Understanding design choices for vibrating screens

As a leading screening OEM, Kwatani is working hard to raise awareness about the advantages and disadvantages of diverse vibrating screen technologies, making it easier for users to make informed decisions

"When a customer considers options for a screening machine, there are a number of good technologies to choose from," says Kwatani CEO, Kim Schoepflin. "The appropriate technology choice will depend on the application, and we believe there is a space for every technology."

Brute force screening is the most common technology employed among mining screens. Its benefits include being generally cost effective, relatively simple to maintain and economic in terms of life cycle costs, which translate to lower total cost of ownership (TCO).

"Having the mechanical and metallurgical knowledge in-house, Kwatani can provide the technology that best suits the application," she says. "We are not tied to one technology, and our primary focus is on understanding exactly what the customer needs, and providing a solution that is engineered for tonnage."

Twin-mass or resonant screens, which run very close to a natural frequency, have a self-amplification benefit, continues Kenny Mayhew-Ridgers, Kwatani's chief operating officer, adding that this gives the screen a greater energy-efficiency. "There are, however, limits on the size of these units. In addition, maintenance is more costly as springs or rubbers must be changed regularly or the efficiency benefit is lost," he says.

A large Kwatani triple deck screen for a diamond mine.

Mayhew-Ridgers notes that twin-mass screens also tend to be heavier. This can cause confusion when presenting technology comparisons to customers.

"Often the overall mass of the twin-mass screen is compared with the mass of the brute force screen, and this is obviously not correct," he says. "Rather, it is the deck sizes that must be compared, as this is the element that does the work."

While the mechanics that drive the screening process is different, the motion of the panel is what is important. This is where interaction occurs between the particles and the screen panels. The efficiency of the process then depends on the screen's speed, frequency, drive angle and movement of the panel relative to the particles.

While some proponents will generalise about common challenges with brute force screens, Mayhew-Ridgers notes that these observations are seldom valid. Various manufacturers offer a range of brute force technology solutions, each with its own benefits.

Schoepflin describes Kwatani as a company that works to raise awareness in the industry about what each technology is about. This makes it easier for users to make informed decisions about the technologies they choose. She says it is important for users to be confident that their chosen screen is well supported by local experts.

"It is vital for OEMs to prioritise the customer's application when considering the basic screen technology and design. While optimising screen panels to achieve higher screening efficiency is always an option, it is not the silver bullet," she concludes. ❑

Weba Chutes to optimise silo ore flow for South African gold mine

Specially designed ore silo chutes from Weba Chute Systems will be installed at a South African gold mine to reduce mill wear and other processing challenges caused by the uncontrolled flow of mined material into the mills.

One of the specially designed ore silo chutes from Weba Chute Systems installed at a South African gold mine.

Developed in collaboration with Kwatani, Weba Chute System's solution is tasked to deal with frequent large-size material as the mine has no crushing stage before the milling circuit.

According to Weba Chute Systems technical advisor Alec Bond, the over-feeding of material through the existing manually-operated chutes is causing regular 'mill vomit' in the mine's four mills. The inconsistent feed exacerbates wear on mill bearings as the material's weight shifts forwards and backwards inside the mill.

The waves of material which cause the 'mill vomit' carry insufficiently milled material out of the mill, including large chunks of rock. This leads to problems for the downstream mineral processing facilities, including inefficient recovery in flotation cells and even blockages in pumps, says Bond.

"The challenge starts with the existing chutes – requiring constant supervision and control by operators – being opened and closed with a chain block device," says Bond. "Our solution was to design a robust, self-controlling chute and feeder system that would ensure an even flow of material into the mills."

The mine's existing system has no means of closing the silo outlet; any maintenance at the chute area requires the emptying of the silo and stoppage of the mill. Each of the four silos has three outlet chutes.

"We therefore added a spile bar arrangement which seals off the silo," says Weba Chute Systems designer Wesley Hunkin. "The chute, which is choke fed, is placed under this installation. This allows the feed rate to be controlled by the Kwatani feeder, which has been integrated into the chute design."

A serious challenge is over-sized rocks in the ore feed, which can be up to 800 mm in size. This makes it important for chute designs to accommodate the worst-case scenario of chutes choking, says Hunkin.

He highlights that the flow of material is also controlled to prevent direct impact onto the conveyor belt feeding the mills, and to ensure central loading onto the centre of the belt.

"If the material from the feeder is biased to the one side, our chute brings everything to the centre of the conveyor," he says. "This enhances the consistency of material flow into the mill.

"Our solution promises direct savings in terms of mill bearings, as well as less mill downtime. There will also be significant gains in terms of recovery rates in the plant if the flow and size of milled material can be improved," Hunkin concludes. ❑

mixedROW™: Two flotation technologies in one

FLSmidth's desire to improve and innovate has led to the development of the mixedROW™ Flotation System, a design that combines two advances – nextSTEP™ forced air and WEMCO® self-aspirating technologies. This flotation solution resolves challenges presented by older flotation systems. In short, mixedROW™ provides boosted productivity, a reduced environmental footprint and higher profitability.

The mixedROW Flotation System exploits the characteristics of two separate technologies. The nextSTEP machines are placed at the beginning of the row, where they can recover coarse material using the least amount of energy possible. Because of this positioning, mixedROW lowers energy consumption by between 15-40% and increases recovery by up to 5%.

The WEMCO machines are placed at the end of the row, which increases both coarse and fine particle recovery, as a wide range of particle sizes can be treated. The elevated rotor position within the machine also reduced energy consumption because the froth only has a short distance to travel.

MixedROW also has the lowest head loss on the market, due to its carefully engineered system of dart valves that allows efficient transfer of slurry from one tank to another without significant losses. The mixedROW can be adapted to whatever application it is needed, making it a highly flexible and effective solution.

Until quite recently, flotation loses were commonly 50%, reaching as high as 90% for coarse particles. Looking to resolve these substantial losses, FLSmidth's goal was to create a product that allowed customers to have more control over the froth recovery process. With this in mind, the Froth Recovery Upgrade Package was designed. It offers a range of equipment that has been engineered to improve the productivity of froth recovery, while minimising the losses of valuable particles.

Redesigned features include: the use of actuators to control the position of the improved dart valves inside the flotation cells; level sensors to sense slurry levels at the highest accuracy on the market; andradial froth crowders that reduce top-of-froth surface area and increase froth movement to the nearest radial launder, enabling deeper froth or faster froth removal.

The result of the new and improved designs are quicker reactions to flow and slurry density changes, which dramatically boosts the performance of flotation machines. All the elements working together in combination with radial froth crowders means this package will deliver better recovery at the same grade or increased grade at the same recovery. ❑

FLSmidth's mixedROW flotation technology offers the lowest head loss on the market, due to its carefully engineered system of dart valves that allows efficient transfer of slurry from one tank to another without significant losses.