

Creating Value from Overburden

Valuable Rock Grade obtained from Contaminated Feed Material

The new dry process clay adhesions from screen waste produced in quarries and gravel pits. Operators report that they are able to convert more than 90 % of contaminated feed material into salable rock grade using the 'Combimix' system.

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Pictures: ©BHS Sonthofen GmbH

The dry Combimix process developed by BHS-Sonthofen removes clay adhesions from screen waste produced in quarries and gravel pits.

Operators report that they are able to convert more than 90% of contaminated feed material into salable rock grade using the Combimix system. At the same time, the dry process significantly reduces water, energy and material costs.

Many quarries contain large quantities of material contaminated with clay that has not been possible to be processed economically up to now. Frequently, the material has to be dumped at considerable expense as mining overburden.

However, wet treatment is one method that allows this material to be used. Washing and subsequent water treatment as well as sludge disposal is extremely costly. The process often fails because many quarries lack access to the volumes of water required. Dry processing in conventional continuous mixers using quick lime is also been problematic because the retention times of the material in the mixer are so short that the clay cannot blend adequately with the lime.

The solution: Variable Retention Time

The patented BHS Combimix system developed by BHS-Sonthofen offers an economical alternative and its practical suitability has already been proven in several quarries. The basic principle has been

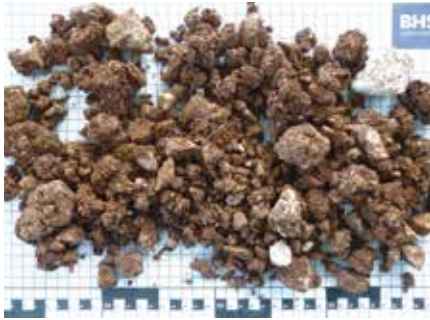
known for years but it has not been possible to implement the system due to various limitations in mixing technology: Mixing clay with quick lime changes the properties of the clay, which can then be reliably separated from the rock.

For the first time, twin-shaft continuous mixers of type DKXC allow regulation of the retention time of the material in the mixer within broad limits. The clay has enough time to mix intensively with the lime and detach from the rock. The intensive movement of material during the mixing process also assists the cleaning process.

After screening, the feed material is so clean that it is no longer classed as waste and can be sold. Grains greater than 5 mm in diameter that are largely free of clay can now be further processed in the gravel quarry. Grains less than 5 mm in diameter form a lime/clay mixture that can be sold to the agriculture industry, for example.

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Example of 0-40 mm feed material that is sticky, clayey and usually considered as waste product.



After the Combimix mixing process, screened material > 5 mm is transformed into a clean, salable end product with no clay adhesions.



After the Combimix mixing process, screened material < 5 mm containing clay with lime is transformed into salable end product.

Combination of Batch and Continuous Mixers

The Combimix process is based on the combination of twin-shaft batch and continuous mixers manufactured by BHS-Sonthofen. Unlike traditional continuous mixers, the retention time of the mixture in the Combimix system can be regulated within broad limits – from less than 30 to more than 100 seconds.

BHS regulates the retention time via a gate on the underside of the mixing trough. The company is the only manufacturer that offers a trough with this design. Extracted material is replaced with an equivalent volume of feed material. Continuous measurements are taken during this process to monitor the weight of the mixer. The quick lime is metered by a screw conveyor inside the mixer accord-

ing to the clay content in the feed material in a range of less than one or a maximum of five percent of the feed quantity.

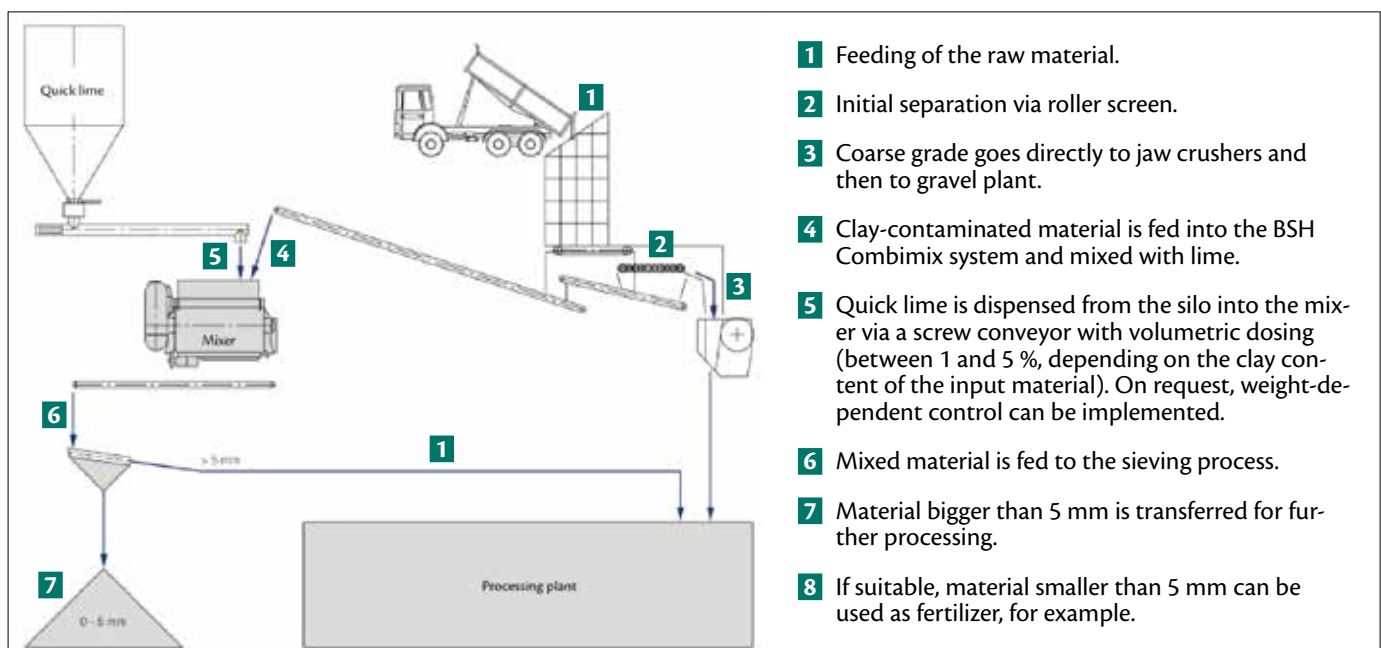
Together with the long retention time, the established three-dimensional mixing principle of the BHS-Sonthofen twin-shaft mixer makes an important contribution to achieving good results: The lime is mixed intensively with the clay so that the treated clay reliably separates from the rock. Costs for supplying water, reslurrying, filtering and disposing of the slurry are no longer incurred because the material is treated dry.

Practical Experience

BHS-Sonthofen manufactures different versions of mixer for throughputs between 85 and 1000 t/h. The grain size of the feed material can range up to 150 mm, depending on the mixer size.

BHS has installed the Combimix system in several quarries. One facility has been operating extremely successfully for several years in a quarry owned by the company Cemex based in France. Before the system was installed, more than 100,000 t of rock/clay mixture from the quarry had to be dumped every year. More than 90% of contaminated feed material is now sold as rock grade thanks to the Combimix system.

Jean-Serge Peret, plant manager at the Chateaubourg quarry owned by Cemex, is extremely pleased about the significant reduction in costs: "Before the mixer was installed, we had to break down 400,000 t of rock each year to obtain 300,000 t of salable material. The new procedure means we only require 330,000 t to achieve the same delivery quantity."



Example process diagram for dry treatment of clay-and-rock mixtures with the Combimix system (DKXC).