



# Betolar Mining Solutions



# Mining

Betolar's competence in geopolymers and alkali-activated materials has been demonstrated in several applications in the concrete product and construction industry. The same principles, backed by tens of millions in past investments in research and development of material technology solutions, can be applied to and utilized in various mining applications.

The mining industry generates annually over 12.7 billion tons of waste. These sidestreams are often hazardous and pose a significant risk if leaked into the environment. By developing local solutions to manage waste and upcycle materials, mining companies can radically reduce their environmental impact and

## Sustainable competitive edge – circular economy solutions for mining sector

create new revenue streams from what was once considered waste.

ESG and social license to operate require mining companies to reduce their carbon footprint and embed environmental values into their core corporate culture. At Betolar, we address the problems of the mining sector through a circular economy. Geoprime solutions are the answer to increasingly stringent environmental regulations and requirements. We help mining companies drastically reduce their CO<sub>2</sub> impact while saving natural resources. In addition, our solutions reduce the environmental risks associated with mining.

  
Up to  
**80%**  
CO<sub>2</sub> savings compared to cement-based solutions

  
**100%**  
Cement-free solutions for mining

  
**100%**  
Circular economy solutions



## Our service

### Geoprime competitive advantage in mining sector

Geoprime solutions deliver concrete opportunities to reduce carbon footprint in mining operations and strengthen environmental values, a part of the core corporate culture. *Betolar Advisory Service* offers continuous technical support of the highest quality. We support the efforts of mining companies in achieving their sustainability goals and strengthening their social license to operate.

Furthermore, we assist mining companies to mitigate environmental risks and to enhance profitability. We provide technical support to assess regulations and help mining companies adapt to them, such as by adjusting production based on the new guidelines and governmental requirements. We also help bring transparency to operations and thereby gain the acceptance of the local community. The CO<sub>2</sub> handprint, sidestream utilization potential and cost-saving

potential will be calculated regarding all of our solutions. Our reports and analysis are ESG-compliant, and we support our customers and partners with environmental impact assessments (EIA).

We intend to establish long-term collaborations that provide significant benefits to all stakeholders. In addition to technical support, the Geoprime license also includes continuous optimization of Geoprime solutions according to customer requirements for value creation in the future as well. We identify and characterize available local sidestreams for supplementary cementitious material (SCM) to be utilized particularly in tailings management. Rapidly deployable Geoprime solutions require no significant new production investment and begin immediately decreasing CO<sub>2</sub> emissions.

### Cementless Paste Backfill, CPB

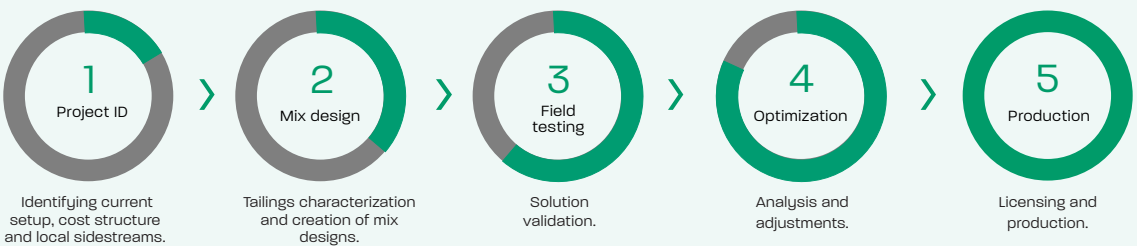
Geoprime cementless paste backfill (CPB) is an application to manage and utilize tailings produced by the mining operation. Traditionally, a CPB mixture contains cement, water, and tailings to produce a wet mass to fill underground mine fillings. Geoprime CPB aims to fully replace cement in the mix design. Our solution enables up to 80% CO<sub>2</sub> savings compared to conventional cemented paste backfills. Cement is replaced with locally available sidestreams, allowing the solution to deliver cost benefits to the mining operator. After analyzing the characteristics of local sidestream, we develop a tailor-made, cost-efficient, and optimized mix design based on the project requirements.

The technical properties of Geoprime CPB are equivalent or better to traditional cemented paste

backfills. In case, for example, a faster initial strength development is required, we customize the mix design to achieve the desired properties. With a robust mix design, we control the different variables in the site to ensure that the technical characteristics such as compressive strength, water absorption, chemical resistance, and leaching (according to EN 12457) of our solution fulfill the technical and environmental criteria.

Geoprime CPB is a reliable and safe application for mine backfilling because of its non-segregation, non-stratification, and non-precipitation features. Geoprime CPB enables significant CO<sub>2</sub> and cost savings. In addition, our solution solves environmental pollution concerns and promotes the sustainability of the mining operator through a circular economy.

#### CPB development roadmap



Expert service and support in every stage of the process





## Shotcrete

Traditionally, shotcrete contains cement, aggregates, water, and admixtures that enhance the characteristics of the concrete. In underground mining operations, shotcrete delivers safety and efficiency to the whole mining operation. Geoprime solution for shotcrete aims for partial or complete cement replacement in the mix design. It is based on the customized accelerator that enables the use of blended cement (CEM III) in the mix design.

Furthermore, we evaluate the possibility of utilizing local sidestreams in the mix design, providing even greater benefits to the mining operator. Our tailor-made solution, accelerates the concrete's early strength development. The accelerated strength development expedites operations and increases the productivity of the mining operation. Geoprime Shotcrete conforms with the applicable EN standards, making it a reliable and durable choice. Our green solution for shotcrete drastically reduces CO<sub>2</sub> emissions, allowing the mining operators to achieve their sustainability targets faster.

## Tailings Management

Currently, most tailing waste is stored at tailings ponds and dams unutilized. Tailing costs account for a large portion of the total end-of-life operating costs for a mine. If tailings are properly managed, the mining company will benefit from significant cost savings and more efficient operations.

With the help of Betolar's expertise, mining operators can use the previously unutilized tailings in various ways. Geoprime solutions for tailings management are tested and validated as cement-free solutions. Our solutions utilize tailings to build dense and sealed temporary or permanent dam structures of reservoirs. The stabilization of the tailings will improve environmental risk management and dust control. In addition, the risk of environmental damage by dam failures is reduced. Utilizing the tailings as supplementary cementitious material (SCM) will drastically decrease the exploitation of natural resources. At the same time, the cost-effectiveness of the mining company is enhanced.

Geoprime solutions are based on dry stacking and deliver substantial improvements and benefits compared to existing applications and practices.

### 1. Radically reducing the overall environmental impact of tailings management

- No dam failures
- Land available for re-uses after mine closure
- Smaller footprint of tailings storage from reducing the need to store tailings in piles
- No dust issues
- Improving water management and less dissolved elements in water

### 2. Raising the utilization rate for tailings materials and improving the cost efficiency of mining operations

- Partial closure structures during operation
- Reduction in financial liabilities required by environmental authorities
- Waste-to-value opportunities, e.g., utilizing the tailings materials in mining infrastructure or nearby construction and road sites

### 3. Creating new closure structures for waste rock piles and tailings storage facilities

- Decreased tailings volume and cost savings in waste taxation
- Circular economy principles applied to tailings materials
- Reduction in usage of geosynthetics and natural resources

## Contact for more info

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