

GOOD VIBRATIONS

Dieter Uebler,
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vibration technology for
coal handling.

The port in the province of Tianjin, 200 km from Beijing, China, serves as the central distribution point for the supply of coal to the country's power plants and steel mills. To meet the users' high demand, the coal is graded at the port in a screening plant before shipment. The enormously high flow of material – up to 10 000 m³/h – requires special technology and comprehensive knowhow.

Working with a local plant engineering company, Jöst Germany was awarded the contract to supply two high-capacity mechanical screens and feed chutes, for the Tianjin project to the following specifications:

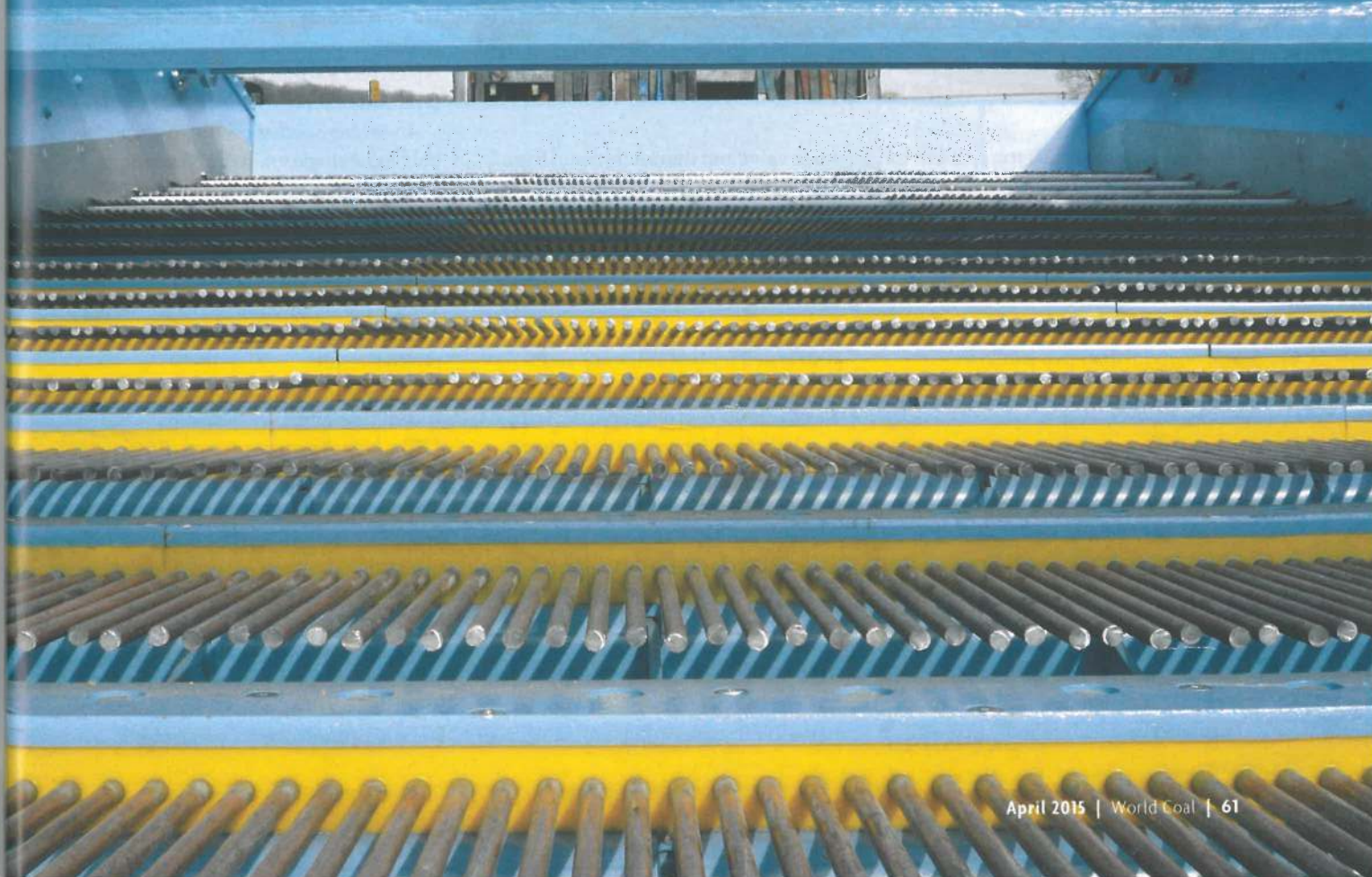




Figure 1. Non-blinding screen type SRGN 4000 x 8000.



Figure 2. Rod finger system: STABROFLEX.

- Material flow: 8000 tph coal (up to 10 000 m³/hr).
- Screen cut: 60, 120 or 160 mm.
- Coal moisture content up to 14%.
- Material feed via a 2.6 m wide belt conveyor at a speed of 5.9 m/sec.
- Division of the flow of material into no more than two subflows.
- Subsequent pooling of screen overflows.

A difficult challenge on this project was that the coal feed from a single conveyor had to be split uniformly to two screens.

A special substructure diverted the material flow from the belt to a temporary storage bunker. The bunker's filling level was continuously monitored. The rate of material extraction was regulated by a hydraulically operated

knife valve and the downstream feed chutes, which featured variable delivery rates and also performed the bunker extraction function simultaneously. The two 3.8 x 4.0 m vibrating feeders in front of the screens were designed in such a way that the material was evenly distributed for best efficiency and maximum utilisation of the screen area. Key to the success of the project were two linear-motion vibrating banana screens. These high-capacity mechanical screens each had a screening area of 4.0 x 8.3 m (33.2 m²).

A unique slotted screen deck was designed by Jöst to handle the moist and very sticky coal product. The slotted grid system's segmental design assures high throughput rates and can be replaced quickly. Different screendeck angles make it possible to achieve different conveying

rates on the screen. This way the product layer in the feed zone remains so thin that bridging and blinding as a result of material pressure is virtually impossible. The conveying speed on the discharge end is reduced sufficiently to ensure that a very high proportion of screening particles that are close to the screen cut size can be separated efficiently.

These high-capacity vibrating screens, with an oscillating mass of 33 t, were optimised by Jöst's designers using finite element analysis (FEA). Only two of the company's Type JR exciters are required for the drive system. The stroke can be continuously adjusted and frequency can be matched to the various feed particle sizes and distribution.

Preclassifying coal at a French power plant

Before the coal can be treated at the power plant, it must be preclassified to prevent coarse material from impeding further processing. This must take place irrespective of weather conditions. Even after days of rainfall, a hard to handle coal slurry must be classified. Jöst has solved this problem on behalf of a German equipment manufacturer for a French coal-fired power plant.

For the first step of classification, the operators used a roller screen which was fed by a feeding belt conveyor. The maximum possible particle size could not exceed 500 mm due to an upstream layer height limit.

In severe weather conditions, not only loose single grains but big lumps were transported over the screen deck under the assumption that they could not be classified. But this material can be classified: after it was treated using Jöst vibrating technology, a test run was done with a coarse separator with positive results.

The solution for this application was a specially designed, shaft-driven 1200 x 4800 Jöst grizzly screen. The shaft drive was placed off-centre to handle the extremely high load, especially in the feeding area. The grizzly reaches acceleration values at a maximum stroke over 5 g and can therefore break up the large, contiguous chunks of material. Special care was also taken to minimise potential for build up inside the machine. Inside the very steep side and end walls, Jöst used a particularly smooth plastic

liner. For this application, no inlet bottom was used in order to avoid dead spots.

While the grizzly was designed for a feed capacity of 300 tph coal slurry, the actual performance has almost doubled at a screen cut of approximately 100 mm.

Additional special applications for Jöst screens include fine coal screenings with moisture content up to 12%. This is vital for power plants that burn both domestic and imported coal. The quality of the latter does not always meet the required

specifications. Here, linear vibrating screens with special screen decks are used, which can handle screen cuts up to 7 mm and remain almost clog-free.

For even smaller screen cuts of products with high moisture content, the flip-flow Oscilla screen is required. Extremely sticky materials may require the clog-free Grecco screen. For conventional screening of coal and lignite, time-tested and reliable circular and linear motion screens are available,


as well as the pulverised coal injection control screens that can be designed to accommodate a particular application.

Preclassification at a Mongolian coal processing plant

For a raw coal processing plant in Baotou in Inner Mongolia, Jöst supplied non-blinding screens for a dry preclassification with a total capacity of 1200 tph. Because water supply in

Mongolia is very limited, wet classification is very difficult, complex and expensive. At the same time the raw coal in Baotou has a significant content of clay and is sticky and difficult to screen consistently. For such material, wet sorting screens are normally the machine of choice.

The solution: a water saving, dry preclassification with high acceleration. The first test runs of the customer using extremely high acceleration values failed. Machines with screen areas of more than 30 m³ experienced cracking and drive failures. Substituting flip-flow screens did not deliver success. The solution proved to be Jöst's special bar screens, which concentrate high acceleration values while protecting the drive and screen box. The proper screening result is guaranteed as demonstrated by intensive test runs.

The screen body is designed in best practice via FEA and is powered by a robust Jöst exciter. Special cross members take the over-the-segmental-clamping of the bar screen system. Each screen can be fed with raw coal up to 600 tph. The smallest screen cut is 13 mm. The machines have an effective screen width of 4000 mm and a length of 8000 mm. Without isolation frame the screens weight 32 t per piece. Jöst supplied these screens as part of a major order that also included several large screens for preclassification and fines classification, as well as the dewatering of the treated coal and mountain material. 

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