Retrofitted two-screen separator boosts capacity by 50 percent for polyethylene manufacturer.

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Separator Retrofit Boosts Capacity by 50%

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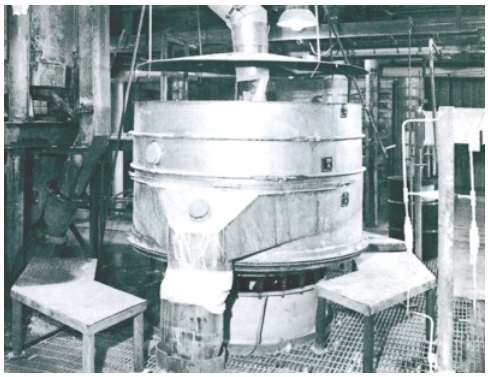
Separator capacity went from 20,000 to 30,000 pounds per hour when the manufacturer upgraded the existing two deck, 72 inch diameter circular vibratory unit.

Alan E. Hodel, Associate Editor, Chemical Processing

Problem:

The engineers of a polypropylene facility located in Deer Park, TX, encountered a production bottleneck when they increased polypropylene pellet output by 50%. They were using a standard 2-deck, 72" diameter, circular vibratory separator to remove oversized pellets and separate fines from prime product 24 hours per day, seven days per week. For 10 years the separator operated reliably. The unit was adequate to 20,000 lbs/hr, but did not have the capacity to handle 30,000 lbs/hr.



Retrofitted separator at work in a polypropylene plant. Prime product is discharged from the oversized spout in the foreground

Besides the separator capacity problem, the plant was troubled by the presence of odd-shaped pellets formed in the underwater pelletizing process (some with tails and others joined together by filaments). These "tails and streamers" would orient themselves, go through the 4-mesh top screen and become part of the prime product. The elongated shapes resulted in several customer complaints, so the pellet manufacturer looked for economical ways to eliminate them. If possible, process engineers wanted to remove tails and streamers', through better classification.

Solution:

Process engineers worked with the manufacturer of the circular vibratory separator to find a solution to both problems. They decided to modify the standard 2-deck unit. A 16 gauge plate perforated with 1/4" holes on 3/8" centers replaced the top 4-mesh screen deck. A 360° screen deck with an auxiliary discharge ramp took the place of the fines screen.

Start-up of the revised system proved disappointing, though, because upstream equipment occasionally left water on the pellets causing them to stick on the separator plate. Process engineers concluded they would have to solve the "tails and streamers" problem upstream in the pelletizing process where it originated and return to using a screen in the top deck of the separator.

When the perforated plate was replaced with a 4-mesh screen and the 360° screen deck was used, the plant still found that about 24,000-25,000 lb/hr of pellets could be pushed through the 72" diameter unit. The manufacturer of the equipment concluded that the remaining bottleneck was the center hole in the feed tray that provided central feed to the lower, 10-mesh screen deck. Modifying or removing the feed tray was recommended. It was removed, yielding 30,000 + lb/hr capacity with negligible "fines" contamination.

The same size (2 hp) motor gyrator that furnished the mechanical power for separating 20,000 lbs/hr operates the modified unit even though the throughput has been increased by 50% .With the feed tray removed, there is actually less material in the machine at 30,000 lbs/hr than at 20,000 lbs/hr. In addition, there is no buildup of product in the machine.

Results:

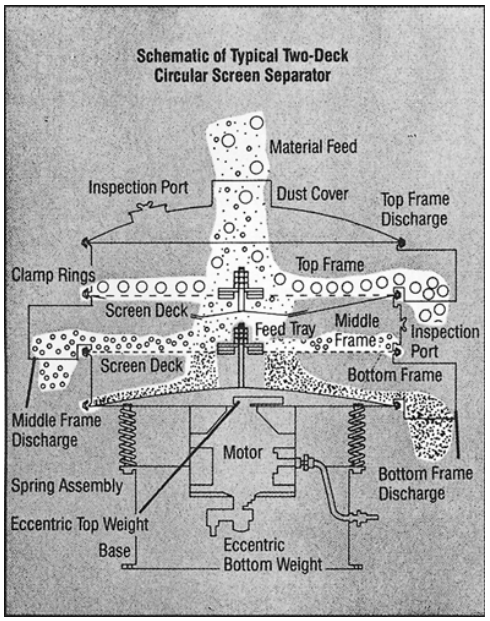
Other than weekly grease lubrication of the motor bearings, there is little maintenance required on the circular vibratory separator. Only 17 hours of extrusion downtime have been associated with the unit.

The plant is able to more than meet capacity needs with the modified circular vibratory separator. Maintenance of the system has remained virtually the same after removal of the feed tray even though a negligible amount of fines is passing beyond the separator. The retrofitted separator has been operated at instantaneous rates of 30,000 lb/hr with no evidence of bottlenecking.

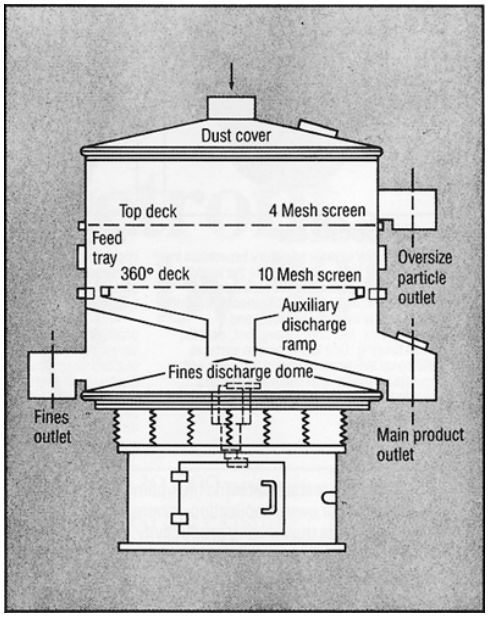
The screen separator is a unitized machine that imparts adjustable multiplane, mechanical, inertial vibrations to the pellets and extraneous materials. Screens are mounted in a rigid structure that contains a motor with a vertical double extension shaft carrying adjustable eccentric weights, The whole vibrating assembly is supported by springs that allow it to shake freely without transmitting motion to the floor.

The top weight generates a horizontal throw while the bottom weight imparts a high frequency tilting action. Tangential motion results from the combined horizontal and vertical thrusts, causing oversize bits to move laterally across the screen deck to the discharge outlet, while undersize particles drop through the screen. The top and bottom weights are independently adjustable in position and variable in mass, to obtain desired separation characteristics.

The 360° deck provides an unobstructed discharge onto the inclined ramp for rapid discharge to the oversized (8 x 16") product outlet. The full screen area is available for separation, and the pellets cannot build up at the screen periphery while waiting for discharge.



Schematic of standard 2-deck separator first used in separating polypropylene pellets at the plant



Schematic of separator retrofitted with high-capacity 360°discharge cone in middle frame and high-capacity inclined discharge ramp with oversized discharge spout in bottom frame