Factsheet

Decarbonisation of Eigenrieden Quarry

Mineral Baustoff GmbH to gradually reduce carbon emissions by 2030

STRABAG pilot project for climate-neutral raw material extraction

A decarbonisation pilot project aims to make the Eigenrieden limestone quarry, operated by Mineral Baustoff GmbH in Thuringia, an industry-wide pioneer in sustainability, environmental protection and innovation. In a multi-phase process, the STRABAG subsidiary wants to reduce CO_2 emissions associated with the extraction and production of building material aggregates and crushed stone at the quarry, with the goal of operating the first climate-neutral quarry in Germany in 2027. The project is also intended to set an example and serve as a model for the climate-friendly transformation of other raw material sites within the STRABAG Group.

The Eigenrieden limestone quarry has been a source of raw materials for the STRABAG Group since 2009 and currently has a deposit of about 6 million tonnes of rock in the Lower Muschelkalk strata. Mineral Baustoff GmbH produces roughly 220,000 tonnes of building material aggregates and crushed stone here every year. To date, the equipment and machinery at the quarry have been powered conventionally using diesel fuel. As a result, the facility emits about 490 tonnes of CO_2 a year. The aim is to gradually reduce these carbon emissions to almost zero by the end of the current decade through a series of steps involving several subprojects.

Eigenrieden Quarry: Roadmap to climate neutrality

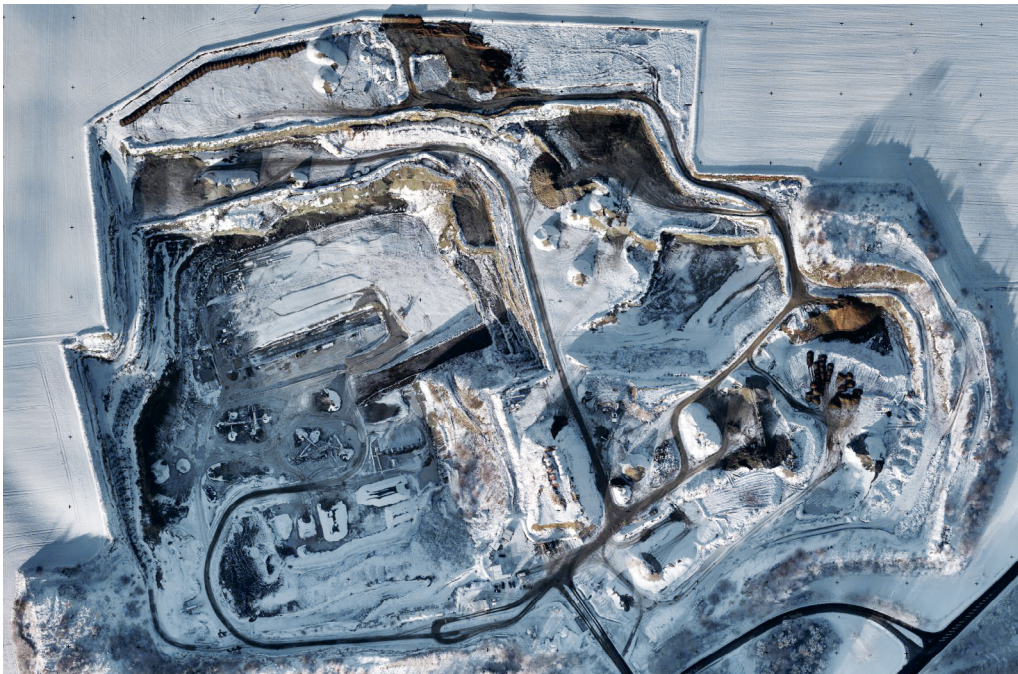
2020	2021	2023	2024	2024	2026	2027	2027
Total carbon emissions at Eigenrieden surface mine	Optimisation of extraction and mining infrastructure	Conversion of processing from diesel to electric	Conversion of raw stone transport from diesel to electric (electric haul trucks)	Use of diesel substitute HVO	Goal: use of hybrid excavators with energy recovery	Goal: use of carbon-neutral explosives	Power supply from photovoltaic system on top of landfill
100%	96%	60%	44%	5%	3%	1%	CO_2*

*when using environmentally neutral electricity

Digitalisation to minimise the environmental impact

STRABAG has already taken the first steps towards a more sustainable and efficient raw material extraction in Eigenrieden. Switching to a selective mining concept by layers has increased occupational safety and product quality while reducing the impact on the environment. The use of modern software tools for long-term, digital mining planning enables the efficient use of the entire deposit within its geological and approved limits – in particular the targeted mining at depth. Digitalisation thus simultaneously minimises land consumption and environmental impact. In order to make the logistics in the quarry efficient and safe in the long term, plant and customer traffic will be kept consistently separate in the future. The construction of new ramps and access roads for the planned traffic management system is in full swing with the goal of reducing distances and increasing work safety.

To achieve its decarbonisation goals at Eigenriegen, Mineral Baustoff GmbH is switching from diesel-powered equipment to electricity or electric powertrains and climate-neutral fuels – across all three stages of the production process: extraction, processing and loading.



Bird's eye view: Carbon emissions are gradually being reduced at the Eigenrieden limestone quarry with the aim of extracting raw materials in a climate-neutral way.
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New processing plant: PV panels for sustainable solar power

At the end of 2023, a process-controlled, electric-powered stationary processing plant has replaced the previously used diesel-powered mobile equipment. The new crushing and screening plant will – like all STRABAG locations and construction sites in Germany – be powered by green electricity from hydropower sources. A modern dust mitigation system with more efficient filtering technology was installed to minimise dust and noise emissions, while the crushers, screening machines and belts were covered and insulated to help reduce noise.

By 2027, the energy needs of the raw material processing plant are to be largely covered by solar power from an in-house photovoltaic system. Two PV arrays including electricity storage are planned on the quarry. Over the next few years, the old quarry, which is no longer being exploited for mining purposes, will be gradually filled in. Depending on the size of the photovoltaic arrays (2 to 4 ha), the solar power generated here will be used not only for the autonomous operation of the processing plant, but can also be fed into the public power grid.

The new stationary processing plant will replace the previously used diesel-powered mobile crushers and screening machines. will be replaced by a new stationary processing plant at the end of 2023, whose energy requirements will initially be covered by green electricity from hydropower and, in the medium term, by self-generated solar power from the planned photovoltaic system. © Mineral Baustoff GmbH

Electric autonomous haul trucks for transport in the quarry

To systematically reduce carbon emissions during raw material extraction, STRABAG is primarily focusing on the gradual introduction of electric-powered, autonomously operated haul trucks to replace the diesel-powered trucks previously used for transporting the raw stone at Eigenrieden. Mineral Baustoff GmbH is one of seven partners in the ongoing ELMAR research project (8/2022–7/2025), which aims to integrate electric heavy-duty machines into the decarbonisation of the raw materials industry. The project, led by RWTH Aachen University, has received a total of €6.3 million in funding from the German Federal Ministry for Economic Affairs and Climate Protection (BMKW). Vehicle manufacturing partner in the project is Volvo.

Trial operation of the first electric self-driving Volvo heavy-duty haul truck in Eigenrieden is scheduled to start in the summer of 2024. In the future, three of these emission-free trucks will be in use at the quarry to autonomously transport the extracted limestone to the processing plant. The innovative autonomous operation of the trucks requires Mineral Group to set up a local 5G campus network at the quarry, with the heavy-duty haulage machines operated in a closed working environment and monitored by sensors and GPS from a central control station. The electric autonomous haul trucks will not only reduce the carbon footprint of the quarry; they will also make a lasting contribution to improving occupational safety and health during the extraction of raw materials.

ELMAR
research project

Gefördert durch:

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Hybrid excavator and HVO biodiesel

Besides replacing the diesel-powered haul trucks with electric alternatives, STRABAG is also aiming to convert the other construction machines used at the quarry for use with sustainable fuels starting in 2024 as well as introducing vehicles with hybrid powertrains in the medium term. The two (instead of the previous three) large wheel loaders used for loading the extracted aggregates and crushed stone are to be fuelled with synthetic biodiesel (HVO diesel from hydrogenated vegetable oil) instead of conventional diesel fuel. The same applies to the excavator used for loading the electric haul trucks with limestone. The use of biofuel will not only reduce carbon emissions by more than 80%; it will also significantly lower particulate matter pollution and nitrogen oxide emissions. As soon as appropriately sized extraction machines are available on the market, the conventional excavator will also be replaced by a modern, fuel-saving hybrid model with energy recovery to further improve the carbon footprint of the quarry operations.

In the future, the loaders and excavators at the Eigenrieden quarry are to be fuelled with HVO diesel from hydrogenated vegetable oil. © Mineral Baustoff GmbH

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