A Guide to Screening optimisation

The art of screening lies in the meticulous fine tuning, tweaking and synchronizing of screen setups within a near-limitless number of applications.

Its science is stratification.

In other words, the vibration of the screen deck agitates the material causing it to stratify, allowing the larger particles to remain on the top deck and the smaller particles to fall through the openings of the screening surface.

Screening efficiency is calculated as the percentage of the undersize materials passing through the openings divided by the percentage of undersize in the feed.

Example: if a screen is only 75 percent efficient, then 25 percent of the material within the desired product range is being rejected with the oversize material

Crushers produce the material;

Screens separate the material;

Screening efficiency affects the operation's overall performance

OPERATING PARAMETERS

Maximum screening efficiency results from proper adjustments in speed, stroke, rotation (or throw) direction and angle of inclination.

Each of these parameters affects one of the most important facets in screening – proper depth of bed.

As feed material is a mixture of varying sizes, oversize material will restrict the passage of undersize material, which results in a build-up, or bed depth, of material on the screen surface. Bed depth diminishes as the undersize material passes through the screen openings.

For efficient screening, the material bed should not reach a depth that prevents undersize from stratifying before it is discharged.

Depth of bed (in dry screening) should not exceed four times the opening size at the discharge end of the screen. Consequently, with a 12 mm opening, the depth of bed at the discharge end should not exceed 50 mm

Phases of screening – there are three distinct phases

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Initially there is a layered phase; a deep bed containing coarse and fine particles feeds onto the feed end of the screen deck.

In the basic phase, the particles begin to stratify as fine material settles at the bottom and larger material climbs to the top of the bed.

The sharp phase occurs toward the discharge end of the deck.

At the final phase that the near-size particles move into direct contact with the screen media and have the last opportunity to fall through the openings

Avoid

There are typically two scenarios you want to avoid when it comes to screening.

1 A deck that completes screening too early. It means that, particles travel only about a third of the way down the deck until all the undersize material has passed through the openings. While the main mission – classifying the material – is still achieved, the entire deck isn't being used to its full capability. **The results are diminished profits from premature screen media wear.**

2 Screening that does not finish completely. In this case, undersized particles travel over the discharge end and contaminate the material. This can double a company's production cost if the material needs to be re-screened, not to mention the lost efficiency and time. And if the material ends up too contaminated to be sold, profitability is lost altogether. **A plant may not recognise it is producing contaminated product, which can lead to costly warranty claims and negative image**

optimal screening, is the ultimate goal of every operation

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The Screen Deck Audit

At Australian Mining Product and services we offer solutions that combine the properties of various screen media types on the same deck ensure the longest product life, limit downtime and maximise profit potential. We will analysis and recommend the right combination of open area and wear life appropriate for each of the three phases of screening.

1 *Machine Inspection*

The results of the vibration analysis also build the foundation for a complete machine inspection of body components, the suspension system and wear parts. Special attention is given to screen media supporting parts such as bar rails, rail liners and tension rails.

2 *Screen Media Audit*

Complete review of the current screen media setup is conducted. Using a consultation guide, the audit will take the phases of screening into account while evaluating material characteristics and overall product quality.

We examine environmental factors, screen condition, signs of premature failure and any blinding and pegging occurring. Blinding happens when moist granules fill the opening and clog the screen surface, while pegging refers to aggregates mechanically lodged in the opening of a screen.

3 *Screen Media Recommendation*

The audit builds the framework for the screen media recommendation. Recommendations will be based on the correct balance between performance and durability, while catering to the appropriate phase of screening. The recommend screen media technology based on categories such as anti-pegging and anti-blinding characteristics, open area and wear life

4 *Screen Media Implementation*

After all recommendations are discussed and a solution is agreed upon, the final process of implementation can begin. Implementing the blended screen media gradually, by replacing one screen section at a time allows the professional to monitor the levels of production and effects of the adjustments. With each change, production rates and final output qualities are evaluated to ensure the screen media combinations are becoming more efficient. This process is continued until the best possible results have been achieved. It's all about making modifications for better ROI — using the proper media for each phase of your unique screening operation.

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APPLICATION PROBLEMS AND SOLUTIONS

Specifying the right screen involves making sure the manufacturer understands the production goals and is supplied with complete application data, which includes information such as tons per hour, material type, feed gradation and top particle size, particle shape, application type (wet or dry), type of screen media and deck opening, and the method of material feed.

Armed with accurate information, the manufacturer can customize the screen setup for maximum performance. For example, with a known feed gradation, the manufacturer can analyze the loading on each deck. If a deck has a heavier depth-of-bed ratio relative to the opening, that deck may be specified at a steeper angle than an accompanying deck. Therefore, one might have an incline screen at 20 degrees on the top deck, and up to 24 degrees on the bottom deck where it's more heavily loaded.

The main obstacles to efficient screening are plugging, blinding and carryover. Each can be minimized with a variety of solutions.

Plugging happens when near-size particles become lodged, blocking the openings. Solutions may include increasing stroke, changing media wire diameter or opening shape, using urethane or rubber media, and adjusting crusher settings.

Blinding occurs when moisture causes fine particles to stick to the surface media and gradually cover the openings. In this case, changing stroke and increasing speed may help. Also, if changing the screen media does not improve the situation, consider ball trays or heated decks. Ball trays incorporate rubber balls into pockets beneath the screen cloth. As the machine vibrates, the balls strike the media to free collected material. Heated decks have an electric current in the wire that heats and dries material, so that it easily knocks itself loose as the screen vibrates.

Carryover occurs when excessive undersize particles fail to pass through the openings. Solutions may involve changing stroke, speed or reversing screen rotation; changing wire diameter or the shape of the opening to increase open area; changing the angle of inclination; changing feed tonnage; controlling feed segregation; and centering feed on the screen

SCREEN MEDIA

Choosing the proper screen media for a given application is the key to delivering screen-sizing accuracy and maximum throughput, which also greatly impacts the performance of upstream and downstream equipment. In its most basic definition, screen media can be described as a surface with openings on a vibrating screen deck that allows undersized particles to pass through, and oversized particles to carry over. A vibrating screen can have anywhere from one to four decks, with each deck having a different sized opening, or mesh, for the separation of various particle fractions. Every application is a unique screening challenge, and thus the type of screen media selected is critical for success.

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Screen media is a replaceable wear surface that can be made up of one or more removable panel sections on a single deck. There are a vast number of screen media configurations based on material types, aperture sizes and styles, fixing systems and surface features, to name a few. As a result, manufacturers are constantly striving to differentiate their products by varying these specifications to dial in a functional and often customized solution for producers.

To get the best possible screen media solution, it is imperative that the producer supplies the manufacturer with complete and accurate application data up front. Vibrating screen inside box dimensions, a particle-size distribution, moisture content and desired final products are some of the minimum requirements to properly select screen media. Further questions that should be asked of the producer include:

- Is it a wet or dry screening process?
- Will blinding or plugging be a problem?
- How abrasive is the material?
- Will there be much impact on the screening surface?
- What is the top size and the bottom size feed to the screen deck?
- How much screening area is there?
- Does the material need to be washed?
- Is noise a concern?

The two most important factors for screen media selection are the screen panel life expectancy and open area.

Always examine the issue of maximum open area versus maximum wear life – there has to be a trade-off between the two in designing the configuration of screen panel openings.

In general, wire cloth will provide the maximum open area with a sacrifice to wear life, and the reverse is true for polymer screen media. However, recent and ongoing developments in material compounds and hybrid solutions (such as urethane-encapsulated wire) have helped to expand the spectrum of this sweet spot and enable producers to enjoy more of the best of both worlds.

Ultimately when making a decision on screen media, the producer needs to consider the benefits realized and the overall costs over the life of the media panel. A panel with a higher upfront cost may provide significant wear life or throughput benefits, compared with one offered at a fraction of the cost. Therefore, cost per ton of material processed is a more accurate gauge of the cost of screen media.

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	Woven Wire	Flexmat **Modular anti-blinding screening media**	**Tensioned rubber screening media**	**Pre tensioned rubber screening media**	**Modular rubber screening media**	**Flat self supporting rubber screening media**	**Self - supporting rubber screening media with skidbars**	**Modular PU screening media**	**Tensioned anti-blinding PU screening media**	**Pre tensioned POLY screening media**	**Tensioned POLY screening media**	**Special screening media**
Screening area	Primary, secondary Final	Secondary and Final	Secondary and Final	Secondary Intermediate	Intermediate And final	Primary secondary	Primary, Secondary	Intermediate And final	Final	Intermediate And final	Intermediate And final	Final
Max feed Size (mm)	1.00 to 100mm	0.5 mm to 20 mm	3mm to 75mm	30-250	20-150	150-300	75-400	10-100	20-50	10-100	10-100	10-50
Separation		2-16	5,6-63	16-90	10-63	45-120	45-120	1-31,5	2-16	1-45	1-45	2-25.4
Application		Dry / anti blinding	Dry	Dry	Dry	Dry	Dry	Wet / Dry	Dry / anti blinding	Wet / Dry	Wet / Dry	Wet / Dry/ antiblinding
Dewatering		No	No	No	No	No	No	Yes	No	Yes	Yes	No
Deck design		Special	Cambered	Cambered	Special	Flat	Flat	Special	Cambered	Cambered	Cambered	Special
Panel type		Modular	Tensioned	Pre-tensioned	Modular	Self Supporting	Self supporting	Modular	Tensioned	Pre-tensioned	Tensioned	Special
Material		Soft rubber	Rubber	Rubber	Rubber	Rubber	Rubber	Polyurethane	Soft Polyurethane	Polyurethane	Polyurethane	Polyurethane
Aperture		Punched	Punched	Punched	Moulded and punched	Moulded and punched	Moulded	Moulded	Punched	Moulded	Moulded	Punched
Thickness offered												
Fastening alternatives		Snap On	Cross or length tensioned	Clamp down	Snap - on	Clamp down	Clamp down	Snap - on	Cross-or length tensioned	Clamp Down	Cross- or Length tensioned	Wedged Or bolted depending on Screen design
Accessories		Side liner And side Liner spacer	Centre Hold down And capping	Side hold down, Centre Hold down and capping	Side Liner and side liner spacer	Side hold down and Centre hold down	Side hold down and Centre hold down	Side Liner And side liner spacer	Centre hold Down spacer and capping	Side hold down, Centre Hold down and capping	Centre Hold down And capping	Wedge

SCREENING MEDIA SELECTION GUIDE