

Weir Minerals' ETO-solution for Nigerian iron ore mine

Challenging process parameters on a Nigerian iron ore project have showcased the design capability of Weir Minerals, as it develops an engineered-to-order (ETO) solution for its mining customer.

Introducing a ground-breaking engineered-to-order (ETO) project for an iron ore mine in Nigeria, Tiisetso Masekwameng, general manager comminution at Weir Minerals Africa says: "The flowsheet we designed includes a crushing and screening circuit, a washing circuit to remove high levels of clay and an Enduron high-pressure grinding roll (HPGR) circuit. The solution also includes two of the largest Enduron classification screens ever engineered and manufactured by Weir Minerals."

In addition, two large Trio® apron feeders have been designed and manufactured locally in South Africa to meet the scale of this project. The two Trio® apron feeders – 2.0x8.0 m in size – will each transfer 750 t of ore per hour with a maximum feed top size of 900 mm.

"In cases like this, we bring in our highly

experienced and well-resourced engineering team to provide a customised product and solution," says Masekwameng. She highlights that the iron ore project will process 1.200 t/h of hematite ore, with a top feed size of 900 mm and a targeted product size of less than 1.0 mm.

"Among the challenges posed by the ore's characteristics were its high moisture content of 15% and clay content of 18%," she says.

As part of its commitment to ongoing research and development, Weir Minerals established its Separation Technology Group in 2017. "This put us in a strong position to respond to this customer's requirements, as we had already prioritised the development of our Enduron double-deck banana screen range to complement our Enduron HPGR offering," says Steven Hunter, separation technology group leader at Weir Minerals Africa.

While the company's existing Enduron® screen range provided a benchmark for the larger unit under design, Hunter emphasises that the two 51 t double deck banana screens (DBHG 43/97) for this project were designed from scratch. The scale of these screens is considerable, with widths of 4.3 m and length of 9.7 m, enabling delivery capacities of 1.750 t/h. The screen's top deck aperture is 3.0 mm, with a bottom deck aperture of 1.0 mm and maximum feed top size of 40 mm.

"Given the size and nature of the screens, we focused on optimising the design," says Hunter. "This meant minimising mass without compromising structural integrity."

The bridge, cross-beams and side-plates, which are the main structural members of the machine, were subject to extensive finite element analysis (FEA) to ensure the units were fit-for-purpose while still being light enough

to be driven by the exciters. The screens are also Syntertex®-enabled; which is an Internet-of-Things (IIoT) platform that remotely monitors machines to alleviate the need for technicians to do this manually. The system will measure the machine's performance and the health of its wear and spare parts, in addition to alerting operators to any deviations arising that may require proactive attention.

Given the mine's relatively remote location, Hunter says the Enduron® banana screens were also designed with logistics in mind. It was anticipated that factors such as transportation, rigging and assembly may present difficulties. These were considered during the design and engineering process, resulting in the inclusion of aspects such as lifting lugs, jacking points and removable suspension brackets.

"To efficiently process the ore, the screen

is required to run at a stroke of 9.4 mm under gravitational force of 4.6 G," he says. "To move that amount of mass, the machine needs large exciters, which we had also started developing."

The result was Weir Minerals Africa's largest exciter, the Enduron® LTX 10, boasting 120 t of excitation force at its maximum setting, and built in its Alrode facility in Gauteng, South Africa. Each screen requires two LTX 10 exciters to achieve the required operating parameters.

"The development of the exciters meant close collaboration between the Research & Development and production teams to manufacture the four LTX 10 units to our high standard of quality and reliability," he says.

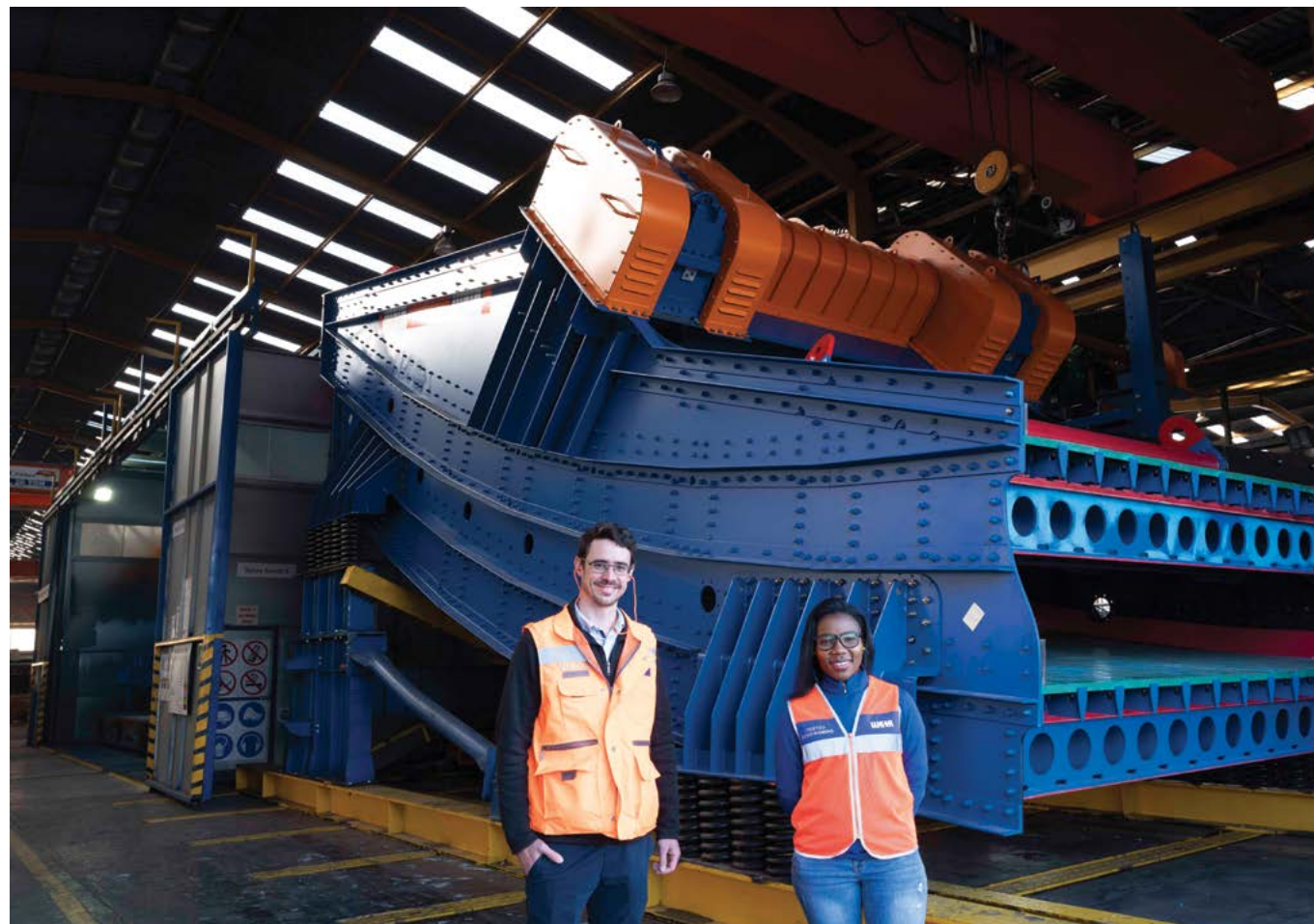
The order for Nigeria also includes two Trio® jaw crushers, two Trio® cone crushers, two large 2x8 m Trio® apron feeders, two Trio®

pan feeders, eight Enduron® vibrating screens and an Enduron® high-pressure grinding roll (HPGR). The Enduron® HPGR supplied by Weir Minerals is a 240/260 model, with a 2.4 m diameter and 2.6 m width. This HPGR is capable of processing 3.720 t/h with a maximum feed top size of 50 mm.

For the clay washing circuit, Weir Minerals Africa will supply the mine with a Trio® twin-shaft blade mill with capacity for 700 t per hour of material up to 70 mm; Trio® twin-shaft coarse washers, each capable of treating 350 t/h with a feed top size of about 60 mm; as well as Warman® slurry pumps.

After the equipment is successfully commissioned, the Weir Minerals team will continue to support the customer, providing local assistance and expertise through the Weir Minerals global service network.

www.minerals.weir



Steven Hunter, technology group leader separation at Weir Minerals Africa and Tiisetso Masekwameng, general manager comminution at Weir Minerals Africa.



A view of one of the 2x8 m Trio® apron feeders under construction at Weir Minerals' Alrode facility in Gauteng.



Two locally designed Trio apron feeders can each transfer 750 t/h of iron ore.



Two 51 t double deck Enduron DBHG 43/97 banana screens were designed from scratch, with the engineering team focusing on minimising mass without compromising structural integrity.