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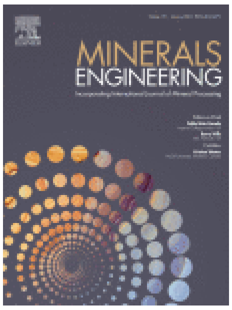

Technical Note

Increased screening efficiency using a Kroosher unit coupled with a Sweco screen (Part 1)

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Abstract

Industrial screens are used in the minerals processing industry to separate solids from liquids and to separate particulate materials into different size ranges. The Sweco separator is a screening device that vibrates about its centre of mass. Sweco claim greater capacity and screening efficiency with less blinding than other types of screening devices. However, technology invented and developed by Vibtec Engineering in Israel has demonstrated that the throughputs of Sweco screens can be increased by at least an order of magnitude (at mesh sizes less than 100 μm) for dry material, without sacrificing efficiency, by retrofitting a device called a Kroosher. The Kroosher is a mechanical converter, converting monoharmonic oscillations to amplified polyharmonic oscillations. Dry screening test work was conducted in order to identify and quantify changes in efficiency for the screening process. It was found that for the same screening efficiency, the throughput may be increased by more than 810% by fitting the Kroosher to a standard Sweco.

Introduction

Screening has been extensively used since the Greeks used horse hair-and-reed sieves to effect particle size separation. The first woven wire screens dates back to the 15th century Germany and remain largely unchanged today (Napier-Munn et al., 1999). Even in these early times, it was realised that shaking the screen by hand the efficiency of the screening process is improved. No great advantages in the screening process have occurred during the intervening years.

Four types of screening devices are used in industry today: grizzlies, revolving screens, vibrating screens and sifters (Hidaka, 1991). The focus of this paper is solely on vibrating screens and more specifically on the enhancement of screening efficiency for vibratory screens.

Vibratory screens, favoured in industry for the separation of coarse particles, consists of one or more screen deck, mounted on top of each other, with each deck having a smaller screen aperture than the preceding screen (Napier-Munn et al., 1999). Vibrating screens have a horizontal reciprocating movement and generally operate in the range 60–800 Hz (Wills, 1997).

Vibratory screens similar to Sweco screens, a widely used industrial screen type, vibrates about its centre of mass due to eccentric weights on the motion generator shaft. Rotation of the top weight, causes the material to move in a horizontal fashion to the periphery. The lower weight acts to tilt the device, inducing vibration on the vertical and tangential planes. The lead angle, the relationship between the lower and upper weights, controls the spiralling movement of material on the screen surface (Sweco, 1996).

Thus far, single frequency, monoharmonic vibratory technology is still used today as it was in the first vibratory screens in 1910 (Napier-Munn et al., 1999). Studies (Kroosh et al., 1997) have shown that although the superposition of high frequency components on the main vibration mode of a vibrating screen does not affect to any great extent the nature and efficiency of the screening process. However, the high frequency components, cause a high level of acceleration and increase the efficiency of powder handling and processing as well as reducing the vibration strokes by two to three times in comparison to normal, single frequency machines (Kroosh et al., 1997).

Kroosh technologies developed a system, whereby a mass is activated (by the vibratory action of the screen) on an elastic structure. The elastic structure deforms and random amplitude oscillations appear (Kroosh Technologies, 1999). Using this add-on increases the G-forces on the screen surface from 10 up to 1000 G.

Section snippets

Experimental work and results

The main focus of the test work was the screening of $-600 \mu m$ material on a 106 μm vibrating 30″ Sweco screen. Two consecutive tests were planned – first a normal run with the Sweco and secondly, with the Kroosher unit attached to the Sweco and the lead angle increased by 90° (as per instructions from Kroosher) (see Fig. 1).

Different flow rates were fed onto the screen and the separation efficiency (i.e., the amount of short circuiting occurring) determined for each process (with and without the

Discussion and conclusion

From Fig. 2, it can be seen that the highest undersize to total feed ratio of 0.0145 occurs for the Sweco system at a flow rate of $122 kg h^{-1}$, whereas the same undersize to total feed ratio for the system with the Kroosh attached, corresponds to a flow rate of $580 kg h^{-1}$, an increase of 480%.

Fig. 2 shows the adjusted efficiency of the Kroosher and Sweco units. At an adjusted efficiency of 68%, the throughput through the Sweco is $727 kg h^{-1} m^{-2}$ whereas the throughput through the Kroosher is $5900 kg h^{-1} m^{-2}$

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There are more references available in the full text version of this article.