

African

Mining Brief

November - December 2019, Vol. 14 No.6

Africa's Leading Mining Journal

Operating and Managing Cyclone Construction

Inside...

- Curbing illegal mining
- Columbus Stainless Steel stays competitive despite cheap imports



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Cover Image: Cyclone Projects & Consulting's cyclone tailings dam construction technique at Damtshaa diamond mine in Botswana

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Contents

November - December 2019, Volume 14 No.6

Methane gas detection <i>Effective gas detection lowers risk of explosion</i>	3
Core trays <i>Reasons for proper core storage</i>	8
Industrial air filtration <i>Brasco's dust extraction capability</i>	17
Water Cooled Chillers for Mining and Allied Industries	26
Activated carbon <i>Activated purification</i>	33
Repowering dewatering pumps for mining projects	38
Railbound Transport Solutions	45
Portable industrial label printers (Locomotives) for mines	52
Pipeline integrity testing <i>Effective inspection, high pipeline uptime</i>	59
Mobile racking in South African fruit stores <i>Mobile racking in South African fruit stores</i>	66
Industrial LED light towers for mining projects <i>Placing mines in a favourable light</i>	72

Editor's word

Paucity of Planning 101 plunges us into darkness

'Failing to plan is planning to fail' may sound a hackneyed expression, but it pretty sums up the cause of the current sorry state of the archetypal African state-owned power utility: dysfunctional, debt-ridden, directionless and pretty much dead. It is the reason ten-hour power cuts (euphemistically termed 'loadshedding') have become more predictable for the few that are privileged to have access to electricity in sub-Saharan Africa than steady supply.

There is a common thread in the crisis. Governments, sole shareholders of the power utility organisations, did not regard increasing power generation capacity as a priority, preposterously ignoring sage advice to build more power plants. Plans for maintenance programmes and meeting potential growth in demand - a basic requirement in any organisation, if at all they existed, were not well implemented. Now, even existing power plants are either on their last legs or in dire need for maintenance.

Thanks to paucity of planning 101, we are plunged into darkness. Now we have to bear the consequences.

Jimmy Swira

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X-Line - Screening the impossible

Multi-Frequency Vibration (MFV) deagglomerates particles by overcoming the interparticle adhesive forces by imparting G-forces above 100G: this allows the effective screening of sticky material, but also prevents bridging of fine material which results in screen blinding.

The X-Line product line is Virto-Cuccolini Group's patented Multi-Frequency Vibration (MFV) screen technology. This technology has been perfected over many years through meticulous research and development. The MFV technology is applicable in both dry and wet applications. This technology provides high energy screening over a multi-frequency range directly to the screening surface: this means the screen structure is isolated from this high energy and it does not compromise the screen's structural integrity.

The MFV technology deagglomerates particles by overcoming the interparticle adhesive forces by imparting G-forces above 100G: this allows the effective screening of sticky material, but also prevents bridging of fine material which results in screen blinding. Furthermore, the MFV technology serves as a mesh self-cleaning system that overcomes screen pegging: through the MFV technology, the X-Line always maintains its optimal open area, which is crucial to high capacity and high-efficiency screening.

This revolutionary technology is well proven in many dry screening applications that include aggregates, dolomites, limestone, granites, gypsum and quartz. The advantage that the X-Line provides is that it is now possible to screen material with significantly higher moisture content at finer aperture sizes while maintaining high efficiencies compared to any other screening technologies that are currently available.

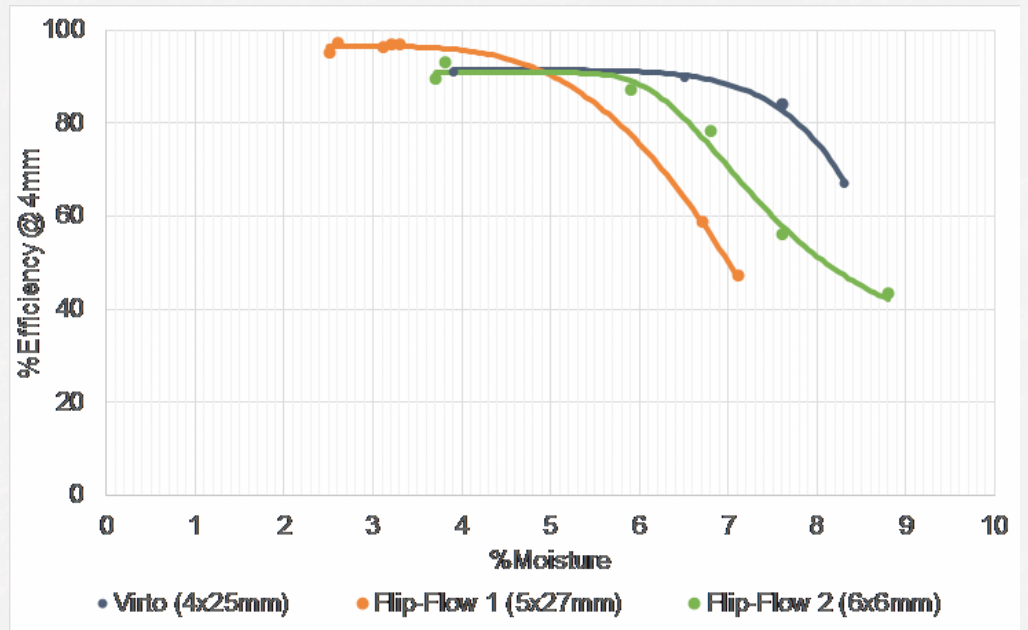


Figure 1: Efficiency curves for Virto-Cuccolini X-Line (RS2310.1) versus two different flip-flow screens on South African coal



Figure 2: A Virto-Cuccolini RS2814.1 installed at a silica mine in South Africa

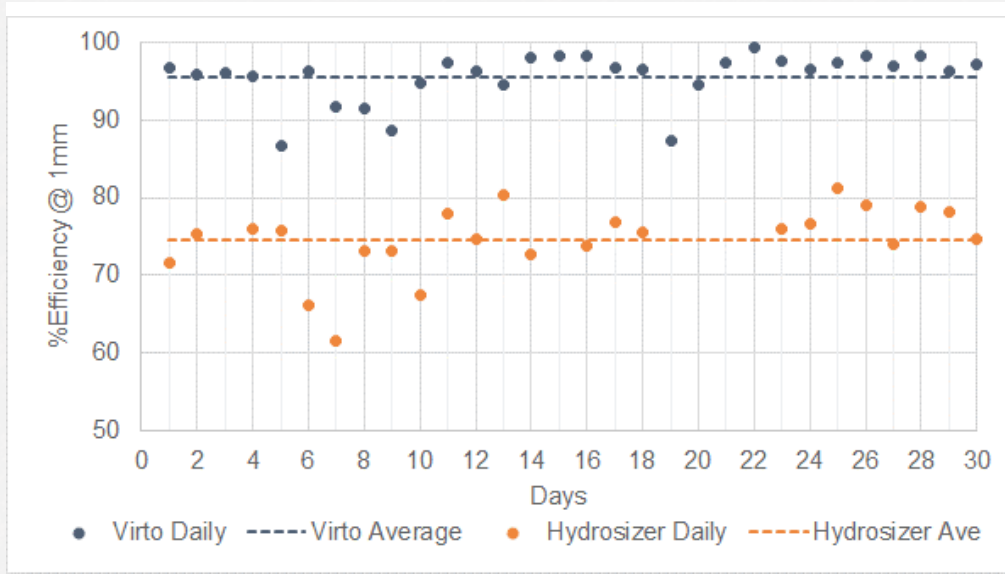


Figure 3: Efficiency of the Virto-Cuccolini RS2814.1 compared to the efficiency of a hydrosizer over a 30 day period at a silica mine in South Africa

In a comparative study on South African crushed coal between flip-flow screens and the Virto-Cuccolini's X-Line, it was found that the X-Line produced significantly higher efficiencies even up to a feed moisture content of 8.4% as can be seen in Figure 1. The X-Line maintained efficiencies above 80% up to moisture levels of 7.6%. In comparison, the flip-

flow screens could only manage 56% efficiency at best: this is a real and significant advantage that the X-Line provides.

The X-Line has proven its production value in the silica industry where crushed silica is notorious for both pegging and blinding of screens. A wet RS2814.1 X-Line (Figure 2) replaced a hydrosizer at a South African silica mine. The aim

was to increase the removal of material finer than 1000µm and therefore, increase the amount of glass sand, which is a higher value product. The mine's previous experience with screening on this type of material was that after a day or two, the separation efficiency would significantly drop due to the deck experiencing both pegging and blinding. After the

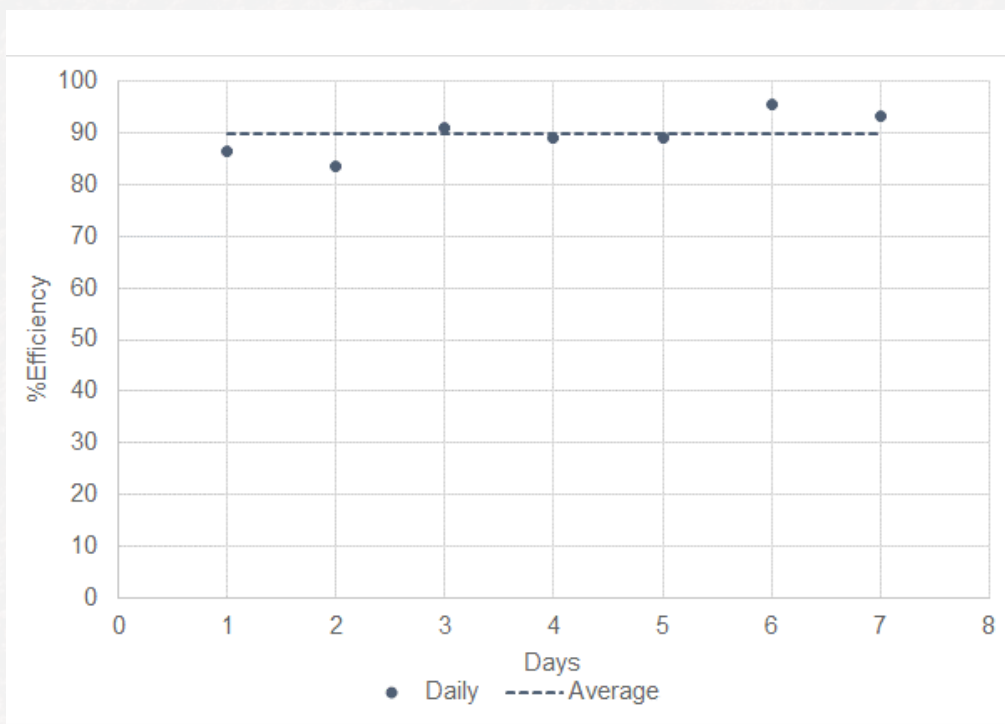


Figure 3: Efficiency of the Virto-Cuccolini RS2814.1 compared to the efficiency of a hydrosizer over a 30 day period at a silica mine in South Africa

new Virto-Cuccolini screen was installed, the screen performed significantly better than the hydrosizer as can be seen from Figure 3.

Furthermore, it is also evident from Figure 3 that the Virto-Cuccolini screen maintained its efficiency at 95% for the entire 30 days, without any manual washing or cleaning by the mine's operators. The mine has since been able to repay the screen in a couple of months by increasing the total glass sand product by more than 20%.

Another installation of the X-Line in the South African mining industry is on a coal fines plant. Two RS2010 screens were installed to deslime the coal product at 100µm. These screens successfully deslime the coal product while maintaining a separation efficiency above 90% and reducing the ash content from 36% to sub 16%.

These results on fine cut points have also been reproduced in the chromite industry where ultra-fine chromite is removed from milled UG2 ore at 100µm while maintaining high efficiency without any blinding as can be seen from Figure 4. The observed 90% screening efficiency was maintained over a week without the need for washing the screen mesh daily, which is a common practice on other screens. This type of performance resulted in a substantial increase in the use of the RS2010 screens in the chrome industry.

Virto-Cuccolini Group has proven time and again that the X-Line technology is on the cutting edge of the currently available screening technology. Virto-Cuccolini is committed to supply their clients with the optimal process solutions together with our local South African distribution partner to add optimal value to their clients. Our South African partner CoreMet Mineral Processing, can provide full process analysis and optimisation service and also provides local support for our products.

Simply the Best
**Screen
Cleaning
System**
Available

*Finer is better
Increased uptime*

X-Line
multi-frequency
technology
takes screen cleaning
to a whole new level.



Water cooled chillers a worthwhile cost saving avenue

Modern water-cooled chiller technology can bring out enormous cost savings in an underground mine when suitable products are selected and installed. Mines need uninterrupted ventilation and cooling, which demands high chiller uptime.

Mining companies are stopping at nothing in pursuit of ways to ensure long-term sustainability of their operations. In a bid to realise this, they are constantly exploring viable cost-saving avenues from pit to port. While the main spotlight is on noticeable areas like fuel management and labour costs, Russell Hattingh of AHI Carrier brings attention to the cost-saving potential hidden in cooling and ventilation. Speaking to mine operators, through African Mining Brief, he touches on the following areas: the business case for mines to make the most of benefits of water-cooled chillers; determining the best method of deployment; cooling method; and the supplier's capability to address industry needs.

• A business case

There is a strong business case for water-cooled chillers in present mining conditions, states Hattingh. "Water-cooled chillers would be considered the convention when it comes to cooling needs in mines. In today's business landscape mining companies, like organisations in other industries, are under pressure to perform and deliver good returns for their shareholders. This means keeping costs down, through avenues like cooling and ventilation. Thus, mines have to approach their cooling and ventilation requirements with due care to ensure long-term profitability by selecting and running equipment optimally. There are few sustainable alternatives today in terms of fans and chillers. How you select these, how you run them and where you place them are some of the secrets to success."

• Determining the method of deployment

The ultimate objective of a water-cooled chiller is serving a mine's cooling requirements optimally. It is paramount to assess conditions to determine the practical way of deploying a chiller. In particular, given the complexity of a mining operation, key factors to be examined would include different mining methods, age of the mine and shape of the underground network.

Hattingh says that one of the first decisions

a mine would need to make is where to locate the chiller plant. "The position of the chiller plant is a lot like a "centre-of-gravity" study that logistics companies would embark on. There are many factors that would determine the ideal position of the distribution hub and equally there are roadblocks from allowing you to position it exactly where the numbers point to, so compromises have to be made. Factors such as the depth of the mine, the temperature gradient of the rock and the distance of the ore body (the part of the mine that contains the good stuff) away from the shaft are just some of the key factors that would help the mine ventilation engineer along his/her way."

• Cooling method

The best method to cool a mine has to be established. At the outset, it is worth noting that every mine has unique conditions. Fundamentally, bearing in mind that water-chillers for mines are rather large as they consume a lot of electricity, the first step in cooling a new mine is to ventilate as far as possible. However, when it becomes impractical to ventilate (for instance, when the cool air being sent from surface is already too hot to provide cooling by the time it reaches the working areas) a chiller plant is needed.

Basically, Hattingh mentions two options when it comes to providing cooling in a mine with water-cooled chillers. The first is cooling the air on surface (often referred to as Bulk Air Cooling, given the massive amount of air being cooled). The second method involves cooling the air, still with chilled water, using open water sprays situated underground. Chillers can be situated either on surface or underground to service the needs of these bulk air coolers.

• Supplier's track record

Ultimately, as water-cooled chillers are central to their operations, mining companies have to be very particular about the track record of a supplier or service provider they elect to engage. The supplier should have the wherewithal to

deal with requirements from supplying, installation, commissioning and subsequent service that may be required. With respect to servicing, Hattingh singles out the importance of suppliers having qualified chiller technicians. "A chiller technician is like any other trade. It requires skills, learning and on the job practice, followed up by continuous on the job training. Although chillers have been around for over 100 years the technology installed in these types of systems has not. Technology is constantly evolving and customers demand greater reliability and uptime," he explains, adding that, on its part, Carrier sets an example by ensuring that its technical teams are properly equipped to service and maintain the equipment, it builds and sells.

Over and above having qualified chiller technicians, mechanisms to be used in increasing equipment uptime are essential. In days gone by, if a chiller detected a fault it would trip. These safeties were reactive and would result in a loss of cooling.

Hattingh assures that Carrier's modern chiller technology continues to strive to meet their customer's stringent requirements. "Our chillers have built-in safeties and controls to preempt unsafe conditions and react to these to bring the machine into a safe operating state first, if possible, before deciding to shut down. Many Carrier chillers are equipped with built-in refrigerant leak detection systems to forewarn plant owners of gas loss and inefficient plant operation."

Additionally, Carrier recognises that efficient plant operation, throughout the operating envelop, is fundamental to ensure annual operational savings. Consequently, it has looked at extending the operating range of their standard chillers so that these chillers are able to operate comfortably in the extreme conditions the mining companies need them to operate in. The Carrier 19XR chiller has two stage compressors as standard which meets this requirement.

In closing, it is clear that modern water-cooled chiller technology is able to simultaneously help mining companies meet their production needs, by ensuring availability of cooling, and assist in reducing operating costs.