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FINE SCREENING –

VARIABLES PRODUCERS MUST CONSIDER WHEN CHOOSING A SCREEN

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The demand for screening fine materials is growing. Screening fine material (below 10 mm) can reduce water needed at the wash plant, as well as fractionate sands. Asphalt producers can fractionate their reclaimed asphalt pavement (RAP) to provide more gradation control and reduce liquid additive consumption in the asphalt plant.

Also, many aggregate producers inadvertently generate huge stockpiles of "waste" material, much of which can be reclaimed by separating the fine particles. Once properly sized, such material can be sold into new markets as premium industrial sands to foundries, glass plants, golf courses and so forth.

When one looks at all of the diverse screening equipment available in our industry to perform this task, the eyes can quickly glaze over. Common screening tools being promoted are inclined, horizontal, multi-angle, overhead eccentric, de-watering, and high frequency – to name a few.

To understand how to select the best tool for separating fines, we need to have a good understanding of screening principles.

Think of a screen as a highway. Just as additional lanes on a roadway increase traffic flow, screen capacity equates to screen width. And just as a vehicle needs time to navigate through traffic to find an exit, screening efficiency equates to screen length.

When selecting a screen, we must understand the feed gradation and the desired openings (i.e., product sizes). From this point, there are essentially three primary variables that further determine screening machine selection:

1. Stroke. To state the obvious, in order for a fine particle to find an opening and pass through, the particle must "stratify" (the process in which coarse particles rise above fine particles) through the bed of coarser material and come into contact with the screening surface. The stroke must be aggressive enough to keep screen openings clear, yet not so aggressive that the material is constantly being suspended in the air where it cannot contact the openings.

A tip: Coarse screening is best accomplished with a long stroke (typically 12 to 20 mm) where fine screening is favorable with a smaller stroke (2 to 9 mm)

2. Revolutions per minute (rpm). Increasing rpm will generate more energy (g-forces). However, excessive rpm with a long stroke can be detrimental to the machine integrity, as well as hinder performance. As such, for fine screening applications, high rpm is generally associated with a smaller stroke.

A hint: Coarse screening is best accomplished with a low rpm (typically 675 to 875 rpm) whereas fine screening is favorable with a higher rpm (up to 4,200 rpm)

3. Screening angle. A horizontal deck will provide a material travel speed of up to 18 meters per minute, where incline decks can increase travel speeds in excess of 27 meters per minute. While a faster material speed will result in a lower probability of separation of near-size particles, the logic that lower travel speed will always result in higher screen efficiency and performance does not always apply.

The gravity provided by a steeper deck incline will obviously accelerate the material. However, the benefit of a faster travel speed is thinning the bed depth of material, allowing for faster stratification. This is essential for separation to occur. The secret is to know when and how to use gravity versus mechanical throw to your advantage.

A hint: A steeper screen angle will provide a thinner bed depth of material, accelerating the stratification process. Generally, as the screening angle increases, rpm should also increase and stroke should decrease, making a steeper incline favorable for fine screening.

HIGH-FREQUENCY SCREENING

As we have established, the separation of fine particles is best achieved by using a screening device configured with a short stroke, high rpm and a steep angle. The reason for this is simple: Fine materials should be introduced to the screen openings as quickly as possible and given the maximum number of opportunities to find an opening to pass through. Ideally, a fine screen will be akin to a drum roll on a snare drum.

For the most efficient separation of very fine materials, special screening tools have been developed to fill this niche as economically as possible. Generally referred to as "high-frequency screens," these machines operate at an angle of up to 40 degrees (to match the natural angle of repose), at up to 4,200 rpm and employ a very small stroke (2 to 3 mm). In fact, one only needs to vibrate the screen media itself – not necessarily the entire screen box. The result is a tool that separates fines much more efficiently at higher capacities than the more conventional screens ever could.

PACKAGING

Given the nature of the opportunity to reclaim materials and fractionate RAP, installing high-frequency screens on mobile, self-contained systems was a predictable outcome. Today, there are a few track-mounted high-frequency screens on the market that provide a perfect tool for the nimble contractor or opportunist.

The end result is track-mounted, high-frequency screens that provide a means for the opportunist to help asphalt producers mitigate the costs of liquid asphalt by using a tighter gradation of RAP, as well as reclaim the vast inventories of low-value excess or waste piles and turn that material into valuable premium materials.

May I have a drum roll, please?