Optimising Salonit Anhovo's crushing process

When Slovenia-based producer Salonit Anhovo looked to optimise its primary crushing process, thyssenkrupp Cement Technologies implemented a modern, alternative system into an existing building. The new double-shaft hammer crusher was selected to handle demanding feed material and has improved raw material grinding efficiency.

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On the basis of a plant process audit carried out by thyssenkrupp service personnel at Salonit Anhovo's crushing and grinding plant in Slovenia, an exciting project arose in 2018-19.

The findings of the plant audit showed that the grain sizes produced by the existing primary crusher (type: HBK 25120) were too large. The crushing plant's output capacity was 500tph with a product size smaller than 70mm, which made it impossible to operate the downstream raw meal grinding plant efficiently. As this crusher was not able to achieve the required material fineness and throughput, an alternative primary crusher solution had to be found to eliminate the process bottleneck.

Salonit Anhovo's quarry base material presented challenging material properties in relation to hardness, abrasiveness and stickiness. To optimise the crushing process and improve investment and operating costs, different types of crushers were considered during this project stage. After several discussions and follow-up reference-plant visits, the customer decided to opt for a new double-shaft hammer crusher system.

thyssenkrupp recommended to Salonit Anhovo a double-shaft hammer crusher (type Titan crusher Ti70D160) to handle the demanding feed material and allow for future capacity increases

Finding the optimal crusher

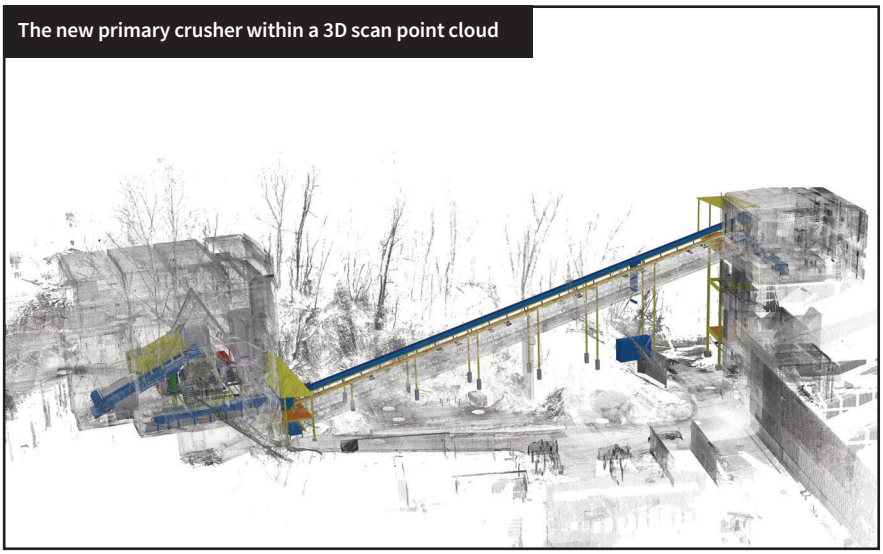
It was Salonit Anhovo's precondition to enhance the crushing plant's design capacity to 1000tph, with a crusher product size of smaller than 30mm. Furthermore, it was the producer's explicit wish to have a sufficiently-dimensioned crushing plant for future decades. As thyssenkrupp always strives for long-term and future-orientated solutions for its customers, the company agreed immediately.

After a detailed examination of the raw material and the project specifications, thyssenkrupp recommended a double-shaft hammer crusher (type: Titan Ti70D160), which performs its crushing operation by rotating hammers between the rotor and on the anvil. It was crucial to understand that the material should not be "ground" on the grate baskets. The grate baskets calibrate the material grain size by means of different openings to produce raw material either for ball mills (0-25mm) or for vertical roller mills (0-80mm).

A suitable location

After the optimal crusher had been identified, the next phase of the project was to find the location where the system should be installed. From the beginning, there were two possible scenarios: either a new semi-mobile crushing plant within the quarry, or the integration of a new crusher into the existing primary crusher building.

However, since integration into an existing system is not easy, a feasibility


The new primary crusher within a 3D scan point cloud

"We are now able to operate at a higher throughput of the plant, higher availability of the crushing line and reduced power consumption of the raw mills."

Tomaž Vuk, chief technology officer of Salonit Anhovo

study was carried out to identify whether integration into the existing building was possible.

Within the feasibility study, thyssenkrupp carried out a 3D scan of the existing installation. This scan and the resulting 3D model of the plant were the basis for all planning processes as well as the detailed engineering. Since the model illustrates the existing dimensions and local conditions, potential design collisions were avoided at an early stage. On the basis of the scan, the precise placement of the crusher was possible.

To avoid high costs across the entire project as well as complex approval work, the customer decided to focus on the integration of the new crushing system into the existing primary crusher building.


The Titan Ti70D160 crusher was successfully installed within six weeks

Defining the plant set-up

After feasibility was successfully ensured, various details were discussed in the project phase to define the optimal set-up of the crushing plant according to the site conditions.

Since the raw material is very sticky, especially in winter, a wide variety of factors needed to be taken into account during the planning phase. In addition to the arrangement, material chutes and the new buffer bin silo before the pre-blending bed stacker were adapted to the local raw material conditions.

Moisture, the degree of wear and occasional tramp metal on the raw material side were other challenges. To have an optimal set-up to counter wear and tear, special "tk-Dur" quality hammers with metal matrix composite (MMC) inserts were used. Furthermore, thyssenkrupp considered special material qualities and a special grate bar distribution within the grate basket area to ensure the best set-up for the fed raw material.

Digitalisation and maintenance reduction

In terms of digitalisation and maintenance reduction, the crusher was equipped with some special features. Besides an automatic lubrication system and a nearly maintenance-free apron feeder system, thyssenkrupp also considered a vibration monitoring system for the rotor bearings. As usual, all bearings were equipped with temperature sensors at the same time.

For the material chutes downstream of the crusher, it was requested that level

sensors be considered for monitoring the chutes and enabling the detection of blockages at an early stage.

To protect the crusher apron feeder against deformation, a level measurement system was installed.

Engineering of the plant control system has been set up so that the crusher can be operated autonomously without personnel. The system is run by monitoring the power consumption of the crusher and regulating the speed of the feeding apron feeder.

Project delivery

After all technical and commercial details were clarified, Salonit Anhovo awarded the contract to thyssenkrupp to deliver the engineering and the necessary machines for this project.

In addition to the crushing system, thyssenkrupp delivered the associated conveyor systems comprising three belt conveyors (total length: 123m centre-to-centre) – including magnetic separators and belt scales, and one lightweight silo discharge apron feeder (type: RKFL 1400 x 4000-D4) for transporting the crusher product to the blending bed.

The project scope also included basic engineering for automation, detailed engineering for the required new steel structures, chutes and engineering for an intermediate bin.

The automation engineering in conjunction with the digitalisation equipment leads to an optimised and smooth crushing process, with the focus on predictive maintenance and production cost reduction. All sensors were integrated into the plant control system.

All contract-related engineering works were carried out entirely by thyssenkrupp, while all machine components were sourced from Europe and neighbouring countries.

Salonit Anhovo was responsible for the supply of the steel structures, the local manufacturing of chutes and parts related to machines, as well as the execution of the foundation and assembly works.

To reduce plant downtime, various machine parts were pre-assembled outside the crusher building while being adapted to accommodate the new plant.

Preliminary and final assembly of the equipment was conducted by the customer with technical assistance from thyssenkrupp at the Anhovo plant. Production resumed after only six weeks – half the time typically needed for such a revamp. This record was made possible by the excellent cooperation of the 'Service Revamps Cement' team from thyssenkrupp Cement Technologies with the customer.

As a result, output from the new and modern crushing plant was increased significantly, thus preparing the customer's plant for the future.

Conclusion

The Titan Ti70D160 crusher supplied to Salonit Anhovo is suitable for difficult raw material mixtures of very hard limestone and sticky clay. It produces crushed raw material with a particle size of less than 30mm. The goal of improving raw material grinding efficiency in the ball mills has been achieved. Moreover, it was achieved by making extensive use of existing infrastructure and equipment.

Commenting on the project, Tomaž Vuk, chief technology officer of Salonit Anhovo, said: "Although the project has some conflicting and challenging demands, it met all the important expectations. The success was the result of good project preparation and design, as well as very good cooperation of all involved parties.

"We are now able to operate at a higher throughput of the plant, higher availability of the crushing line and reduced power consumption of the raw mills. I am proud of our engineering team and I am grateful to thyssenkrupp for carrying out a successful project." ■

Steel construction with intermediate bin