent chemical usage, equipment wear, and system downtime.
- **Inefficient** water treatment processes lead to increased operational expenses and reduced production efficiency.
- **Sustainability** targets often conflict with the economic realities of maintaining plant operations.

Challenge:

Traditional methods rarely meet compliance fully, and when they do, it’s costly and unsustainable.

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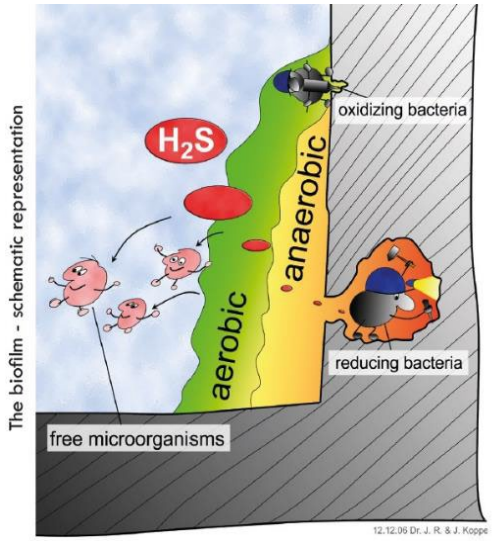
COOLING WATER: THE SILENT ENERGY DRAIN

- Inefficient heat transfer leads to **higher energy demand & unplanned shutdowns**
- MATpure: **Prevents biofilm, reduces scaling, and stabilizes cooling cycles**
- **Up to 20% lower pump & chiller energy consumption**



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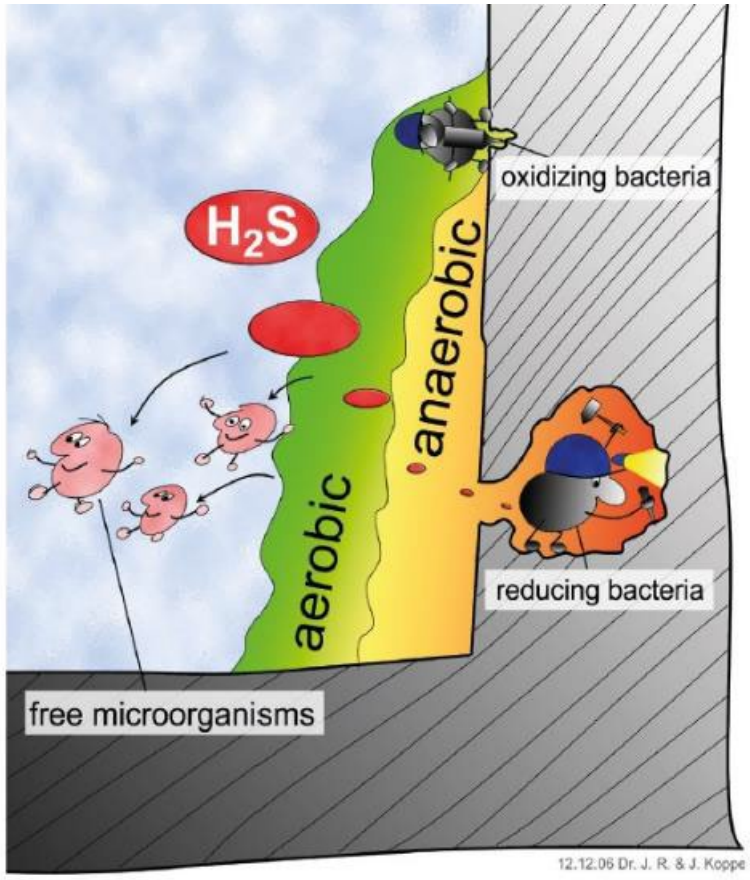
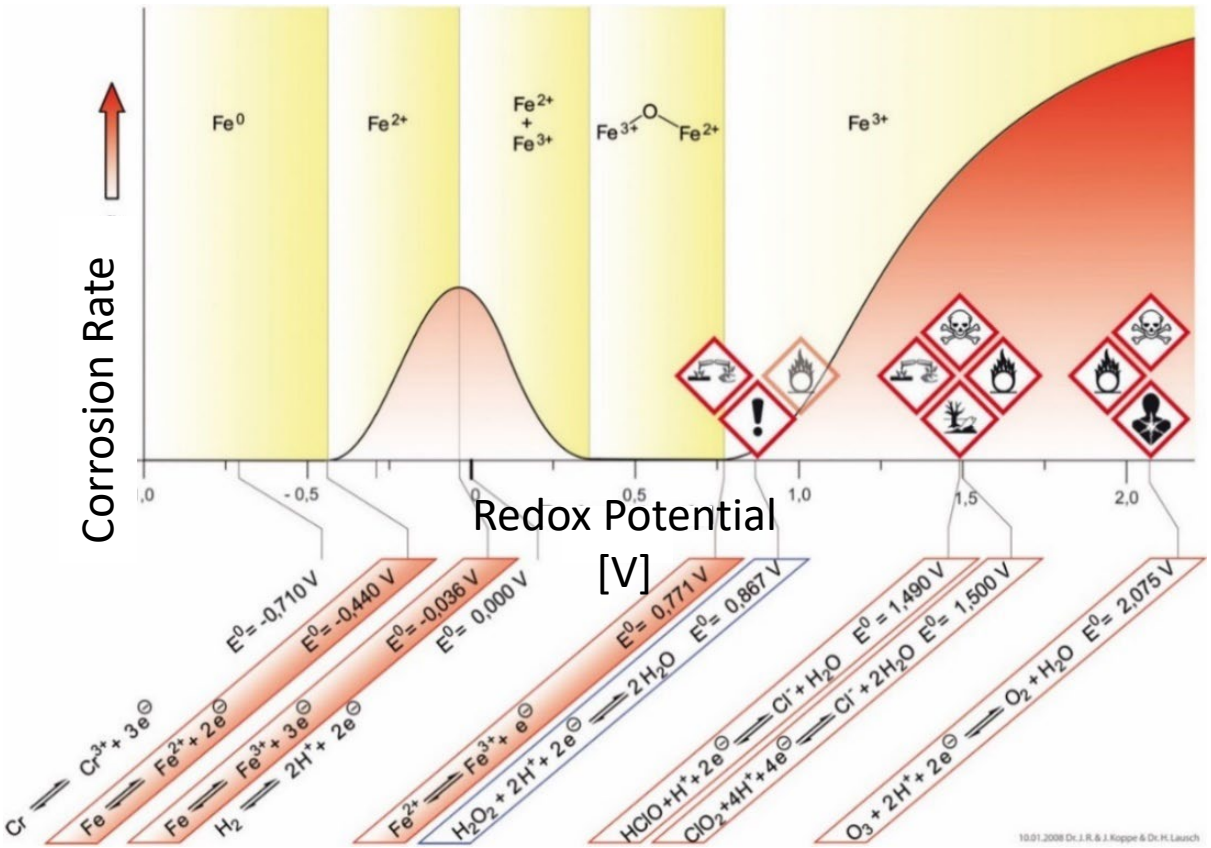
COOLING WATER: INDUSTRY CHALLENGES





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Less is More

Only as much chemistry as necessary
...not as much as possible.

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MATPURE – GAMECHANGER FOR WATER MANAGEMENT

MATpure® Concept

- **Revolutionary approach**
  …combining advanced scientific principles with practical customer benefits.
- **Utilizes micro water vapor gas bubbles**
  to transform water's molecular structure, reducing scaling, biofouling, and corrosion.
- **No reliance on harmful chemicals**
  …results in cleaner, more efficient operations.
- **MATpure's performance has been proven**
  in industrial, petrochemical, power plants, and even public and residential buildings, ensuring robust results across various sectors.
- **Key Impact**:
  Sustainable solutions that enhance production efficiency and provide long-term cost savings.

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MATPURE - EFFECT ON WATER

With MATpure®
➔ **Economic Benefits:**
✓ **Healthy Water**
✓ **Cleaning Effect**
✓ **Optimal Heat Exchange**

Without…
➔ **Material Damage:**
👎 **Cavitation**
👎 **Legionella**
👎 **QHSE Issues**

Bubble Size	Diagram	Explanation
Very small bubbles Ø ~ 0.15 nm		**Smaller than bacteria** Ø ~ 1 µm
Small bubbles (not visible) Ø < 500 nm		
Medium bubbles (stable) Ø approx. 500 nm - 100 µm		**Ø Alveoli** 50 µm - 250 µm **Ø Amoeba** 100 µm - 800 µm
Large bubbles (unstable) Ø > 100 µm - 150 µm		**Cavitation**

Small

Gas Bubbles

Large

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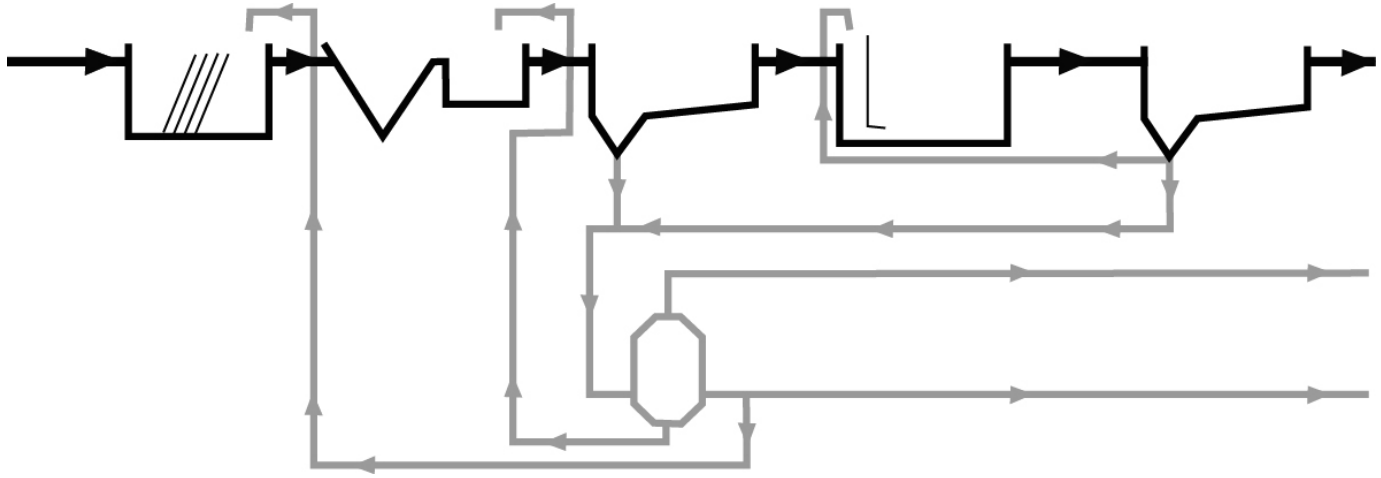
FLOCCULATION & COAGULATION: A HIDDEN COST DRIVER

- **Inefficient particle separation**
  = higher chemical demand
  & increased OPEX

- Poor flocculation leads
  to **downstream troubles**

- MATpure: **Optimizes particle binding,**
  reduces sludge & improves water clarity



Flocculation redefined:

Better performance. Less chemicals. Maximum sustainability

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THE BREAKTHROUGH

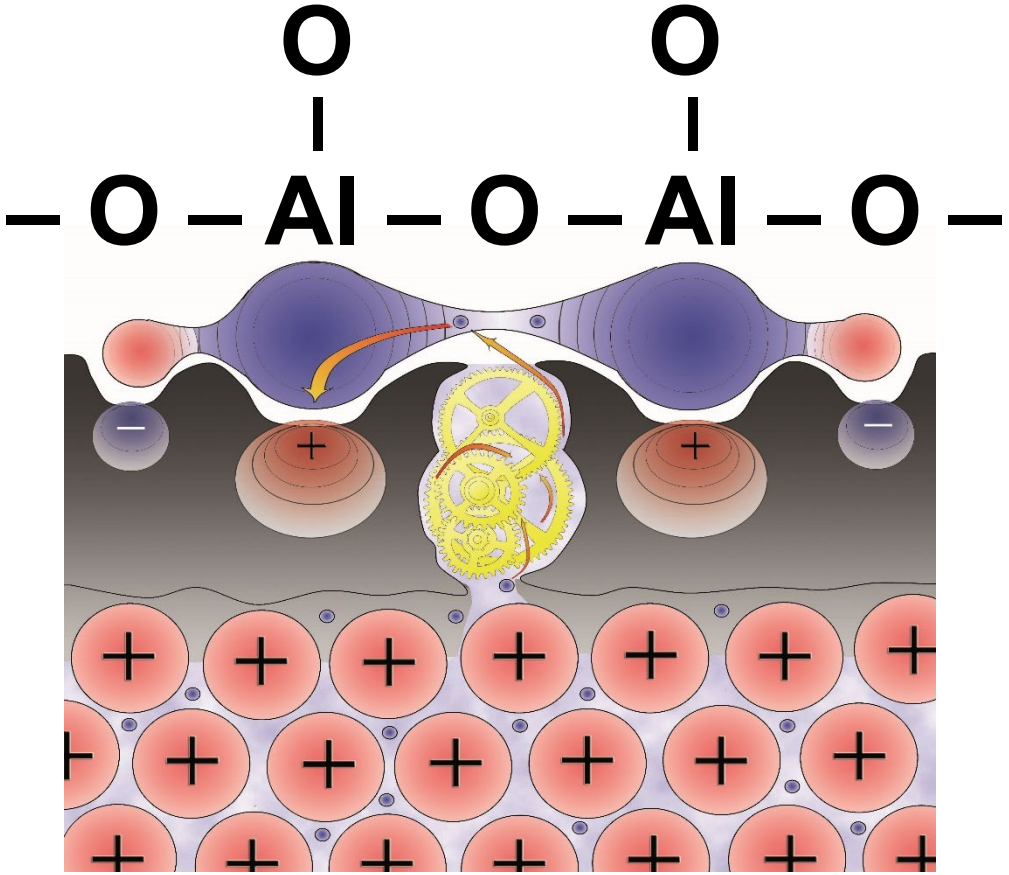
Catalytic Activation of Coagulants

✅ up to **50% Reduction in Aluminum Consumption**

✅ **Stronger, Faster Floc Formation**
→ More effective pollutant removal

✅ **Eco-Friendly & Cost-Saving**
→ Reduced chemical waste, lower sludge production

How? By using a **Mineral-Metal Composite Catalyst** to enhance aluminum-based coagulants.



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PROVEN IMPACT

Real-World Applications

📌 Municipal Wastewater Treatment:

- **Before:** 20 l/h aluminum-based coagulant
  → Residual phosphate: 0.5 – 1.0 mg/L
- **After:** 12.5 l/h aluminum-based coagulant
  → Residual phosphate: **0.25 – 0.75 mg/L**
- 🚀 **Result: ~ 40 % coagulant reduction** + improved phosphorus removal

📌 Drinking Water Treatment:

- ✅ Enhanced particle removal
- ✅ More efficient coagulation, reducing chemical footprint

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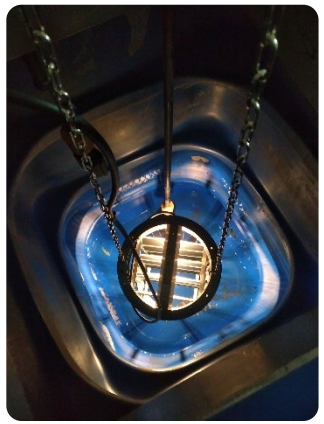
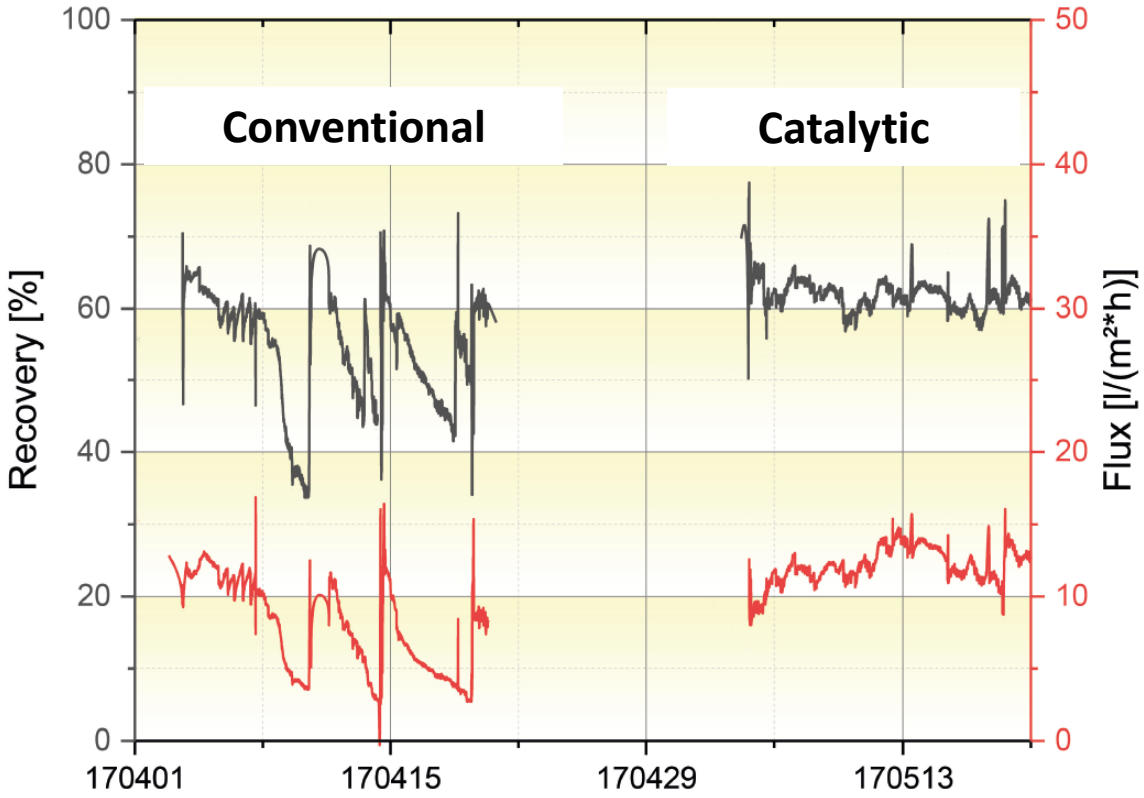
FILTRATION & RO: WHERE ENERGY COSTS SPIRAL

- **High Differential Pressure**
  = Increased Pump Load & Rising OPEX
- **Unstable RO flux**
  = More CIP cycles, shorter membrane life
- MATpure: **Stabilizes DP, prevents fouling, extends membrane & filter life**
- **Up to 90% fewer cleanings, lower energy use, and reduced downtime**





Based on: Reyniers, S.; Depuydt, V.: Chemicaliënvrije Afvalwater Recuperatie in de VoEdingsindustrie – CARVE Projekt Meeting - Tussentijdse meeting; 23.06.2017; https://www.vlakwa.be/fileadmin/media/pdf/presentatie_Pantarein__hergebruik_bij_voedingsbedrijven_.pdf

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MATPURE – BENEFITS SYSTEMWIDE

Key Benefits for Your Operations

- **Economic Benefits**:
  Up to 90% reduction in chemical consumption, particularly in desinfection, flocculation and coagulation processes.

- **Increased Production Efficiency**:
  Significant improvements in heat exchange performance.

- **Operational Stability**:
  Fewer shutdowns, extended maintenance intervals, and reduced operational risks.

- **Environmental Compliance**:
  Full compliance with environmental guidelines,
  while drastically lowering chemical use and water wastage.

- **Sustainability that Pays Off**:
  MATpure is not just environmentally friendly but economically efficient
  …making it a viable long-term solution for operational excellence.

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MATPURE – SUCCESS STORIES

- **Schkopau Lignite Power Plant – Schkopau, Germany**
  900 MW utilizing river water for cooling processes
- **Rostock Hard Coal Power Plant – Rostock, Germany**
  515 MW utilizing seawater for cooling, ensuring high efficiency
- **Wendelstein 7x Nuclear Fusion Reactor – Greifswald, Germany**
  Advanced water management for fusion research, supporting cutting-edge energy development
- **Food&Beverage Facility – Barby, Germany**
  20 MW process cooling tower ensuring operational reliability in high-volume production
- **PROFERRO Iron Foundry – Ypres, Belgium**
  Effective cooling in high-temperature industrial environments
- **CLARIANT Chemical Plant – Höchst, Germany**
  Optimized water and energy management in chemical production

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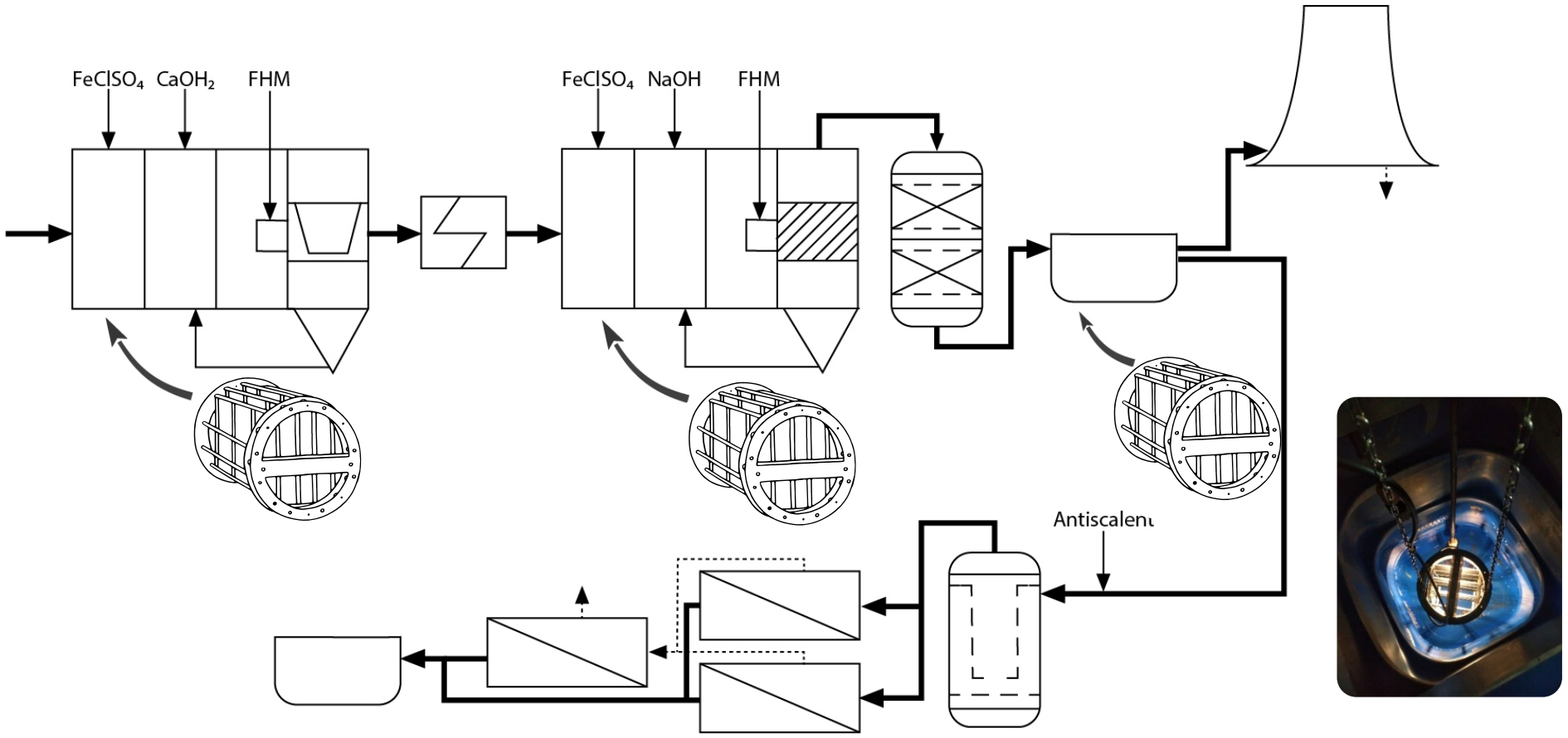
MATPURE – UNLOCK PEAK PERFORMANCE



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MATPURE – UNLOCK PEAK PERFORMANCE

Water & Catalysis …the formular of success on common projects

Application	MATpure® Effect
Cooling (HX)	✓ **Optimizes** thermal performance ✓ **Streamlines** maintenance ✓ **Regulatory** compliance
Membranes (RO)	✓ **Increases** efficiency ✓ **Extendes** maintenance intervals ✓ **Eco-friendly** & safer operation
Pretreatement	✓ **Optimizes** flocculation & coagulation ✓ **Reduces** iron salt usage ✓ **Performance** enhancement

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MATPURE – BOOSTING EFFICIENCY

Boosting Efficiency Through Water Optimization

- **Minimized Chemical Use**:
  Major reductions in chemicals, which translates to lower operational costs and environmental footprint.

- **Production Gains**:
  By optimizing the water treatment processes, MATpure enables smoother and more efficient operations — leading to fewer interruptions and higher throughput.

- **Proven ROI**:
  Industries using MATpure technology report higher yields and operational stability, with significantly reduced downtime and maintenance costs.

- **Scalable Solutions**:
  From industrial plants to public buildings and residential complexes, MATpure has demonstrated its effectiveness across a wide range of applications.

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MATPURE - BENEFITS SYSTEMWIDE

Legionella Control:
Ensuring Safe and Compliant Operations

- **Effective Legionella Prevention**
  MATpure's water treatment process ensures high water quality standards while reducing the need for traditional, chemical-intensive methods.
- **Reliable control of bacterial growth**
  without reliance on harmful chemicals, especially in public and residential buildings where health standards are critical.
- **Demonstrated success in various applications**
  from cooling towers to potable water systems, ensuring compliance and minimizing public health risks.

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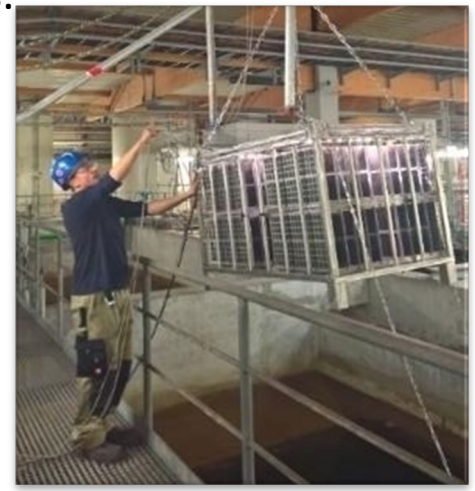
MATPURE - BENEFITS SYSTEMWIDE

A Gamechanger for Industrial and Public Water Systems

- **Proven Sustainability**:
  MATpure's approach eliminates the need for biocides and minimizes chemical dependency, while delivering measurable improvements in efficiency and environmental performance.

- **Economically Viable Sustainability**:
  MATpure proves that sustainability doesn't have to be a cost burden. Its adoption has led to tangible economic benefits in every sector it's applied, from power generation to municipal systems.



- **Versatile Applications**:
  Successfully deployed in industrial facilities, power plants, petrochemical industries, and residential buildings, MATpure is adaptable to various operational scales and requirements.

- **Long-Term Savings**:
  By significantly lowering operational costs and improving equipment lifespan, MATpure's long-term ROI positions it as a gamechanger in sustainable water management.

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MATPURE - BENEFITS SYSTEMWIDE

Partnering with MAT for Operational Excellence

- **Collaborative Approach**:
  We work closely with you to tailor our water management solutions to your specific operational needs. Rounded by Audits for Facilities for identifying bottlenecks.

- **Local and Global Expertise**:
  Our technology integrates seamlessly with existing systems, ensuring smooth transitions with minimal disruptions to your operations.

- **Global Footprint**:
  MolAquaTech has established successful partnerships worldwide, and we're committed to helping Indian industries achieve their water management goals through innovative, sustainable solutions.

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ACTIONABLE NEXT STEPS: HOW YOU CAN START NOW

- **Is your cooling water costing you energy?**
- **How stable is your flocculation process?**
- **Are your filters & RO membranes suffering from rapid fouling?**

Let’s assess and optimize with MATpure

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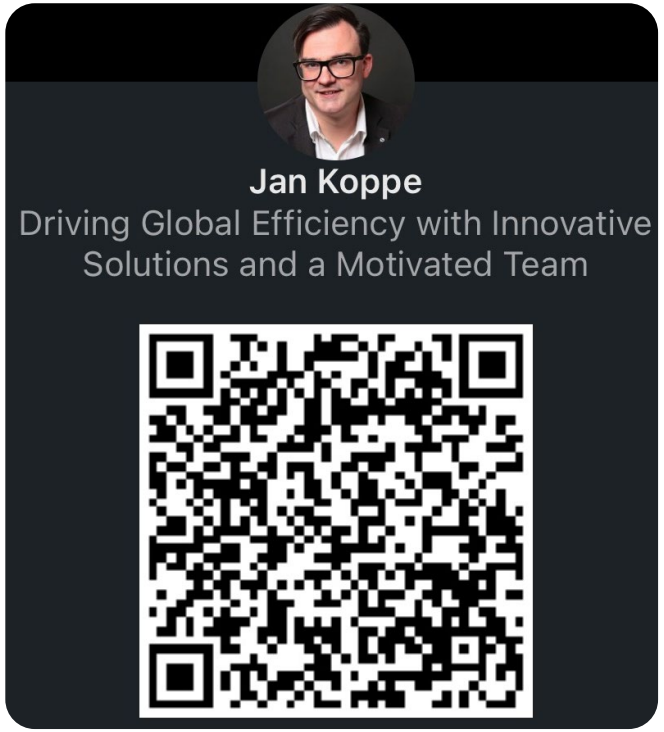
LET´S CONNECT & TALK SPECIFICS

- **Inefficiency is expensive – let's turn water into a driver of productivity.**
- Ready to optimize? Let's discuss **your plant's efficiency bottlenecks.**



Key Takeaway: Smart Water Management
= More Output, Lower Costs & Decarbonisation

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