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AQUASMART - Water and Wastewater Treatment Solutions

A Reconversão de ETAR existentes em Unidades Geradoras de Recursos

The Conversion of existing WWTPs to Resource Generating Units

Luís Marinheiro

DI(FH) Dr. Simon Jabornig

7th February 2018

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CONTENT

1. **Technologies C-MEM, C-TECH and C-ION**

2. Case Study 1: Reconstruction of industrial WWTP of Bimbo-Tijuana – Reuse of treated water for washing and irrigation

3. Case Study 2: Reconstruction of industrial WWTP of biomass heating plant Flachau – Reuse of treated water for internal use and heat recovery

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SFC and AQUASMART ACTIVITIES

- Water & wastewater treatment
- Engineering/Contracting worldwide

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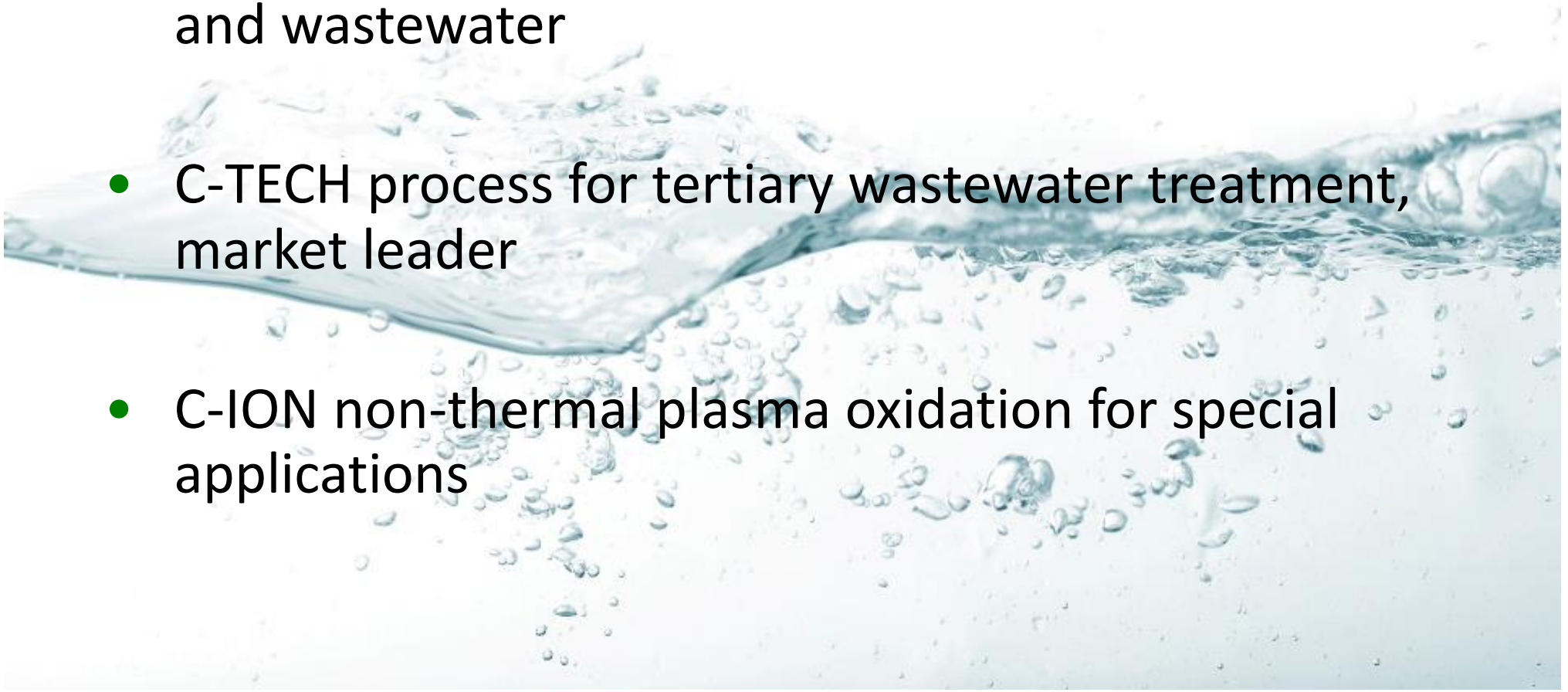
ADVANCED TECHNOLOGIES AVAILABLE

- C-MEM membrane ultrafiltration for potable water and wastewater
- C-TECH process for tertiary wastewater treatment, market leader
- C-ION non-thermal plasma oxidation for special applications



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C-MEM™

High-rate Ultrafiltration System

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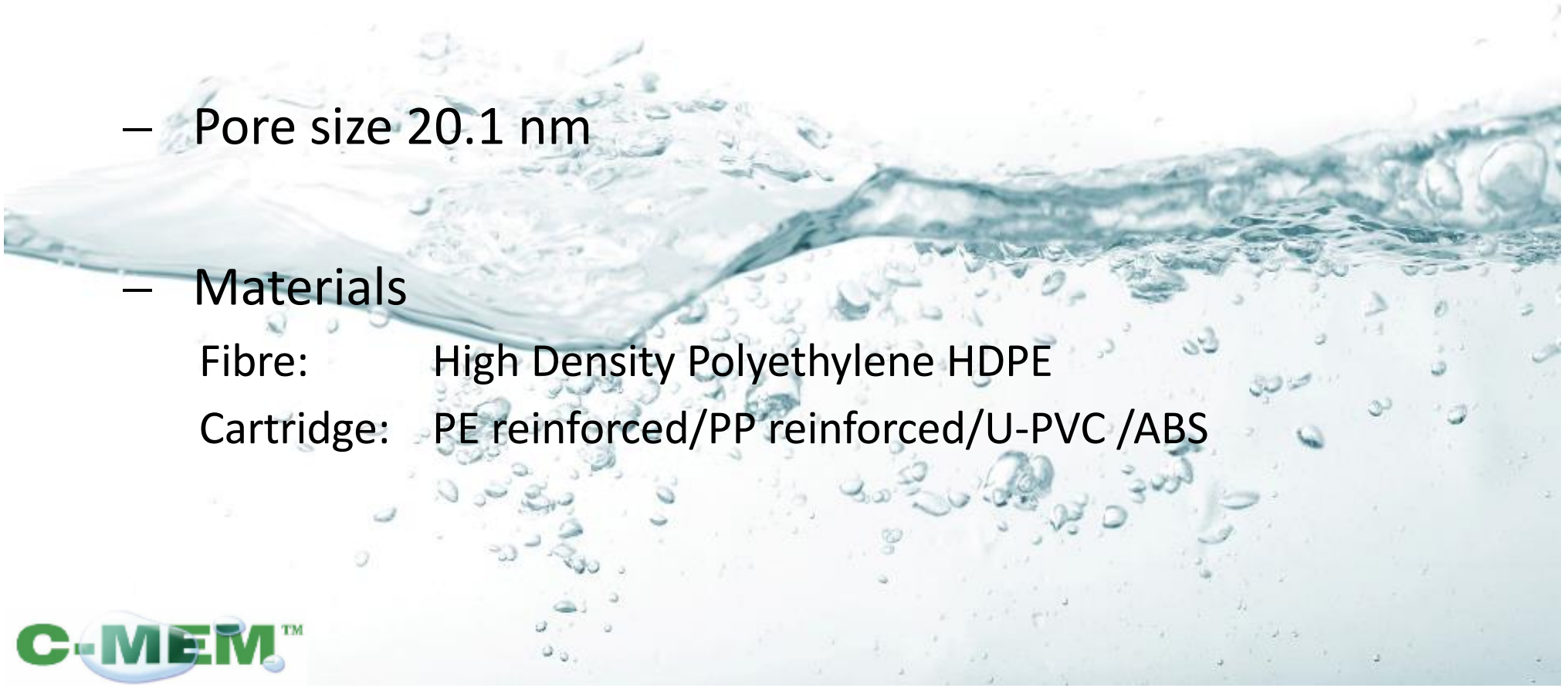
WHAT DOES C-MEM STAND FOR?

- C-MEM™ is a hollow fibre ultrafiltration system
- Pore size 20.1 nm
- Materials

  Fibre: High Density Polyethylene HDPE

  Cartridge: PE reinforced/PP reinforced/U-PVC /ABS



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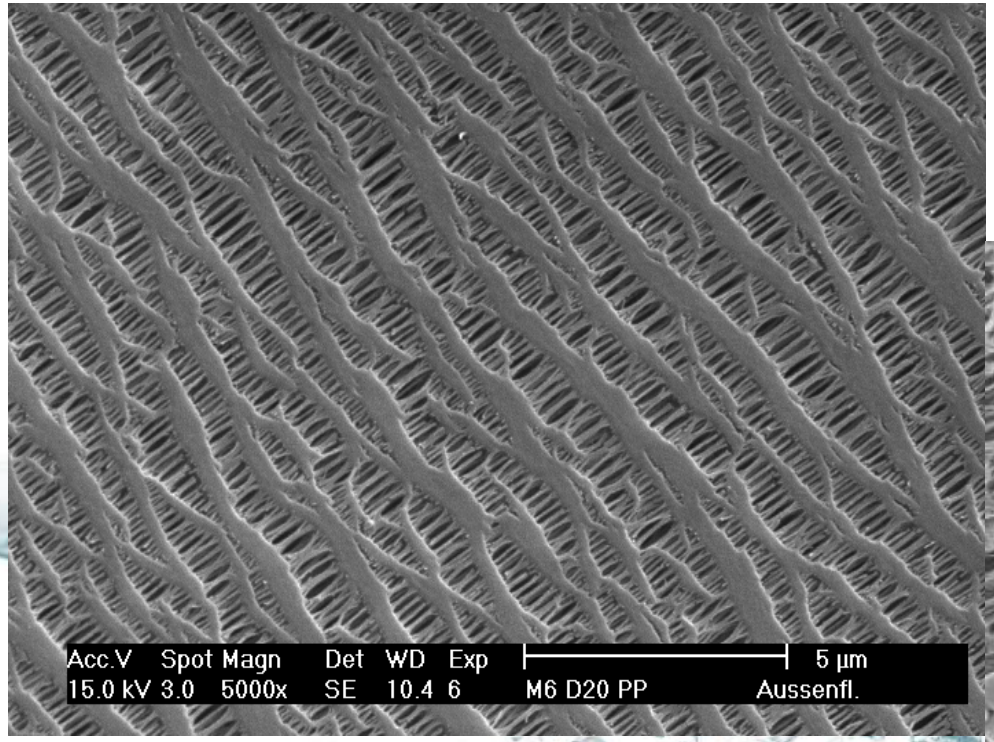
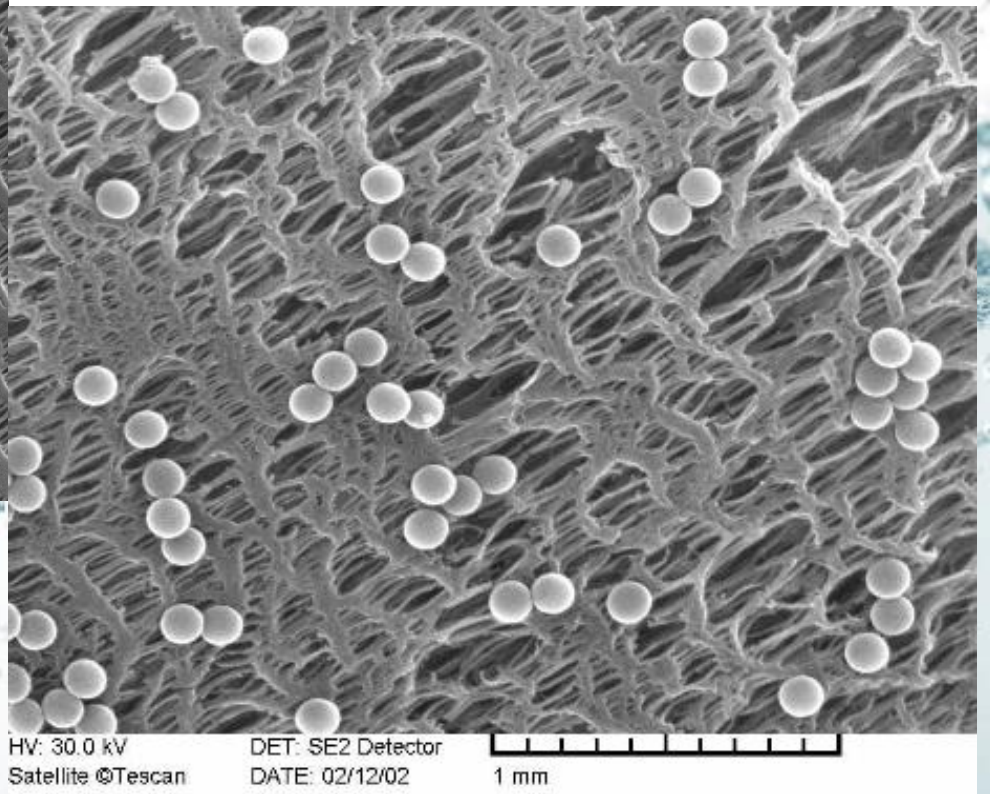
MEMBRANE



Hollow fibre membranes with 3-D membrane pores



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CARTRIDGE

- High packing density
- Safety for membranes
- Higher flux and better CIP efficiency

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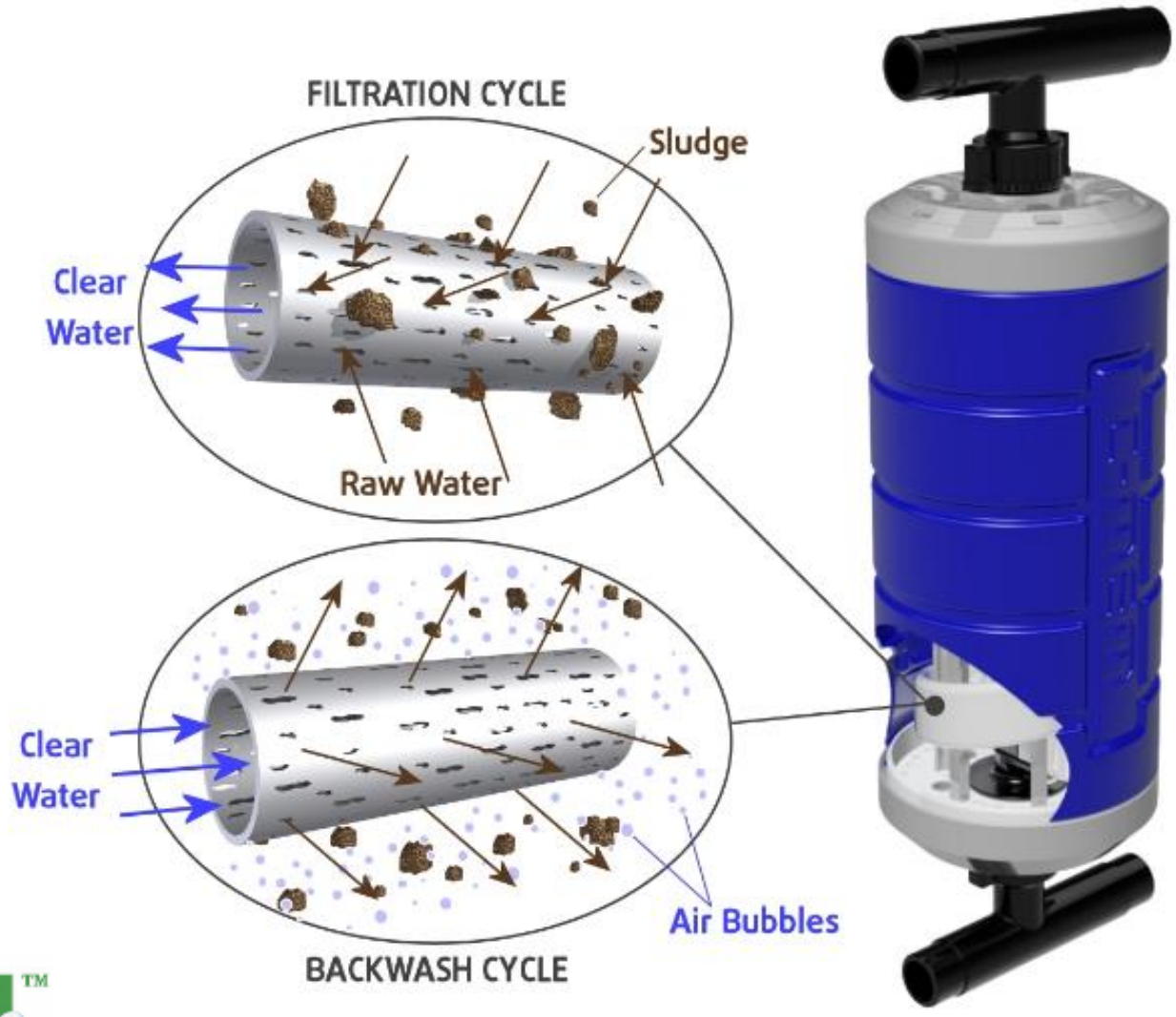
PRINCIPLE



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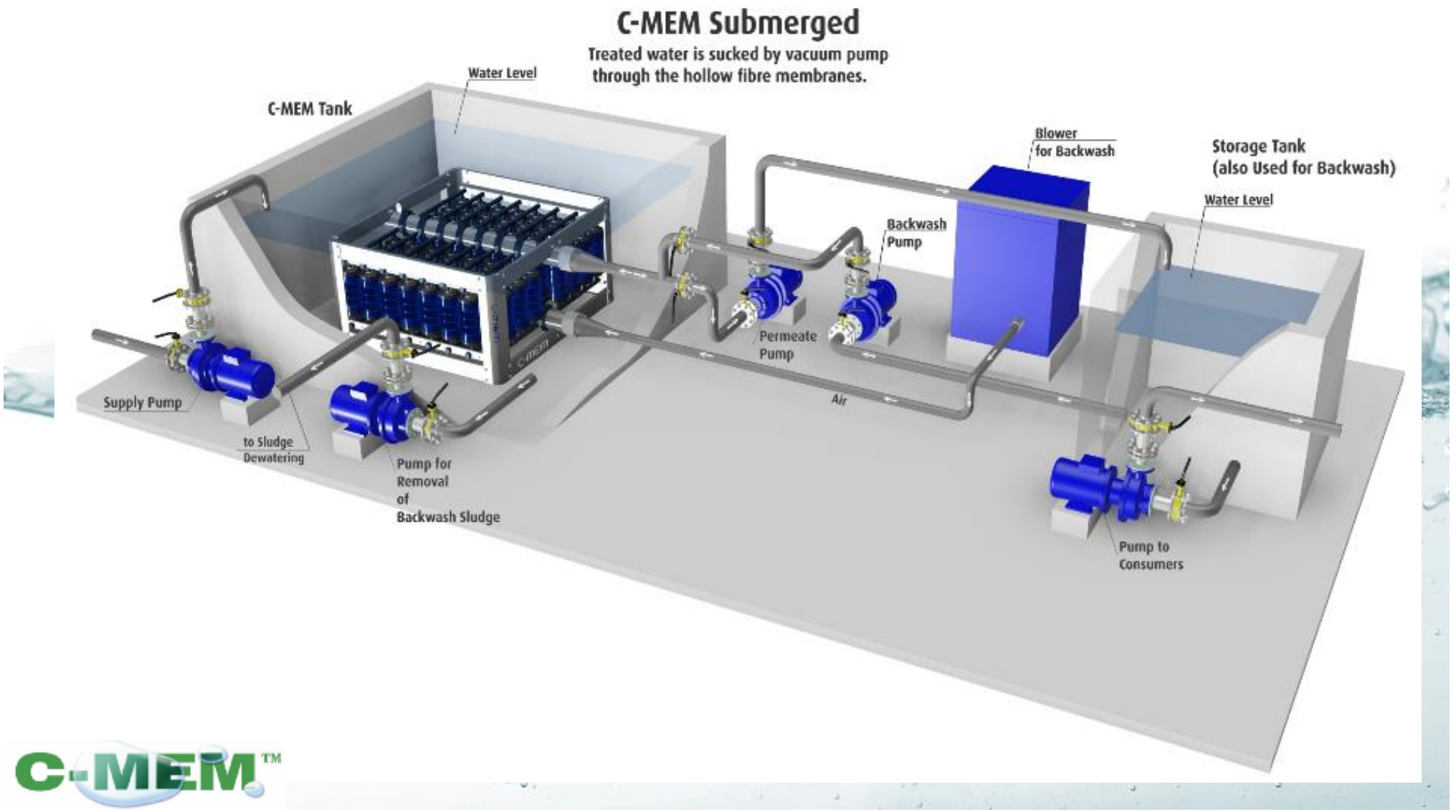
SUBMERGED SYSTEM



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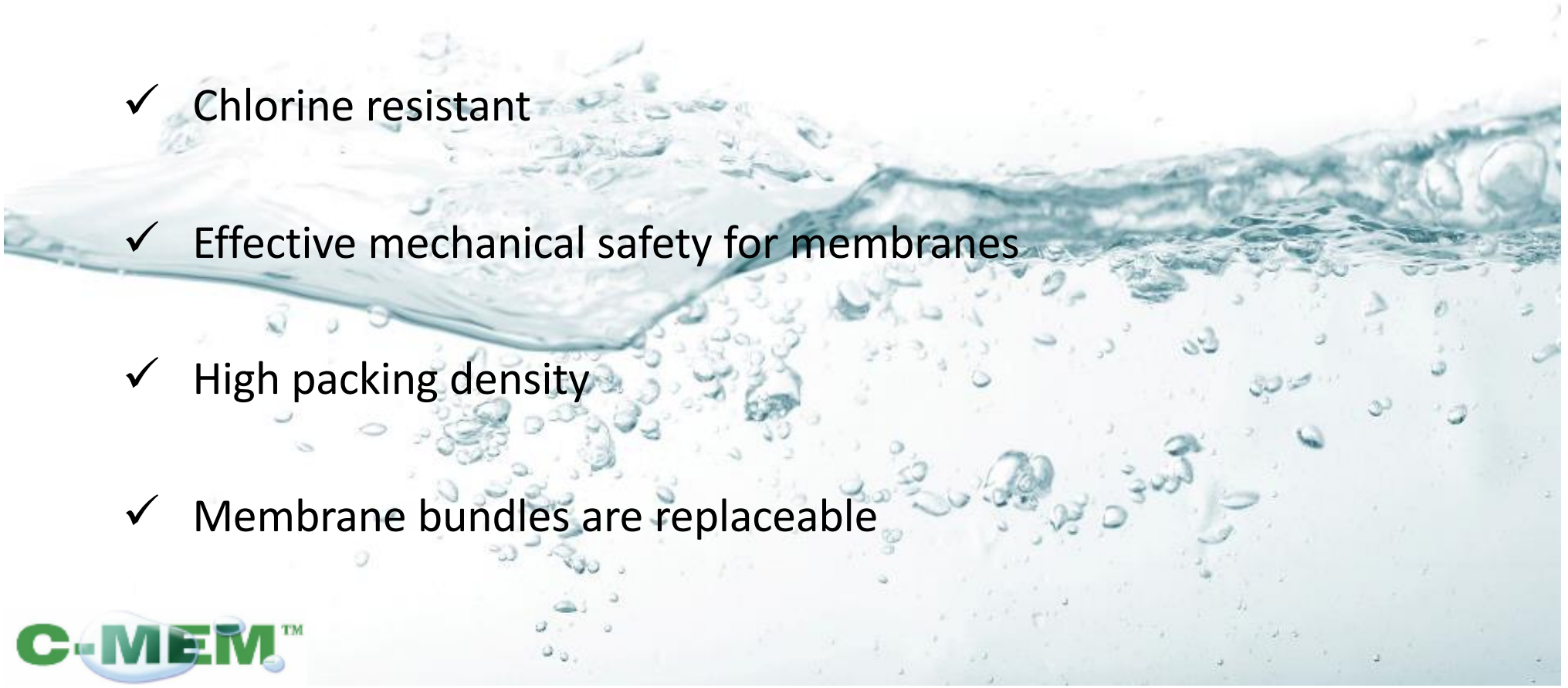
ADVANTAGES

- ✓ Permanently hydrophilic
- ✓ High mechanical strength (QC-pressure test with 4 bar)
- ✓ Chlorine resistant
- ✓ Effective mechanical safety for membranes
- ✓ High packing density
- ✓ Membrane bundles are replaceable



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ADVANTAGES

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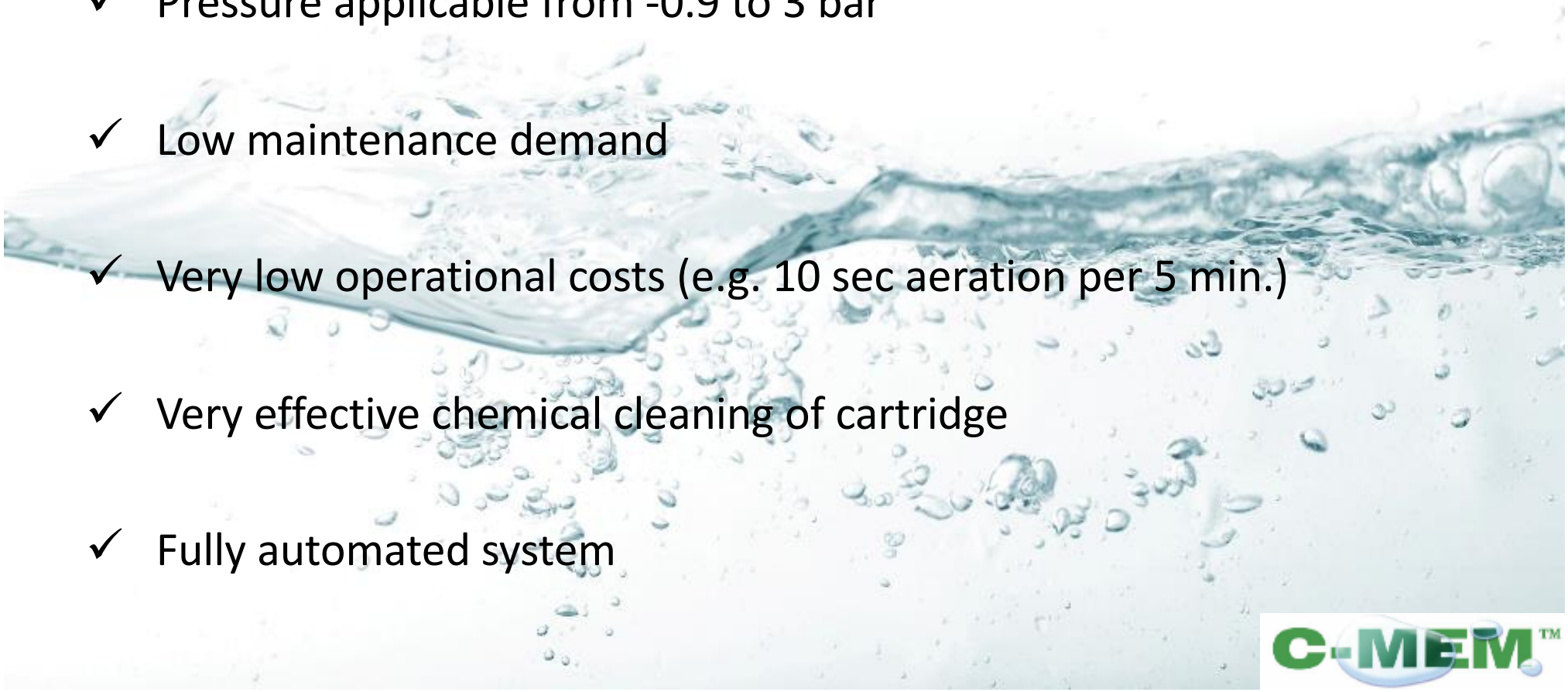
- ✓ Technical disinfection
  (removal of bacteria and viruses up to log - 6)
- ✓ Pressure applicable from -0.9 to 3 bar
- ✓ Low maintenance demand
- ✓ Very low operational costs (e.g. 10 sec aeration per 5 min.)
- ✓ Very effective chemical cleaning of cartridge
- ✓ Fully automated system



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3. Case Study 2: Reconstruction of industrial WWTP of biomass heating plant Flachau – Reuse of treated water for internal use and heat recovery

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Case Study 1: GRUPO BIMBO

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Case Study 1: GRUPO BIMBO

Raw water composition

1. Industrial WW from food production
2. Flow of 1 – 1.5 l/sec
3. High loads of COD up to 25,000 ppm – good biodegradability
4. High loads of oil, fats and grease
5. Lack of nutrients

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Case Study 1: GRUPO BIMBO

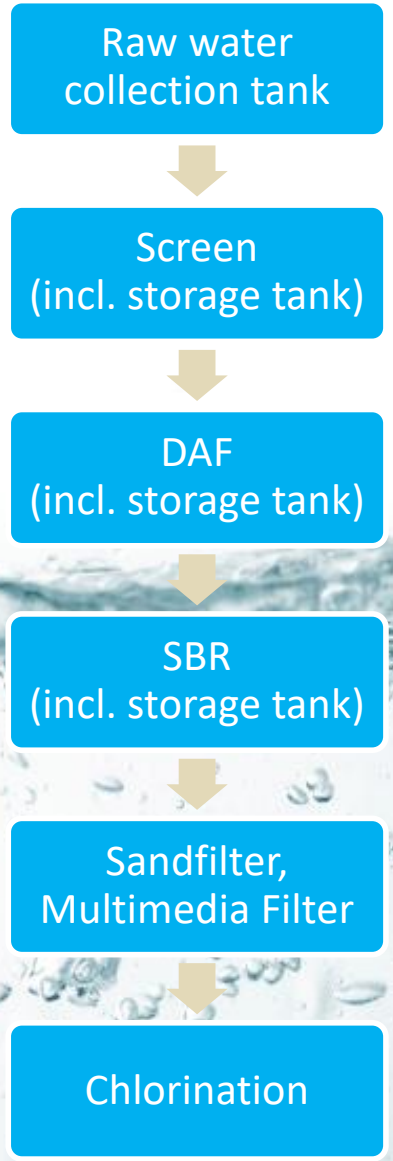
Existing industrial WWTP:

Reason for reconstruction:

1. Increased capacity
2. High operating costs
3. Process problems (Floating sludge)
4. No reuse of water

Goals for reconstruction:

1. Use of existing concrete structures
2. Reuse quality
3. Lower operating costs



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Case Study 1: GRUPO BIMBO

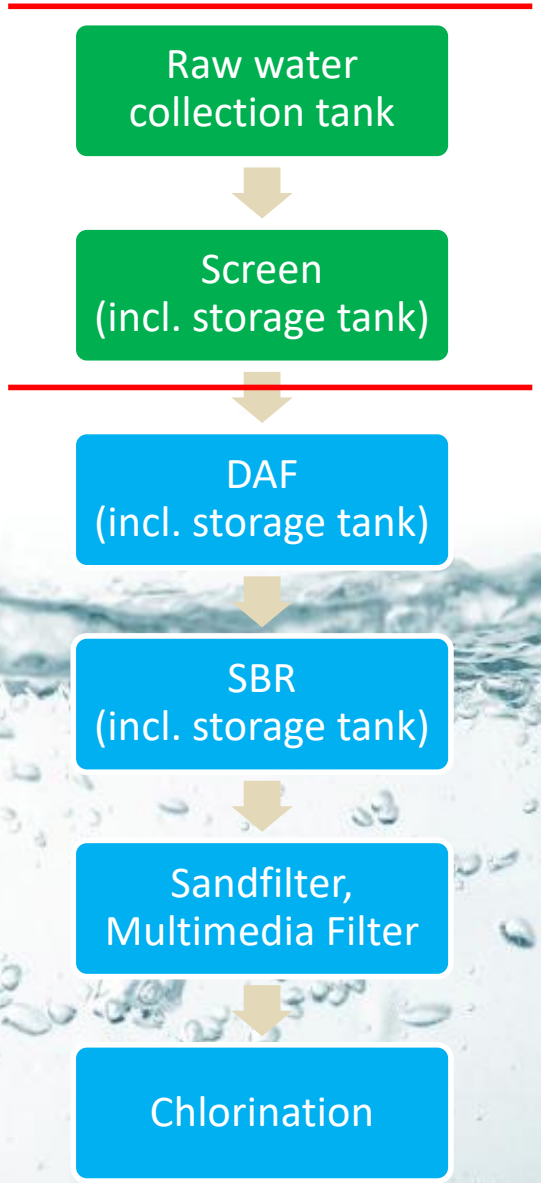
Reconstruction of industrial WWTP:

Process design:

1. Redesign to complete continuous flow system after pre-treatment

→ Balancing will be done in raw water collection tank with flow controlled lifting pumps

→ Savings of pumping costs



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Case Study 1: GRUPO BIMBO

Reconstruction of industrial WWTP:

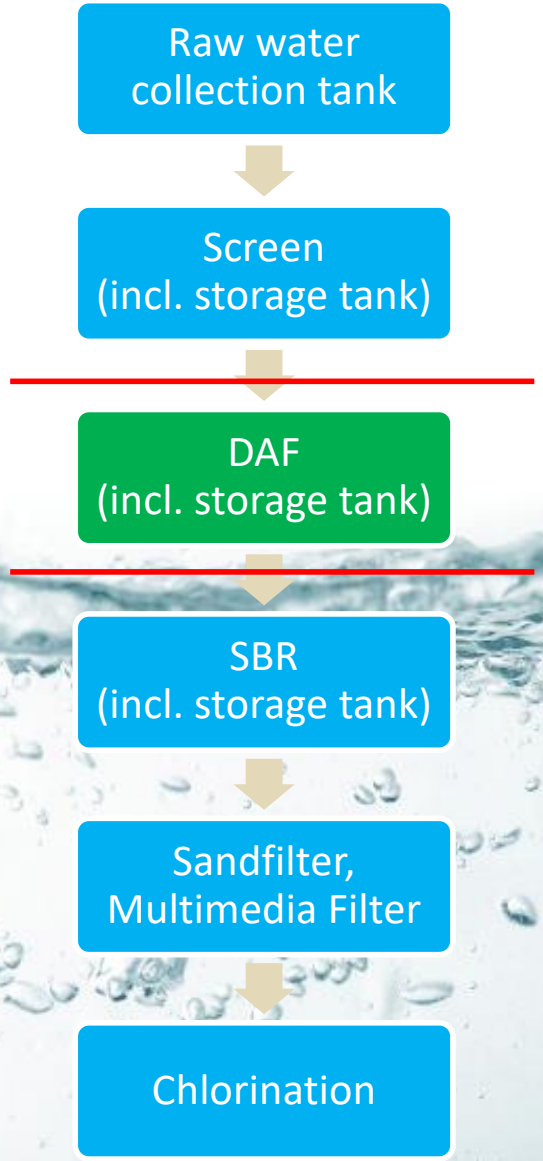
Process design:

2. Redesign of DAF (Dissolved air flotation)

→ Increase of COD removal

→ Increase of fat, oil and grease removal

→ Savings of electrical consumption through high efficiency equipment



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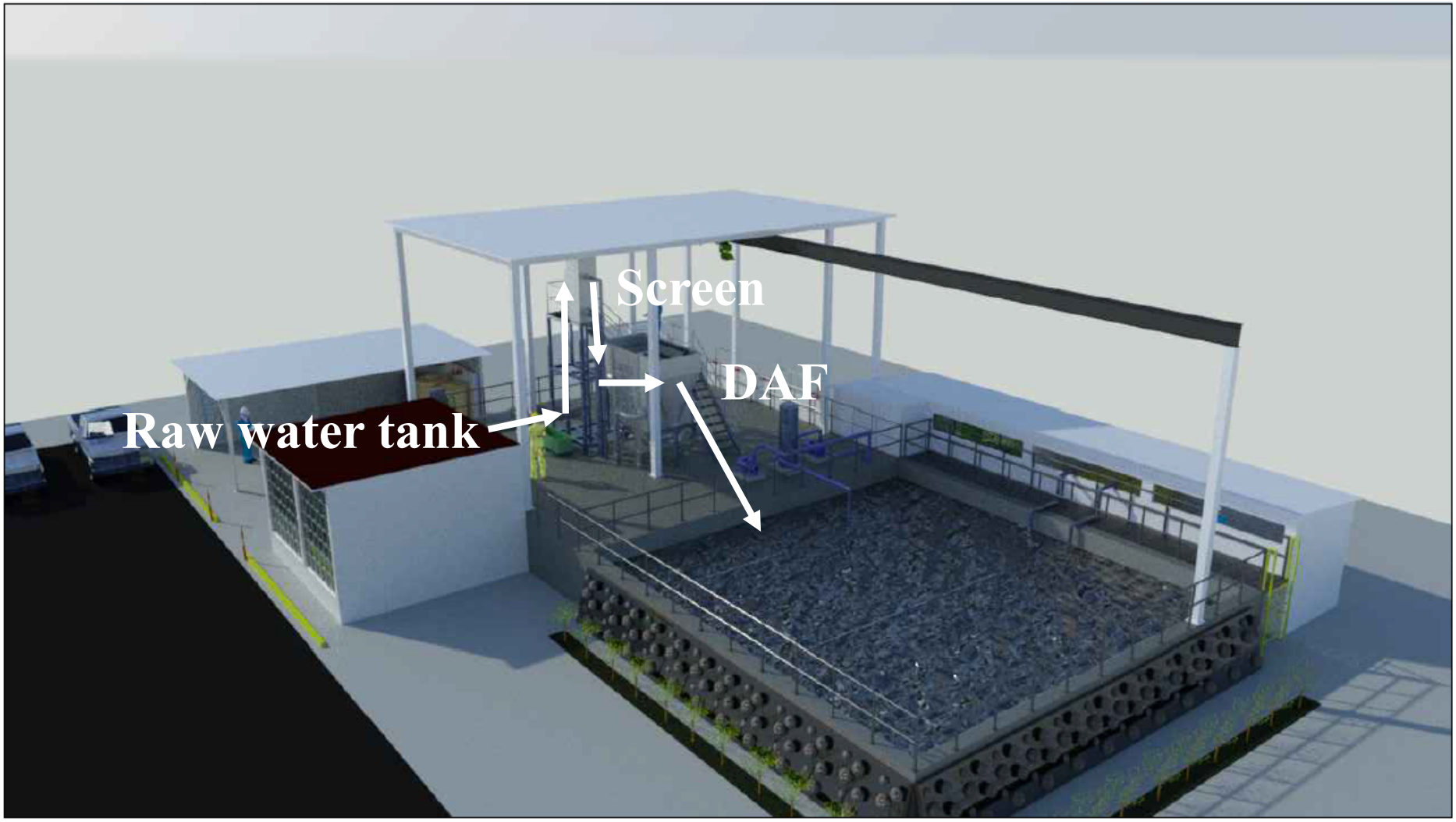
Case Study 1: GRUPO BIMBO



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Case Study 1: GRUPO BIMBO

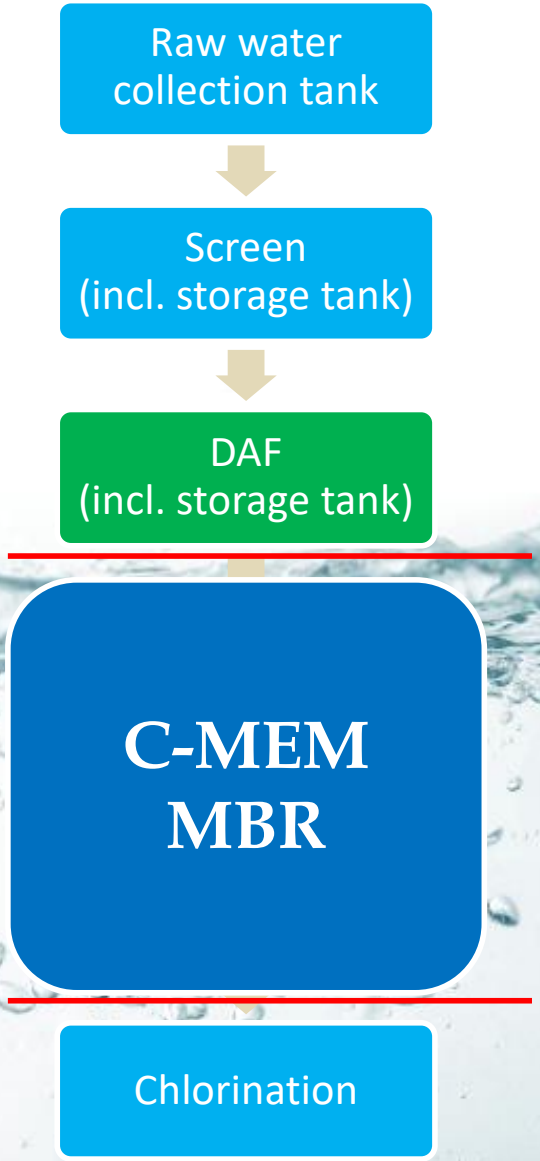
Reconstruction of industrial WWTP:

Process design:

3. Redesign of biological process to C-MEM MBR (Membrane bioreactor) incl. selector

→ Improve of sludge quality by selector

→ Increase of efficiency through nutrient dosing (UREA and phosphoric acid)



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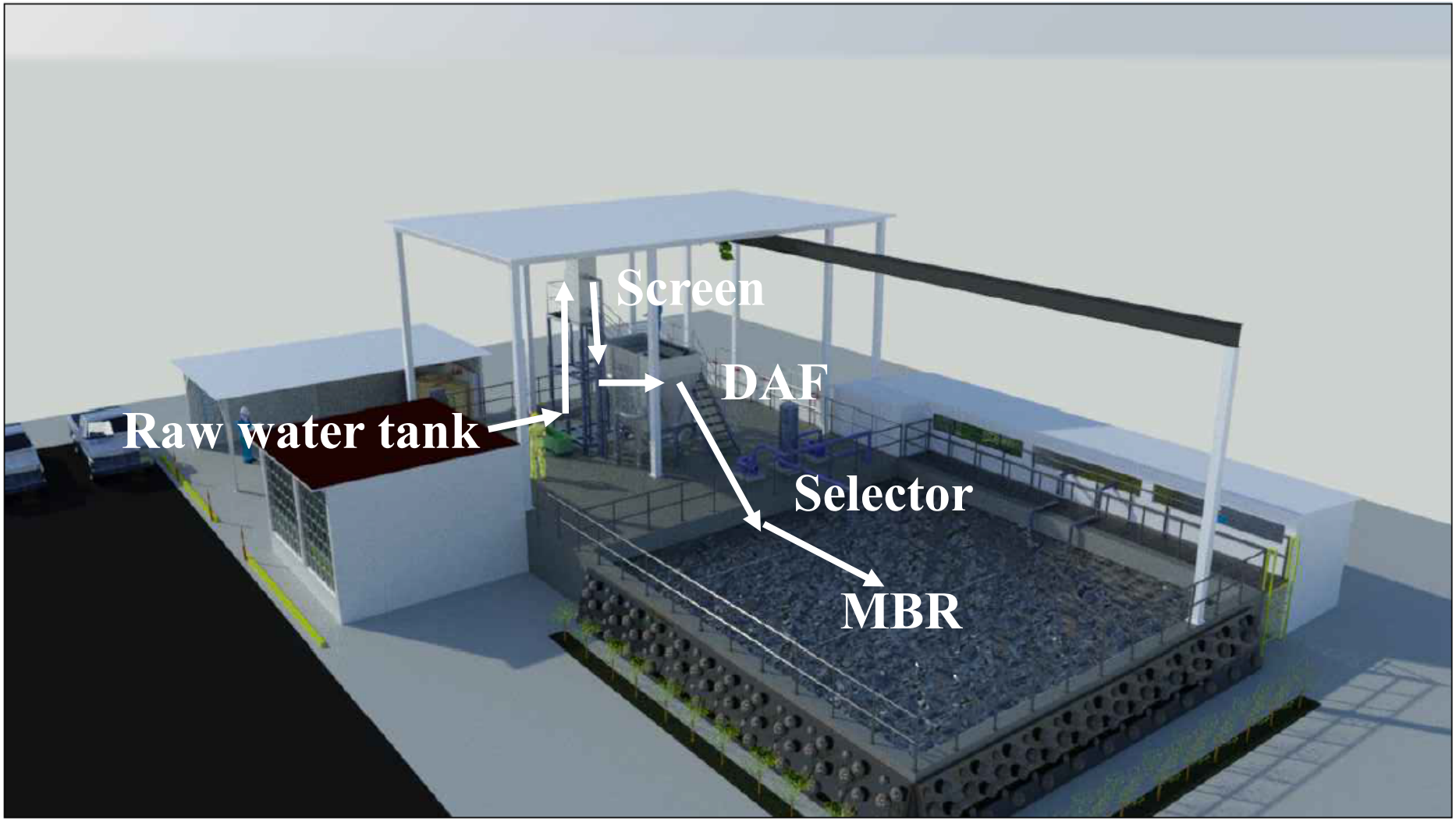

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Case Study 1: GRUPO BIMBO

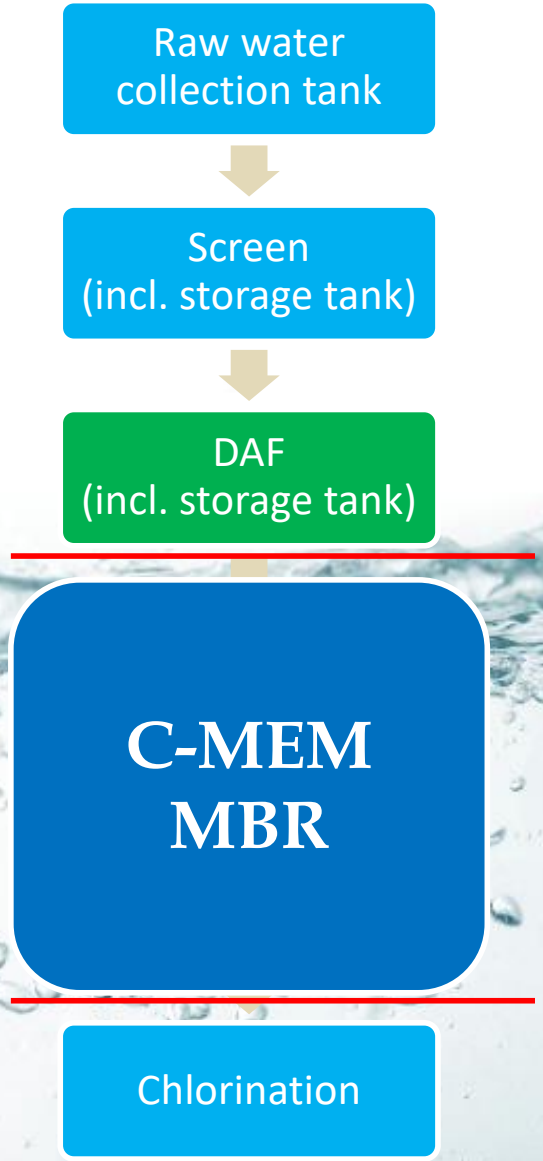
Reconstruction of industrial WWTP:

Process design:

3. Redesign of biological process to C-MEM MBR (Membrane bioreactor) incl. selector

→ Reuse of existing SBR tank

→ Installation of membrane modules inside bioreactor



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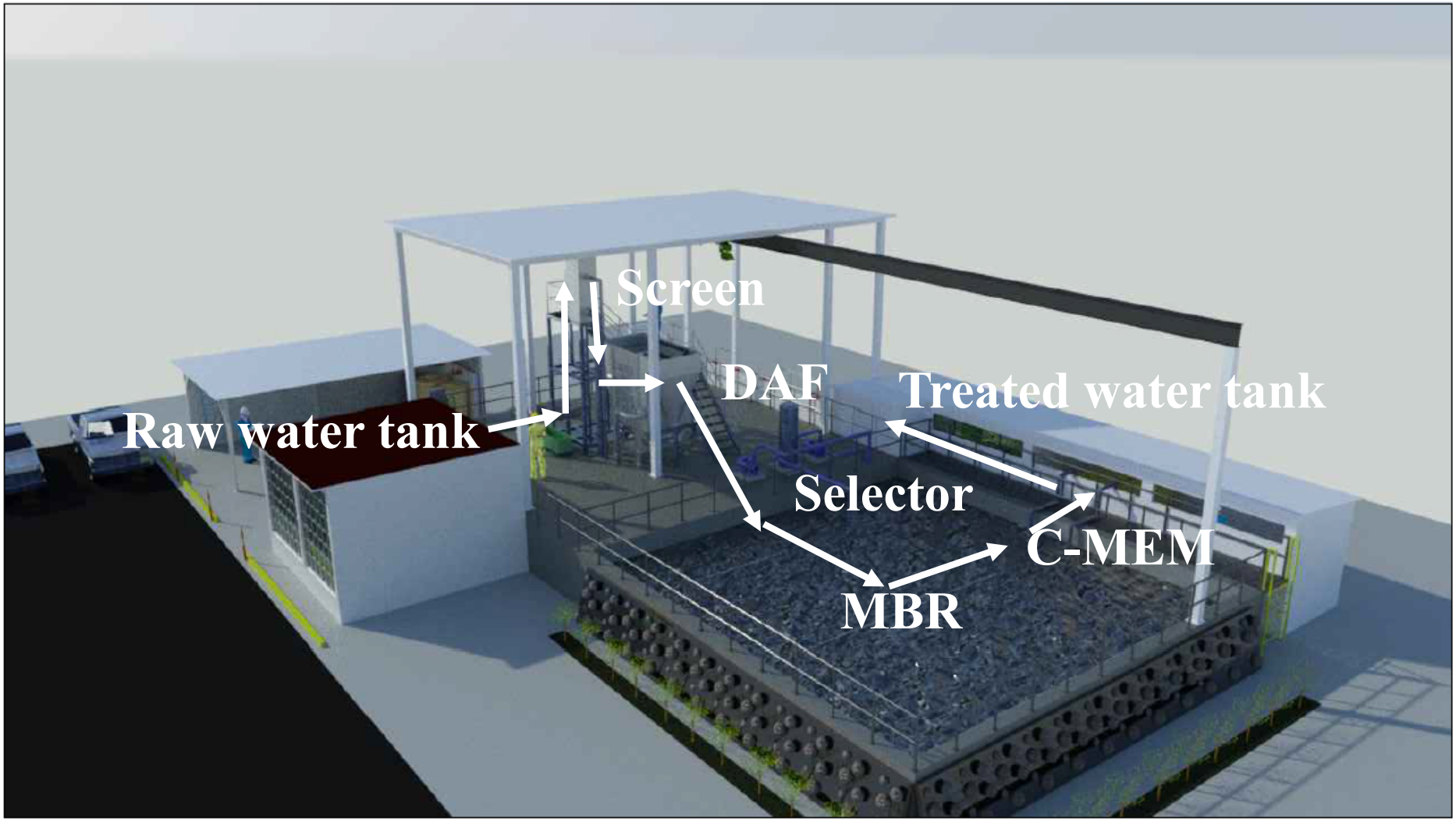

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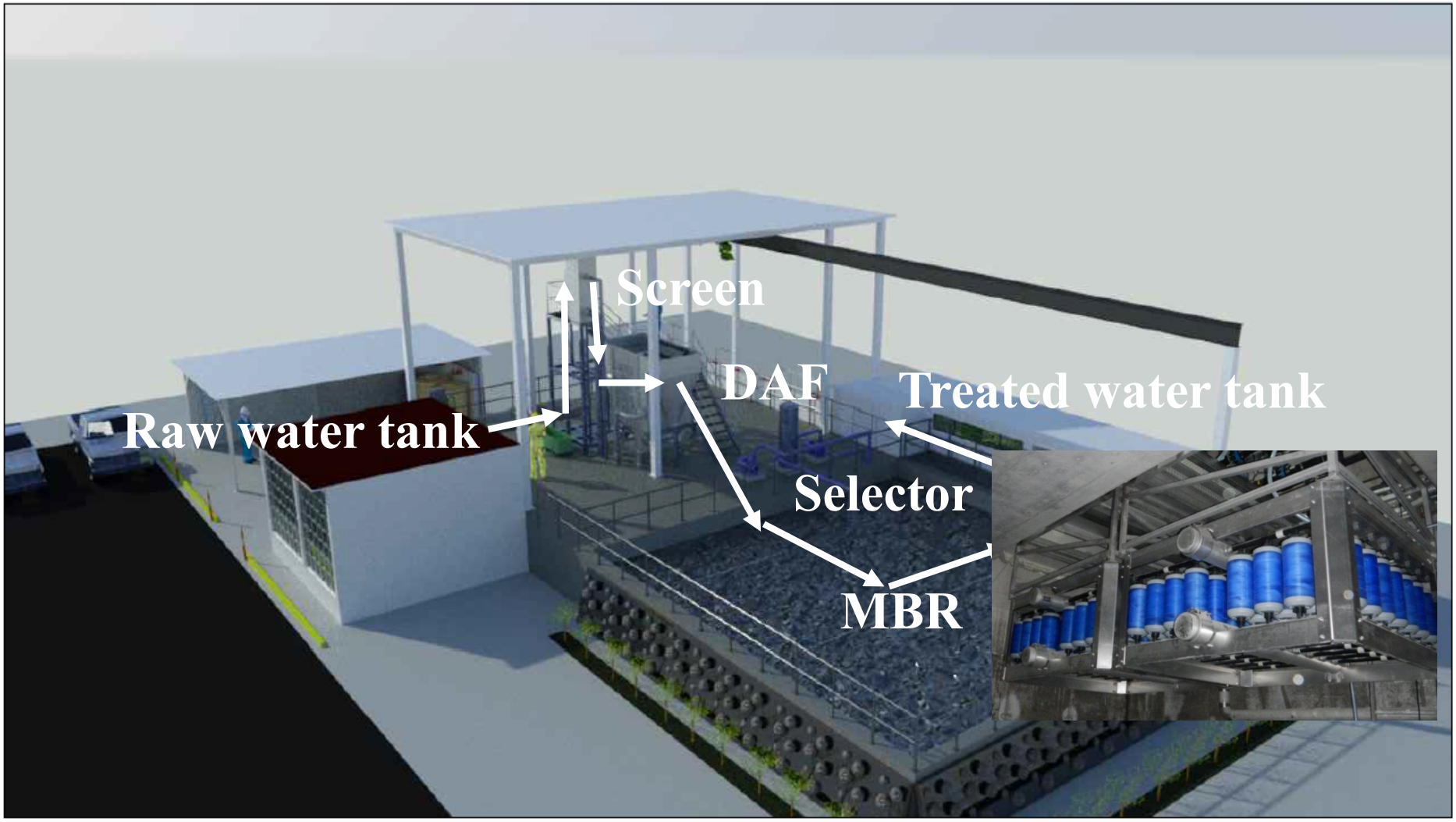

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Case Study 1: GRUPO BIMBO

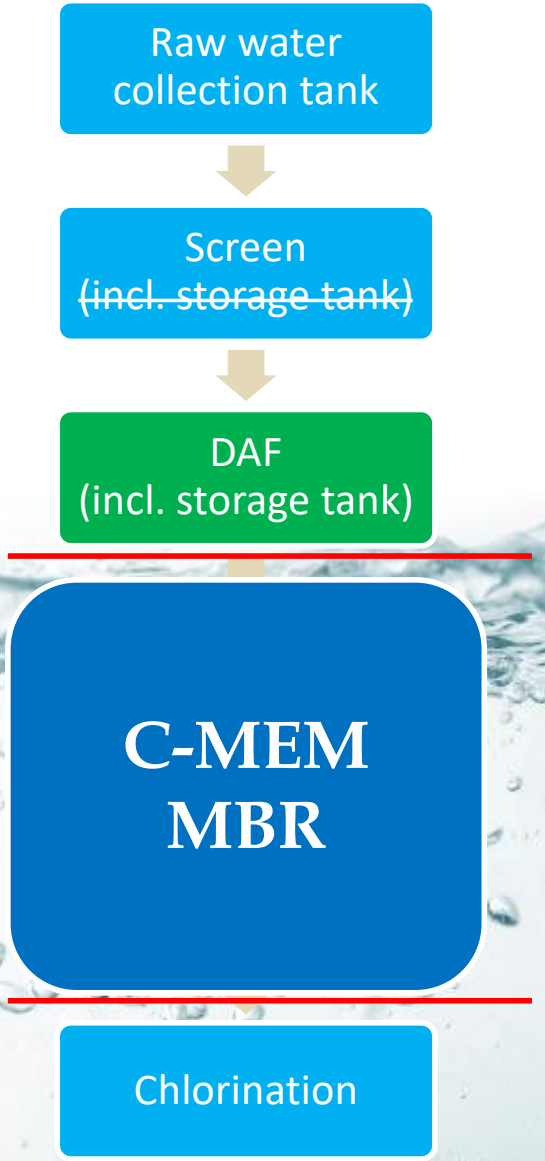
Reconstruction of industrial WWTP:

Process design:

3. Redesign of biological process to C-MEM MBR (Membrane bioreactor) incl. selector

→ Savings of electrical consumption through full process automation (OUR control) and high efficiency equipment

→ Technically disinfected effluent by ultrafiltration



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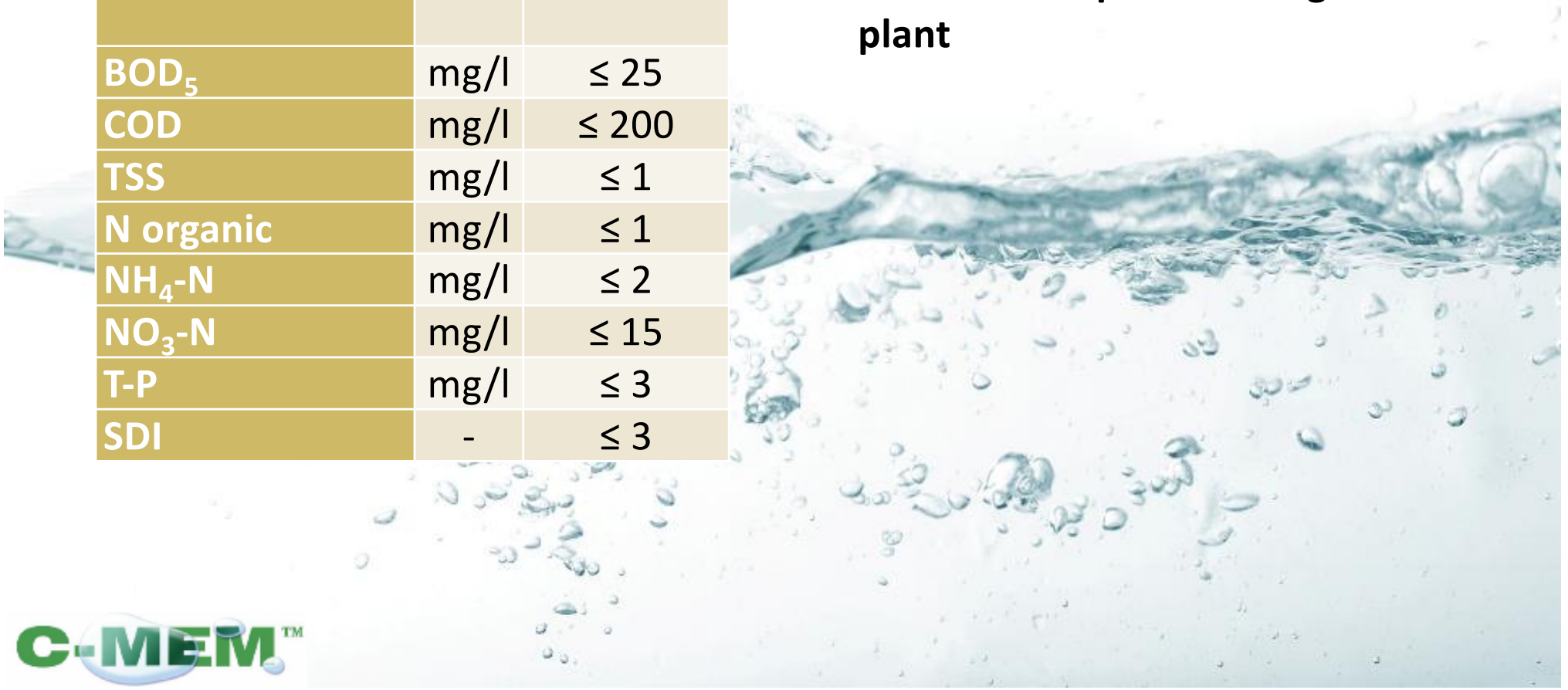
Case Study 1: GRUPO BIMBO

Treated water quality:

Effluent after C-MEM MBR		up to 130 m³/d
BOD_5	mg/l	≤ 25
COD	mg/l	≤ 200
TSS	mg/l	≤ 1
N organic	mg/l	≤ 1
NH_4-N	mg/l	≤ 2
NO_3-N	mg/l	≤ 15
T-P	mg/l	≤ 3
SDI	-	≤ 3

Power consumption:

→ 500 – 600 kWh/day
→ 50% less compared to original plant



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Case Study 2: FLACHAU

Raw water composition

1. Industrial WW from biomass heating plant (condensate)
2. Flow of up to 5 m³/h
3. High loads of TSS (ash), heavy metals, nitrogen
4. Low amount of carbon (BOD, COD)
5. High temperature of up to 50°C

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Case Study 2: FLACHAU

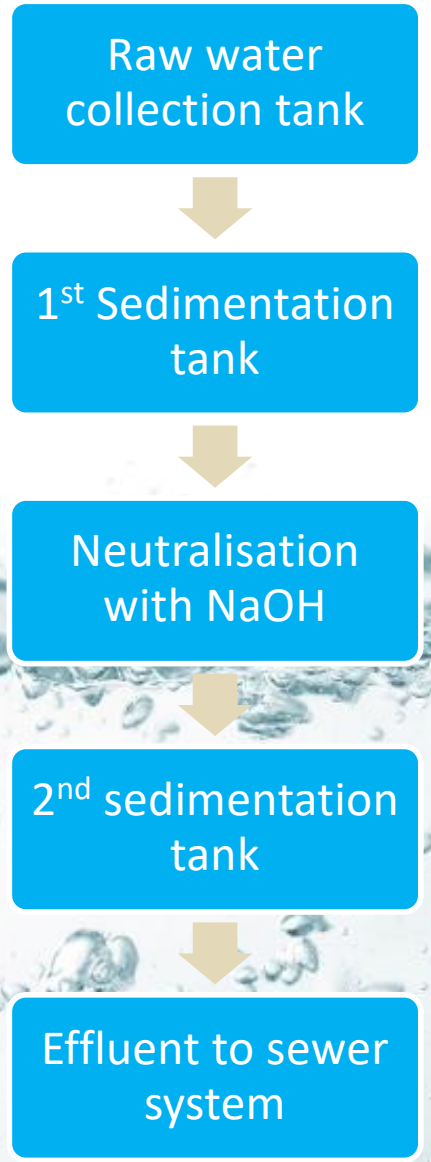
Existing industrial WWTP:

Reason for reconstruction:

1. High sewage fees
2. No further permit for municipal sewer
3. No reuse of water

Goals for reconstruction:

1. Use of existing concrete structures
2. Reuse of water and heat – or direct discharge



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Case Study 2: FLACHAU

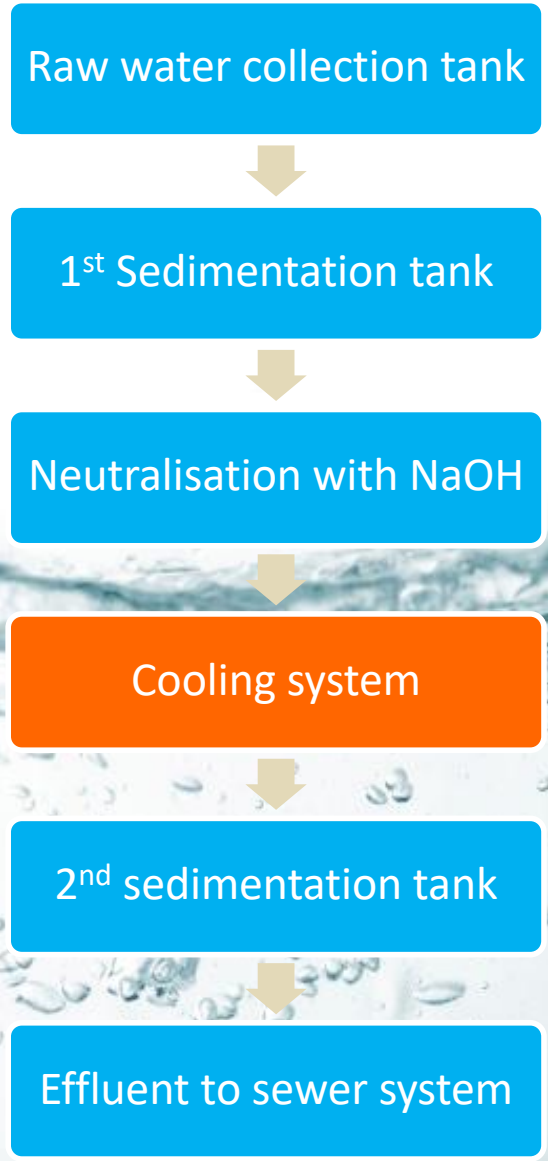
Reconstruction of industrial WWTP:

Process design:

1. Adding of cooling system for heat recovery and cooling of water

→ Heat will be used for heating of streets in winter

→ Water temperature in further process of less than 30°C required



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Case Study 2: FLACHAU

Reconstruction of industrial WWTP:

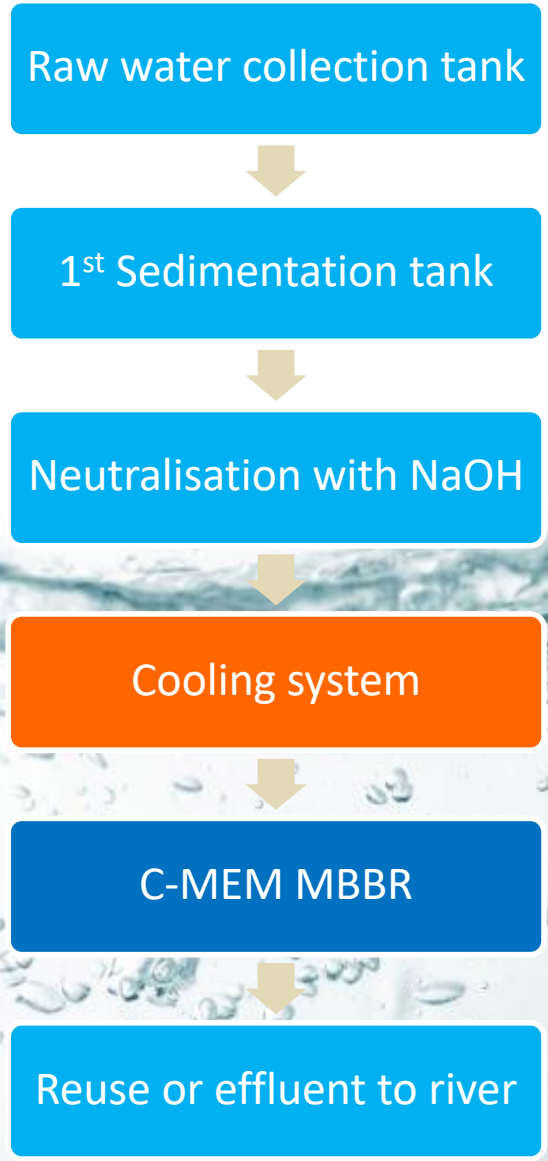
Process design:

1. Redesign of 2nd sedimentation tank to C-MEM MBBR (Membrane moving bed biofilm reactor)

→ Reuse of existing tank

→ Installation of membrane modules inside bioreactor

→ Reuse of treated water of direct discharge to river – no sewage fees



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Case Study 2: FLACHAU

Treated water quality:

Effluent after C-MEM MBBR		up to 70 m³/d
BOD_5	mg/l	≤ 3
COD	mg/l	≤ 10
TSS	mg/l	≤ 1
NH_4-N	mg/l	≤ 1
NO_2-N	mg/l	≤ 1
T-P	mg/l	≤ 1
Heavy metals (zinc, copper, mercury, …	mg/l	≤ 1

Heat recovery:

→ **Saving of equivalents of 40 tons of wood per year!**

Amortization:

→ **Due to savings of sewage fees it is less than 2 years!**

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PROJECTS

Condensate wastewater treatment with C-MEM Moving Bed Biofilm Membrane Reactor (MBBR)

References:

- **Holzwärme Flachau (Austria)**
- **R+Z Klagenfurt (Austria)**
- **Pfeifer Kundl (Austria)**
- **Utrecht (Netherlands)**

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For more information please visit our webpage

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Thank you very much for your attention.

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