REGENESIS®

In Situ Barrier Reduces CVOCs by >99.8%

PRB Combining PlumeStop and S-MicroZVI reduces PCE and TCE at an industrial facility in Rio de Janeiro, Brazil

Project Site:
Active industrial facility in Rio de Janeiro, Brazil

Geology:
Sandy clay and weathered bedrock

Contaminants of Concern:
Tetrachloroethene (PCE) up to 20,936 µg/L and trichloroethene up to 2,200 µg/L (TCE)

Remedial Challenge:
High-concentration chlorinated solvent plume in a heterogeneous shallow aquifer, with the potential for off-site migration beyond the property boundary

Remedial Approach:
Permeable reactive barrier with PlumeStop® colloidal activated carbon and S-MicroZVI® sulfidated colloidal zero valent iron

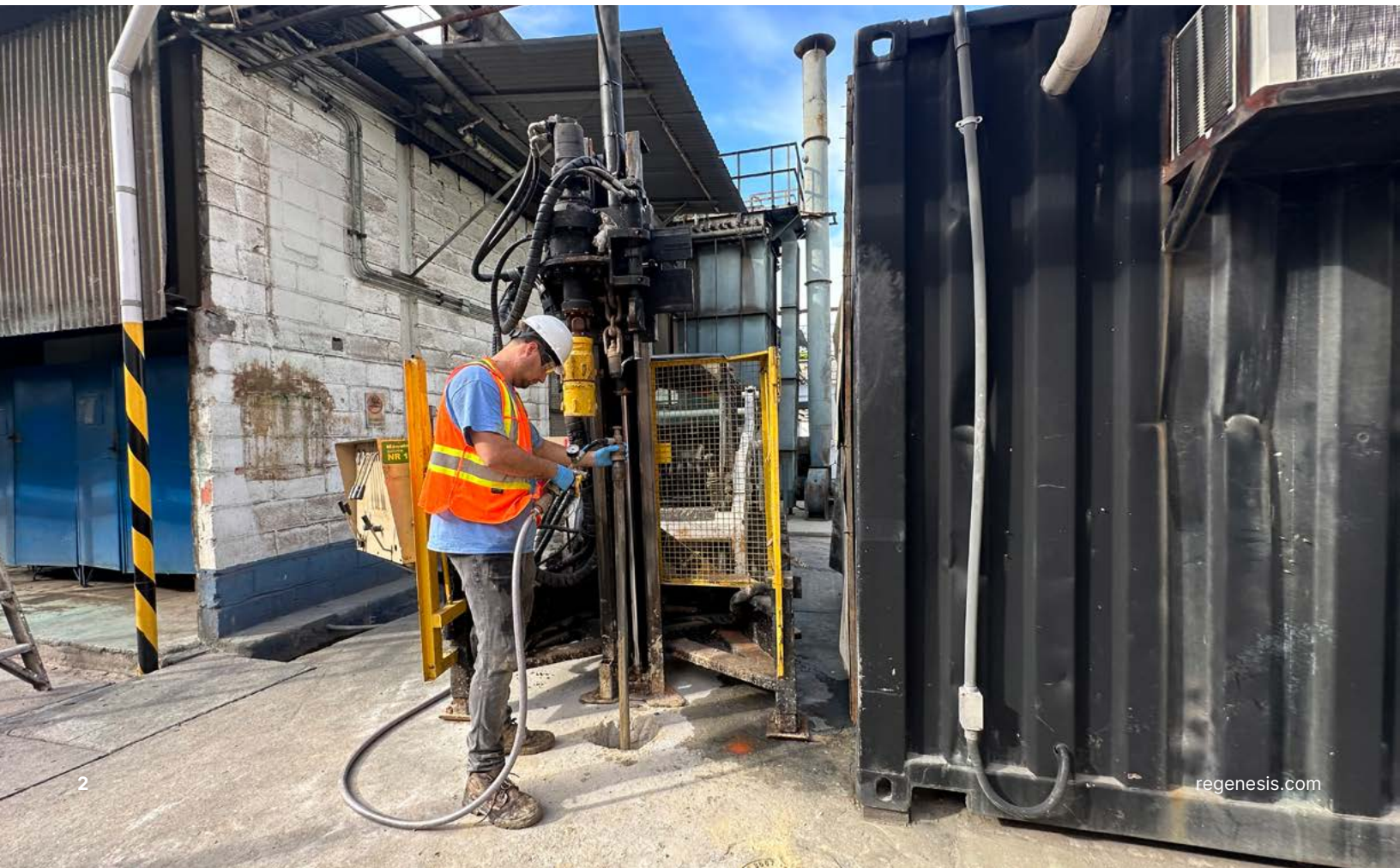
Results:
Within one year, PCE concentrations were reduced by 99.96%, and TCE concentrations were reduced by greater than 99.80%

Overview

An active industrial facility in Rio de Janeiro, Brazil, was impacted by high concentrations of dissolved chlorinated ethenes in groundwater presenting a potential off-site migration concern. Tetrachloroethene (PCE) was detected at concentrations up to 20,936 µg/L, and trichloroethene (TCE) was detected at concentrations up to 2,200 µg/L.

To mitigate contaminant migration, a compact permeable reactive barrier (PRB) was installed along the property boundary using a combined in situ treatment approach. The PRB incorporated PlumeStop colloidal activated carbon and S-MicroZVI sulfidated colloidal zero valent iron to provide immediate contaminant mass flux control through a combination of sorption and abiotic chemical reduction. The innovative approach and application represented the first time PlumeStop was applied in Brazil.

GeoBrasil Soluções Ambientais supported the project on behalf of the industrial client. In Situ Remediation Limited (IRSL) supported the remedial design and implementation strategy, with field installation performed by Aquífero Serviços de Remediação Ltda.



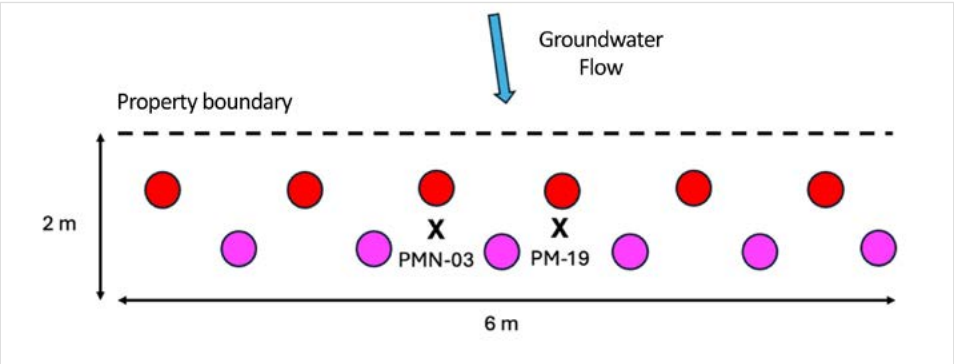
Remedial Design and Implementation

The PRB was installed using direct-push technology across a treatment zone approximately 6 m long by 2 m wide, extending from 1.5 to 9.3 m below ground surface. The injection program used a dense grid of lateral injection locations and multiple vertical intervals to promote reagent distribution across the target treatment zone.

Approximately 550 kg of PlumeStop® colloidal activated carbon and 250 kg of S-MicroZVI® were applied. The combined reagent approach was selected to support rapid contaminant mass flux control through sorption, while also promoting abiotic and/or biologically mediated degradation processes within the reactive barrier. Installation was completed in approximately two weeks and was executed within the estimated budget and schedule.

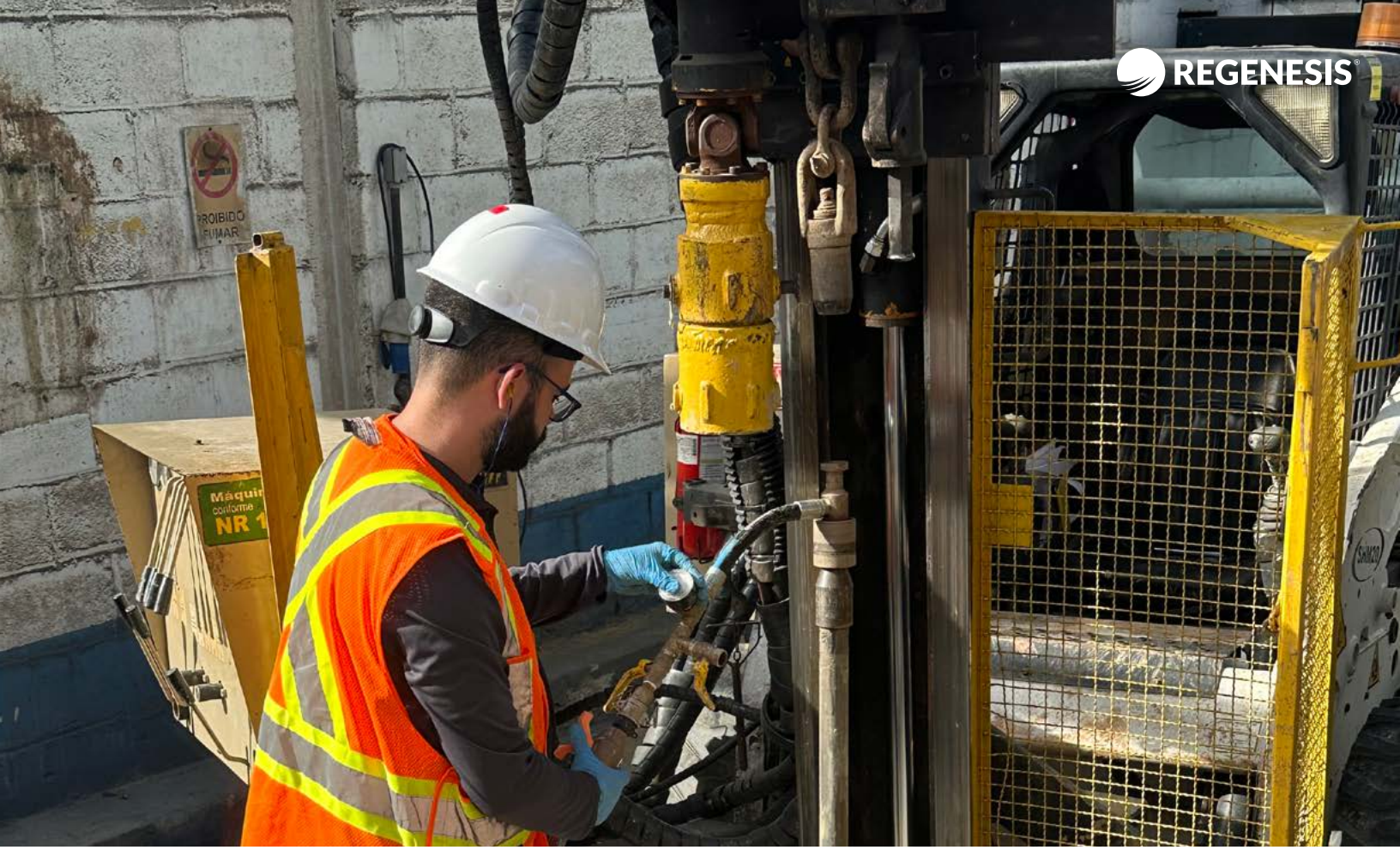
Figure 1 PRB Injection Layout

Diagram depicting injection layout of PRB



Site Challenges

Several site-specific conditions required careful planning during field implementation. The geology consisted of sandy clay and weathered bedrock, creating drilling and distribution challenges. Heterogeneity within the aquifer required careful control of injection intervals and reagent placement to improve contact with the impacted groundwater flow path. Additional challenges included high dissolved-phase PCE and TCE concentrations, the shallow depth of the aquifer increasing the potential for daylighting during injection, and the need to perform the work safely and efficiently at an active industrial facility.

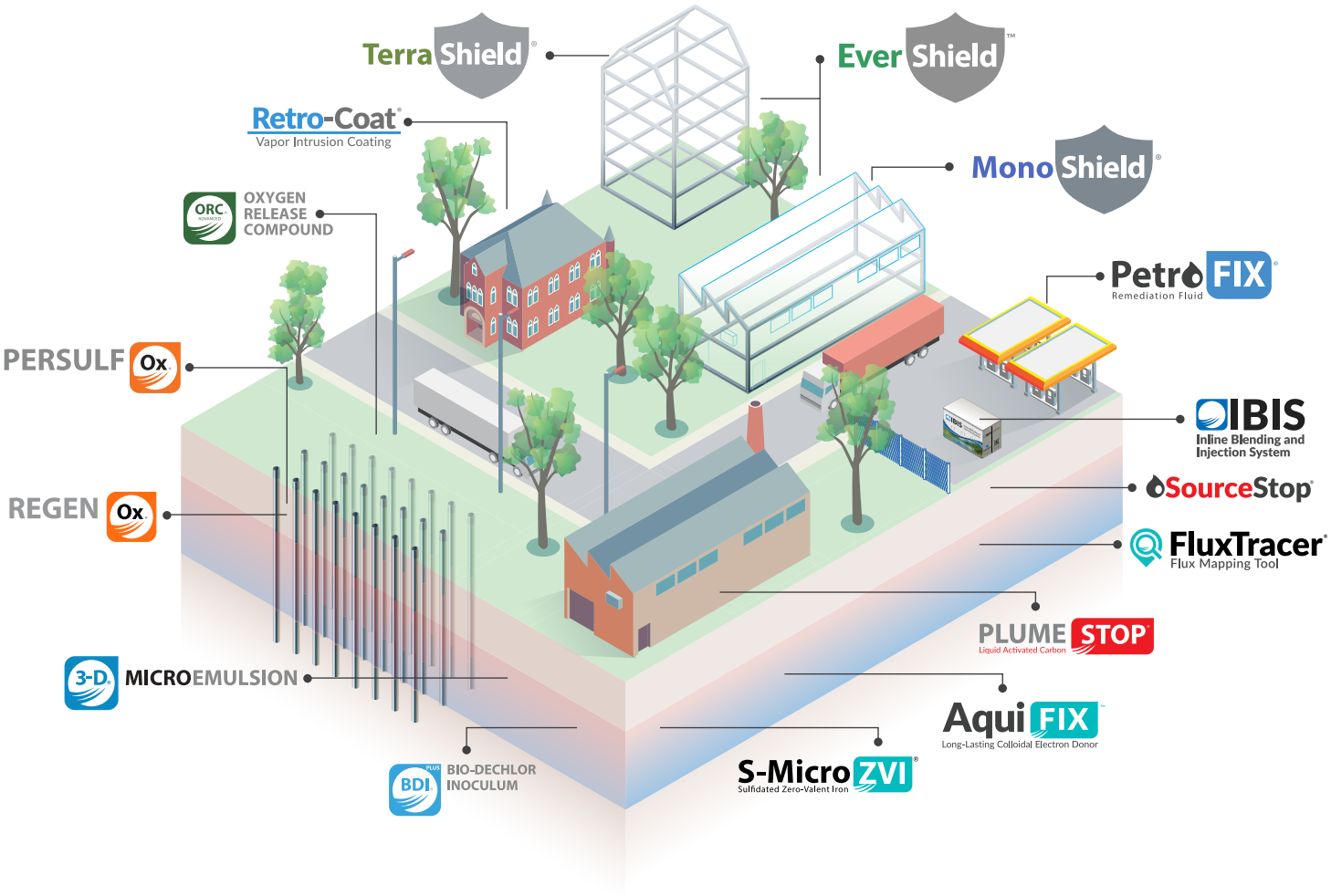


Results

Post-installation groundwater monitoring demonstrated substantial reductions in dissolved chlorinated ethene concentrations within one year of PRB installation. PCE concentrations were reduced by 99.96%, while TCE concentrations were reduced by more than 99.8%. These results indicate that the PRB successfully reduced dissolved-phase chlorinated solvent concentrations along the property boundary, supporting the project objective of mitigating off-site migration.

Significance

This project demonstrates the use of a compact, injectable PRB for chlorinated solvent migration control in a complex geologic setting. By combining PlumeStop colloidal activated carbon with S-MicroZVI sulfidated colloidal zero valent iron, the remedy provided both immediate mass flux control and a reactive subsurface treatment zone within a short installation period. The project demonstrates a practical in situ remediation approach for managing PCE and TCE impacts at an active industrial facility.



About REGENESIS

At REGENESIS we value innovation, technology, expertise and people which together form the unique framework we operate in as an organization. We see innovation and technology as inseparably linked with one being born out of the other.

Inherently, innovation imparts new and better ways of thinking and doing. For us, this means delivering expert environmental solutions in the form of the most advanced and effective technologies and services available today.

We value expertise, both our customers' and our own. We find that when our experienced staff collaborates directly with customers on complex problems, there is a high potential for success including savings in time, resources and cost.

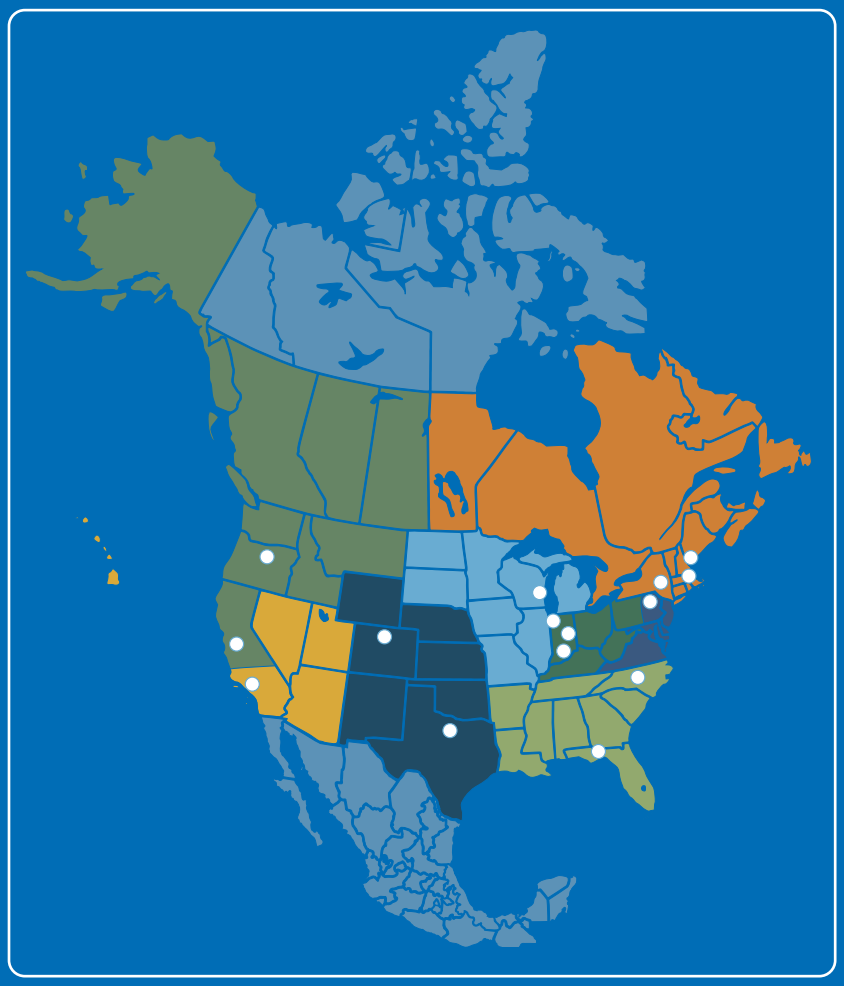
At REGENESIS we are driven by a strong sense of responsibility to the people charged with managing the complex environmental problems we encounter and to the people involved in developing and implementing our technology-based solutions. We are committed to investing in lasting relationships by taking time to understand the people we work with and their circumstances. We believe this is a key factor in achieving successful project outcomes.

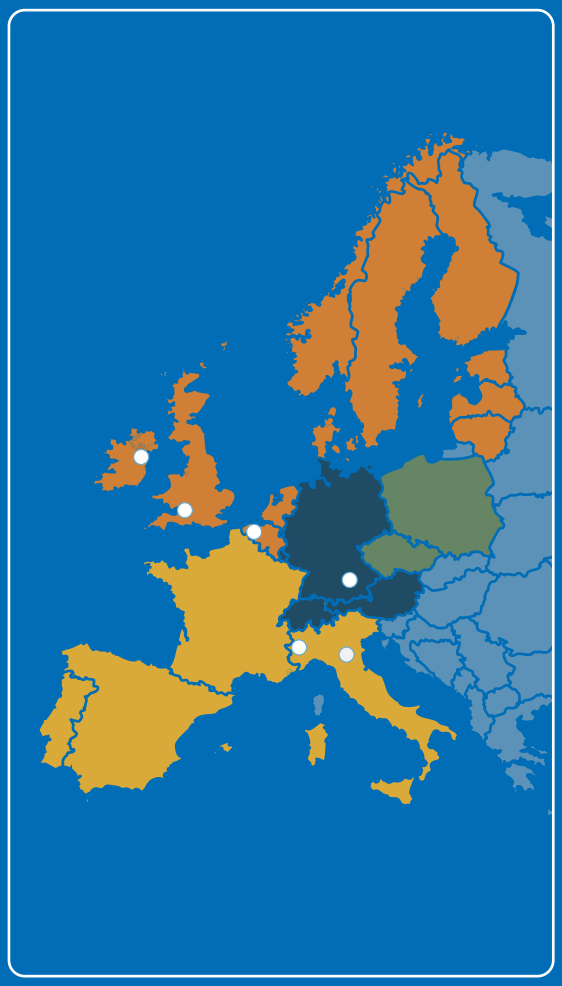
We believe that by acting under this set of values, we can work with our customers to achieve a cleaner, healthier, and more prosperous world.

REGENESIS®

Have a challenge? Let's solve it together.

Contact us today to discuss your specific needs.





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