



Smith & Loveless Inc.
Above All Others.

PISTA® Grit Removal System

PISTA® Grit Removal System vs. Stacked Tray Systems

PISTA 360™ WITH V-FORCE BAFFLE™

This bulletin compares the PISTA® Grit Removal system with V-FORCE BAFFLE™ (shown below in Figure 1) to a stacked tray grit removal system.

Removal efficiency, headloss, utility requirements, and energy usage data for the 18 MGD (68,137 CMD) stacked tray unit was taken from a recent project specification (published for bid date 9/24/10).

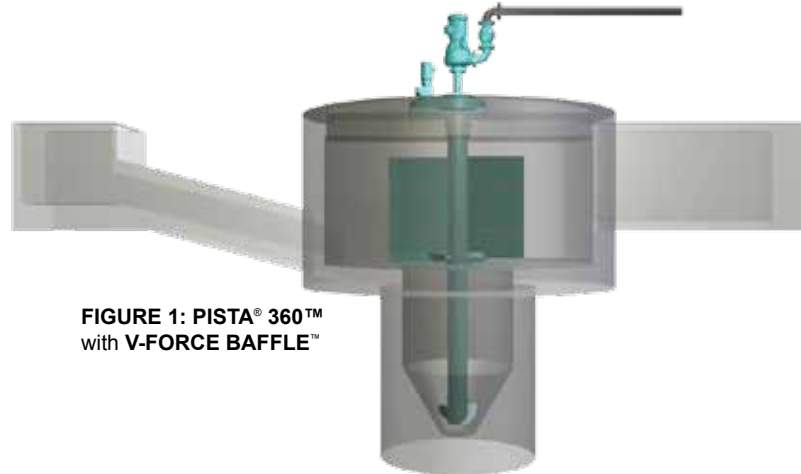


FIGURE 1: PISTA® 360™ with V-FORCE BAFFLE™

1) Operation

PISTA®	STACKED TRAY UNIT
Vortex principle	Solids plate settling principle

Figure 2 below shows a CFD model illustrating the vortex principle. A true vortex unit has a flat chamber floor and does not rely on gravity as the primary force to capture grit but instead uses hydraulic forces. True vortex units do not have the same settling area requirements as a unit operating on the settling principle. Flat floor units should not be downgraded like the gravity based systems – for example, selecting a 70 MGD (264,980 CMD) unit to handle 30 MGD (113,562 CMD).

FIGURE 2:
CFD Model



2) Removal Efficiency

PISTA®	STACKED TRAY UNIT
95% of grit down to 140 mesh (100 microns) particle size Peak flow rate, and no decrease in efficiency will be allowed at flows less than this design rate.	Peak flow 18 MGD (68,137 CMD) 95% of all grit 140 mesh (100 microns) and larger.

When looking at removal efficiency it is important to note that 69% of grit found in North America's WWTPs is 50 mesh (300 microns) and larger and only 18% of the grit is 100 mesh (150 microns) and smaller. Based on actual data gathered in more than 150 certified full-scale grit tests.

FIGURE 3:
Removed Grit



3) Hydraulic Control

PISTA®	STACKED TRAY UNIT
V-FORCE BAFFLE™	No mention in specifications

When working with grit removal systems, the wastewater stream velocities are very critical for the overall performance of the system. Grit is “carried” at minimum velocities around 1.6 - 2.0 fps (0.5 - 0.6 m/s). These velocities are powerful enough to prevent grit particles from settling out. When velocities start to drop below this limit, the grit particles will settle out and will start to accumulate in the channels prior to the grit trap.

When the V-FORCE BAFFLE™ is used, the inlet channel velocities are within the ideal limits for proper grit transportation and removal, without relying on large flushes, over a 10:1 flow turn down range. For example, the Model 20.0B with V-FORCE BAFFLE™ maintains the inlet channel velocities from 18 MGD (68,137 CMD) down to 1.8 MGD (6.8 CMD).

4) Headloss

PISTA®	STACKED TRAY UNIT
11" (280 mm) at 18 MGD (68,137 CMD)	No more than 12" (300 mm) at 18 MGD (68,137 CMD)

The PISTA® system with V-FORCE BAFFLE™ has an integral flow control device to maintain inlet channel velocities. This flow control device is what creates the headloss. The headloss through the grit chamber itself is only 1/4" (6 mm).

5) Utility Requirements

PISTA®	STACKED TRAY UNIT
50 GPM (3.2 LPS) at 50 psig (120 seconds every 4 hours) – Flooded Suction grit pump line. Not required when using a Top-Mounted pump.	20 GPM (1.3 LPS) at 50 psig (continuous) – grit capture unit.
	15 GPM (1.0 LPS) at 50 psig (continuous) – grit separation/ classification unit.
	50 GPM (3.2 LPS) at 50 psig (30-120 seconds every 1-2 hrs) – grit separation/ classification unit.
	10 GPM (0.6 LPS) at 50 psig (continuous) – grit dewatering unit.
Daily Total: 600 gallons/day (2.4 CMD)	Daily Total: 66,000 gallons/day (250 CMD)

These water requirements are for non-potable water that will have been processed once and will be added back to the waste stream to be treated a second time.

6) Energy Use

PISTA®	STACKED TRAY UNIT
10 HP (7.5 kW) (15 min. every 4 hours) – grit pump motor.	10 HP (7.5 kW) (continuous) – grit pump motor.
1 HP (0.7 kW) (20 min. every 4 hours) – dewatering unit drive motor.	1/3 HP (0.2 kW) (continuous) – dewatering unit drive motor.
1-1/2 HP (1.1 kW) (continuous) – chamber drive motor.	
Daily Total: 53 hp-hr/day (40 kW- hr/day)	Daily Total: 247.2 hp-hr/day (184 kW- hr/day)

These HP (kW) values do not take motor efficiencies into account.

7) Previous Project Equipment Costs

	PISTA®	STACKED TRAY UNIT
2 x 29 MGD (2 x 109,800 CMD) (OH)	\$270,000	\$688,000
2 x 20 MGD (2 x 75,700 CMD) (CO)	\$260,000	\$796,000
1 x 50 MGD (1 x 189,250 CDM) (IN)	\$140,000	\$259,000
2 x 50 MGD (2 x 189,250 CMD) (UT)	\$263,000	\$596,000

Many of these equipment costs are pre-negotiated numbers included in formal bid documents.

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