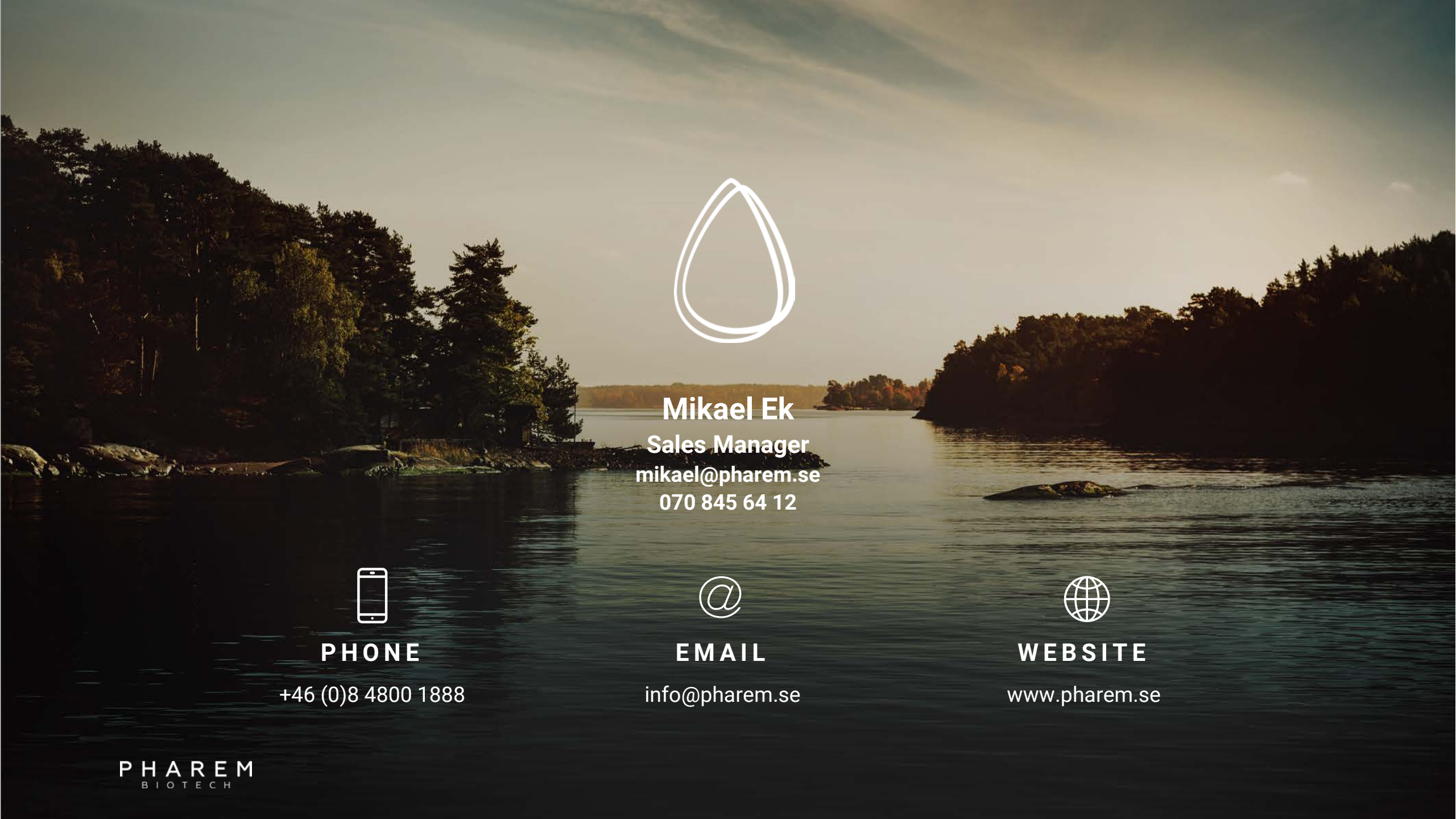

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PHAREM
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”Develop enzymes for the degradation and removal of harmful organic compounds and their applications”

Pharem was founded in 2013 with the goal of applying biotechnology to some of the most complex pollution issues that we stand before. The platform technology was established by the founders and the continued development has resulted in 2 product groups with 5 different applications.

Our team of experts

We attract experts to all our core areas where we jointly develop the business further and continuously deliver efficient solutions to our customers.

Martin Ryen
Founder & CEO
MSc Molecular Biotechnology

Christian Ryen
Founder & COO
MSc Chemical Engineering

Domenico Palumberi
Head of Enzyme Development
PhD Molecular Medicine

Maria Humble
Head of Bioprocess Development
Former Lector in Biotechnology at KTH

Stefan Eldenholt
Project Manager
Senior Industrial Manager

Mikael Ek
Sales Manager
PhD Physical Chemistry

Sven-Erik Sköld
Chairman of the board
Former Head of Research at Pharmacia

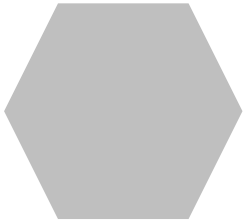
Zeyed Abdulkarim
Application Engineer
PhD Organic Chemistry

Sree Vathsava
Technical research engineer
MSc Industrial Biotechnology

Ruta Paulaviciute
Technical research engineer
MSc Industrial Biotechnology

Alina Duca
Business Operation
MSc Environmental Management

Alexander Sima
R&D Project Manager
Professor in Medical Science



Annika Josefsson
Economy and Adminsitration

Stefan Ottosson
Senior Advisor in Web/Marketing
Senior Developer

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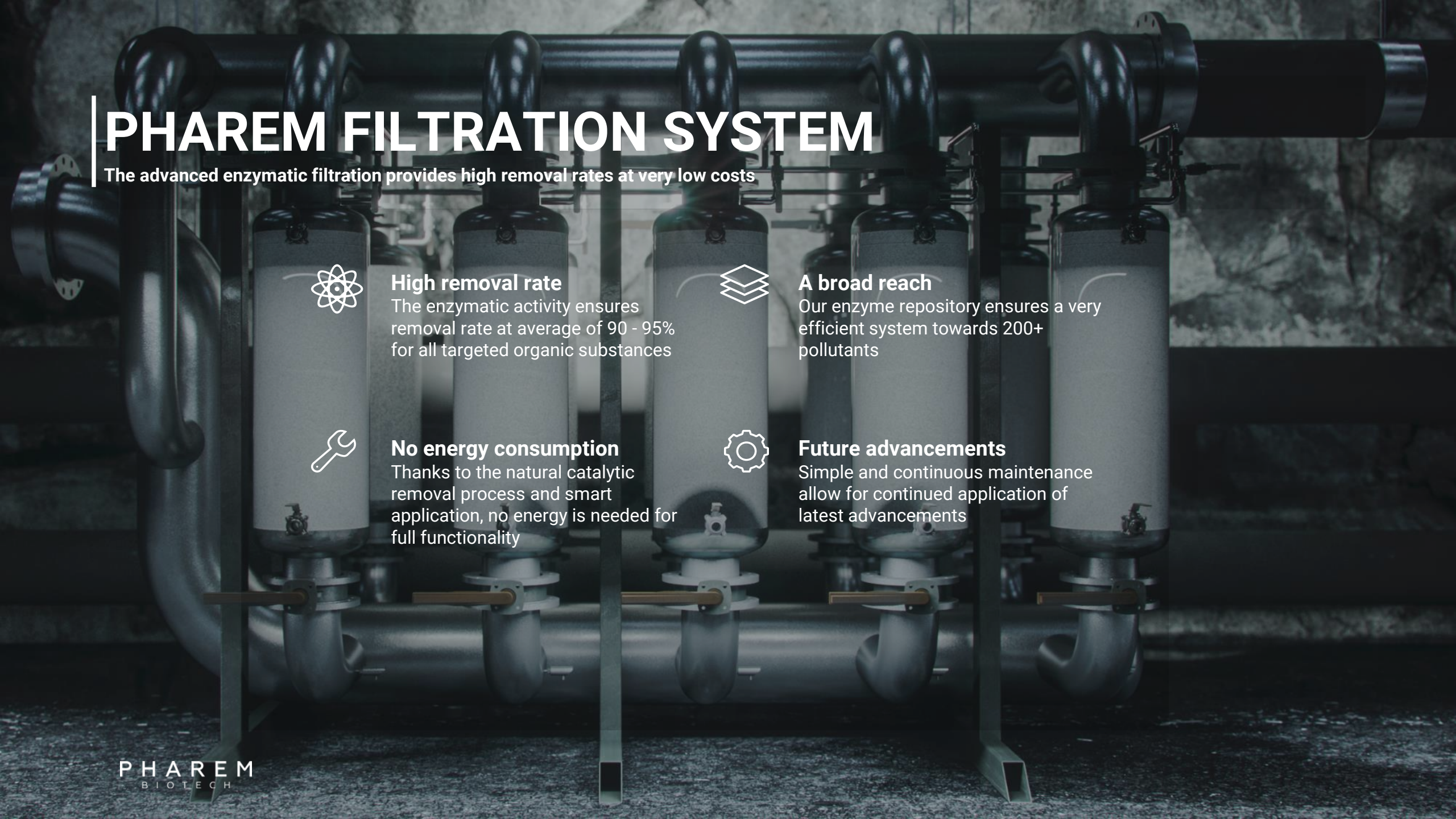

PHAREM FILTRATION SYSTEM

The advanced enzymatic filtration provides high removal rates at very low costs

High removal rate
The enzymatic activity ensures removal rate at average of 90 - 95% for all targeted organic substances

A broad reach
Our enzyme repository ensures a very efficient system towards 200+ pollutants

No energy consumption
Thanks to the natural catalytic removal process and smart application, no energy is needed for full functionality

Future advancements
Simple and continuous maintenance allow for continued application of latest advancements

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PFS - INDUSTRY

High degradation rate
Specialized solution can deliver degradation in demanding environments

No energy consumption
Based on natural catalytic effect and inherent flow, no energy is needed for effect.

A broad reach
Our enzyme repository ensures a very efficient system which easily adapts to new developments in detection and process.

Future advancements
Improvements are applied to all existing systems for integration of best available technology.

Process water flexibility
The matrix can be adjusted to fit any industrial process for optimal efficiency

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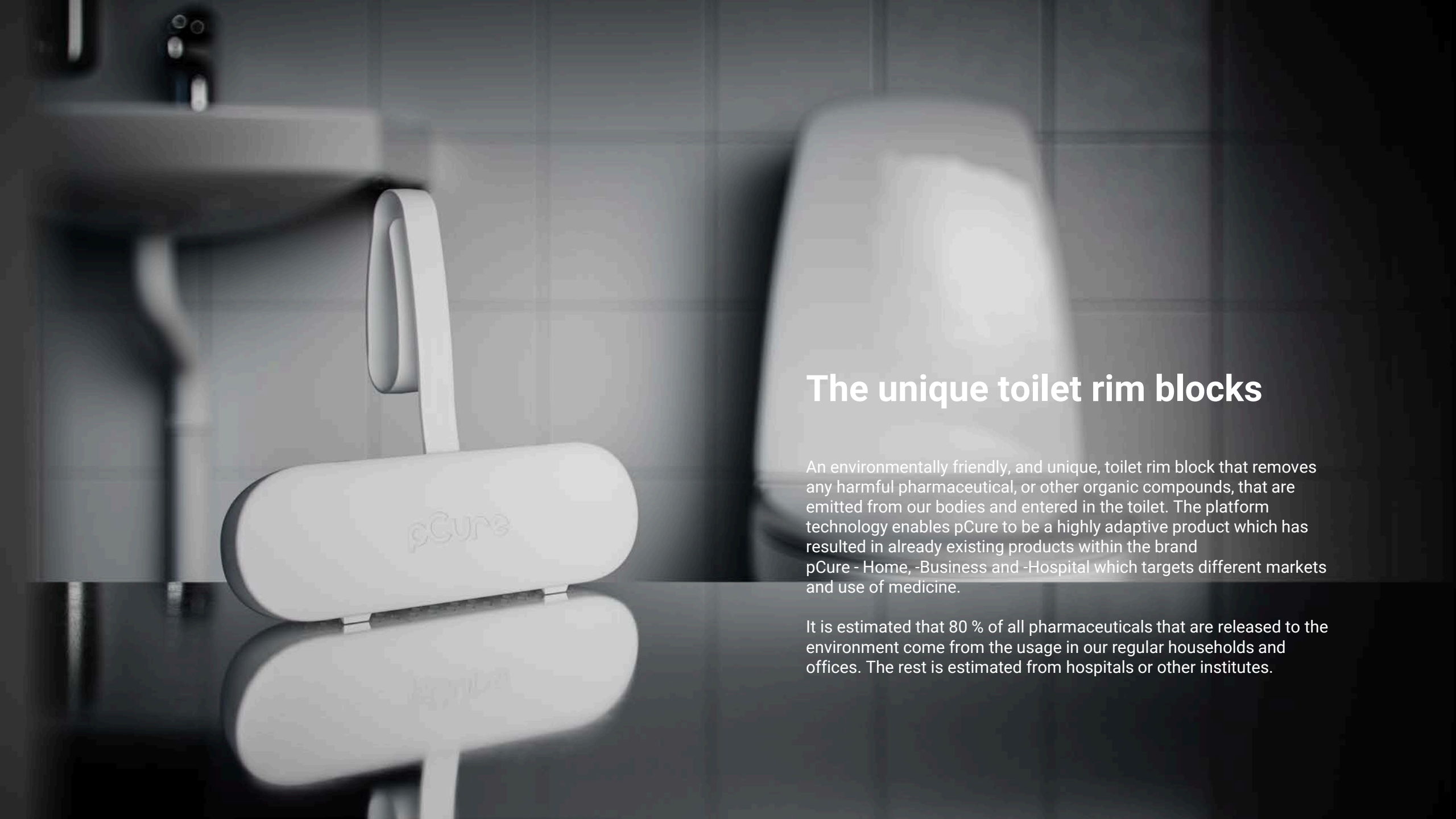


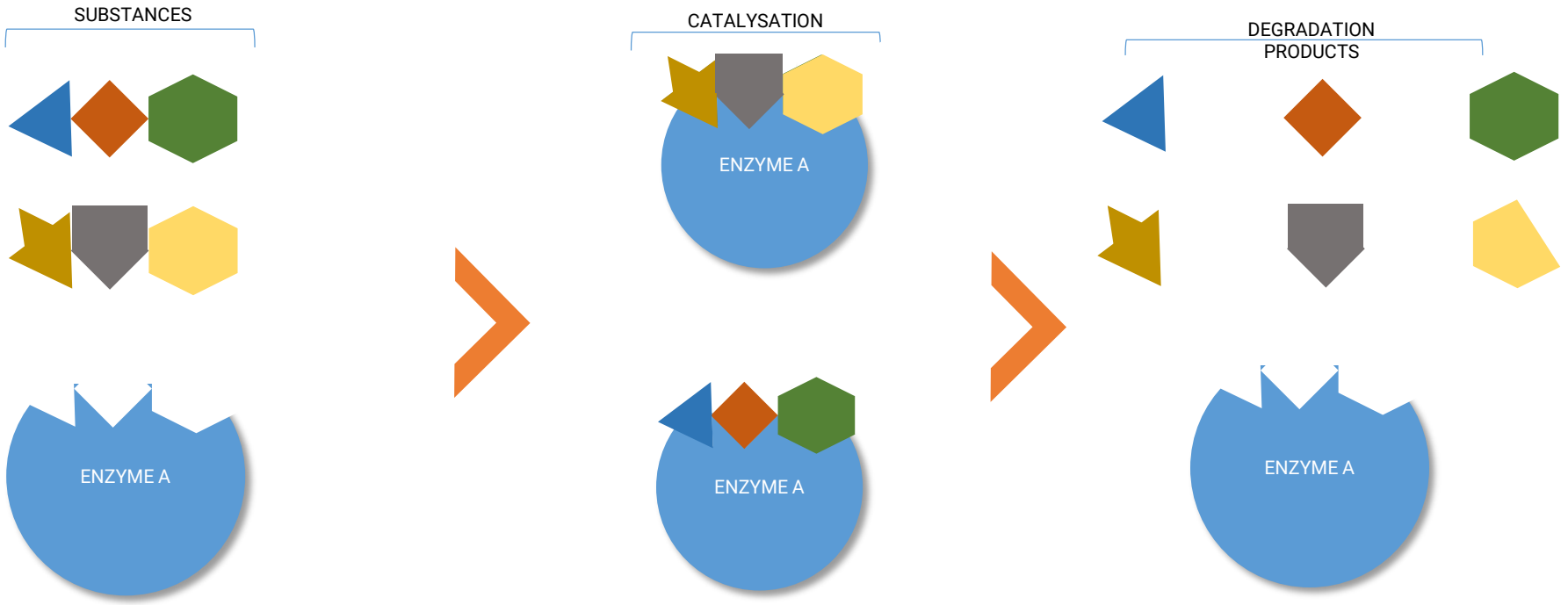
The unique toilet rim blocks

An environmentally friendly, and unique, toilet rim block that removes any harmful pharmaceutical, or other organic compounds, that are emitted from our bodies and entered in the toilet. The platform technology enables pCure to be a highly adaptive product which has resulted in already existing products within the brand pCure - Home, -Business and -Hospital which targets different markets and use of medicine.

It is estimated that 80 % of all pharmaceuticals that are released to the environment come from the usage in our regular households and offices. The rest is estimated from hospitals or other institutes.

BROAD SPECTRUM ENZYMATIC DEGRADATION

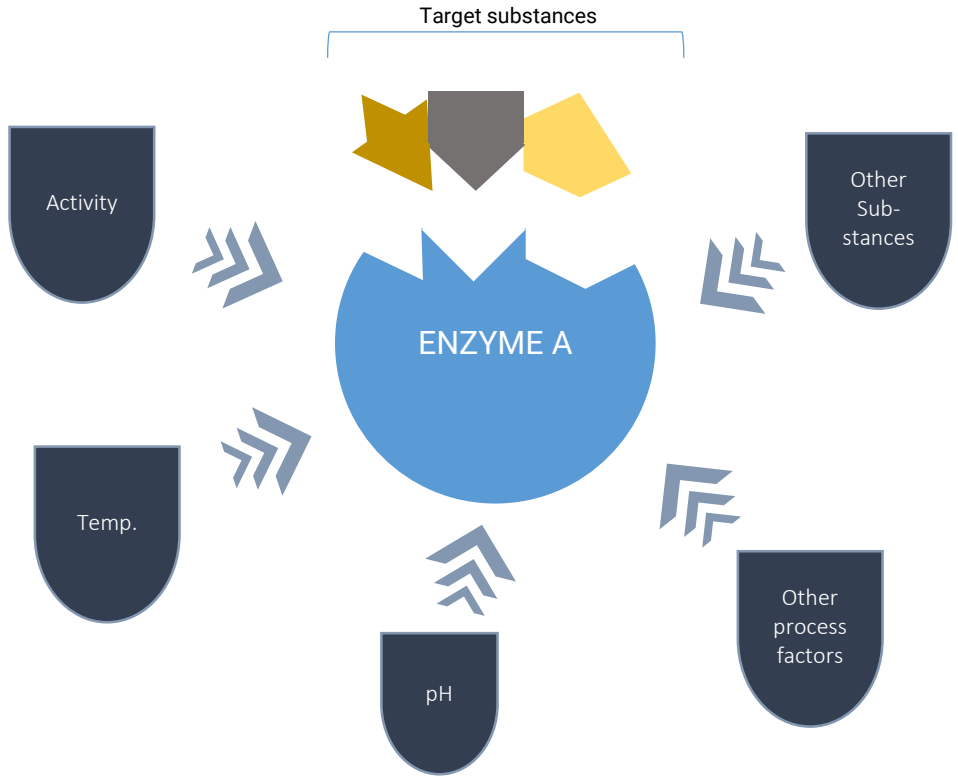
The technology used in the products is a novel technology where enzymes are developed to be used against organic pollutants in different environments.



PHAREM BIOTECH

ENZYMES OPTIMISED TO THE ENVIRONMENT

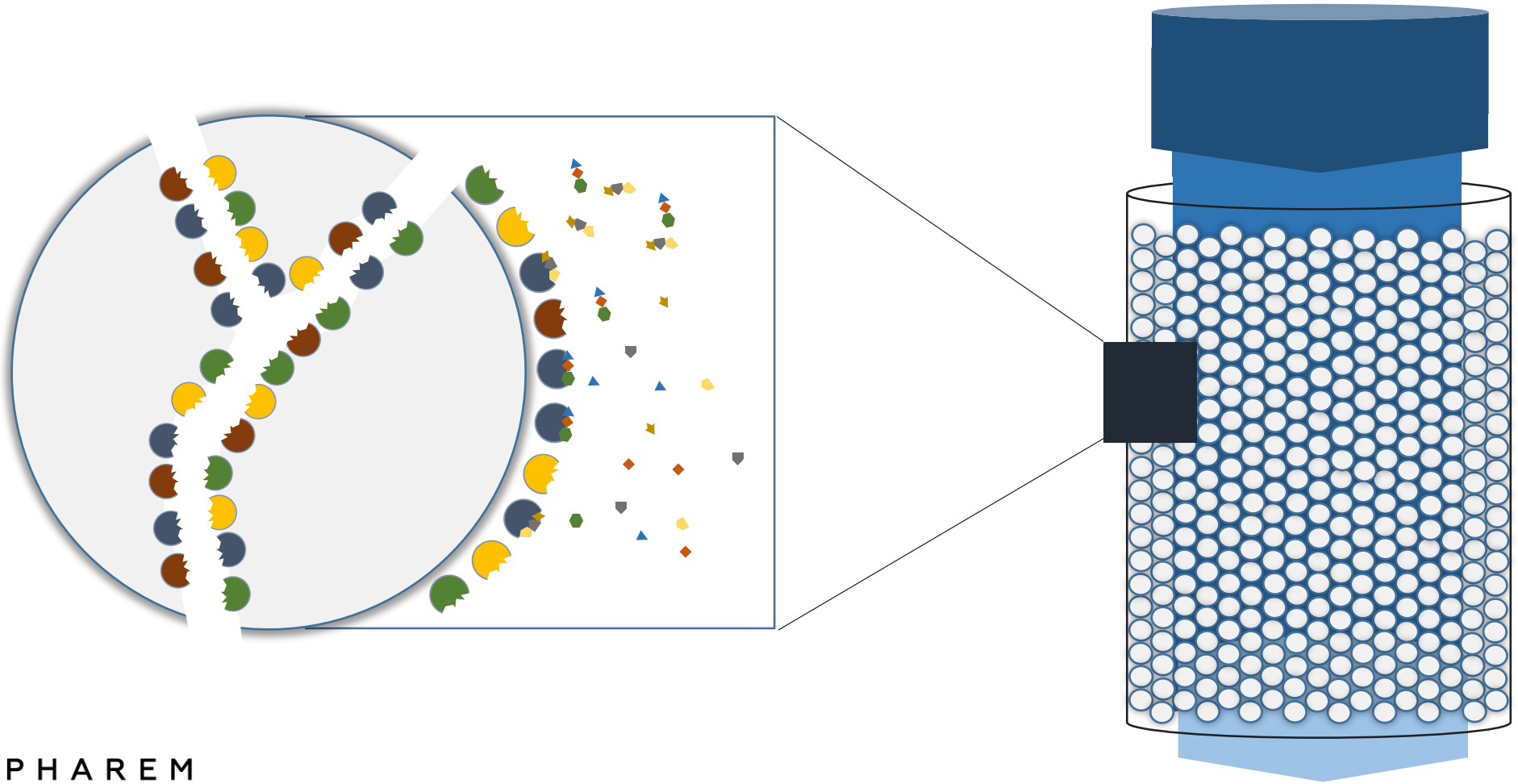
The technology used in the products is a novel technology where enzymes are developed to be used against organic pollutants in different environments.



PHAREM BIOTECH

ENZYME IMMOBILISATION

This step in the process immobilises the selected enzymes to a filter material. This step is designed to increase enzyme activity.



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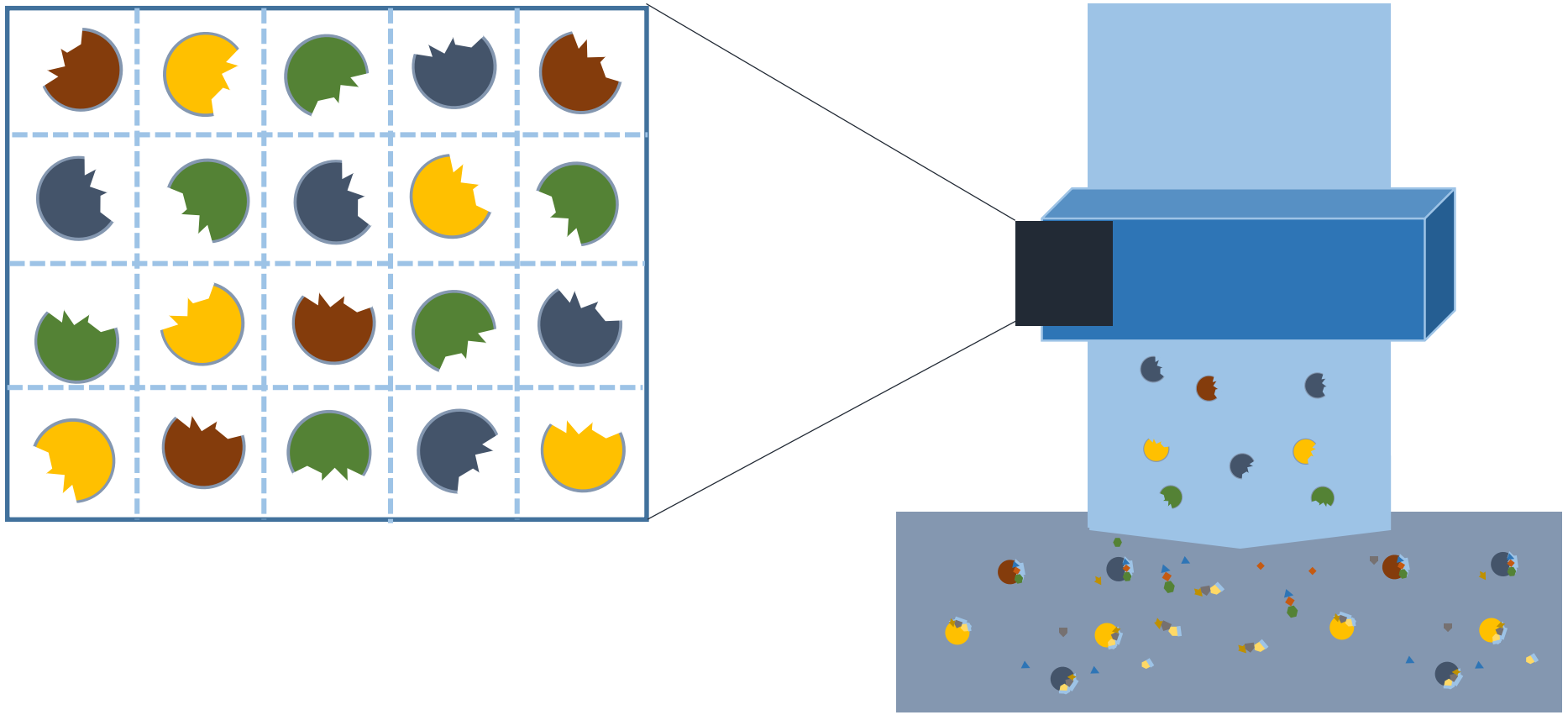
ENZYME INCAPSULATION

The technology used in pCure products incapsulate enzymes in a formulation for the control of release mechanism to contaminated water.



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Overview

Cost-efficient solution
Makes it possible for any healthcare institution to engage in water purification, with no CAPEX

Effect
Effect already at the source of the problem without needing to install a WWTF

Safe is the key!
Safest possible solution. No installation should put employee or patient in any danger

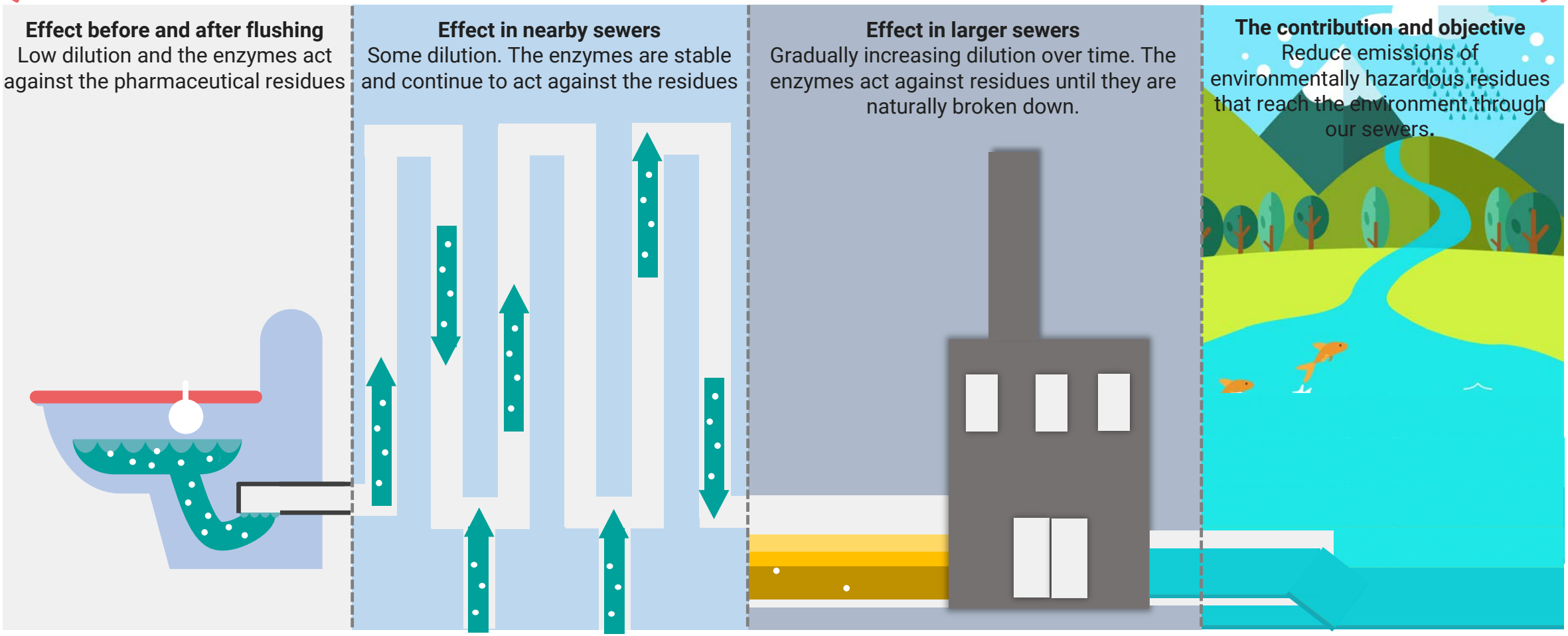
Easy to implement
Doesn't disrupt daily routines. No long-lasting projects. Order and start using as soon as they arrive.

http://www.pcure.se/en

Pharmaceuticals through our sewers

http://www.pcure.se/en

A toilet rim block that reduce pharmaceutical residues



http://www.pcure.se/en

Prioritized pharmaceutical residues*

Here is some of the most prioritized substances identified and assessed by the authorities

Antibiotic
Ciprofloxacin
Azithromycin
Clarithromycin
Erythromycin
Sulfamethoxazole
Trimethoprim

Hormone
Estradiol
Ethinylestradiol
Levonorgestrel

Serotonin inhibitor
Sertraline
Citalopram

Anticonvulsant
Carbamazepine
Oxazepam

Beta-blocker
Metoprolol
Propranolol

Anti-fungal
Fluconazole
Ketoconazole

Anti-inflammatory
Diclofenac

NSAID
Naproxen

Anti-inflammatory/cytostatic
Methotrexate

Antihypertensive
Losartan

Sedative
Zolpidem

Painkiller
Ibuprofen

Opiate Analgesic
Tramadol

*These substances can as an example be found in lists from EU, governmental- or water organizations
- EU Watch List, https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/development-first-watch-list-under-environmental-quality-standards-directive
- Nationella läkemedelsstrategin, NLS, 2015: https://lakemedelsverket.se/upload/nyheter/2015/miljoindikatorer-rapport-NLS_2015-09-07.pdf
- Naturvårdsverket, 2017: *Baresel, C., Magnér, J., Magnusson, K., Olshammar, M. (2017). Tekniska lösningar för avancerad rening av avloppsreningsvatten. IVL Svenska Miljöinstitutet, rapport Nr C 235. På uppdrag av Naturvårdsverket*..

Effect and verification process

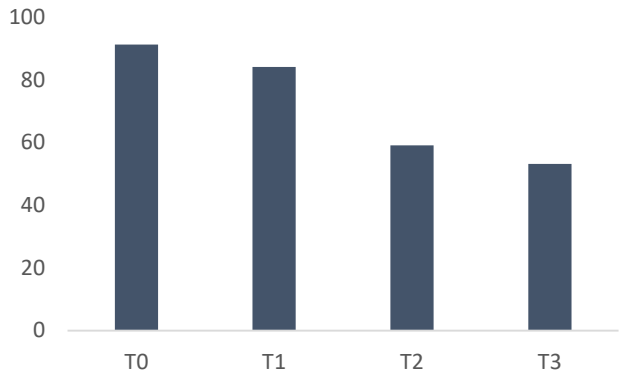
Substance	Classification
Ciprofloxacin	Antibiotics
Doxycycline	Antibiotics
Diklofenak	Anti-Inflammatory
Estradiol	Hormone
Etinylestradiol	Hormone
Ketovonazol	Anti-fungal
Norfloxacin	Antibiotics
Ofloxacin	Antibiotics
Tetracyclin	Antibiotics

Broad range of substances

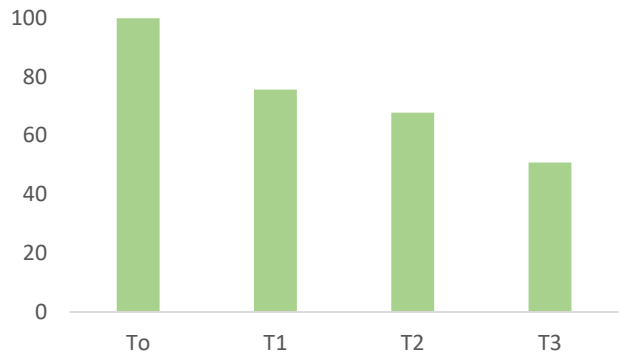
- pCure have effect on many substances due to use of enzyme blends
- Before claiming effect on a substance, a verification process is performed

Verification process

- Verifying the product effect in a process that aim to certify towards ISO 14034
- Process to consider environment, effect over time and other variations.
- Verfication process to show typical perfromance of the product



Graph.1 Diclofenac degradation over time (T3=60 min)



Graph. 2 Ofloxacin degradation over time (T3=60 min)

http://www.pcure.se/en

Standard implementation: Infrastructure

Scale implementation to feasible level

- Costs are mostly allocated to the analysis and not to pCure
- Analysis do not scale with number of toilets included and therefor more toilets are a much feasible approac
- Analysis scale with substances and number of samples

Standard implementation:

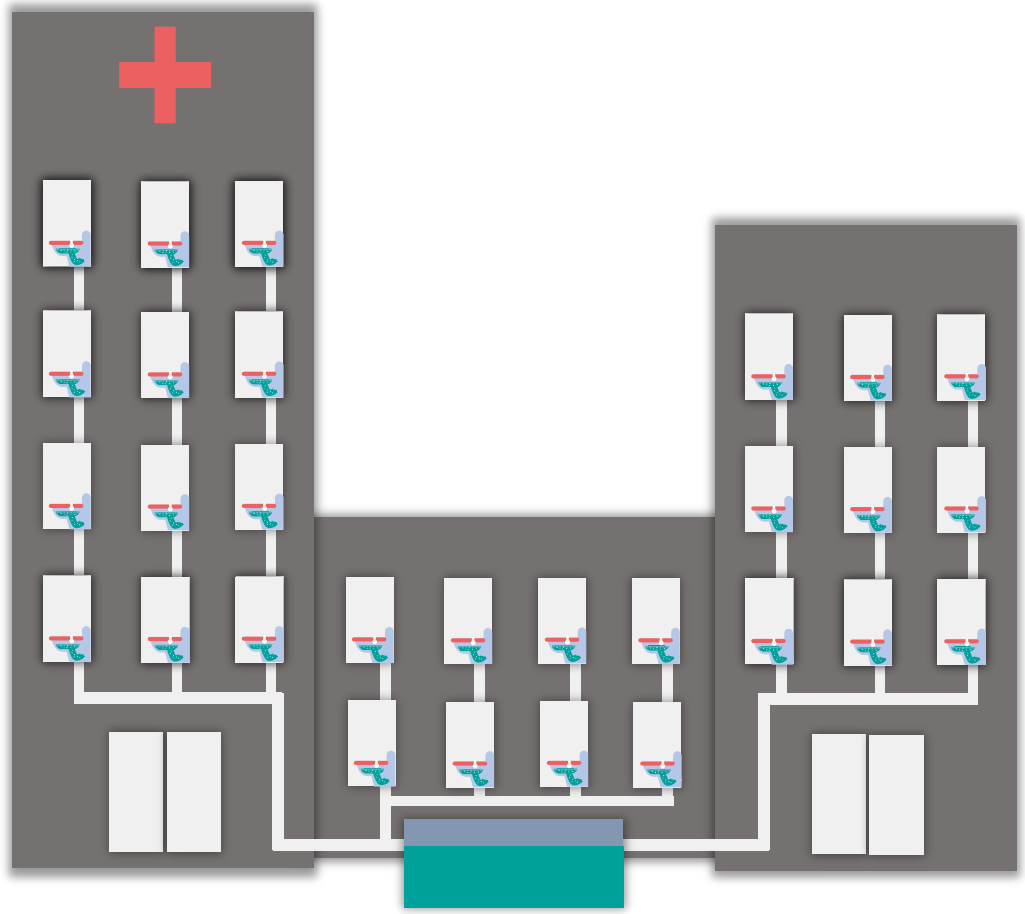
- minimum 200+ toilets
- 2 months period of pCure use

Cost reference: total costs for pCure for 400 toilets during 2 month period: ~8400 EUR

Sustainable infrastructure / drainage

- Find outgoing effluent for the complex or building
- Use collection tank that are natural, or
- Construct a tank that takes part of consistent sewage

- Note: Identify controlled systems e.g. no drainage or other disrupting flows.

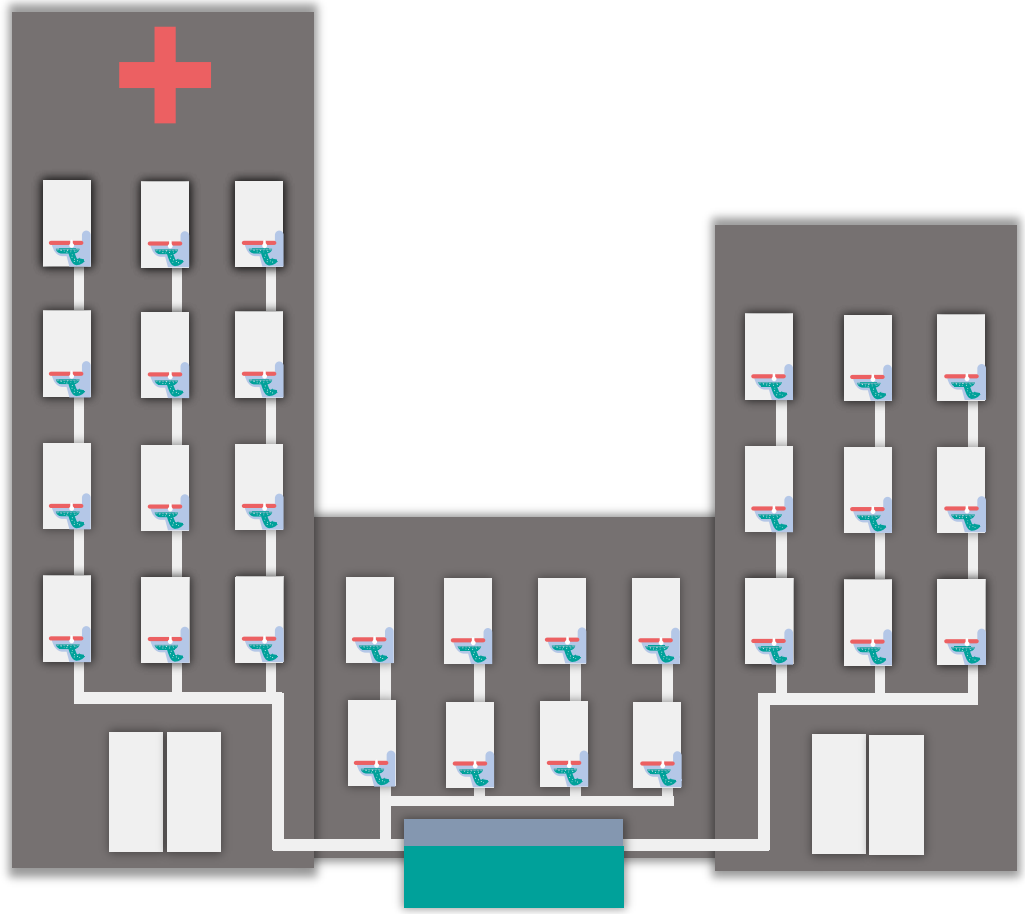


Standard implementation: Preparations

Identify requirements
- Create a clear overview on what is required from the hospital/healthcare region regarding
- That will simplify creating feasible goals for the pCure implementation

Identify the budget
- pCure costs are very low compared to analysis
- Make sure your trial can be performed with high statistical quality

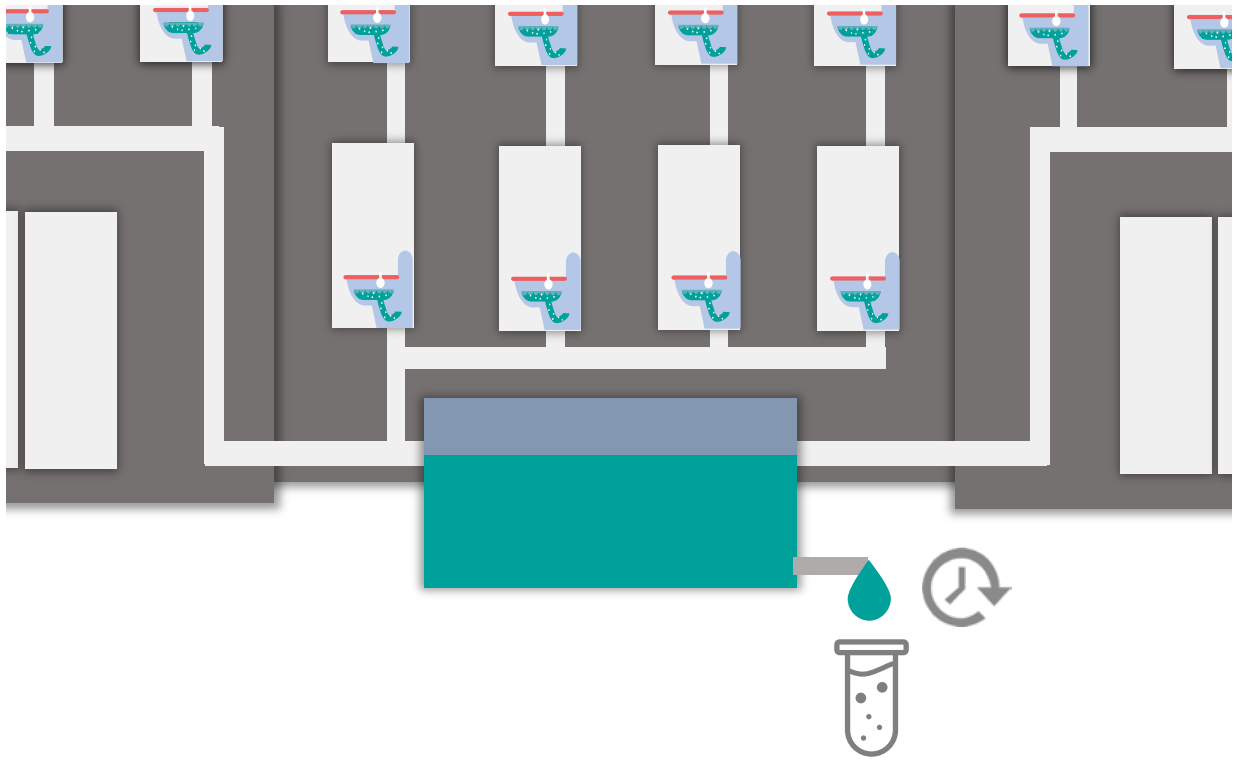
Integrate in the infrastructure
- pCure was designed to be installed by anyone
- Integrate in cleaning service/procedures if possible since this gives both involvement and understanding for the concept



http://www.pcure.se/en

Standard implementation: Analysis

- **Select substances**
  - Select target substances from list
  - About 5 substances are normally used by our customers
  - pCure have effect on more substances but are not claimed if not thoroughly investigated in our verification process
- **Creating base-line analysis**
  - Sampling is only done on outgoing values
    - Ingoing values are hard to control in hospital environments
  - If not already started, the recommendation is to start analyzing the base-line without use of pCure
  - If already known, perfect!
  - Create your own statistical ground
- **Sampling**
  - Take samples every 24 hours after stirring
  - Control sample ID, procedure and log deviations



Discussion and planning

KONTAKTA OSS!

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HEMSIDA

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