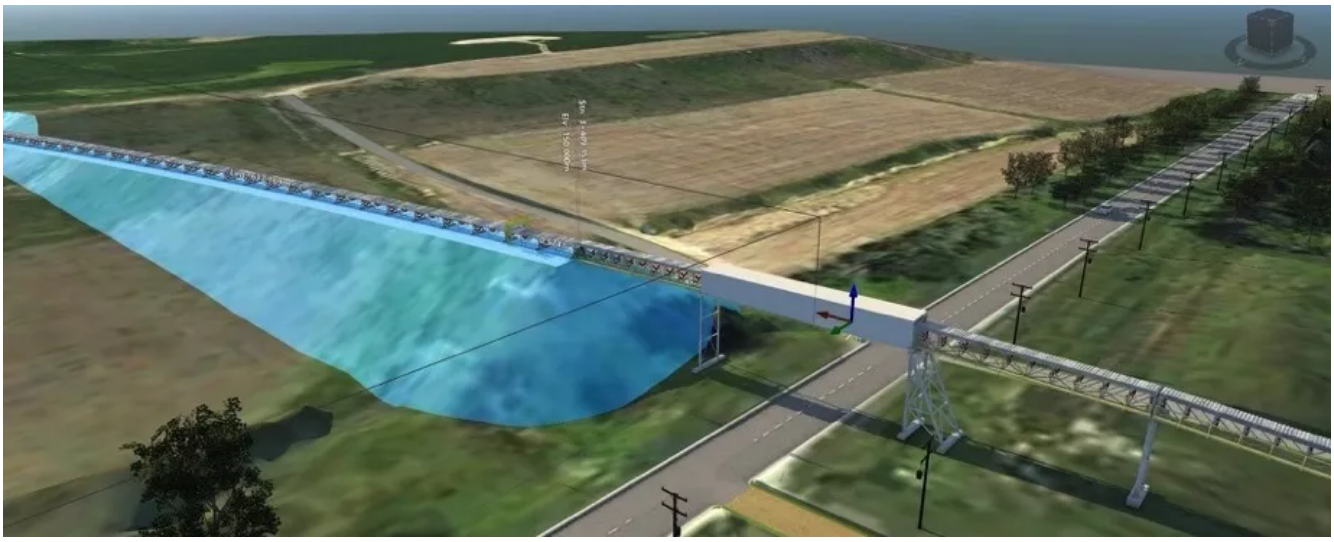

White Paper

# BEUMER Group: Transporting Material efficiently over long Distances with Curved Belt Conveyors

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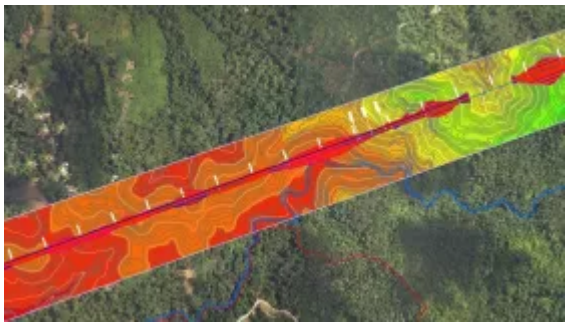
How can mining companies make their operations more sustainable to reduce their environmental footprints? One element that can be perfectly adapted to match the conditions is the efficient transport of the mined material. Here overland conveyors that can move large quantities of material over long distances are required. BEUMER Group relies on modern planning and layout tools to support operators at an early stage of the project and design the ideal conveying solution together with the customer.



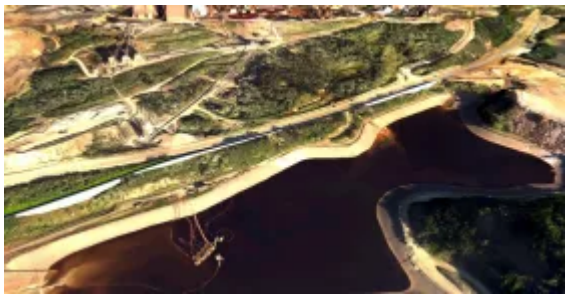
The topography of the existing terrain has a significant influence on the design of the conveying system. (Pictures: ©BEUMER Group GmbH & Co. KG)

BEUMER Group installed the first overland conveyor with horizontal curves as early as 1969. Since then, calculation methods and components such as idlers, belts and drives have undergone constant development, resulting in the

implementation of increasingly efficient conveying systems for routes that are often complex. Mine operators can use BEUMER curved troughed belt and pipe belt conveyors to transport raw materials over routes with steep inclines and narrow curve radii. “We can exactly match our systems to the required conveying task and topography,” says Dr. Kilian Neubert, Global Head of Mining at BEUMER Group. “We rely on state-of-the-art planning tools to provide our customers with an efficient, sustainable and cost-effective material flow.”

## Sustainability in Mining

Raw materials are needed to produce almost all industrial and consumer goods; however, extracting them has far-reaching effects on the environment and society. This is why mining companies constantly strive to make their extraction and processing operations even more efficient and sustainable, and such efforts are called for in the planning of a new mine.



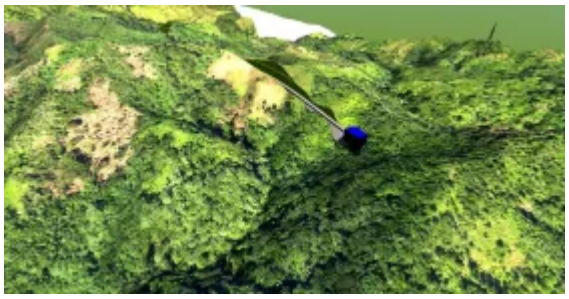
Long and difficult conveyor lines distances must be considered during the planning phase.

Mine operators must ensure that the population generally approves of the planned project. This approval can be obtained through extensive approval procedures, environmental impact studies, geo-monitoring, and the implementation of suitable risk management systems. “Mining companies need to build trust with the public,” Neubert explains. “For example, they need to involve the public and key stakeholders at an early stage of projects.” This is why operators need to integrate the issue of sustainability into all aspects of planning a mine and improve the environmental compatibility of the overall system by ensuring the efficient transport of ore and waste rock over longer distances. Optimised routing and the selection of suitable methods achieve these objectives

## The Fundamentals and Capabilities of modern Conveying Systems

No two conveying systems are alike, even if the primary task of transporting bulk material from A to B appears comparable. “We must adapt the components and

the system to the material to be conveyed," says Neubert. "The mass flow to be conveyed and height differences that need to be overcome over the length of the conveyor line are important factors that we must address when designing a system."



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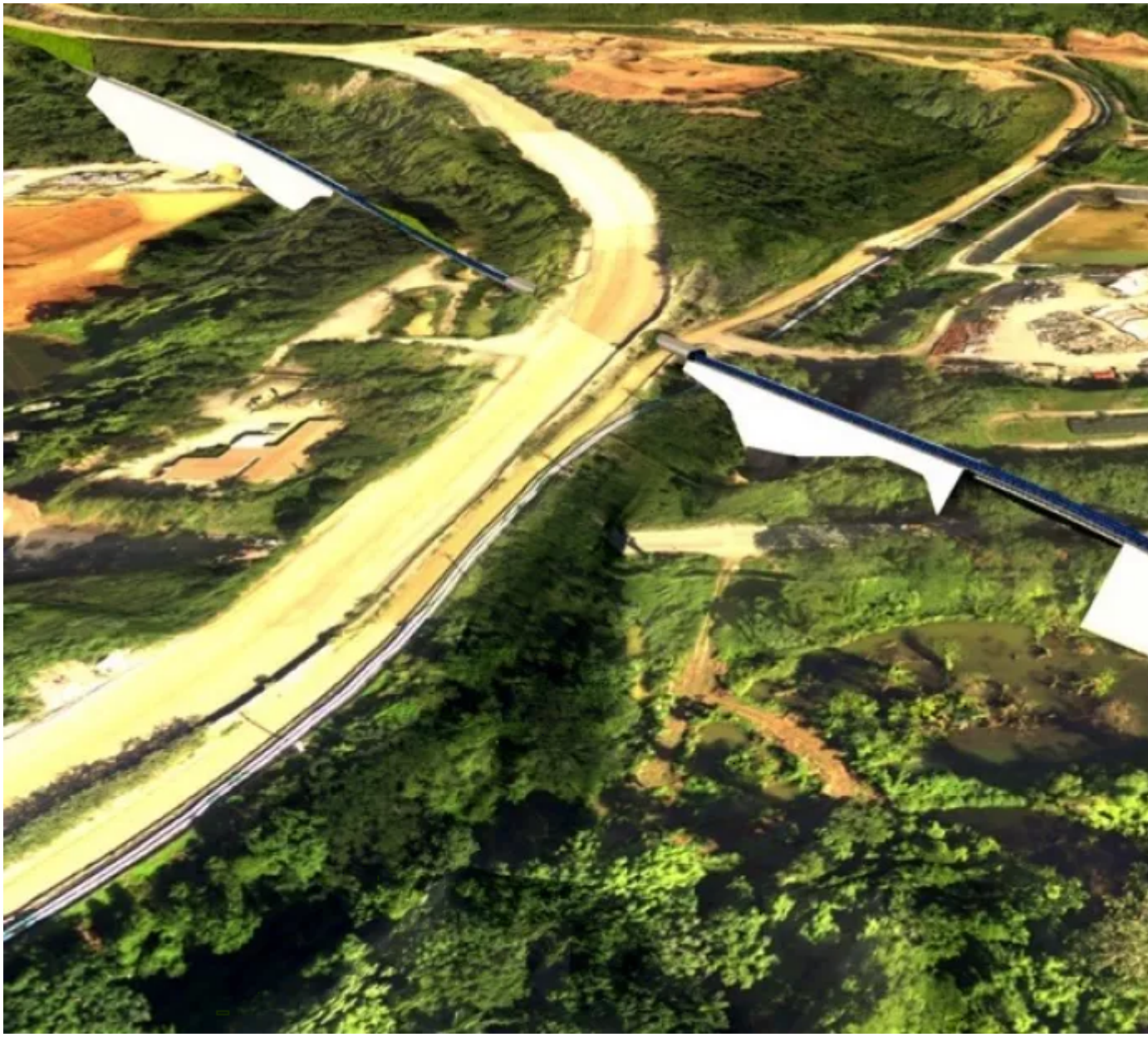
The energy consumption of long, horizontal belt conveyors is primarily determined by the main resistance in the upper and return strand in stationary operating conditions. This resistance consists of the running resistance of the idlers, the indentation rolling resistance, and the flexing resistance of both the conveyed material and the belt as they run over the idlers. The forces required to overcome these resistances depend on various operational and design parameters; however, they can be determined using the 'single resistance method.' If components with low running resistances are used, such as belts with reduced indentation rolling resistance or running-optimised idlers, the calculations of the systems nowadays show considerably lower tractive forces of the belt than those of a few years ago. This leads to lower energy costs, and smaller radii can also be selected for the horizontal curves thanks to the lower tractive forces of the conveyor belt.

The topography of the existing terrain also has a significant influence on the design of the conveying system. An in-depth analysis of various dynamic load cases and a thorough investigation of the technically feasible horizontal and vertical curve radii must be conducted to design the system in the most efficient and environmentally friendly way. This is especially true for longer and more difficult conveyor lines. Potential obstacles that must be considered during the planning phase include residential areas, roads, and rivers. "Today, we can design curved overland conveyors of up to twenty kilometres or longer without the need for a transfer tower," says Neubert. The conveying capacities of a system like this are more than 20,000 tons per hour.

## The right Layout

The BEUMER Overland Layouting Tool generates a digital 3D model of the conveyor in the virtual landscape during project planning – almost automatically.

“We use our BEUMER Overland Layouting Tool to ascertain the ideal layout for the system,” says Neubert. “It generates a digital 3D model of the conveyor in the virtual landscape during project planning, more or less automatically.” The critical topography data can either be provided by customers, or drones are used to capture terrain data. “These 3D visualisations are also ideal for supporting mining companies in their PR relations work,” explains BEUMER expert Neubert. Important factors such as ‘cut and fill’ volumes, i.e. the necessary excavation work, and the required steel structures for the conveyor can be evaluated and illustrated on this basis. “This procedure considerably accelerates the project planning process and enables us to provide project-critical data to the customer at an early stage of the project,” says Neubert.



A 3D model of terrain and conveyor: the advantages of earthworks (cut & fill) or steel

## Ongoing Development in Conveying Technology

The 1990s saw BEUMER Group start its development into one of today’s leading suppliers of pipe conveyors. In these systems, the idlers form the belt into a closed pipe that protects the material to be transported against external influences and the environment from emissions such as dust and odours. This conveying solution is therefore ideally suited for fine bulk materials such as ore concentrates. Pipe conveyors also allow tighter curve radii and greater angles of inclination compared to conventional troughed belt conveyors.

However, what if bulk material with large grain sizes requires a larger pipe diameter? The rule of thumb here is that the pipe diameter should be about three

times the maximum grain size. To solve this problem, the BEUMER Group developed the U-shape conveyor. “This variant combines the advantages of a troughed belt conveyor with those of a pipe conveyor,” says Neubert. The idlers form the belt into a U-shape rather than a pipe. The U-shape conveyor enables tighter curve radii than a troughed belt conveyor and higher mass flows than a pipe conveyor and also protects the conveyed material from environmental influences and the environment from material loss and emissions.