PROFOUND

Innovation by Bauer

N° 2
2025

Soil mixing
Versatile. Efficient. Eco-friendly.

Assistance systems
Smart. Connected. Safe.

The digital construction site
Powerful. Precise. Reliable.

BAUER

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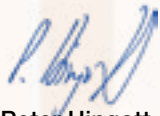
Dear Readers,

We are facing global challenges that test our imagination: Climate change, scarcity of resources and the digital transformation all demand creative and courageous solutions – and that's true in specialist foundation engineering as well. Change is not only possible but necessary.

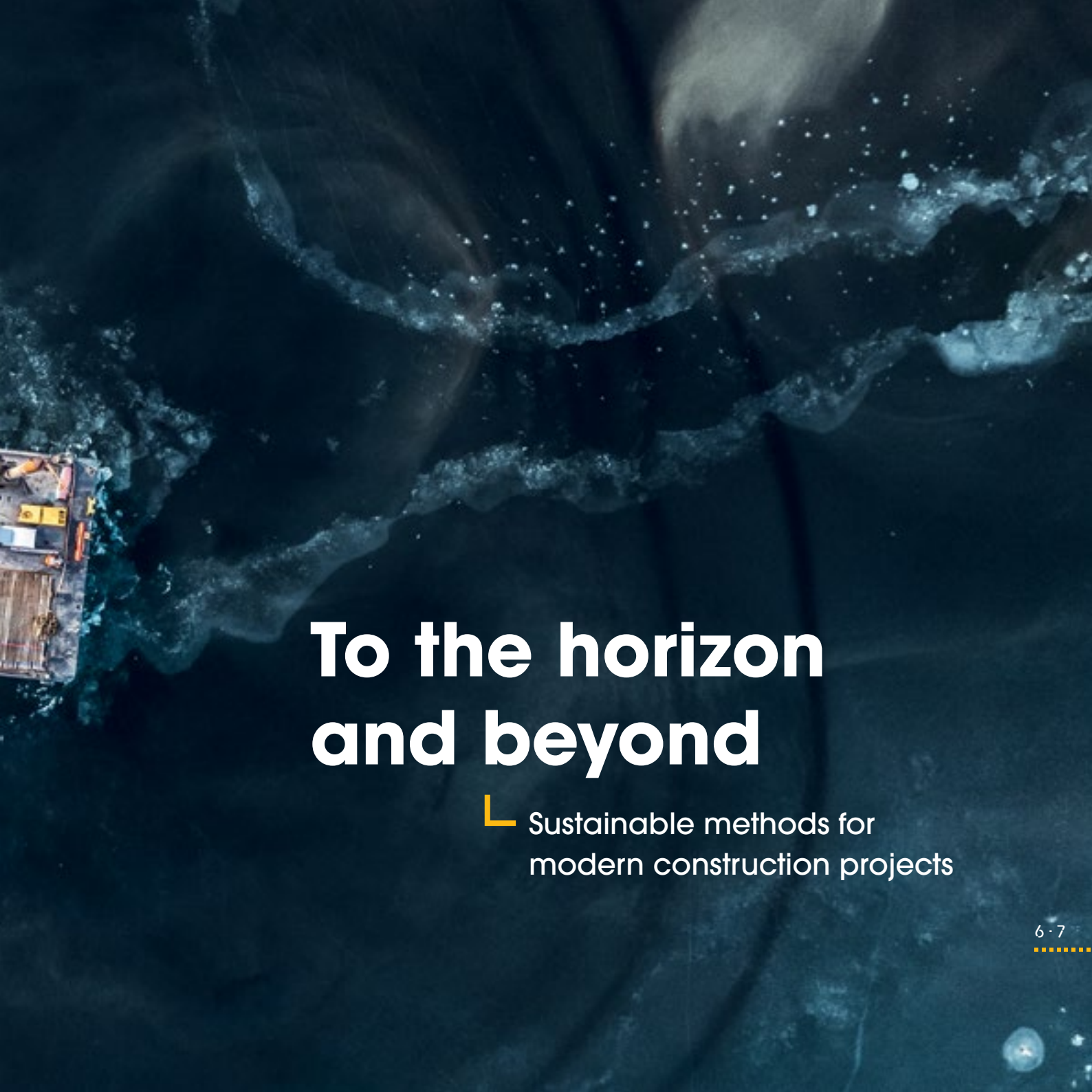
Our aspiration in the BAUER Group is to successfully execute complex and unique construction projects while always preserving resources. Every day, we ask ourselves the following question: How can we make work on the construction site even more effective and sustainable?

Our innovations are not developed in isolated research labs. They are the result of our close network of global cooperation. Digitalization opens up new opportunities for us to exchange ideas in the blink of an eye and further develop them by working together – geographical borders hardly matter anymore. This diversity of perspectives and the interplay of different areas of expertise form the foundation on which our innovations are constructed. Our focus is always on our customers and partners.

The new edition of our innovation magazine ProFound illustrates how Bauer is setting new standards for the future of specialist foundation engineering and beyond. Enjoy reading!



Peter Hingott
Executive Board BAUER Aktiengesellschaft



To the horizon and beyond

Sustainable methods for modern construction projects

Soil as construction material

Versatile, efficient and eco-friendly

BAUER Spezialtiefbau GmbH's innovative soil mixing techniques provide efficient and sustainable solutions for the complex challenges of construction in the 21st century. Why remove drill spoil and bring in concrete if the existing soil can be used as construction material? With Deep Soil Mixing (DSM), the experts from Bauer Spezialtiefbau mix the soil with binder slurry directly on site to create load-bearing soil mixing elements. These can be used, for example, as a foundation for structures, as walls for excavation pits or to seal off dams. One strength of the DSM method is its adaptability to a wide range of soil conditions, from cohesive soils all the way to sandy and gravelly layers. This flexibility is particularly valuable on construction projects in complex geological environments. Since mixing the soil with self-hardening slurry generates low levels of vibrations, DSM is also suitable for urban sites and sensitive environments.

Soil improvement under water

In Single Column Mixing (SCM), a single mixing tool mixes the soil with binding agent which is inserted primarily during penetration. SCM is particularly suited for improving loose, non-cohesive soils. For example, Bauer Spezialtiefbau applied the method for underwater soil improvement in Östrand, Sweden. What made this project unique was the use of the GPS-based BAUER-Assistant Positioning System (B-APS), which helped the team to approach each drilling location precisely. Working from a floating platform, a total of 210,000 m^3 mixed columns were precisely installed underwater in the soil. This minimized the environmental impact and effectively prevented turbidity.

Climate-friendly heat production

With geothermal activation of soil mixing elements such as Mixed-in-Place walls (MIP), Bauer is making sustainable heat production possible. At the "Am Kreisel" residential district in the German town of Lindau, Bauer geothermally activated a 3,200 m^2 wall and a 2,000 m^2 foundation slab, for example.

Focusing on sustainability

Bauer continuously improves its mixing technology in order to efficiently mix different soil strata together. The specialist foundation engineering experts create custom cement slurries and mortars that are precisely tailored to the local geological conditions. They mix their materials on site according to the project requirements and insert them directly into the construction soil. This results in environmental benefits such as resource efficiency and the reduction of CO_2 emissions. Since the soil does not have to be removed and disposed, and the slurry is produced on site, long transport routes are eliminated. In addition, less bentonite is consumed during soil mixing, which reduces CO_2 emissions even further.

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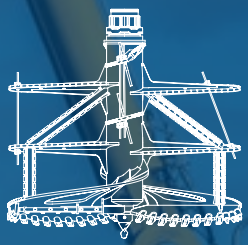
With **innovative soil mixing techniques**, Bauer Spezialtiefbau improves construction soil efficiently and sustainably, right on-site.

The benefits:

Soil mixing conserves resources, reduces CO_2 emissions and enables customized solutions even for complex geological conditions.



Watch the video for more information on the innovative soil mixing techniques of BAUER Spezialtiefbau GmbH!

Performance quadrupled

Next-level soil mixing

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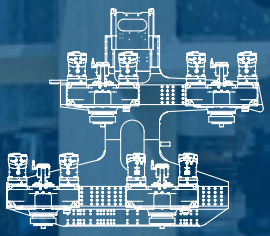


RTG Rammtechnik combines innovation, experience, technical expertise and the use of state-of-the-art methods. Their pile driving equipment sets standards for performance capacity in specialist foundation engineering.

Precision meets flexibility. The Multi Shaft Mixing System uses four independent rotary drives to insert mixing paddles into the soil and continuously pump in cement slurry via a hollow stem. Mixing distances and configurations can be adjusted flexibly to the site requirements.

Multi Shaft Mixing System

With four drives to peak performance

Modern specialist foundation engineering needs to find innovative solutions that can fulfil the growing requirements for precision, efficiency and environmental compatibility. The Multi-Shaft Mixing System (MSM) of RTG Rammtechnik GmbH is a pioneering example. With its quadruple mixing drive, the MSM system offers a level of flexibility and efficiency that far exceeds conventional triple mixing drives. Particularly for soil mixing, the MSM system has proven to be an economical and versatile solution.

The centerpiece of the MSM system is up to four independent rotary drives that insert the mixing paddles – aligned parallel to one another – into the soil. Binding agent is continuously pumped in through the hollow stems. Thanks to the multiple rotary drives, various mixing distances and configurations can be adapted to the individual site requirements.

The MSM system is ideal for a wide range of possible applications. It is used when constructing cut-off walls in contaminated soils, for groundwater barriers and for the sealing and rehabilitation of dams and dikes. The system also proves its strengths in excavation pits and when it comes to soil improvement.

Bauer's B-Tronic system makes the MSM system even more user friendly and efficient to employ. It enables seamless monitoring of all relevant production data in real time. This minimizes downtimes and optimizes the entire production process. The system's synchronization mode enables automatic synchronization of the mixing drives during the mixing process.

The MSM system of RTG Rammtechnik GmbH is an essential tool for modern specialist foundation engineering with its advanced technology, adaptability to individual site conditions and technological assistance from the B-Tronic system.

Because true progress is fuel-free

Renewable energy gains ground

In the research project “Deep Sea Sampling”, a consortium of research institutions, BAUER Maschinen GmbH and other industry partners is developing innovative solutions for deep sea mining in a variety of work packages. The project is subsidized by the Federal Ministry for Economic Affairs and Climate Protection and received the Bauma Innovation Award in 2022.

Soil mixing goes electric

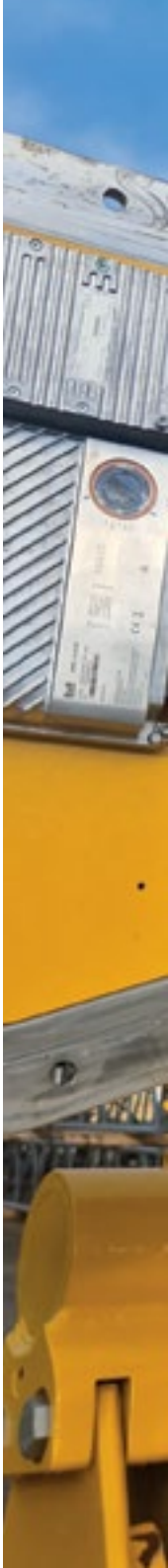
A subproject within “Deep Sea Sampling” is developing an electrical Cutter Soil Mixing (eCSM) method in anticipation of the electrified cutter. CSM is a soil mixing technique derived from the technology of trench cutters. Cutting wheels loosen the soil and mix it with slurry to form a homogeneous soil-binder mortar.

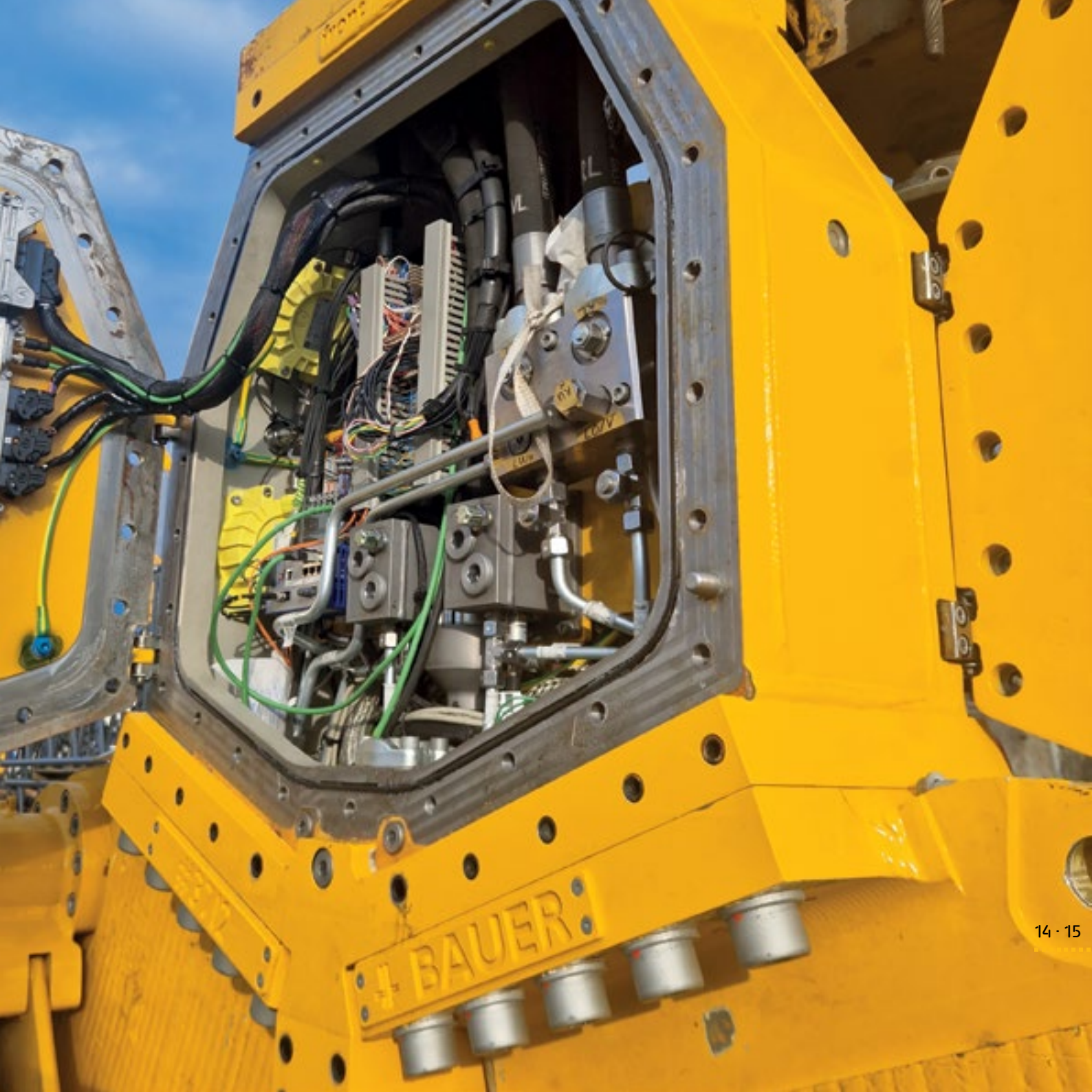
The vision of the BAUER Cutter Mixing (eBCM) research project is to develop a new electrical mixing tool that improves efficiency and environmental compatibility. Specifically, this means relying on an electrical motor directly in the gearbox instead of the diesel-powered hydraulic drive. This saves space and significantly increases the mixing speed. An external cooling system enhances heat dissipation, preventing premature concrete hardening. The system operates semi-autonomously, which means that the operator no longer has to continually adjust the speed manually. This automation enables precise overall control of all process parameters, significantly improving the mixing quality. The energy consumption is also reduced: The system’s efficiency increases from its prior value of 60 % to 85 %. In other words, less output is required from the base carrier.

Success in load testing

During load tests at the company’s plant, Bauer Maschinen has already successfully used the electric motor for soil mixing under real conditions with cement slurry. The long-term objective is to convert the entire cutter and CSM process with Bauer equipment to the use of power from renewable energy sources.

With the electric BAUER Cutter Mixing (eBCM) research project, Bauer Maschinen is bridging the technological gap between traditional soil mixing and a precise, fully automated method. This demonstrates how research and development can give rise to solutions that are environmentally and economically sustainable.




BAUER

Construction sites in motion

B-Tronic 5
Smart Grab
Stability Plus
Tracking & Tracing

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Connected construction site

The B-Tronic 5 connects all the equipment and active players on site. Sensors at all crucial points collect the data of the drilling rig in real time. The DTR module enables equipment, tablets and Internet to act in concert. Thus, execution on site becomes faster, safer, and more cost-efficient.

You can find more information on our website.

B-Tronic 5

The smart control system for specialist foundation engineering equipment

In specialist foundation engineering, one thing matters most: efficiency. Every delay costs money, every inaccuracy causes problems. This is where the B-Tronic system from BAUER Maschinen GmbH comes into play. The latest generation, B-Tronic 5, is capable of far more than simply controlling specialist foundation engineering equipment. It monitors the entire construction process and offers a solution that makes sites faster, safer and more economical. The system ensures efficient construction work and reduces downtimes. With B-Tronic 5, the connected construction site is becoming a reality.

Safety is the top priority here. The B-Tronic system guarantees that errors in operation are practically impossible. In the operator's cab, a high-resolution touch screen assists the equipment operator. Thanks to the intuitive operation of the B-Tronic, the training period for equipment operators is minimized. Clear displays and warnings make work easier for the operator, so that even less experienced equipment operators can manage their tasks with ease. The technology takes care of repetitive and monotonous sequences. This saves time and reduces wear on the equipment. For example, the system automatically regulates the rotational speed during drilling to save material.

The B-Tronic 5 connects all the equipment and active players on site. Sensors at all crucial points collect the data of the drilling rig in real time. The DTR module enables equipment, tablets and Internet to to act in concert. As a result, all data is available at any time – whether on site or in the office. All data is stored in the WEB-BGM equipment management system, which facilitates comprehensive analysis. This displays the construction progress and assists operators with using equipment more efficiently while more precisely controlling and optimizing work processes. This makes it easier to maintain an overview and react quickly to any problems that may arise.

B-Tronic 5 defines the standards for efficient and secure operation of drilling rigs. With its advanced technology and focus on user-friendly operation, flexibility and connectivity, it offers a tailor-made solution for the challenges faced on modern construction sites.

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Stability Plus compares parameters relevant to the stability of the drilling rig in real time. Watch the movie!

Smart Grab Control simplifies the operation of diaphragm wall grabs and increases safety on the construction site. Operating errors and the resulting uncontrolled movements of the grab are virtually eliminated.

You can find more information on the website.

Stability Plus

Maximum stability and safety

The Stability Plus assistance system from BAUER Maschinen GmbH, which received the EuroTest Award from the employer's liability insurance association for the construction sector (BG BAU), offers optimized safety and flexibility for drilling rigs. Stability Plus makes it possible for the drilling rig to have a longer outreach without endangering its stability. The system automatically regulates the rotational speed of the upper carriage when necessary, enabling the outreach to be increased. The B-Tronic control system shows the operator the permissible winch pulling forces in real time. New stability safety data sets can be loaded directly into the machine control system via the DTR module. The equipment operator can select saved configurations at the push of a button, making the use of service technicians unnecessary. For construction companies, Stability Plus means added flexibility and time savings on site. Thanks to this innovation, Bauer is setting new standards for safety and efficiency in specialist foundation engineering. With Stability Plus, companies can increase their productivity – true to the motto of: Safety first!

Smart Grab Control

Precise work with diaphragm wall grabs

To excavate deep trenches for cut-off walls and diaphragm walls in the soil, mechanical diaphragm wall grabs are used. These are suspended freely from the ropes of a duty-cycle crane during operation and controlled by winding and unwinding the ropes. Their operation requires sensitive skills and often demands multiple years of training. The equipment operator has to stand on the hydraulic foot pedals at all times and remain highly concentrated during work. Even for experienced equipment operators, such work is highly demanding.

With Smart Grab Control (SGC), BAUER Maschinen GmbH has developed a solution that makes the operation of mechanical diaphragm wall grabs safer and easier. The SGC system encompasses various assisted functions. The diaphragm wall grab is now joystick-and-button operated. This reduces the physical and mental strain on the operator and increases operating comfort. An adapted and enhanced visualization of the work process on the screen enables precise tracking of individual work steps in real time. Smart Grab Control simplifies significantly the operation of a mechanical diaphragm wall grab while at the same time increasing operation safety.

Tracking & Tracing

Going deep with drilling tools

In specialist foundation engineering, every detail is important. Precise monitoring and the right use of drilling tools can make all the difference between the success of a major project or expensive stagnation. BAUER Maschinen GmbH has developed a new tracking system that represents a decisive step toward improving process reliability on construction sites.

The centerpiece of this innovation is a smart tracker housed in a pressure-tight, robust plastic casing. The durable design ensures that the technology functions reliably even under extreme conditions. In tests, the tracker achieved an operating life of more than 200 hours with a single battery charge.

A brain for drilling tools
Equipped with sensors such as GPS, gyroscope and acceleration sensors, the tracker acts as the brain of the drilling tool by continually recording all movements and operating data. This information is then combined with the equipment data, visualized and analyzed. This allows precise tracing of position, activity and operating times of the drilling tools. Enabling the site manager to determine which tools were used where, and for how long.

A detailed analysis makes it possible to plan the ideal combination of tools, minimizing downtimes and improving site logistics. The tracker is a valuable tool for experts on site that uses experiential values and best practices to facilitate work and improve standardization.

Longer service life
and better resource planning
One important feature of the tracking system is predictive maintenance. By analyzing recorded operating data, maintenance cycles can be planned more precisely and thus the service life of tools can be extended.

Especially on major projects, improving efficiency with the new drilling tool tracking system is a crucial advantage. Precise data enables exact planning and optimal utilization of resources. The time during which tools sit unused on site is minimized, leading to an increase in productivity.

Build on precision

Digitalization makes perfection tangible

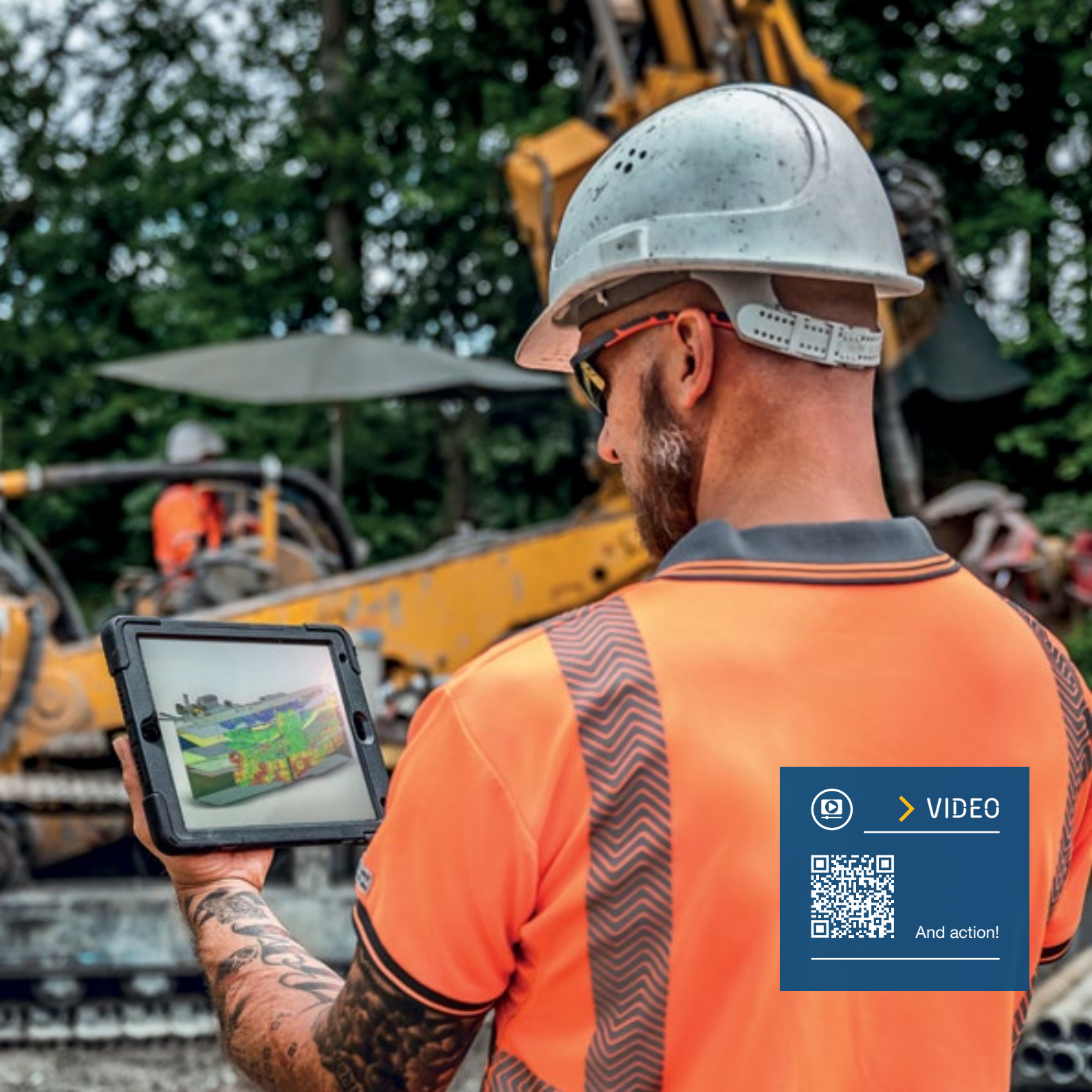
At a lock in the German town of Hessigheim, BAUER Spezialtiefbau GmbH is improving the construction soil using injection technologies across an area of approximately 1,900 m^2. Injection methods involve stabilizing the soil by injecting self-hardening slurries and solutions.

To ensure success in Hessigheim, Bauer relies on digital technologies. From the very start, a 3D model of the site and construction soil has been an integral part of the project. It serves as a visual and technical basis for simulating all work steps in advance. Using the latest Building Information Modelling technologies (BIM), the expert team plans each drilling and injection task with millimeter precision.

During execution, the static 3D model is used to generate a dynamic digital twin of the site which is fed continuously and almost in real time with data provided by sensors in the drilling rigs as well as the tachymetric monitoring system. Automatic analysis and ongoing adaptation of engineering plans help the team to carry out their work more precisely.

The BAUER Digital Portal consolidates all digital information and connects all parties involved. It documents the construction progress and provides information that enables actions to be planned, analyzed, and optimized with quick response times.

Thanks to the digital technologies employed by Bauer Spezialtiefbau in Hessigheim, the use of materials can be planned precisely and reduced to the necessary minimum. At the same time, the monitoring system working around the clock ensures that the security of the lock is guaranteed at all times. The construction period is reduced and environmental impacts are minimized. Bauer combines digitalization with technical precision in a sophisticated approach to impress its customers with sustainable and efficient solutions.


VIDEO
And action!

Joint forces

Cooperation for the site of the future

Data power for specialist foundation engineering

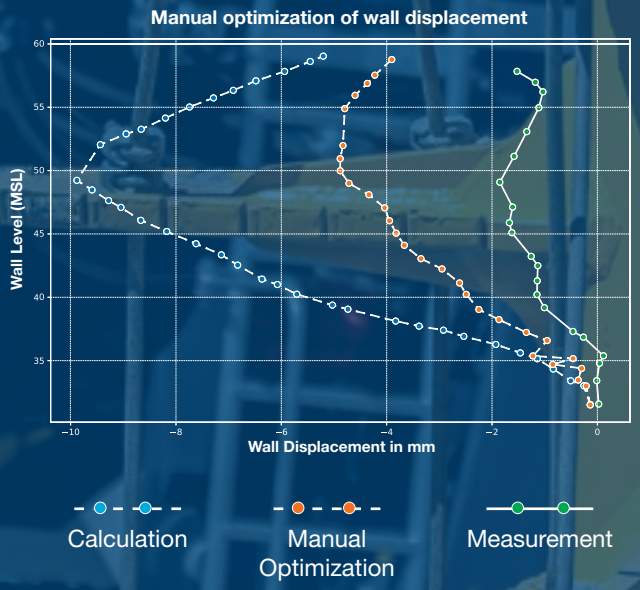
Connected, optimized, ready for the future

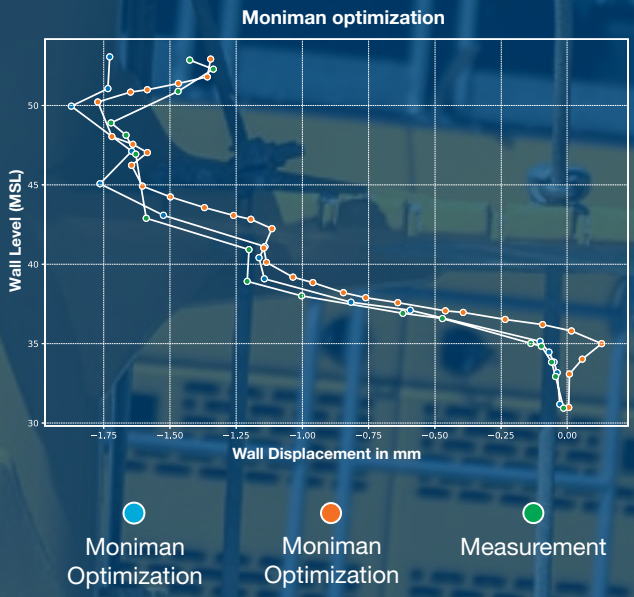
Construction sites generate large volumes of data that come from equipment, sensors and activities. When such data is used intelligently, it can play a decisive role in the optimization of construction processes. However, data is often stored in various formats or distributed across multiple systems. This results in data silos that cause valuable information to be lost. Here is where the cooperation between Bauer Spezialtiefbau and the company abaut comes into play: Innovative methods aim to make the site of the future more efficient. The main focus of this cooperation lies in the development of a digital twin for drilling and site processes.

All site data is collected, combined and analyzed on a platform. This generates a real-time depiction of the site with all relevant information, enabling forecasts to be made for optimal construction progress. The innovative technology provides transparency for the entire construction process. Experts on site can immediately detect anomalies and deviations as well as their effect on the project as a whole. Seamless monitoring prevents delays and inefficiencies from an early stage and optimizes construction progress. The digital twin controls individual processes, while also keeping an eye on the bigger picture. This improves efficiency on site, including collaboration with suppliers and other parties.

Real time data analysis

How Moniman is revolutionizing design processes





The adjustment of a calculated wall displacement to actual measurement values through manual optimization is possible, but only efficient to a certain extent (left). Moniman automatically recalibrates soil parameters and ensures that forecasts remain precise during the construction process (right).

Digitalization and the use of artificial intelligence (AI) are transforming specialist foundation engineering. The in-house platform Moniman helps to optimize design processes, lower costs and make critical decisions. In addition, Moniman analyzes measurement data from the construction supervision in real time and offers solutions to make construction work safer, more efficient and more precise. For example the tool makes use of wall distortions or the force detected at anchors. Based on continuous comparison of measurement data with calculation models, Moniman automatically recalibrates soil parameters and ensures that mathematical forecasts remain precise during the construction process.

An ongoing capacity to learn based on AI helps to refine the model with each new data set and improve the reliability of construction processes. Real-time feedback makes it possible to quickly identify and eliminate problems on the site before they delay the construction process or drive costs higher. While that still involves manual intervention at the moment, Moniman will use recalibrated soil parameters in the future to automatically propose adjustments, for example the length and depth of anchors, to prevent potential deviations during subsequent construction phases.

One central module of Moniman is design optimization, which lowers costs and at the same time improves safety. Using optimization algorithms, numerous construction concepts are examined and the best solutions are selected. Design optimization uses input data such as soil conditions, geometry and loads, as well as specifications for desired parameters or elements. These are processed in a complex model that calculates various design solutions on this basis. Using specific criteria, the optimal solution is selected. Unrealistic drafts are excluded based on defined restrictions. This makes the entire process economical and safe.

Thanks to AI-based optimization, Moniman will adjust construction drawings in real time. As soon as the conditions change, the system will provide this information to the experts on site. This dynamic adjustment saves time and minimizes errors.

NOTES

Bauer Resources provides comprehensive support for geothermal projects, from consultation through to completion. In this way, the company supports the heat transition and contributes to a climate-friendly future.

You can find more information on the website.

And action!

Energy from the earth

Geothermal energy for a climate-friendly future

The days of fossil fuels are numbered: climate change is making them unsustainable. As a future-proof and environmentally friendly key technology, geothermal energy is the solution for a sustainable heating transition. It harnesses the earth's heat to warm buildings in winter and cool them in summer. BAUER Resources GmbH has been driving this technology forward for years to help create a greener future.

All from a single source – from concept to completion

At Bauer Resources, the motto “All from a single source” is more than just words – it’s a guiding principle. The company supports geothermal projects from initial consultation to completion and beyond. Economic feasibility assessments and geothermal potential analyses provide the basis for well-informed decisions. With thermal simulations and Building Information Modeling (BIM), Bauer Resources ensures resource-optimized and economically efficient project planning. As a general contractor, the company oversees the entire process – from drilling to commissioning – always using the latest technology and maintaining a strong focus on outstanding quality.

Even the equipment and materials used in geothermal projects come from a single source at Bauer Resources. KLEMM Bohrtechnik GmbH, a member of the BAUER Group, supplies high-performance drilling equipment, while the subsidiary GWE GmbH provides high-quality well construction materials. This integrated approach enhances efficiency and guarantees the highest standards of quality.

Flagship Project “Kellerbergbreite”

Near Bauer’s headquarters in Schrobenhausen, Germany, Bauer Resources has implemented on a 5.5 ha area a geothermal probe system including "cold heating type" distribution network for the development "Kellerbergbreite" providing sustainable heating and cooling for 64 residential buildings and a kindergarten.

Project highlights:

- 119 geothermal probes reach depths of up to 60 m and enable climate-friendly energy production.
- 50 km of pipelines connect the geothermal probes and the local cold heating network.

Less PFAS, more future

with the new mobile soil washing plant

PFAS – per- and polyfluorinated alkyl substances – can be found in numerous everyday products from cosmetics to clothing, packaging and coatings all the way to fire extinguishing foams. Their ability to repel water, grease and dirt was long considered an advantage. However, the widespread use of PFAS has serious consequences: These so-called "forever chemicals" severely contaminate the soil and are extremely difficult to remove.

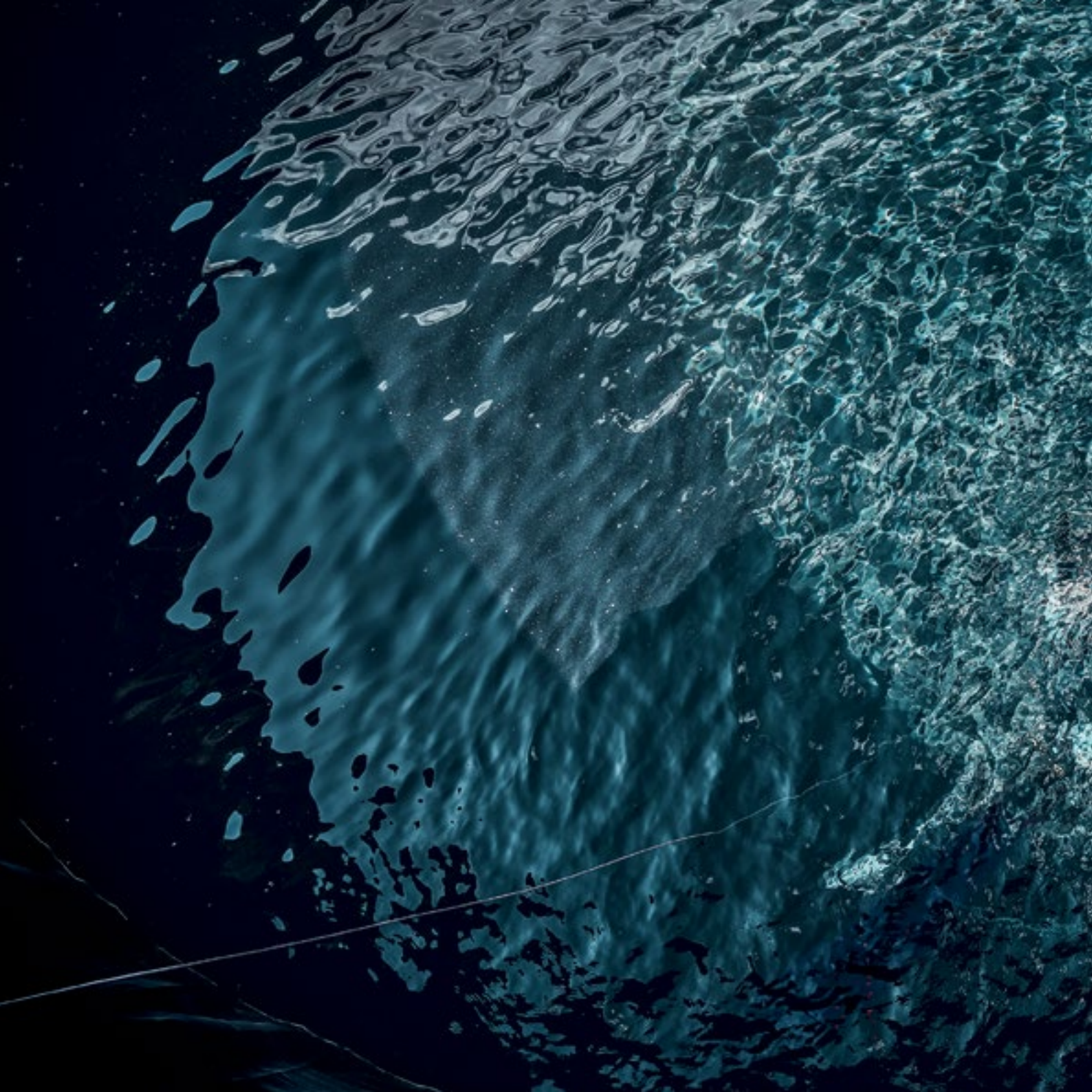
The Bauer Umwelt Division of BAUER Resources GmbH has developed a ground-breaking solution: a mobile soil purification plant that efficiently tackles PFAS pollution. Whether on military sites, industrial brownfields or agricultural areas – the plant cleans washable soils, especially sand and gravel mixtures with a silt content from 10 to 15 %.

How does the plant work?
A washing and fractionating stage separates the contaminants from the soil and transfers them to the aqueous phase. Two different material aggregates remain: The cleaned, fractionated soil particle mixture, which is free of contaminants, can be reused as soil material. The water-mud mixture is dewatered in a further step to separate it from the mud. The remaining portion of water then passes through a cleaning stage and can be reintroduced into circulation after treatment. The result: The soil washing plant removes up to 98 % of the contaminants.

The benefits at a glance

- Sustainable: The cleaned soil can be reused on site. This saves landfill space, reduces waste and cuts down on CO_2 emissions.
- Mobile: The plant is flexible, ready to use and takes up little space.
- Cost-effective: Reusing the soil considerably reduces costs for transport, landfill and backfill material.

The mobile soil washing plant from Bauer Umwelt is a breakthrough in the rehabilitation of soil polluted with PFAS. With this innovation, Bauer demonstrates yet again how technological expertise and responsibility can work hand in hand.



> NOTES

30 t of soil are cleaned by the plant per hour and up to 98 % of the contaminants are removed.

From military sites to agricultural spaces all the way to the chemical industry, the **mobile soil washing plant** can be used at almost every location where PFAS are present in the soil.

The newly developed mobile soil washing plant is pioneering for medium-scale projects involving **10,000 to 30,000 t** of soil polluted with PFAS.

You can find more information on the website.

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