

BIOCOS® Waste Water Treatment BIO-4 :: smart water solutions



Product Presentation, Austria

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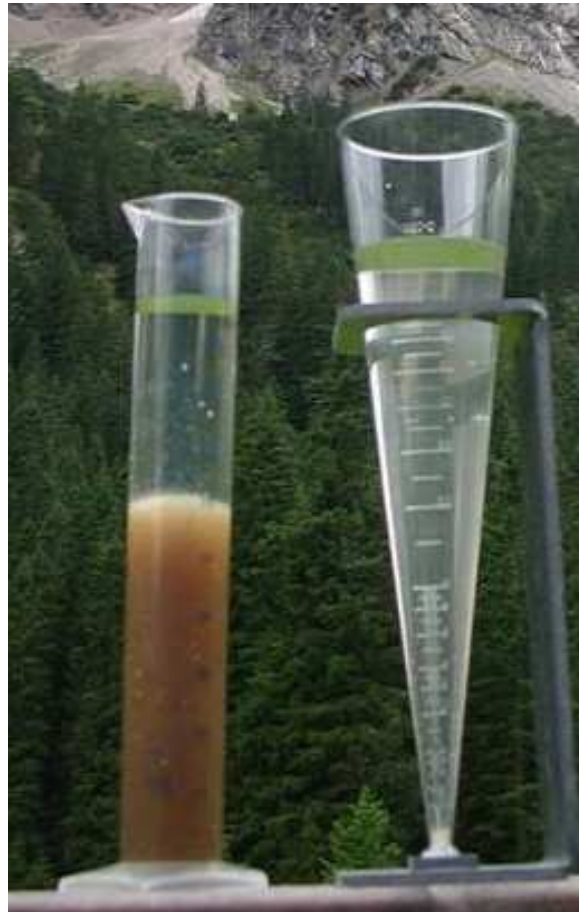
BIO-4 :: smart water solutions is an internationally operating enterprise with Austrian head quarters



Our main markets are:

- Mexico
- Central America
(Panama, Costa Rica,
Honduras)
- Caribbean Islands
- Peru
- Portugal, Italy, Austria
- Saudi Arabia
- United Arabian Emirates
- South Africa, Namibia
- Australia, New Zealand

BIO-4 :: smart water solutions is focused on products and services associated to waste water treatment



Our competitors may be surprised, but we don't do everything.

We focus on waste water treatment and it is our and our clients' claim to have waste water treatment plants which simply perform – sustainability in terms of environment and economics.

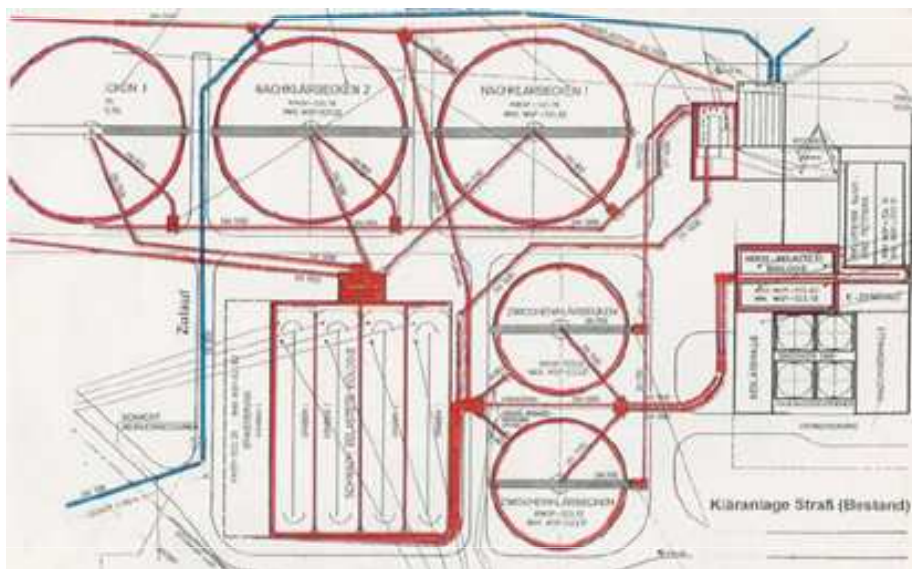
We and our plants are not able to work wonders, but plants with purification performance of 99% are very close to wonders.

BIOCOS comes with low construction costs due to not required circular basins with conic bottom and expensive machinery

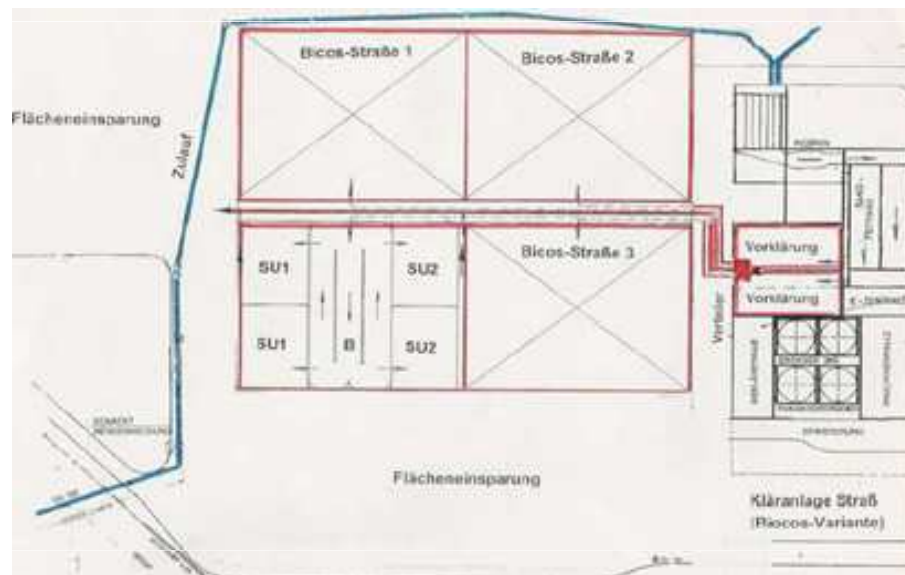


smart water solutions

BIOCOS® comes with significant space/ foot print saving compared to conventional activated sludge systems



Activated Sludge system, overview



Same capacity – significant space savings with BIOCOS®

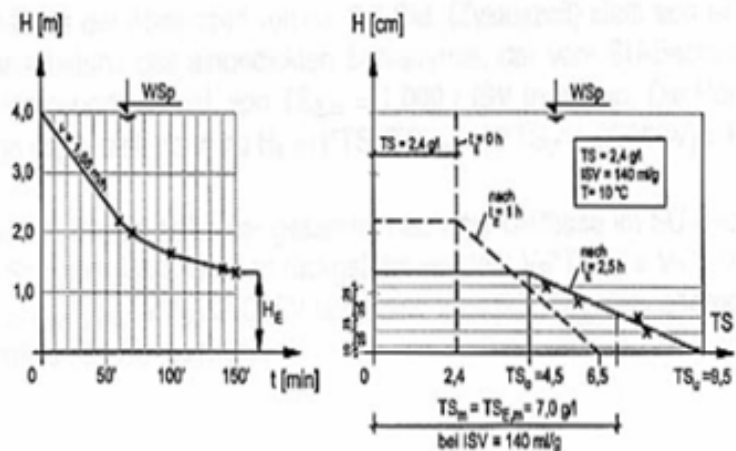
BIOCOS® a simple sedimentation and circulation reactor replaces conventional secondary sedimentation basin



**BIOCOS®- 10.000PE plant of the community
Petershausen in Germany**

BIOCOS® was developed in Austria in order to improve conventional technologies and similar processes significantly

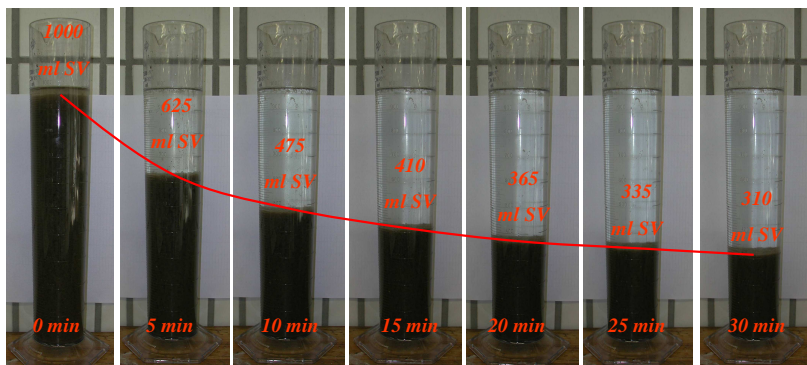
BIOCOS® = BIOlogical COmbined System



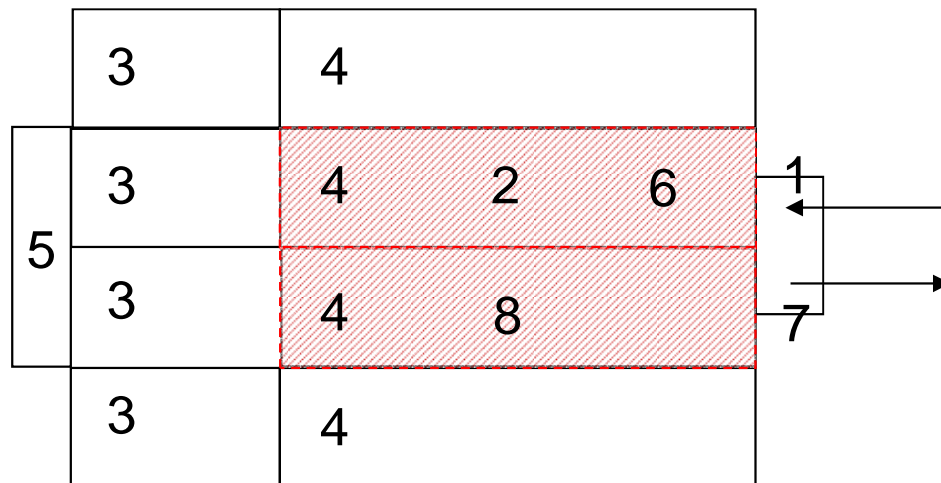
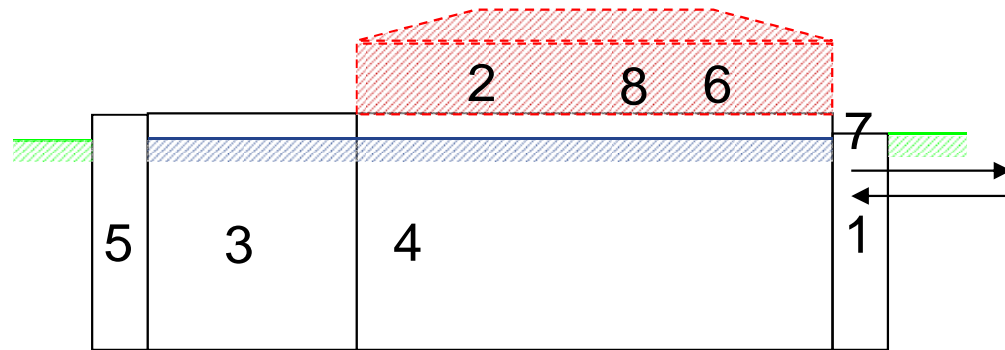
BIOCOS® is one of the most innovative and proven solutions for waste water purification. The technology was invented and has undergone further development in Austria and Germany. BIOCOS® was named “Most Innovative Process for Waste Water Treatment” in Germany in 2002.

BIOCOS® is based on the activated sludge technology but replaces all the disadvantages of the conventional activated sludge process. The result is a simple, innovative and highly effective solution for waste water treatment.

In addition, the competitive investment and comparably low operating costs make BIOCOS® a very economic solution for municipals and resorts/hotels around the world. Hundreds of installations and satisfied customers confirm the excellence of BIOCOS®.



BIO-4 BIOCOS® plants are designed to achieve significant savings in space demand by ensuring highest functionality and usability



1. Inflow, pumping station
2. Pre-treatment within control building
3. BIOCOS® Aeration reactor 1-4
4. BIOCOS® Sedimentation and circulation reactor 1-4
5. Surplus sludge thickener A + B
6. Sludge dewatering device
7. Effluent
8. Control room, compressor room within control building

Overview of the main elements of a 4 line BIOCOS® plant for approx. 13.000 PE

BIOCOS® is an award winning biological process for wastewater treatment



Basic process steps

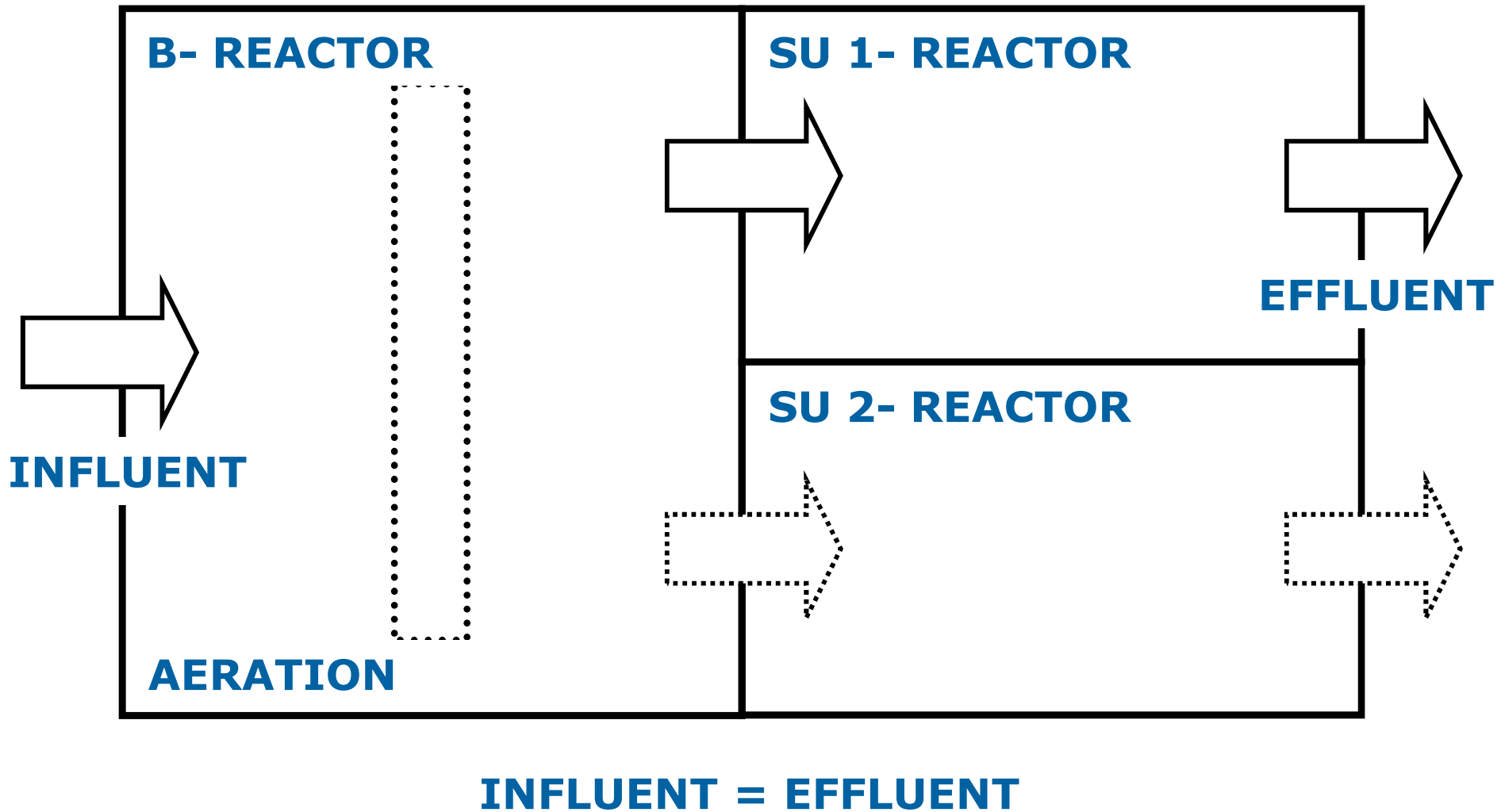
- (1) Oxygen input in the aeration reactor (Nitrification)
- (2) Oxygen enriched biomass carried to sedimentation and circulation reactor
- (3) After circulation Sedimentation, De-nitrification
- (4) Purified water is withdrawn
- (5) Settled sludge is carried back to aeration reactor (constant mass)
- (6) Surplus sludge is withdrawn to sludge thickener and sludge dewatering unit (15% DR)
- (7) Cycle starts again

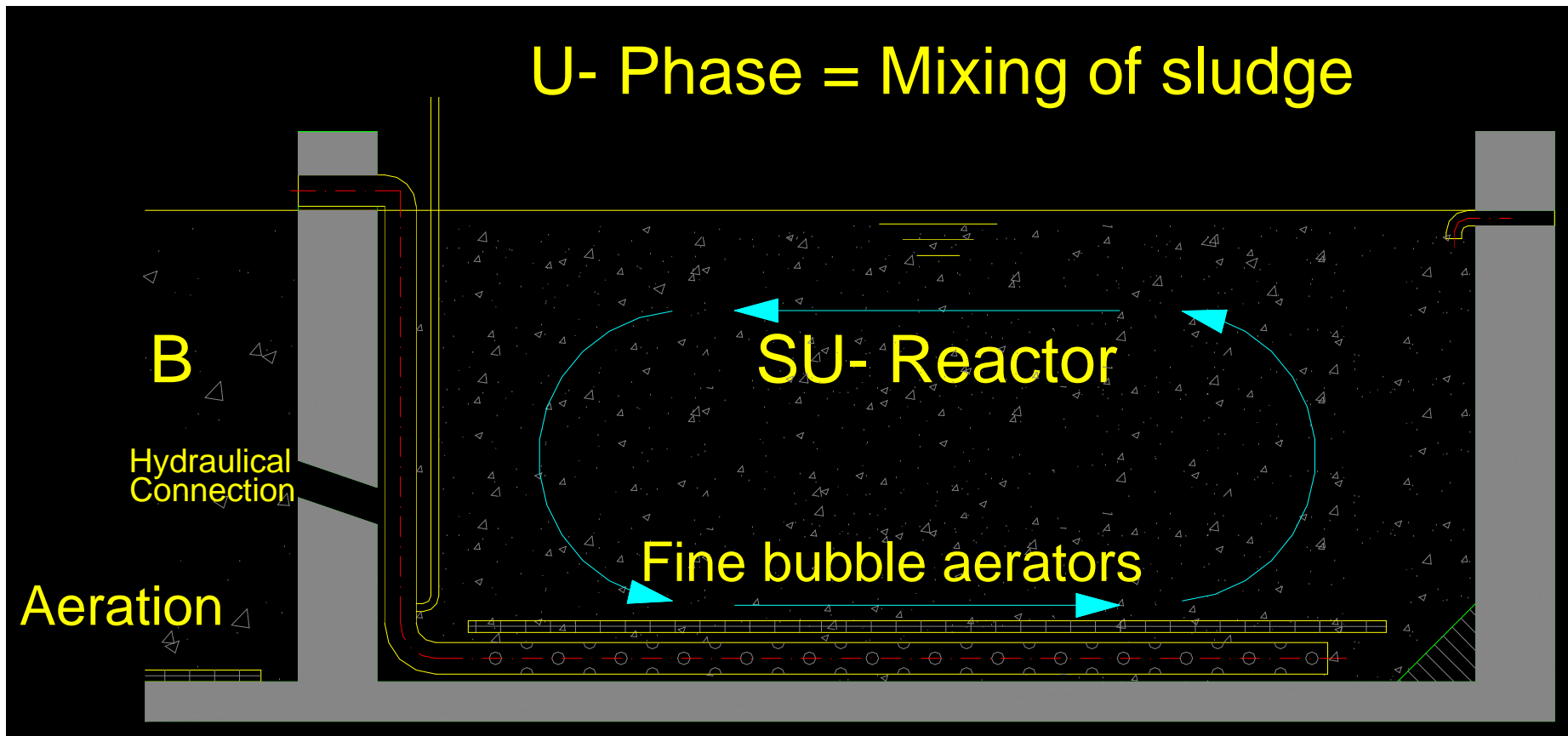
BIOCOS® a simple sedimentation and circulation reactor replaces conventional secondary sedimentation basin



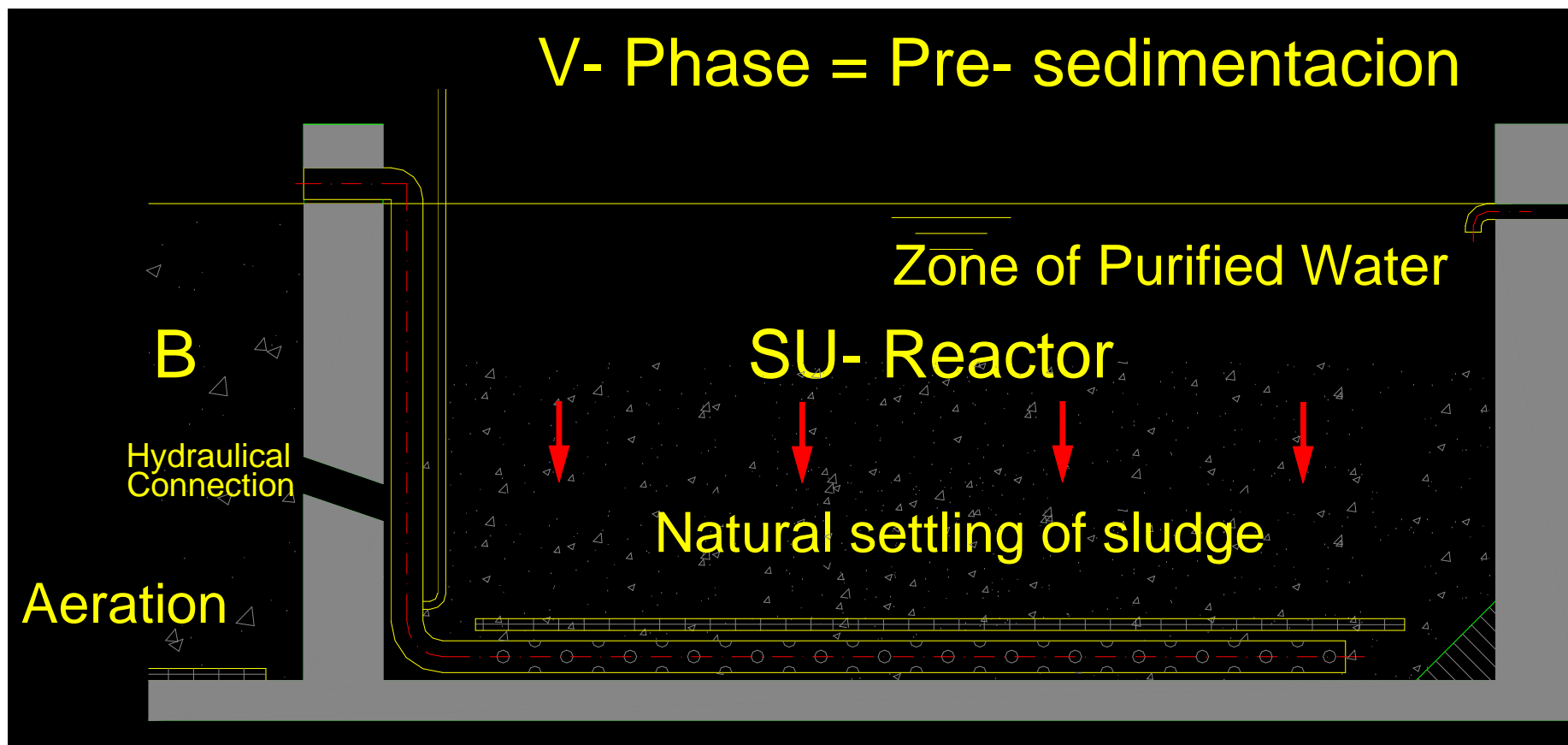
**BIOCOS®- 10.000PE plant of the community
Petershausen in Germany**

BIO-4 BIOCOS® - flow through process



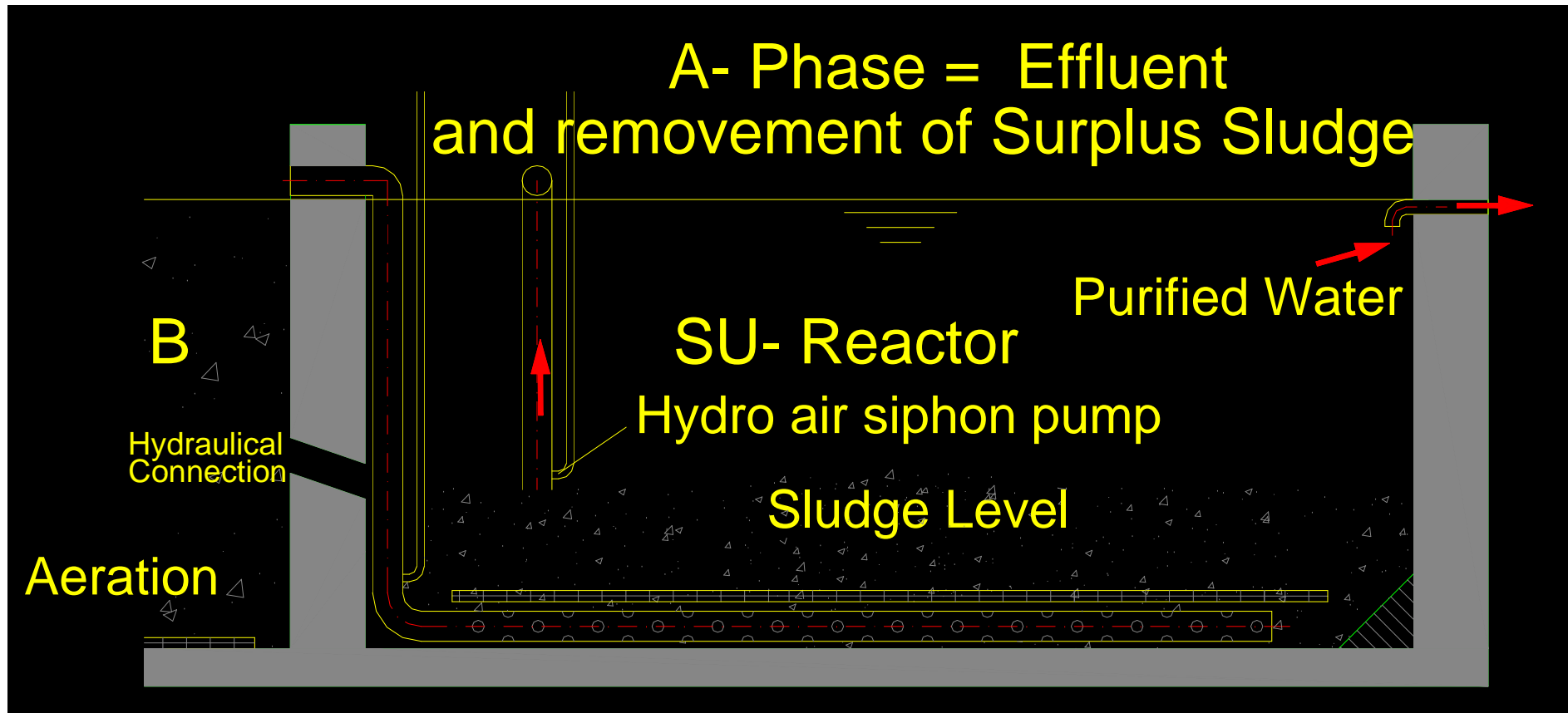


Circulation of the new oxygen enriched sludge in the SU- reactor to create a new homogenous flocculent filter



Natural settling of the sludge by gravity:

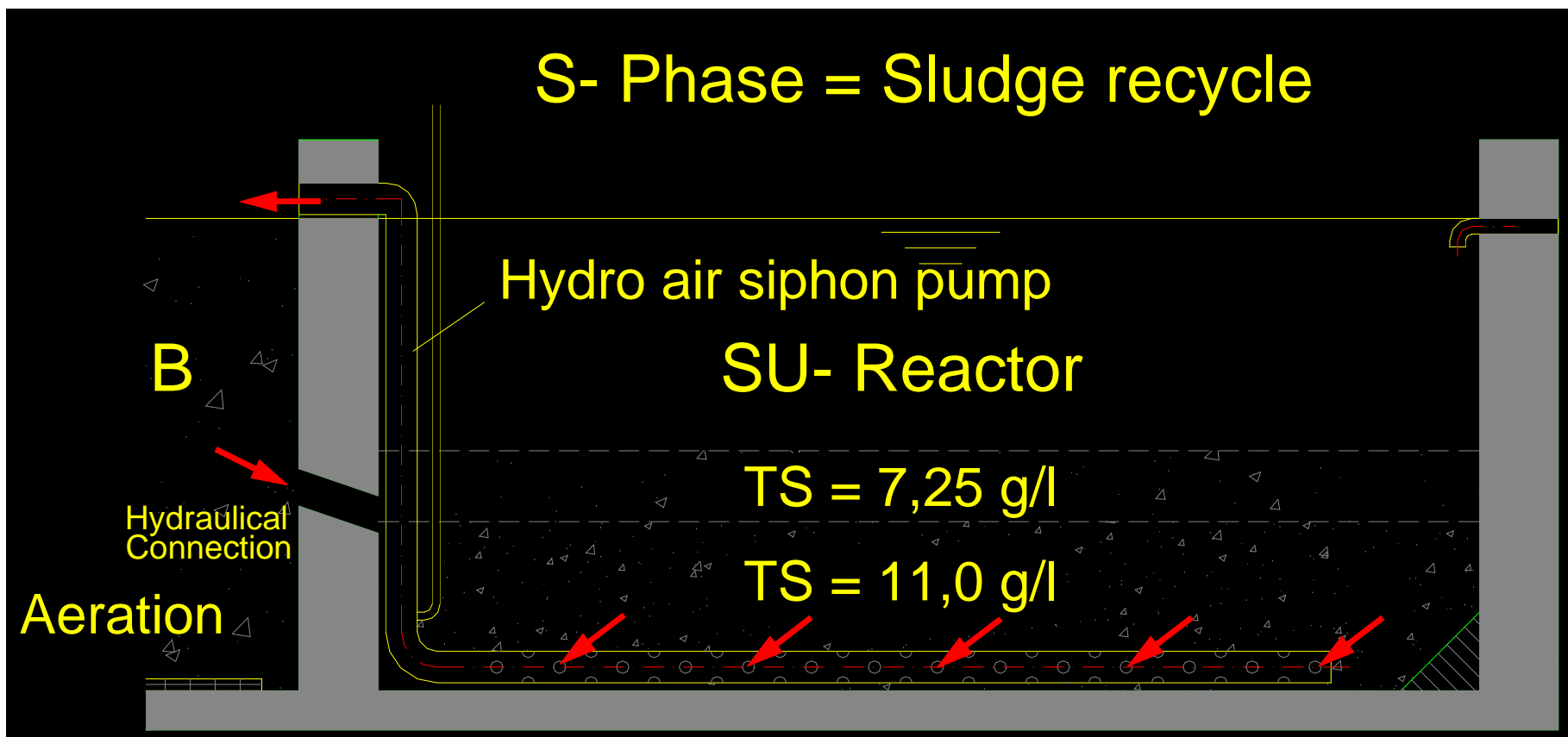
- **Flocculation for small particles**
- **Additional COD- removal**
- **Biological Phosphate removal**
- **Endogenous Denitrification**



Withdrawn of the purified effluent

Surplus sludge removal

S- Phase = Sludge recycle



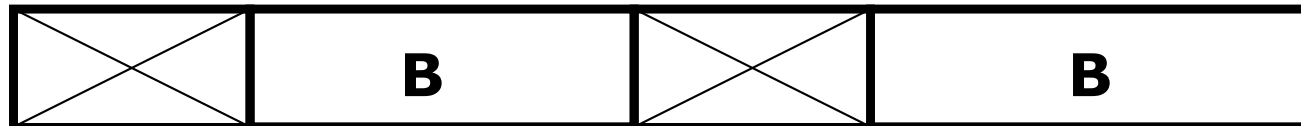
**Sludge recycle of the denitrification sludge from the bottom of the SU- tank into the B- tank, but:
without the clear water zone in the SU- tank!**



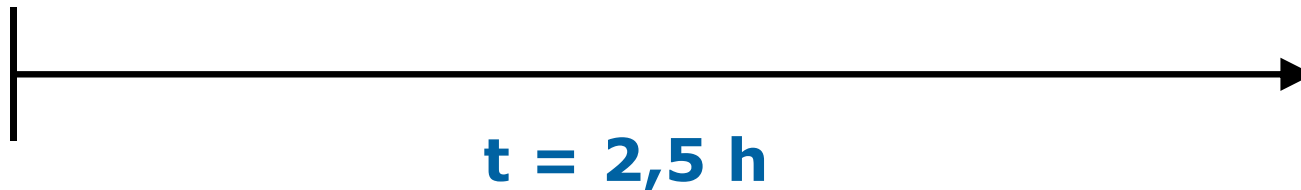
SU - REACTOR 1



SU - REACTOR 2

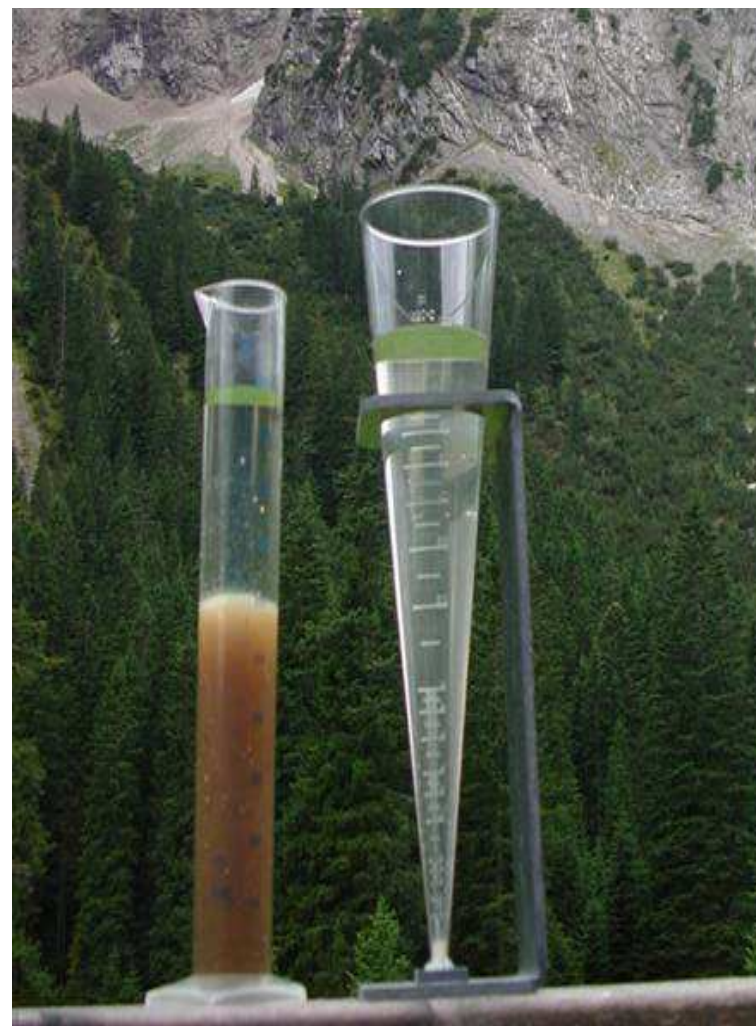
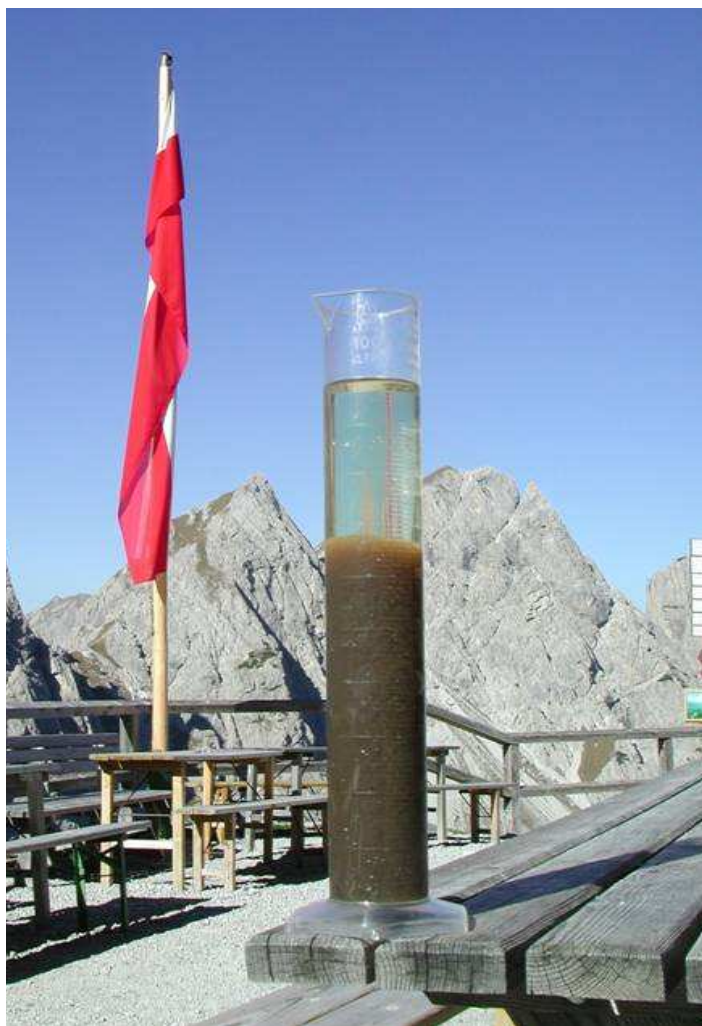


B - REACTOR



smart water solutions

BIOCOS® effluent quality is visible – a minimum of solids results in crystal clear purified waste water



BIOCOS® plants are in line with all regulatory requirements and stay below allowed limits of bio-treated sewage

Figure	European law	BIOCOS effluent ¹⁾
BOD ₅	< 25 mg/l	5 – 10 mg/l
COD	< 75 mg/l	30 mg/l
N _{tot}	< 10 mg/l	< 5 mg/l
P _{tot}	< 1 mg/l	1 – 3 mg/l (BIOCOS); ²⁾ < 1 mg/l with additional flocculant
Solids	< 0,5 ml/l	0,1 – 0,2 ml/l

The effluent can additionally be treated with:

- BIO-4 Chlorine treatment
- BIO-4 UV treatment – perfectly applicable for BIOCOS® treated water is perfectly due to its nearly solid free and clear effluent

1) Effluent quality values are based on the performance of existing plants

2) Depending on influent P_{tot} quantity

With our approach, we will fulfill clients' goals regarding economic, environmental and operational stability

1 Economic sustainability

- **Low investment** due to simple construction
- **Low operational costs** concerning maintenance and spare part demand
- **Outsourcing** of all or selected processes
- **Low energy costs**
- **Low effort to enlarge plant** (while operation!)
- **Direct Usage of purified water** for irrigation

2 Environmental sustainability

- **Compliant to European Laws** and Limits for biologically purified sewage
- **Direct usage of purified water** for irrigation purposes
- **Silent and odorless** operation

Project Goals

3 Operational security

- **Full automatic operation** guarantees constant purification performance
- **Easy operation** and day to day handling
- Possible power shortages are no problem
- **Flexible concerning change of hydraulic and / or organic load**
- Optional **operation** by BIO-4 professionals

4 Professional project implementation

- **Short project implementation** times in each stage
- **BIO-4 deals with all aspects of the project**
- **BIO-4 names direct contacts for the client**
- Project is executed exclusively by BIO-4 professionals

BIOCOS delivers superior output at lower capital investment and lower operational cost compared to conventional installations

Superior Output

- **Effluent quality better than highest limits**
- **Effluent quality is stable even at fluctuating influent**
- **Effluent quality has been proven** in existing installations **and is guaranteed by BIO-4** as long as the operators follow operating/maintenance guidelines
- **Perfect to be integrated in surrounding environment**
 - Silent operation
 - Odor neutral operation
 - Covered construction possible – tanks can be closed
 - Direct reuse of purified water possible (e.g. for irrigation)
 - Easy expansion possible (modular design)



Lower Investment and Operational Cost

- **Minimal space requirement and construction cost**
 - Compact construction of rectangular tanks
 - Simple construction with flat bottom
- **Reduced equipment/installation/training cost**
 - Simpler installation with less mechanical parts
 - Reduced complexity in installed equipment
- **Lower energy consumptions**
 - Less high power consuming compressors installed
 - Fully-automated process control to save energy
- **Savings in maintenance/spare parts and higher sustainability**
 - Reduced number of parts/equipments installed (less wear and tear, less spare parts, less break-downs)
 - No electrical parts below water surface
- **Minimized personnel requirements**

BIOCOS® purified waste water guarantees hazard free and save secondary application e.g. irrigation

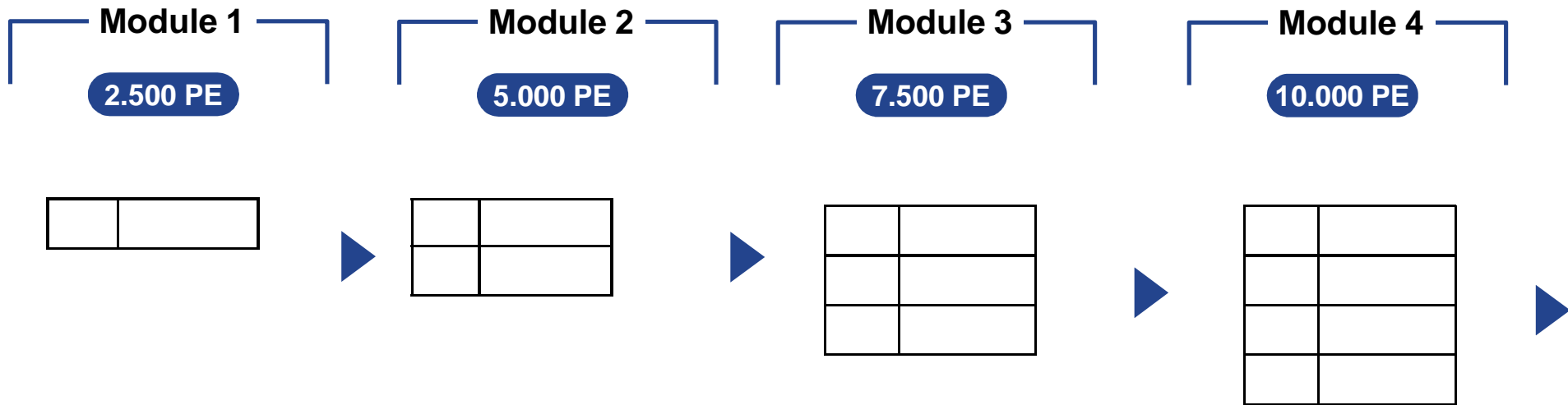


BIOCOS treated waste water is in line with the highest standards for biological purified waste water.

The reuse of purified waste water results in significant savings in expensive and primary or drinking water supply. Also the supply - dependency for dry months can be reduced.

This is especially important for resorts / hotels which own or are connected to golf courses, parks etc.

BIOCOS® enables modular growth of a plant to easily adjust capacity and ensures safe investment

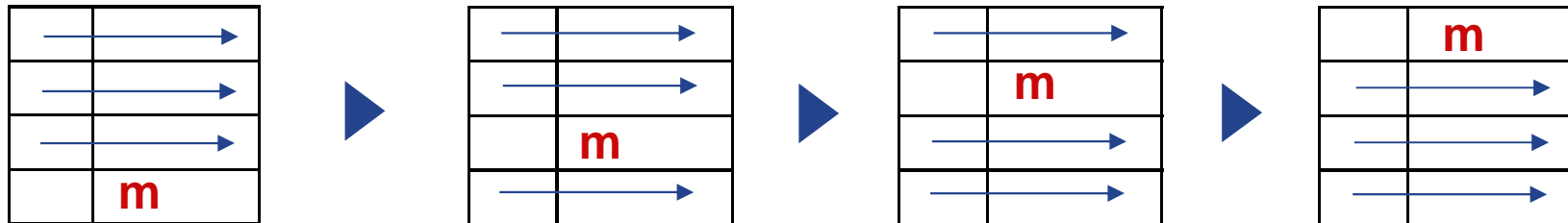


Support of modular growing strategy

- Easy enlargement is enabled and guaranteed with multi line strategy
- Each of the lines corresponds with the growing demand for waste water treatment capacity
- All BIOCOS® are equal concerning technology

BIOCOS® plants enable maintenance strategy while operation

Example for a possible maintenance strategy¹⁾ for a four line BIOCOS plant.
Maintenance works are possible while operating the plant with **75%** of its total capacity.



m = maintenance

→ = operation

1) This is one possible strategy to maintain multi line BIOCOS plants, the specific strategy will be applied according to the current situation. Additionally, according to our experience, no maintenance is required below the water surface of the BIOCOS lines for >10 years

BIO-4 BIOCOS® plants are designed to perform for decades to ensure safe investment and operation

- Siemens Control panel (approved in approx. 300 plants worldwide)
- Compressors from leading European manufacturers (adequate even for fluctuating power)
- pre-screening and sludge dewatering units from leading European manufacturers (most parts stainless steel) if necessary
- Only stainless steel equipment inside the reactors (no maintenance > 10 years) or
- High quality HDPE pipes and high pressure hoses (no maintenance > 10 years)
- Simple approved laboratory equipment
- No moving electrical devices under the water surface!

Due to the design of a BIOCOS® plant, demand for spare parts is significantly lower than for other plants

Reasons for lower spare-part demand with BIOCOS - plants

- Reduced number of parts/equipments installed (less wear and tear, less spare parts, less break-downs)
- No moving electrical parts below water surface
- Movement of water done only by compressed air
- No pumps within the BIOCOS purification lines
- Only high quality and approved equipment used

BIOCOS® plants are easy and cheap to build due to rectangular basins with flat bottom also for small applications



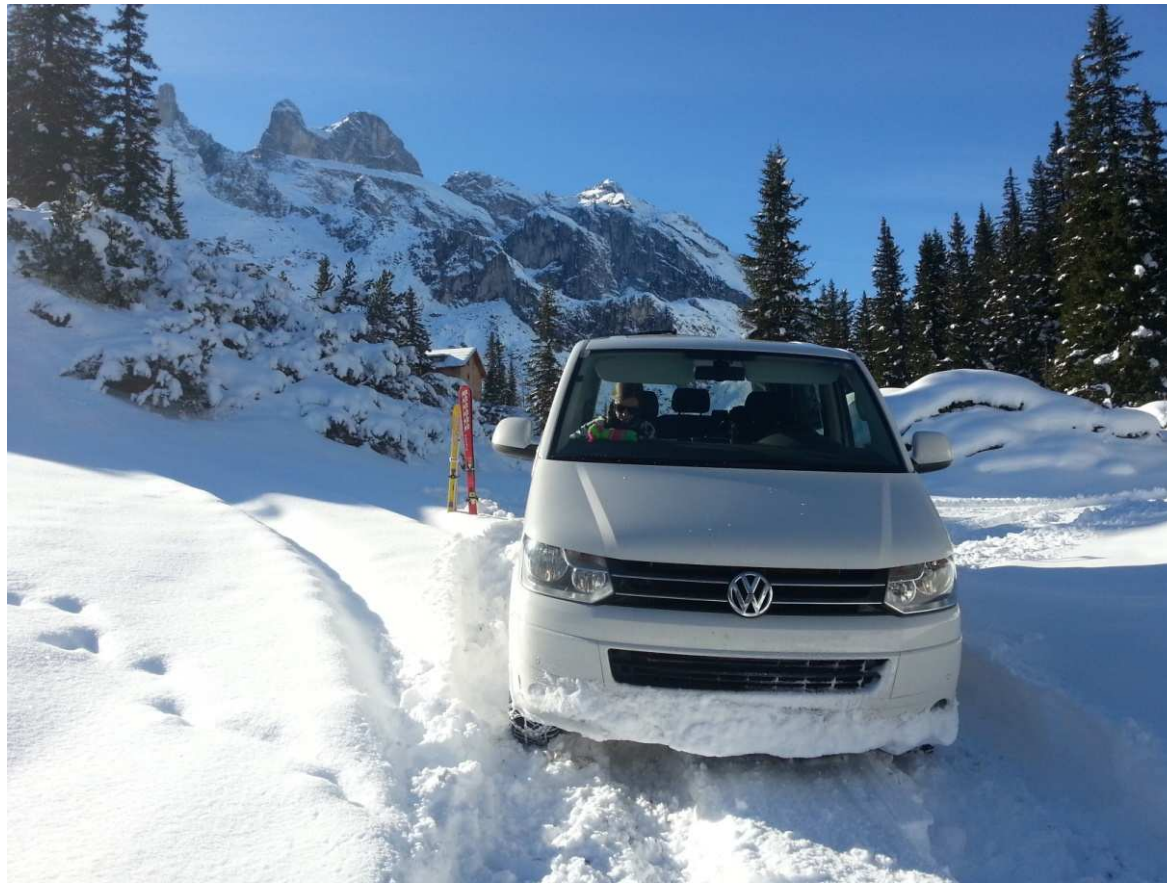
Hotel at Lake Garda, Italy – 50 PE, Concrete construction

BIOCOS® plants perform everywhere, under hardest conditions



BIOCOS plant for 100PE in an alpine refuge 365 days operation – sewage temperature of about 5°C

BIOCOS® plants perform everywhere, under hardest conditions



BIOCOS plant for 400PE in an alpine refuge 365 days operation – sewage temperature of about 5°C

BIOCOS® plants perform everywhere, under hardest conditions



BIOCOS plant for 400PE in an alpine refuge 365 days operation

BIOCOS® plants can be established as covered construction



Hotel Estrella Azzura, Cabarete, Dominican Republic. Covered construction 750 PE

BIOCOS® plants operate without nuisance of odor or noise



Hotel Vila Taina, Cabarete, Dominican Republic. Covered construction, 750 PE

BIOCOS® plants can be perfectly integrated in their individual surrounding – even in sensitive applications like hotels or resorts



**Hotel Resort & Spa Sun Village, Cofresi Beach, Puerto Plata
Dominican Republic. Covered construction 2.000 PE**

BIOCOS® can be established below or above ground level – only depending on local circumstances



**Resort Cofresi Beach Consortium, Puerto Plata Dominican Republic.
Covered construction 4.000 PE**

BIOCOS® plants are designed to meet individual demands



Municipality of Landersdorf, Germany, 200 PE

Compact rectangular basins ensure easy modular enlargement and maintenance strategy while operation



Municipality of Michelsfeld, Germany, 2.500 PE

BIOCOS® plants fit for municipal water treatment and deliver purification performance of about 99%



Municipality of Niederwetz, Germany, 3.000 PE

BIOCOS® plants can be equipped with sludge treatment individually adjusted to plant size, sludge quantity and application



Municipality, Germany, 3.200 PE

BIOCOS do not have the floating sludge problems which most other systems and processes have to address with expensive equipment



Municipality of Rudelzhausen, Germany, 4.000 PE

BIOCOS® technology is applicable from 4 PE up to 'unlimited' PE



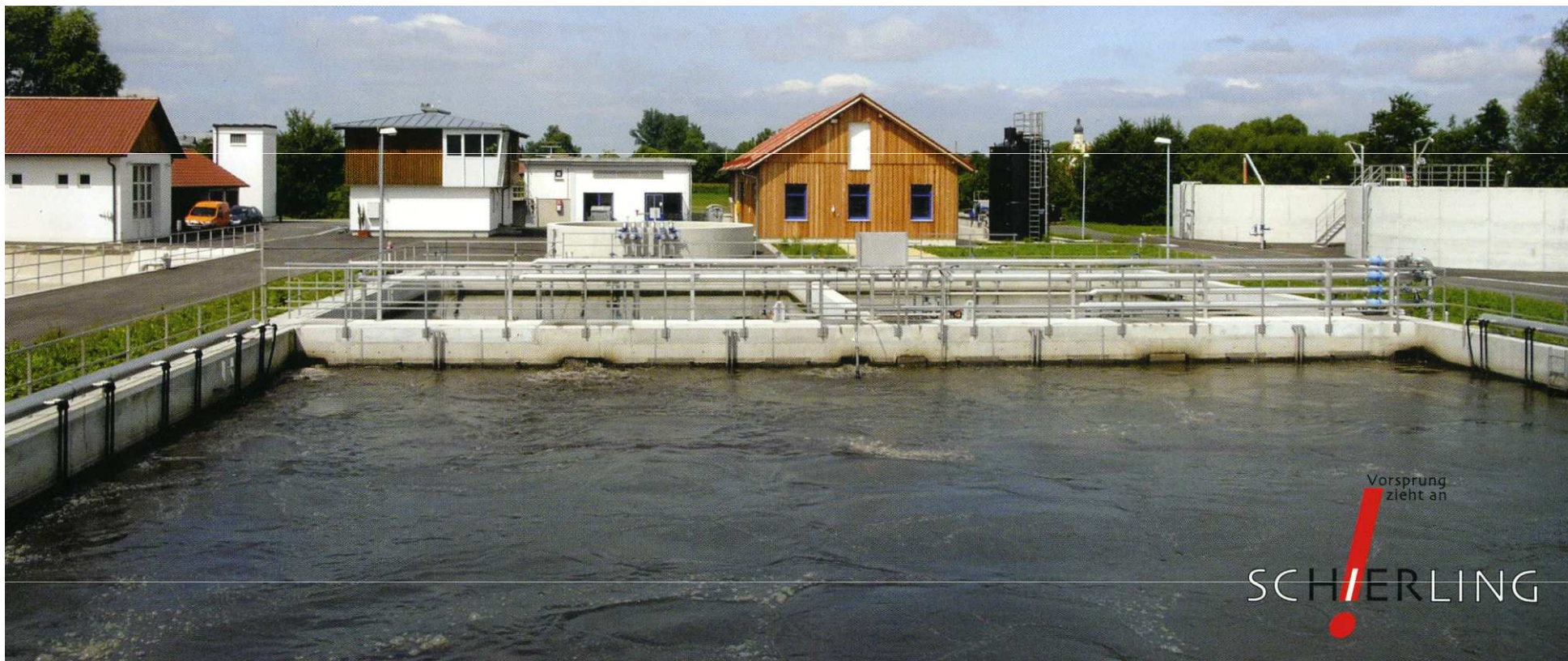
Municipality of Petershausen, Germany, 10.000 PE

BIOCOS® technology is applicable from 4 PE up to 'unlimited' PE



Municipality of Schierling, Germany, 20.000 PE

Korrespondenz Abwasser 2008 Nr.11



Municipality of Schierling, Germany, 20.000 PE

Monthly Average: 2,0 mg BOD5/l; 15 mg COD/l; 4,5 mg Ntot/l

Energy Demand: only 0,5 kWh/kg BSB5

BIOCOS- STP- Villarrobledo in Spain/ 85.000 Hab.

Area_{BIOCOS} = 70 * 35m = **2.450m² only**

Hydr. Load = 8.500 m³/d (100 l/PE)

Q_{max} = 460 m³/h; Q₂₄ = 354 m³/h

Org. Load = 5.100 kg BOD₅/d (85.000 Hab.)
= 8.670 kg COD/d

N_{tot} = 850 kg/d

P_{tot} = 85 kg/d

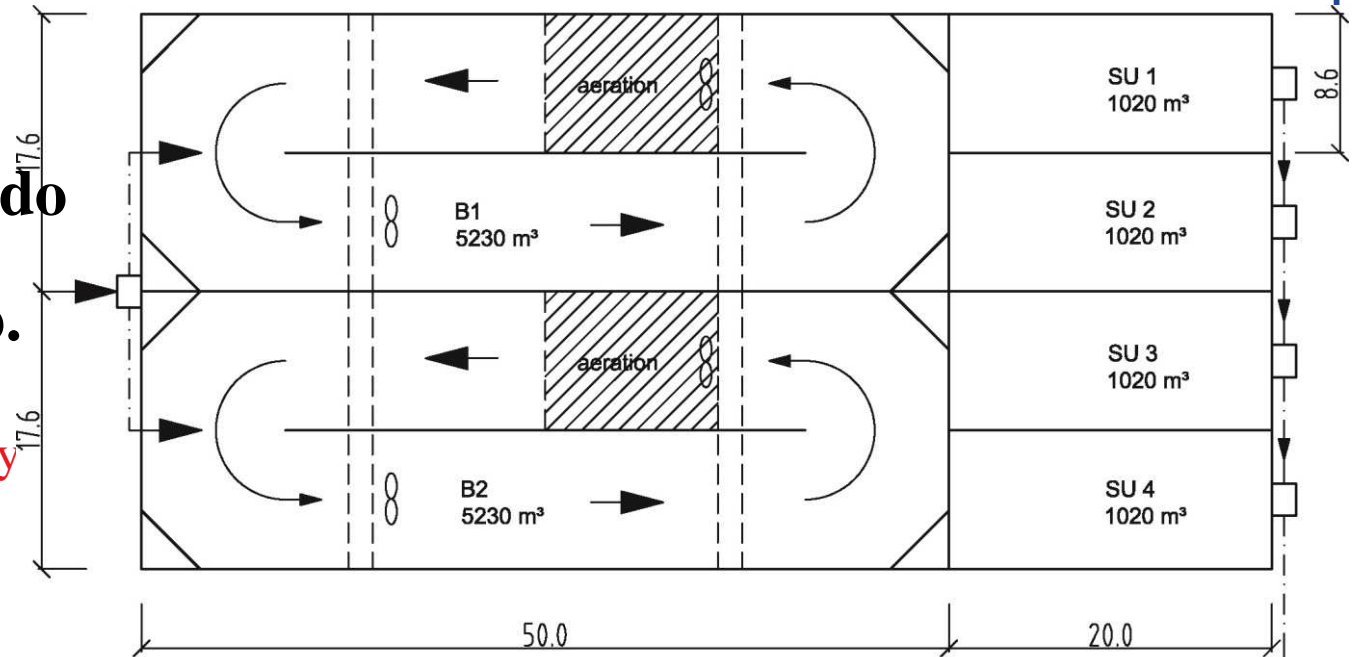
Water Temp ~ 15°C / t_{TS} = 10 days

Estimated Effluent Values:

BOD₅ = 5 mg/l (< 20 mg/l) COD = 30 mg/l (< 70 mg/l)

N_{tot} = 5 mg/l (< 10 mg/l) P_{tot} = 1 mg/l SSD = 10-20 mg/l

E_{BIOCOS} = 4167 kWh/d (B+ SU Tanks) ~ **49 Wh/day/PE only!**



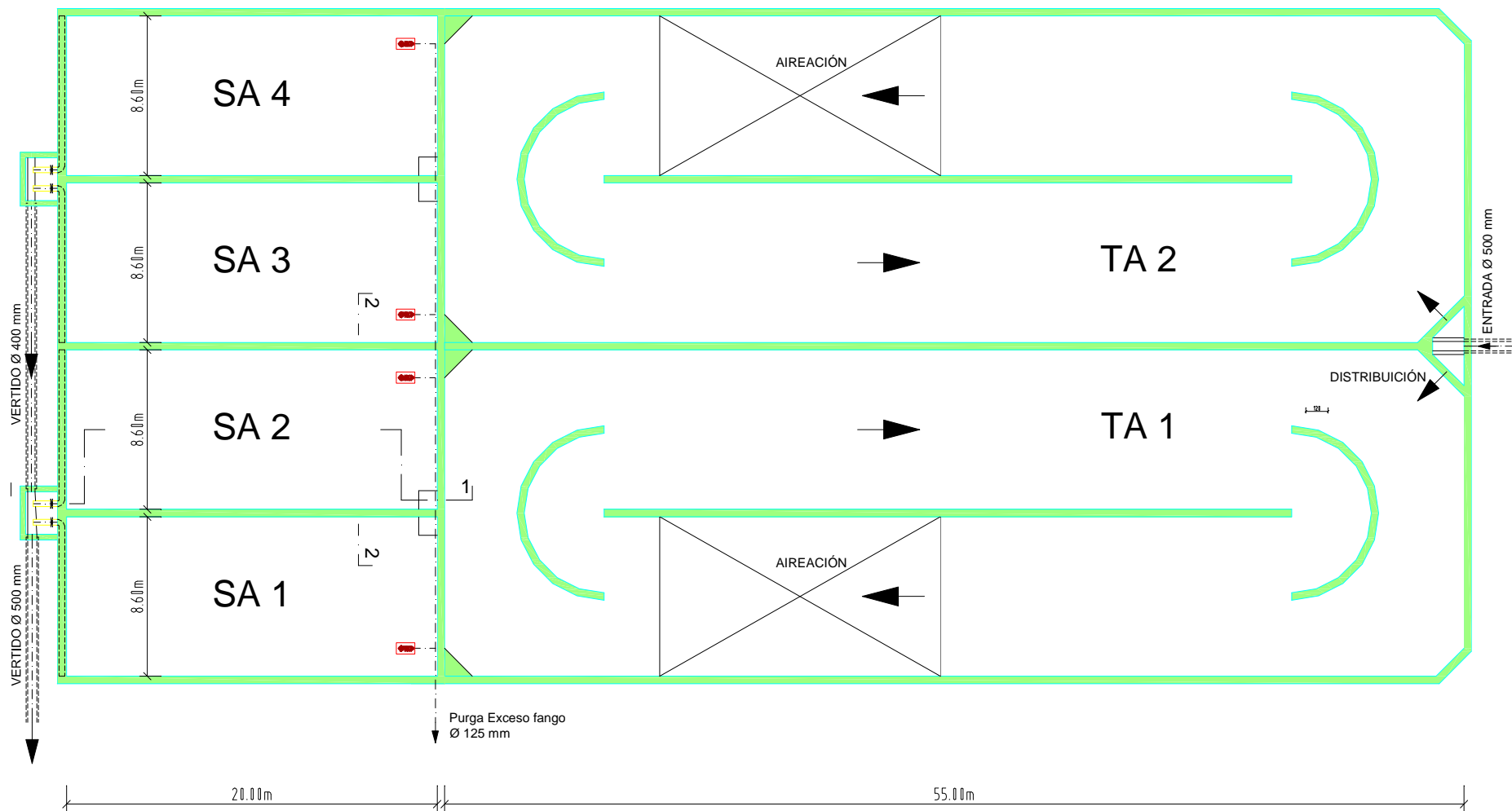
smart water so



Municipality of Villarrobledo, Spain, 85.000 PE

BIOCOS® technology is applicable from 4 PE up to 'unlimited' PE

PLANTA BIOCOS 1: 200 - VARIANTE CON AIRE COMPRIMIDO
ANTEPROYECTO



smart water solutions

Municipality of Villarrobledo, Spain, 84.000 PE



Municipality of Villarrobledo, Spain, 84.000 PE



Municipality of Villarrobledo, Spain, 84.000 PE

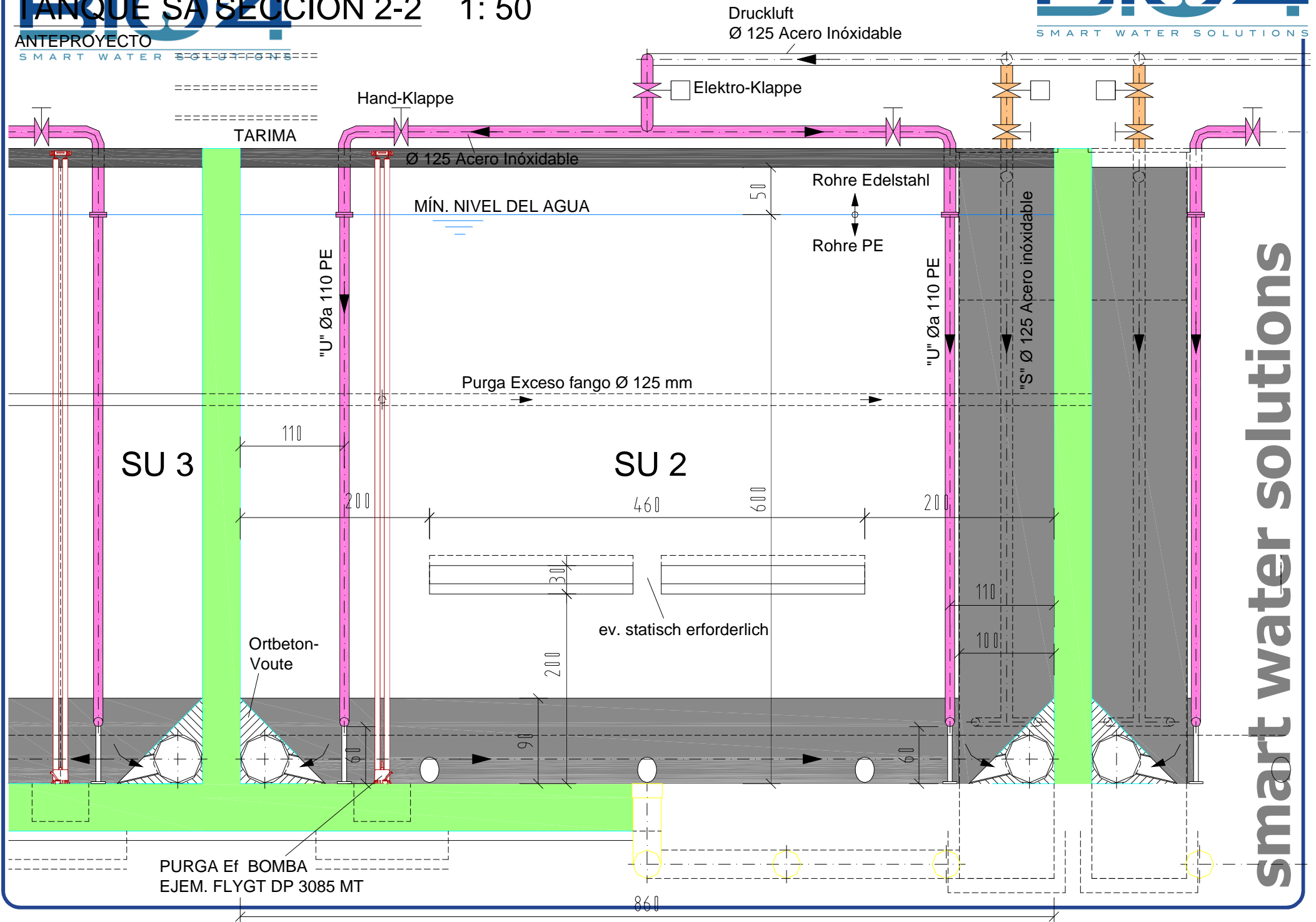


Municipality of Villarrobledo, Spain, 84.000 PE

TANQUE SA SECCIÓN 2-2 1: 50

ANTEPROYECTO

SMART WATER SOLUTIONS



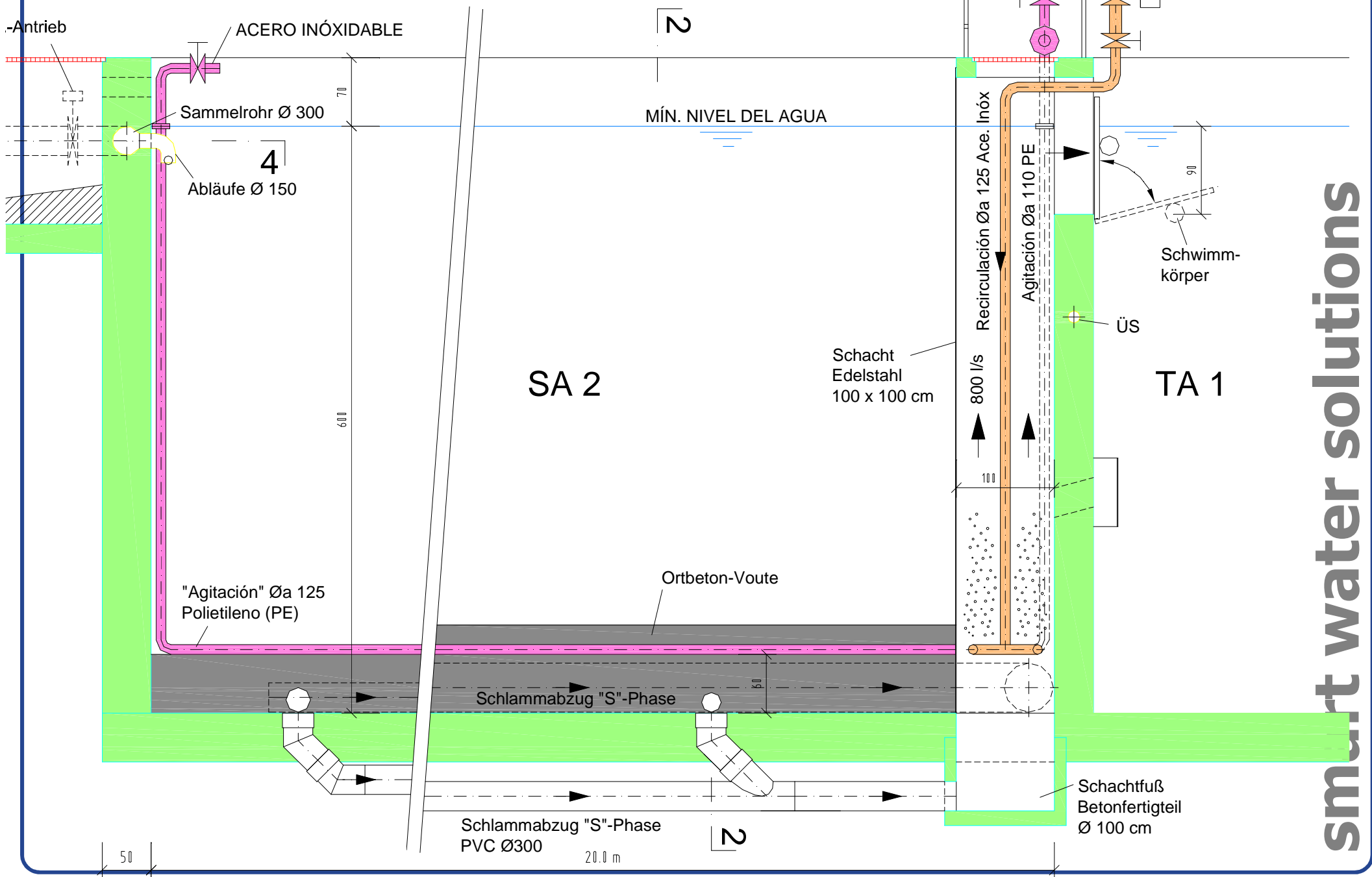
smart water solutions



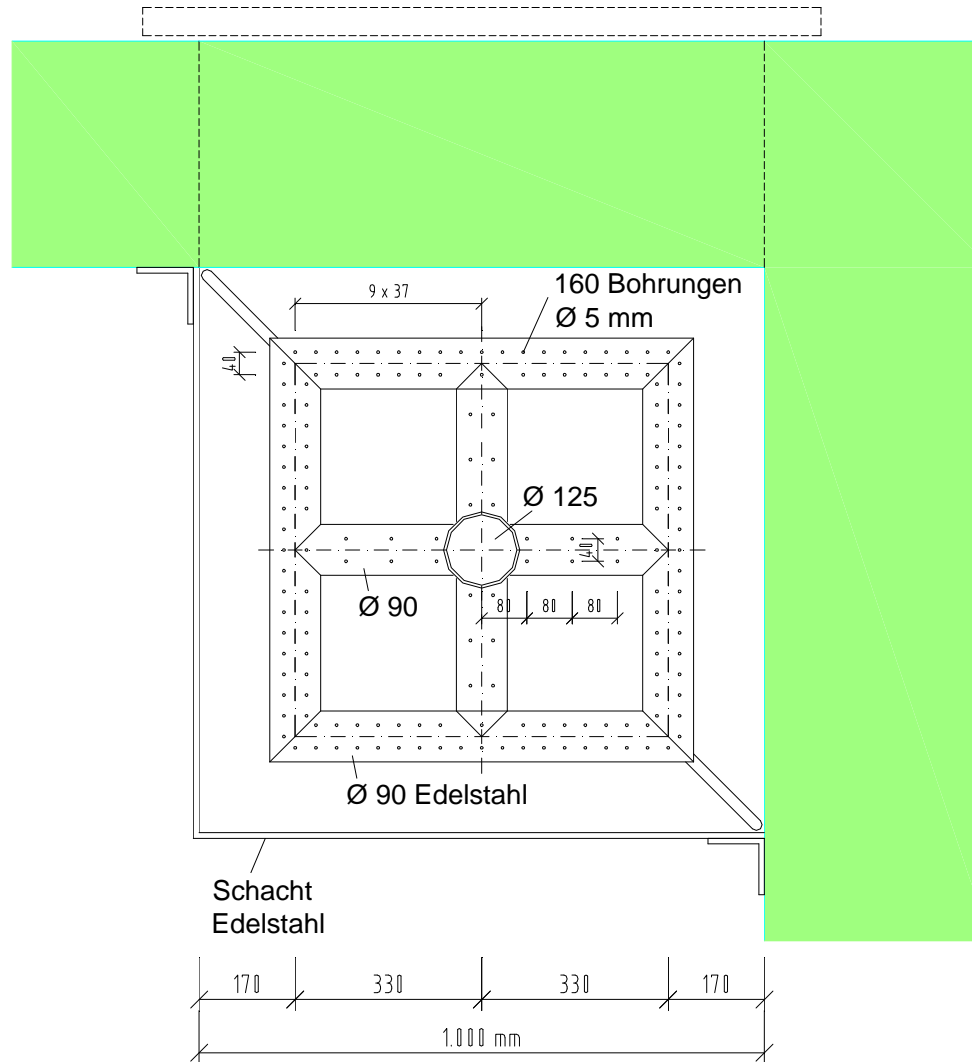
Municipality of Villarrobledo, Spain, 84.000 PE

TANQUE SA SECCIÓN 1-1 1:50

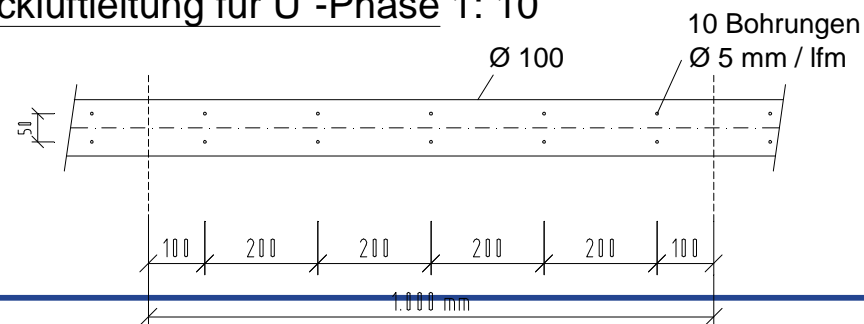
ANTEPROYECTO
SMART WATER SOLUTIONS



smart water solutions



Druckluftleitung für U"-Phase 1: 10





Municipality of Villarrobledo, Spain, 84.000 PE



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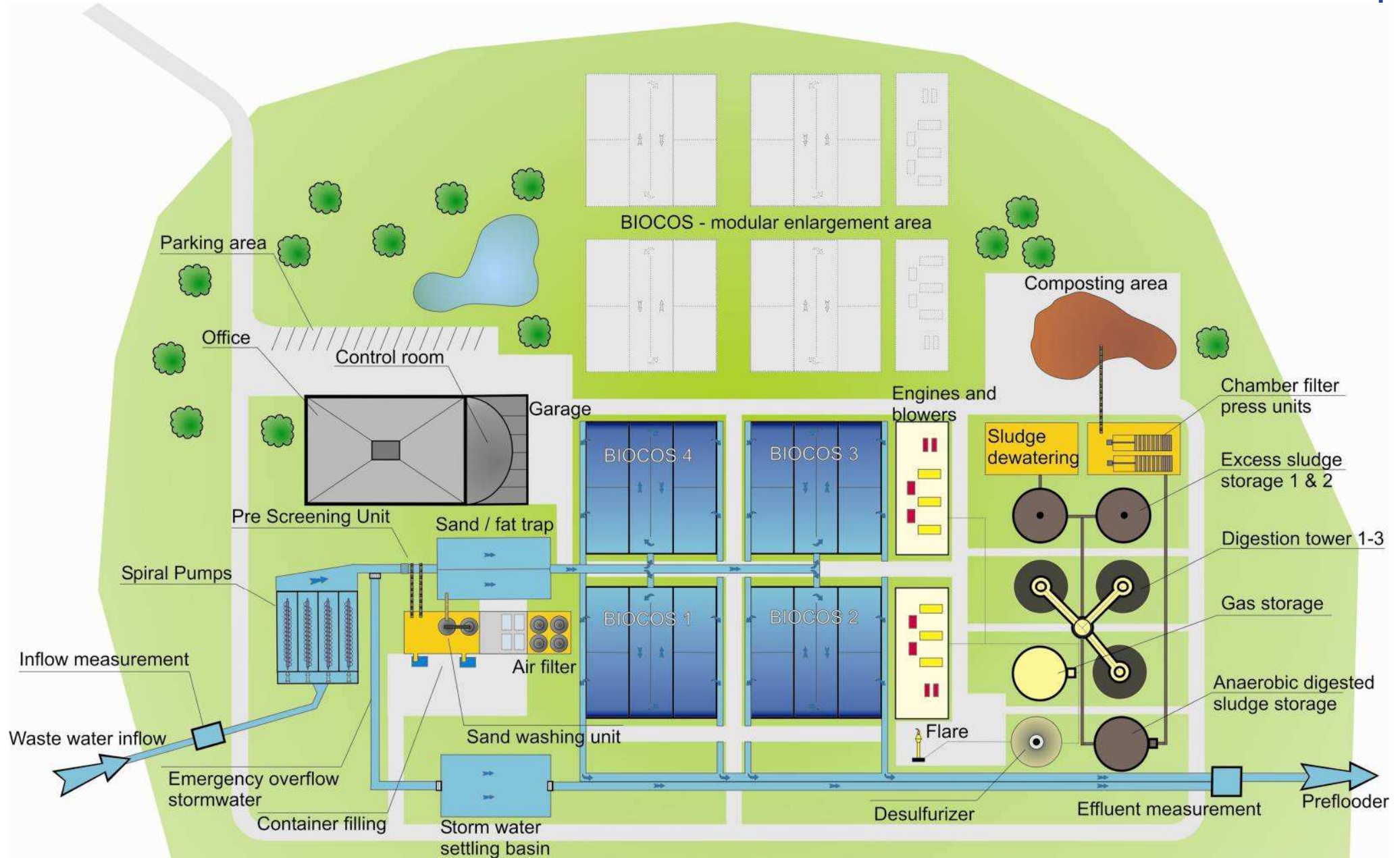
Municipality of Villarrobledo, Spain, 84.000 PE



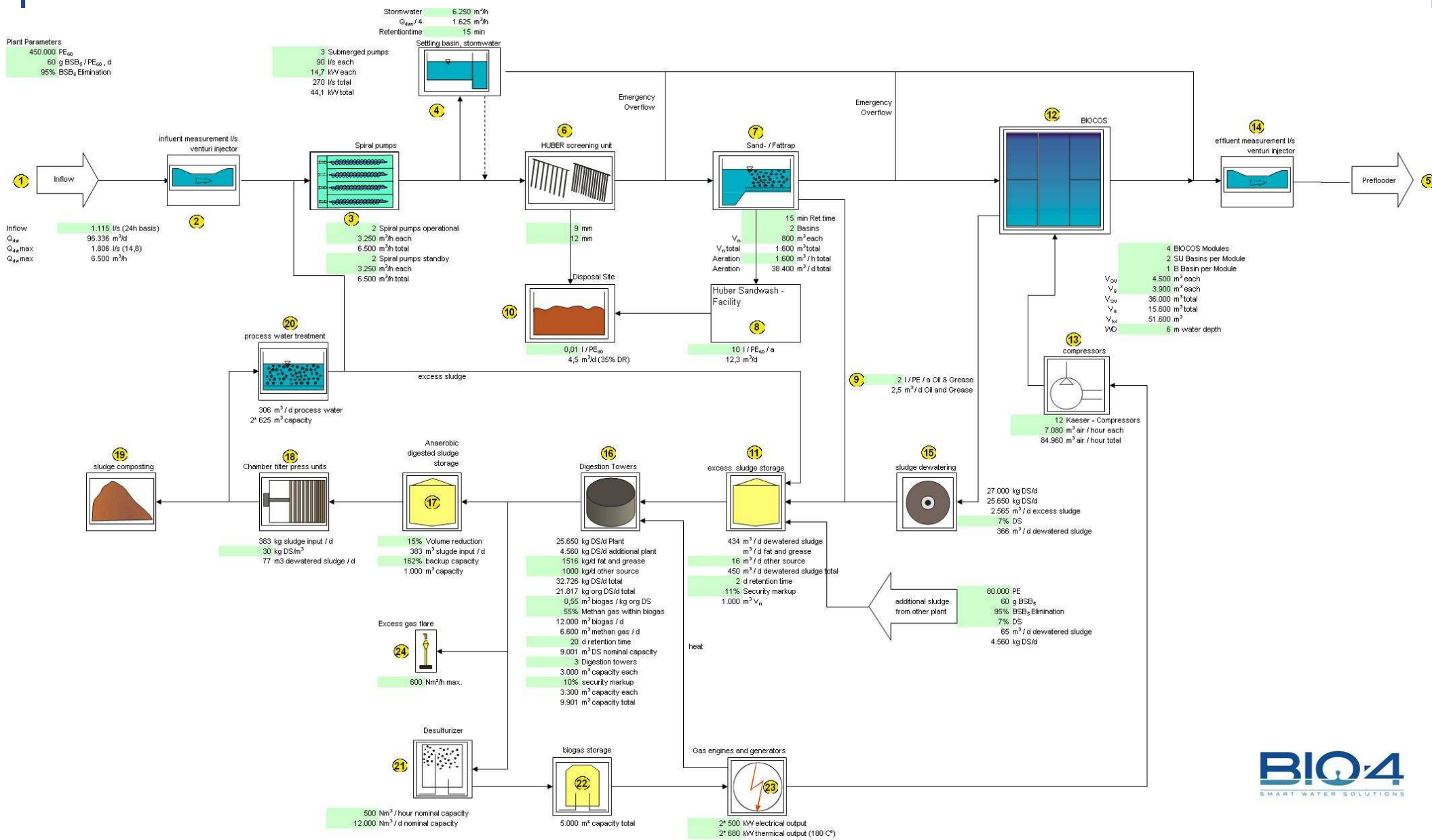
Municipality of Villarrobledo, Spain, 84.000 PE



Municipality of Villarrobledo, Spain, 84.000 PE



Sand / fat trap, spiral pumps and screening unit as covered construction. Discharged air is being filtered





Municipality of Puertollano, Spain, 185.000 PE



Municipality of Puertollano, Spain, 185.000 PE



Municipality of Puertollano, Spain, 185.000 PE



Municipality of Puertollano, Spain, 185.000 PE



Municipality of Puertollano, Spain, 185.000 PE



Municipality of Puertollano, Spain, 185.000 PE

We appreciate your questions and feedback concerning our products and services

Please feel free to contact us at:

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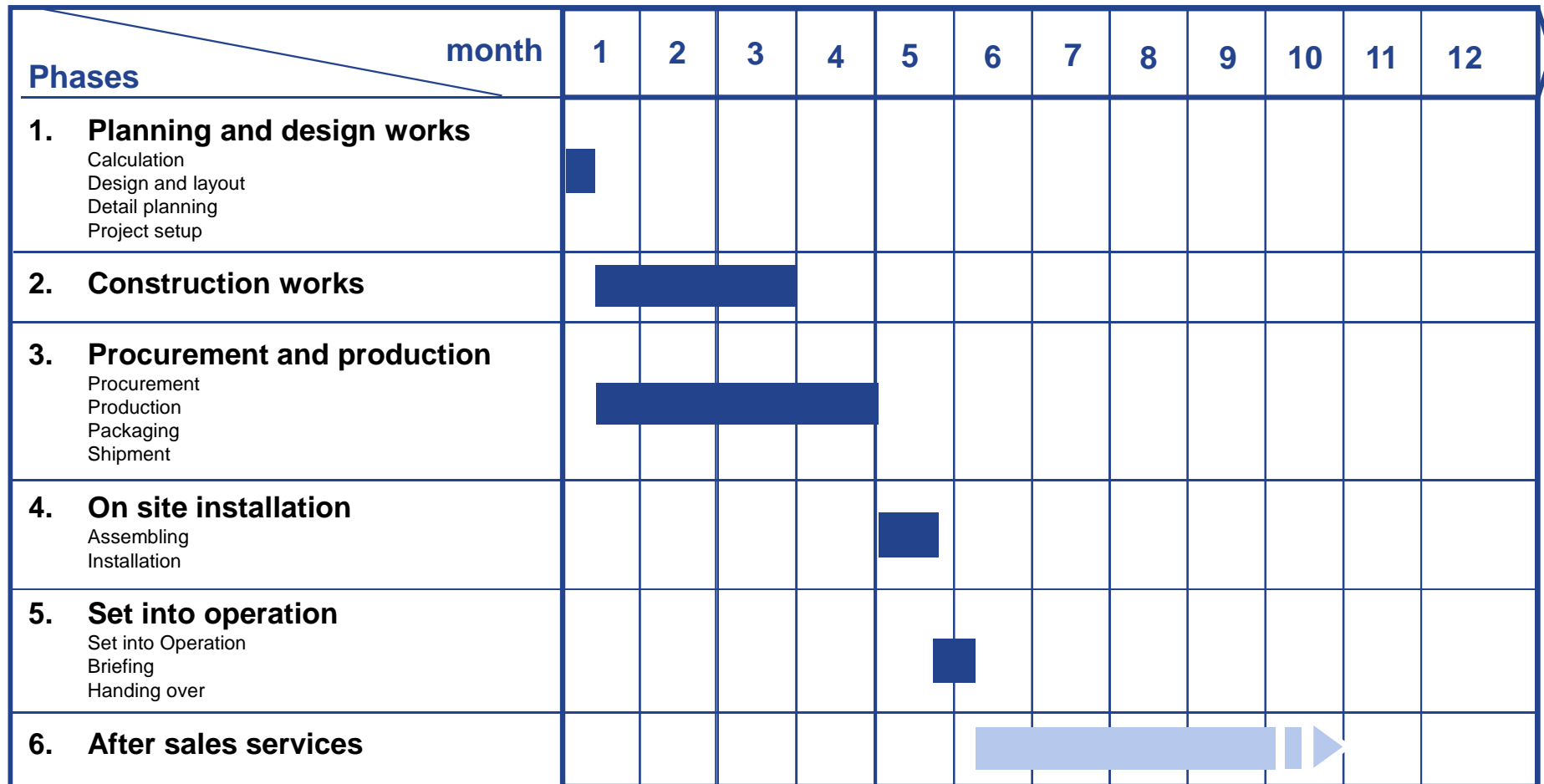
What we do

BIOCOS® waste water treatment plants

BIO-4 project execution and services

BIO-4 operation and maintenance

Efficient project execution is BIO-4 policy¹⁾



1) Example for a timetable for the execution of a 5.000 PE plant

BIO-4 builds turn-key plants – pricing includes everything to finish and start the plant – no extra charges apply during the project

BIO-4 pricing includes all BIO-4 deliveries, services, allowances etc.:

- Calculations, planning, detail planning
- Machinery & technical equipment according to BOM
- Off site pre-assembling
- On Site construction works¹⁾
- Transport to installation site
- Coordination of the project
- On site assembling and installation
- Set into operation & handing over
- 10 days initial supervision and technical briefing
- Technical documentation
- All travel expenses of BIO-4's and subcontractors' personnel

1) On site construction works can be included optionally (construction of reactors, control building etc.)

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To assure proper function and high durability BIO-4 proposes different stages of operational and maintenance contracts

Maintenance Contracts

- **Package M full:**
 - 12 x 3 days or equivalent days of preventive on site maintenance by authorized BIO-4 professionals
 - SMS operational data surveillance by authorized BIO-4 professionals
- **Package M – advanced:**
 - 8 x 3 days or equivalent days of preventive on site maintenance by authorized BIO-4 professionals
 - SMS operational data surveillance by authorized BIO-4 professionals
- **Package M-standard:**
 - 4 x 3 days or equivalent days of preventive on site maintenance by authorized BIO-4 professionals



Operation Packages

- **Package: O & M full**
 - 365 days / 24h full plant operation by authorized BIO-4 professionals¹⁾
 - Energy costs included
 - Spare parts included
 - Full Maintenance included
 - Optional invoicing: all in package or by m³
- **Package: O & M advanced**
 - All year operational support (5 days, 8 hours per day)
 - Stand by for on demand full operation
 - Spare parts included
 - Full Maintenance included
 - Optional invoicing: all in package or by m³

1) Transfer to customer at the end of contract period possible