



TECHNICAL WHITE PAPER

TROMMEL SCREEN VS SHAKER DECK





In-depth research on gold recovery in the Yukon conducted in 1990 by Randy Clarkson concluded that efficient gold recovery on sluice runs requires feed classification, typically at an aperture size of 0.5" or 0.75". Excluding the oversize from the sluice runs reduces the feed top size and volume which results in improved conditions for fine gold recovery. The recovery of large nuggets - or the concern of rejecting them with the oversize - is sometimes discussed in this regard.

Feed classification machines include static or vibrating finger screens, de-rockers, trommel screens and vibrating screen decks ("shaker decks"). This whitepaper discusses the pros and cons of trommel and vibrating screen decks and explains typical applications.

The common perception is that screen decks are high capacity but maintenance intensive, whereas trommels are simple, durable and preferred in clay rich ground conditions. Let's have a closer look.

SCREEN AREA

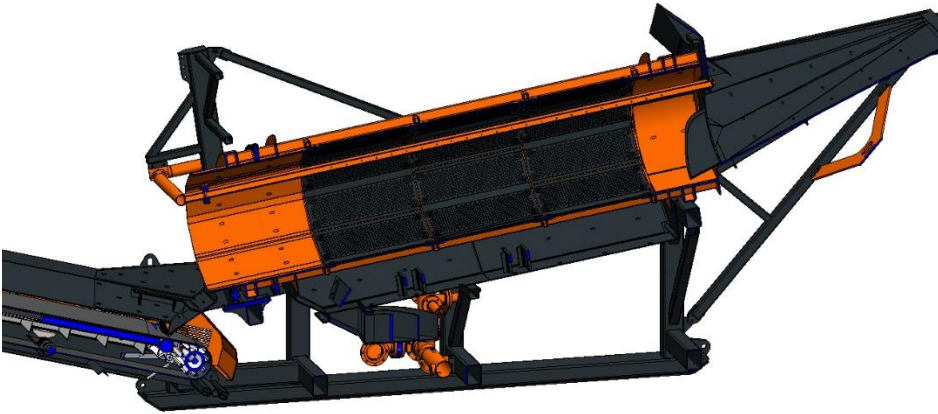
The production rate or screening capacity of any machine type is primarily governed by its active surface area. The cylinder shaped trommel typically comes with uniform aperture screen media along its length, with solid structural ends for feed entry and oversize discharge. The mechanism of material transport in a slightly inclined, rotating drum is dominated by tumbling and displacement. Material resides in the bottom quadrant of the drum, meaning that only about 25% of trommel screen media performs work at any given time, while 75% is raised without material contact. This results in a low active screen surface area.

Vibrating screen decks typically come as double deck designs. The upper deck is used for scalping off large rocks and reducing the load on the lower deck. Inclined vibrating screen decks utilize a circular vibrating motion to stratify and move material across the deck. The entire screen surface area is in material contact, which is why vibrating screen decks are rated for higher production rates than trommels (of equal diameter / width).

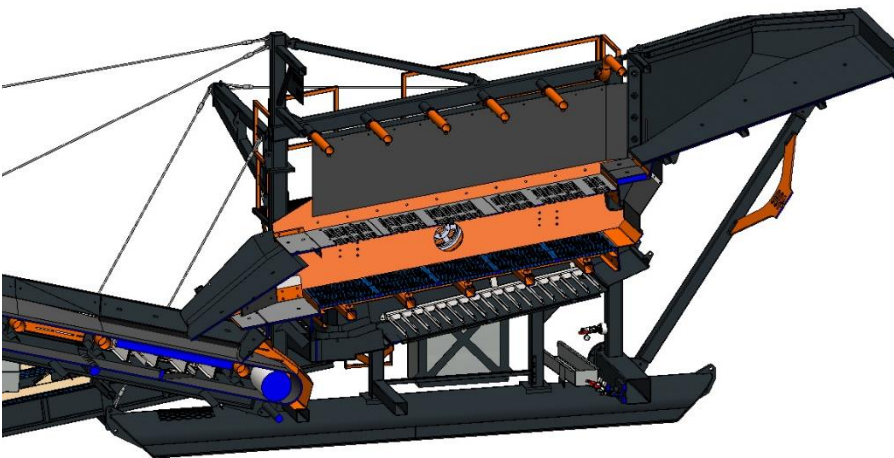
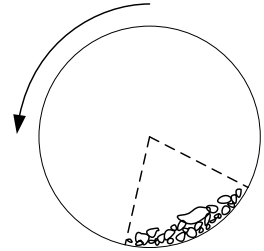
FEED SIZE

Trommels and Shaker Decks, built for placer applications, both accept large top feed sizes, typically up to 24", which in most cases eliminates the need for a grizzly. Vibrating screen decks utilize their rugged upper deck to guard the screen media on the bottom deck.

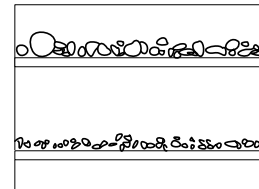
Feed topsize needs consideration when selecting small rotary equipment (i.e. < 4 feet diameter) because of their restricted feed opening, which tends to material jamming at entry points if not pre-classified on a grizzly screen. On the other hand, not requiring a grizzly screen minimizes the loss of fines rejected with the oversize as explained in the next section.



Trommel Screen
 Example: T400
 Diameter: 4'
 Screen Length: 10.6'
 Screen Area: 33 ft²
 (25% active)



Shaker Deck
 Example: SD400
 Width: 4'
 Screen Length: 10'
 Double Deck
 Screen Area: 2x 40 ft²
 (100% active)



MATERIAL BREAKUP, WASHING, SCRUBBING

Material scrubbing and washing is relevant, because placer/alluvial gold deposits form in proximity of larger rocks as a result of natural settling mechanisms in stream currents. Fines adhering to larger rocks or boulders are typically of higher gold grade. Scrubbing is particularly relevant where clay is involved.

Trommel screens and shaker decks both perform well in breaking up moderate clay contents. Trommels are often preferred, because it is possible to configure trommels with an inline scrubbing section prior to the screening section - a hybrid scrubbing-screening solution. Dedicated rotary scrubbers turn faster than trommel screens and may be considered for deposits with extensive clay content.

Two mechanisms of material breakup can be differentiated:

- Attrition shear forces dominate breakup in rotary trommel screens and scrubbers
- Accelerated collision and high pressure water jets facilitate breakup on vibrating screen decks

The residence time of material in the drum or on the deck also determines the effectiveness of material breakup and washing. The residence time depends on feed rate, screen geometry, inclination and motion of vibration. Prolonged residence time can be achieved by reducing the feed rate or adding retention dams to a trommel or screen deck. The inclination of placer screen decks is shallower than typical aggregate screen decks for that matter. It is also possible to reverse the direction of the circular motion of a screen deck to prolong retention of material on the deck.



SLURRY DISTRIBUTION / PRIMARY SLUICE RUNS

Distribution of fines is key to achieving even material flow conditions across wide sluice runs. It requires a balanced collection of material from under the trommel or screen deck. Trommel screens utilize a splitter box in the underpan to homogenize the material, otherwise biased towards one side due to the rotation of the drum. Engineered slurry distributors guide the material to the respective external sluice runs.

The collection of fines from under a screen deck is easier because slurry passes evenly across the screen width. This also allows for the installation of a “primary” sluice run directly in the underpan of the screen. The primary sluice run often recovers a majority of free gold and is easy to access for frequent cleanouts.



MAINTENANCE

Trommel screens and shaker decks differ in their respective maintenance intervals. The gentle turning motion and high portion of inactive screen area on trommel screens typically allows for longer intervals between which screen panels require replacement or bearings require inspection.

Modern trommel and shaker deck designs incorporate bolted screen panels and bolt protectors, eliminating the need for cutting and welding, while reducing downtime. Punch plate screen panels are common and cost effective for smaller equipment, while polyurethane and rubber lined screen panels provide more durability.

SUMMARY

While the capital equipment cost for trommel and shaker decks of equal diameter/width is similar, trommel screen plants come with the advantage of longer maintenance intervals and slightly lower operating costs for maintenance. Trommels are often preferred in moderate clay conditions. The shaker deck design handles higher tonnage throughput and provides the opportunity for running a primary sluice run in the screen underpan. Macon offers both trommel and shaker deck washplants that can be configured to most ground conditions.