SUPPLIERS' TIPS

Separation: How can I keep my screener running at high rates while producing sharp size separations?

Examine, test, and chart the material's moisture and mass balance variations

The screener's efficiency depends on various factors. These include the material you're processing, material size consistency, separator type and design, screen type, moisture content and variation, friablity, agglomeration tendency, finished material size tolerances, and maintenance and cleaning.

Provided that there are no issues with feeding to and discharging from the separator or screening equipment, you should examine, test, and chart the material's moisture and mass balance size variations. Conduct multiple tests on multiple samples. By controlling moisture you can reduce the material's tendency to agglomerate or blind the screens.

If moisture isn't the problem, but the material has an almost unpredictable size variation, you may need a prescreener. The idea here is to quickly scalp the material out of the stream so that the primary screener doesn't have to deal with it.

Another big factor is maintenance. Unfortunately, most screeners are enclosed and not easily inspected, but it's important to perform regular, scheduled equipment and screen inspection and maintenance.

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Effective screen motion

Make sure your screener provides the following:

- Effective screen motion — amplitude, speed, and alignment — for the material to separate
- Adequate screen area for the feedrate and separation efficiency you need
- Uniform material distribution over the screen area with minimal material agitation
- Effective screen deblinding

In addition, make sure that other factors in the process aren't adversely influencing the sifter's performance. These include static charge on the particles caused by the material grinding or pneumatic conveying systems, excessive airflow into or away from the sifter, and spouting restrictions to or away from the sifter.

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Don't alter factors determined by physical laws

First, don't try to alter factors that are determined by physical laws. To make sharp size separations every particle has to come in contact with the screen. A screen measures the width and thickness of a particle — don't expect the screener to make a separation by particle length or density. In most process situations, quantity and quality of separation are inversely related. Analyze the material to be separated. Keep in mind that the differences in the particles' physical characteristic make the separations.

Second, accurately determine your process line's maximum capacity. Then size the screener so that your maximum requirement is in the middle of the unit's operating range.

Third, provide the screener with a consistent flowrate. Fluctuations in the flow will negatively affect the separation quality.

Fourth, don't forget to size the machine's discharge to handle the required capacity.

Tom Helman,
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Check motor rotation, blinding, feeding

Check motor rotation, which is critical to screener efficiency on many separators. Choose the correct antiblinding device (ball trays, plastic sliders, screen heaters). A blinded screen can't perform properly. Make sure that material is properly fed to the screener. Round screens should be fed at the center and rectangular screens should be fed evenly across their entire width. All screening equipment should be free of surges.

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Optimize dwell time on the screen

The key to getting high rates and high efficiencies is also simple — optimize dwell time on the screen and keep the holes from blinding. Also, carefully select your woven screen cloth — this is crucial for optimizing results.

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Optimize the dispersion mechanism

One key to keeping the capacity rates on a separator high is to optimize the effectiveness of the dispersion mechanism. Separators usually have a point at which they become overloaded or the air-to-particle ratio is too high, causing the cut sharpness to diminish. Knowing where that point is and monitoring it will allow you to run the separation process at an optimized capacity and still maintain a sharp cut.

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Plot the size distribution on a log-probability grid

If you're using perforated-plate screens, change to woven wire-screens to increase your percentage of open area. Choose a screen that has a maximum ratio of clear opening to wire diameter consistent with necessary strength. Try a slotted wire cloth if permitted by your particle shape and material specifications.

Plot the size distribution of your feed material on a log-probability grid. Most distributions will plot as a fairly straight line, allowing for easy interpolations. Mark your specification limits and your screen openings on the grid. Most specifications allow some deviation above and below the nominal size range. Taking into account that screening efficiency deteriorates rapidly as particle size approaches the screen aperture, use the curve's slope at the coarse and fine limits to evaluate the probable effect on material size distribution of incremental differences between the aperture size and your nominal specification limits. Often, you can increase within-spec production this way without any change in the process flowrate.

Unless your screener is a gyratory type with material introduced on the centerline, visually check the material distribution across the screen surface's width. The oversize bed depth should be reasonably uniform. If it isn't, experiment with flow divider vanes, reversing plates, or another means of improving the material distribution at the material feed point to the screening surface. Irregular distribution can easily reduce capacity by half at a given efficiency.

If your screener has a component of motion in a direction at right angles to the screen surface, the depth of the retained material bed will affect its efficiency. For the best efficiency at any depth, the amplitude of the component normal to the screen surface should vary in some direct proportion to the load. A corollary is that efficiency, even at optimum amplitude, will tend to decline as the load increases. In many designs, amplitude is adjustable. When you make changes from the manufacturer's initial amplitude settings, adjust the frequency by the inverse square root of the amplitude ratio in order to maintain the initial energy level with least effect on bearing life.

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Selecting the appropriate equipment and media

One of the most important considerations for achieving optimum screen performance is equipment and screening media selection. There's a model and screen type for virtually every material characteristic, operating condition, and capacity requirement. Carefully consider and study these items to make the best screening choice for the application. A good match between the selected screen and the application will ensure an efficient and effective screening operation.

Changes in material characteristics can affect screen performance as well as the ability of the screening media to produce sharp separations. Anytime there's a decline in performance, analyze the material for changes in bulk density and moisture content. Perform a sieve analysis to determine measurable changes in particle distribution. If the material characteristics have changed, determine the nature of the change and consult the screen manufacturer for assistance in correcting or compensating for the problem.

Process changes, such as changes in material input to the screen, an increase or decrease in capacity, and changes in the upstream process, can also affect screen performance and separation quality. Carefully compare process changes to the original application requirements and consult the screen manufacturer for assistance.

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