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After supplying two drymix mortar plants to Thailand's biggest cement and mortar manufacturing company in 2011 and 2013, in 2015 Rhewum GmbH was contracted with the supply of two additional drymix mortar screening plants with an annual production capacity of 1 000 000 t each.

TEXT Dipl.-Ing. Thorsten Middelhof, Area Sales Manager, Rhewum GmbH, Remscheid/Germany



All Rhewum GmbH

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High-performance screening plants for the production of high-quality drymix mortar in Thailand

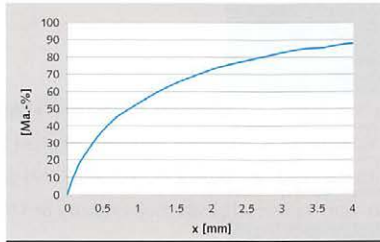
1 Introduction

Rhewum GmbH is an independent family owned company which was founded in 1927 as "Rheinische Werkzeug- und Maschinenfabrik". The headquarters are based in Remscheid/Germany,

an important center of metal processing in the so-called "Bergisches Land".

Since the beginning of the 1950s Rhewum has been developing and manufacturing screening machines as well as vibrating feeders. These cover the

1 Particle size distribution of the feed material



entire field of dry and wet screens for a vast variety of applications for leading companies worldwide. The development of highly efficient air classifiers is the logical extension of our activities for the near future of the company.

2 Project description

Due to their references in the mortar industry Rhewum GmbH was initially approached in 2011 to supply a drymix mortar screening plant to Thailand with five different screen cuts ranging from 2.36 mm (8 mesh) down to 0.15 mm (100 mesh) and an annual product output of 500 000 t/a, which was delivered within the same year. In 2012 Rhewum was again contracted with the supply of another screening plant with similar properties, however with an annual product output of 1 million t to be supplied in the following year. Two

more additional screening plants of the same size were ordered by the same customer in 2015 to boost their overall annual dry mortar production from 5.5 million t in 2015 to 7.5 million t in 2016.

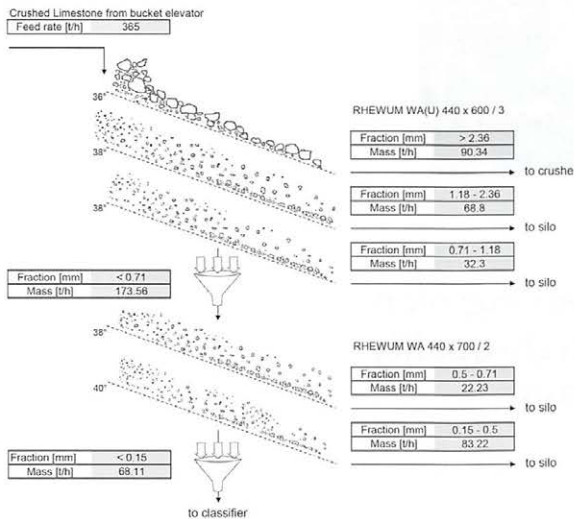
These two screening plants shall handle a feed rate of already 365 t/h of limestone each in a wide particle range, which will be screened into six different fractions. Particles coarser than 2.36 mm have to be recirculated via a crusher. The five fractions needed to produce various grades of drymix mortar are 1.18 mm to 2.36 mm, 0.71 mm to 1.18 mm, 0.50 mm to 0.71 mm, 0.15 mm to 0.50 mm and 0 to 0.15 mm, which again are split into two fractions of 0 to 0.09 mm and 0.09 mm to 0.15 mm.

3 Challenges

One major reason the client decided in favor of Rhewum with the supply of the screening machines was that the screening plant can be located high above the silos. To keep construction costs economical, this calls for screening machines which only barely transmit any dynamic load into the steel structure underneath. Due to Rhewum's patented drive system with direct-excited screen cloths and a static housing, dynamic loads are 20 times less compared to the old design of circular or linear motion screening machines.

Another reason the client chose Rhewum screens was that he required a high product purity of at least 85 % in all major fractions, especially the highly valuable fractions. Screening fine materials with a high efficiency at high feed rates requires a precise adjustment of all machine parts. This is only possible on precisely working, high quality equipment. The setting of the ideal amplitude for each screen deck has to be adjusted individually. Keeping in mind the fluctuation of granulometry of the heterogeneous limestone feed material, the amplitude on each screening deck has to be able to be adapted quickly to the steadily changing feed material characteristics. The electromagnetic drives of the Rhewum WA screening machine allow the customer to change the amplitude live in process, while screening machines driven by electromechanical eccentric motors cannot provide this unique feature.

Another challenge is the likeliness of crushed limestone particles getting stuck in the screen mesh, thus clogging the screen cloth and reducing the capacity of the process and the purity of the product. Both Rhewum's direct-excited WAU screening machine with small unbalanced motors and the likewise direct-excited WA with electromagnetic drives have pre-installed self-cleaning mechanisms to prevent clogging. While the WAU achieves accelerations of the screen cloths of up to



2 Mass flow diagram of the screening plant

10 g, which is enough to keep meshes with openings of 1 mm and more reliably free, the WA achieves 15 g during the cleaning cycle, keeping even the 0.15 mm mesh free from clogging.

4 Plant setup

4.1 Installation of feeders

The limestone feed first enters the screening plant from the bucket elevator into the top-located, dust-tight flange connected chute. The λ -shaped chute embodies a pneumatically adjustable flap, which divides the on-coming material stream into two streams during standard operation. It is also possible to divert the material flow onto one half of the screening plant, which is practical either for maintenance purposes or in case the production capacity should be temporarily lowered.

The two Rheum SV 4400 screen feeders contain an inner distributing plate which conveys and distributes the limestone feed material equally over the full width of the downstream screening machines. The inner plate is driven by two counter-rotating unbalanced motors creating a linear motion, while the feeders' housing remains static. The static housing is crucial to ensure a permanent dust-tight flange connection of all machine parts, which is essential for processing fine materials.

4.2 Installation of coarse screens

The coarse screens are two direct-excited WA(U) screening machines with a screening surface of 26.4 m² each on all three screen decks on both sides. The upper deck for the 2.36 mm screen cut and the middle deck for the 1.18 mm screen cut are driven by small unbalanced motors (type WAU). The lower deck for the 0.71 mm cut is driven by electromagnetic vibrating heads (type WA). Both types of drives have a power consumption of only 0.16 kW per drive.

Due to the higher number of small drives compared to conventional screens with a small number of larger motors, Rheum's direct-excited screens are highly reliable. In case one or two of the small drives fail during operation, the process does not have to be stopped, the drive can be replaced while the others are still running, continuing the process.

Each inlet and outlet half of each screen deck or screen cloth may have its individual amplitude and self-cleaning interval to maximize the efficiency for every fraction. Every screen cloth can be changed individually without removing the other, which is very useful considering that the wear of the screen cloths can lead to individual maintenance intervals. Overflows from each deck are collected and discharged via an overflow chute, which is pivoted to access the cloth tensioning system for the outlet half of each deck. The inlet half can be reached by comfortable inspection doors on the backside on top of the screening machines, just below the feeders. The tensioning system is optimized for quick tensioning

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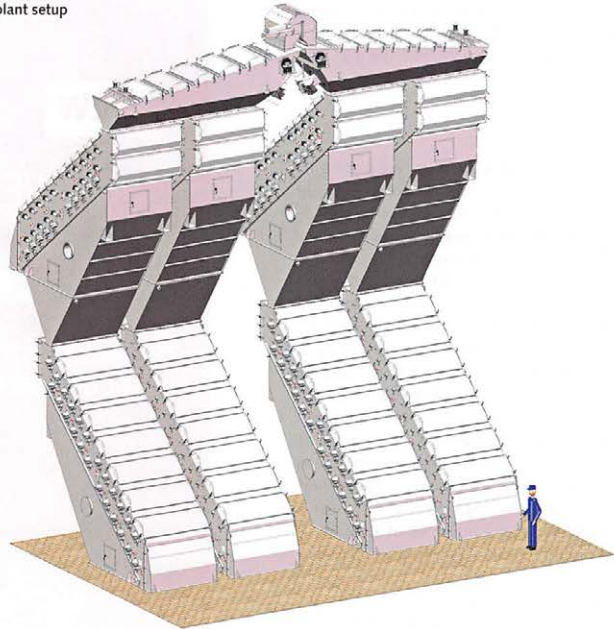
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3 Screening plant setup

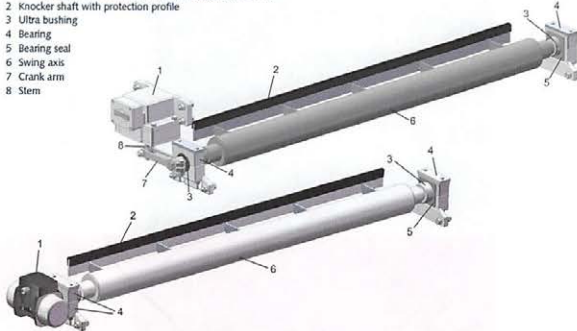


and easy changing of the cloths, which takes two skilled workers only about five minutes per mesh. The covers are made of aluminium for easy handling due to the low weight of only 18 kg. No cranes are required.

4.3 Installation of fine screens

From the underflow hopper and chute the material finer than 0.71 mm enters the fine screens – two WA screening machines equipped with electromagnetic drives for direct-excitement of the screen cloths. The width of the fine screens is identical to the coarse screens, but the length is enhanced by additional 1000 mm to ensure the highest possible efficiency even for the more difficult to screen fractions below 0.50 mm and 0.15 mm. Also at this screening stage the overflow streams are collected and discharged into the silos by an overflow chute, while the underflow is being collected by an under hopper and conveyed into an air classifier to take out the filler material.

- 1 Drive – top: Unbalanced motor (type WAU)
– bottom: Electromagnetic vibrating head (type WA)
- 2 Knocker shaft with protection profile
- 3 Ultra bushing
- 4 Bearing
- 5 Bearing seal
- 6 Swing axis
- 7 Crank arm
- 8 Stem



4 Rhewum drive units for direct excitation of screen cloths

4.4 Electrical control unit

The screening plant is controlled by a centralized PLC and four decentralized control cabinets – one for each side of each screening stage. Positions for the flap of the λ-shaped chute can be set either via the PLC or manually from the control cabinet. The amplitudes of the electromagnetically driven screening decks can be adjusted separately for the screen inlet and outlet half of each deck via the thyristor controllers installed in the control

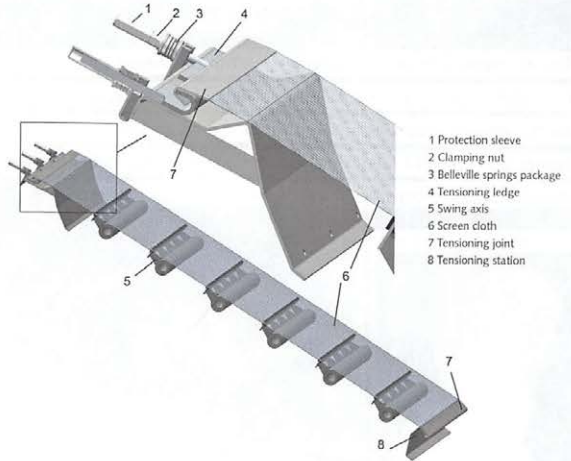
cabinets. The automatically running self-cleaning cycles can be set either via the PLC or manually from the control cabinets. Motor brakes for the unbalanced motors of the SV feeders ensure a smooth starting and stopping phase.

5 Summary

Together with its customer, Rheum GmbH designed, supplied and commissioned highly efficient and flexible drymix mortar screening plants, which contribute to strengthen the customer's position as the leader of drymix mortar manufacturers in Thailand. The entire screening plant consumes a total of only 43.4 kW, which means only 0.13 kWh per ton of processed material.

The supplied state-of-the-art screening plants are a product of Rheum's tremendous experience in limestone screening gained over several decades and recent developments that were implemented to achieve and surpass the customer's challenging demands in terms of capacity and efficiency.

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5 Screen cloth tensioning system

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