



Smith & Loveless Inc.

PISTA[®]

— GRIT REMOVAL SYSTEM

Superior 95% Grit Removal.
At All Flow Conditions.
Never Derated.



PISTA



ONE NAME

Stands Above the Rest in Advanced Grit Removal Technology.

The state-of-the-art Smith & Loveless **PISTA®** grit removal system is the most-specified and awarded system in North America and abroad.

S&L leads the industry in grit removal system research and development, emphasizing advanced CFD analysis with extensive factory and field-testing. We offer a complete range of **exclusive, flat-floor hydraulic forced vortex** grit chambers, durable grit pump configurations and smart grit washing and dewatering options for new installations and retrofits — including complete packaged headworks. We deliver you proven, advanced solutions for flows ranging from 0.5 million gallons per day **up to 100 million gallons per day** in a single unit and larger flows with multiple units. Most importantly, the complete **PISTA®** systems achieve **95% grit removal efficiency down to 75/100 microns at all flow conditions through the entire grit removal system—with no derating.**

Grit removal plays a vital role in enhancing the efficiency and longevity of downstream Water Resource Recovery Facility process equipment. Without proper removal, grit accumulation will lead to extensive wear and tear on plant equipment, reduced process efficiency and increased maintenance costs. So, safeguard your WRRF with the brand synonymous with total grit removal: **PISTA®**.

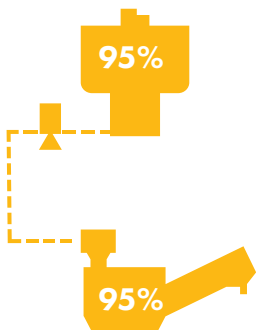
Exclusive PISTA® Advantages



Decades of Grit Removal R&D + Field Testing
Expertise Provides Assurance to End-Users and Consultants



Installations Globally / Proven
Most By Far of Any Advanced System Manufacturer



Superior Grit Chamber Removal Efficiency
Across All Flow Conditions — Never Derated

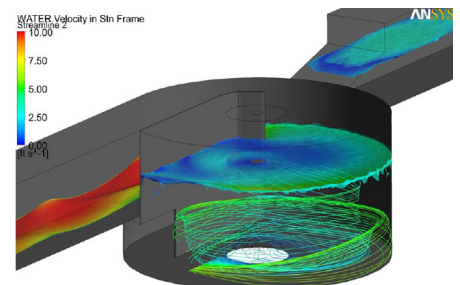
Grit Dewatering Removal Efficiency
95% Removal Through the Entire Grit Handling System



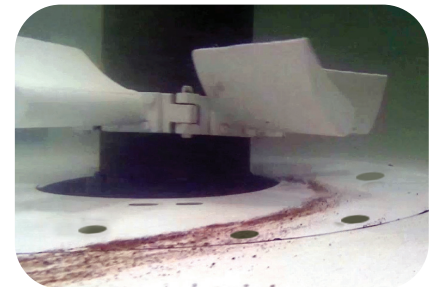
Unit Capacities for Most Chamber Models*
Lowers Project and O&M Costs with Fewer Required Units
* 4.381 L/s | INVORSOR™ Unit Capacity = 50 MGD [2.190 L/s]



Only USA-Owned Advanced Manufacturer
100% USA Owned & Based — Unlike Others



S&L advances the science of grit removal through rigorous CFD, leading to several PISTA® innovations.



Underwater view of true vortex grit travel along exclusive flat floor of a PISTA® VIO™ grit chamber.

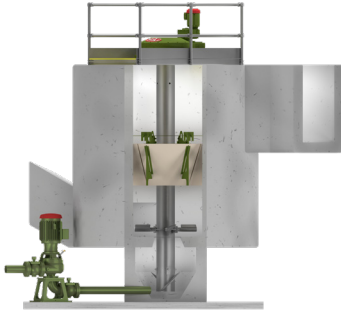


The PISTA® Grit Removal System offers a complete range of new equipment and retrofit solutions.

PISTA® Grit Chamber Solutions

Achieve 95% Grit Removal Down to 75 & 105 Microns... At All Flows.

Advanced **PISTA®** Grit Chambers deliver industry-best removal efficiencies with low total operating costs and design benefits to meet your project requirements. These uniquely baffled, flat-floored chambers induce hydraulic vortex action to move grit toward new perforated **PISTA® iPLATES™** which more rapidly distribute entrapment into the lower storage hopper. Find your solution:



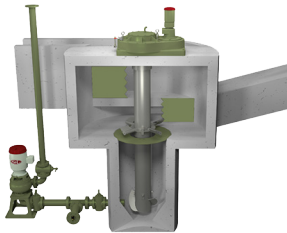
PISTA® INVORSOR®

The **PISTA® INVORSOR®** vortex grit removal system combines the power of proven particle capture methods: enhanced settling by inclined plates meeting a defined surface overflow rate [SOR] with the established hydraulic forced vortex grit removal process to achieve industry-best, ultra-fine grit removal efficiency down to 75-micron particle size across all flows—with no derating. See *S&L Brochure No. 925*



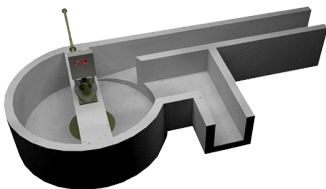
PISTA® VIO™

The **PISTA® VIO™** vortex grit removal system provides unprecedented application flexibility and superior grit removal efficiencies with a design that allows for full variability of the inlet and outlet channels. The **PISTA® VIO™** provides 95% removal down to 105-micron grit and the ability to design the inlet and outlet channels at any variable angle up to the full 360° of the chamber. See *S&L Bulletin No. 953*.



PISTA® 360™ with V-FORCE BAFFLE™

The **PISTA® 360™** with **V-FORCE BAFFLE™** lengthens the grit extraction path to effect 95% grit removal efficiency of particles down to 105 microns. Ideal for low-flow conditions because of its 10:1 turndown, it saves majorly on capital costs because smaller and/or fewer units can be specified and the need for downstream level control eliminated.



OPTIFLOW 270®

The **OPTIFLOW 270®** Baffle System brings previously unachieved grit removal efficiencies to new and existing **PISTA® 270™** grit chambers, optimizing grit removal to 95% for grit particles down to 150-microns. **OPTIFLOW 270®** baffles can be applied to a new 270-degree design and retrofitted into legacy units—including non-S&L units. See *Bulletin No. 954*



Select the Chamber that Meets Your Efficiency Goals & Site Requirements

S&L Grit Chambers	Grit Removal Efficiency	Inlet & Internal Flow Velocity Controls	Inlet/Outlet Layout	Single Unit Capacity
PISTA® INVORSOR®	95% Down to 75 Microns*	✓	Variable	9 Unit Models 0.5 to 50 MGD 22 to 2.190 L/s
PISTA® VIO™	95% Down to 105 Microns*	✓	Variable	11 Unit Models 0.5 to 100 MGD 22 to 4.381 L/s
PISTA® 360™ with VFB™	95% Down to 105 Microns*	✓	360°	11 Unit Models 0.5 to 100 MGD 22 to 4.381 L/s
OPTIFLOW 270®	95% Down to 150 Microns*	✓	270°	11 Unit Models 0.5 to 100 MGD 22 to 4.381 L/s

General PISTA® Grit Chamber Unit Model Flow Capacities

PISTA® Model No.		0.5	1.0	2.5	4.0	7.0	12.0	20.0	30.0	50.0	70.0**	100.0**
Recommended Max. Flow	MGD	0.5 MGD	1.0 MGD	2.5 MGD	4.0 MGD	7.0 MGD	12.0 MGD	20.0 MGD	30.0 MGD	50.0 MGD	70.0 MGD	100.0 MGD
	L/s	22 L/s	44 L/s	110 L/s	175 L/s	307 L/s	526 L/s	876 L/s	1.314 L/s	2.190 L/s	3.067 L/s	4.381 L/s

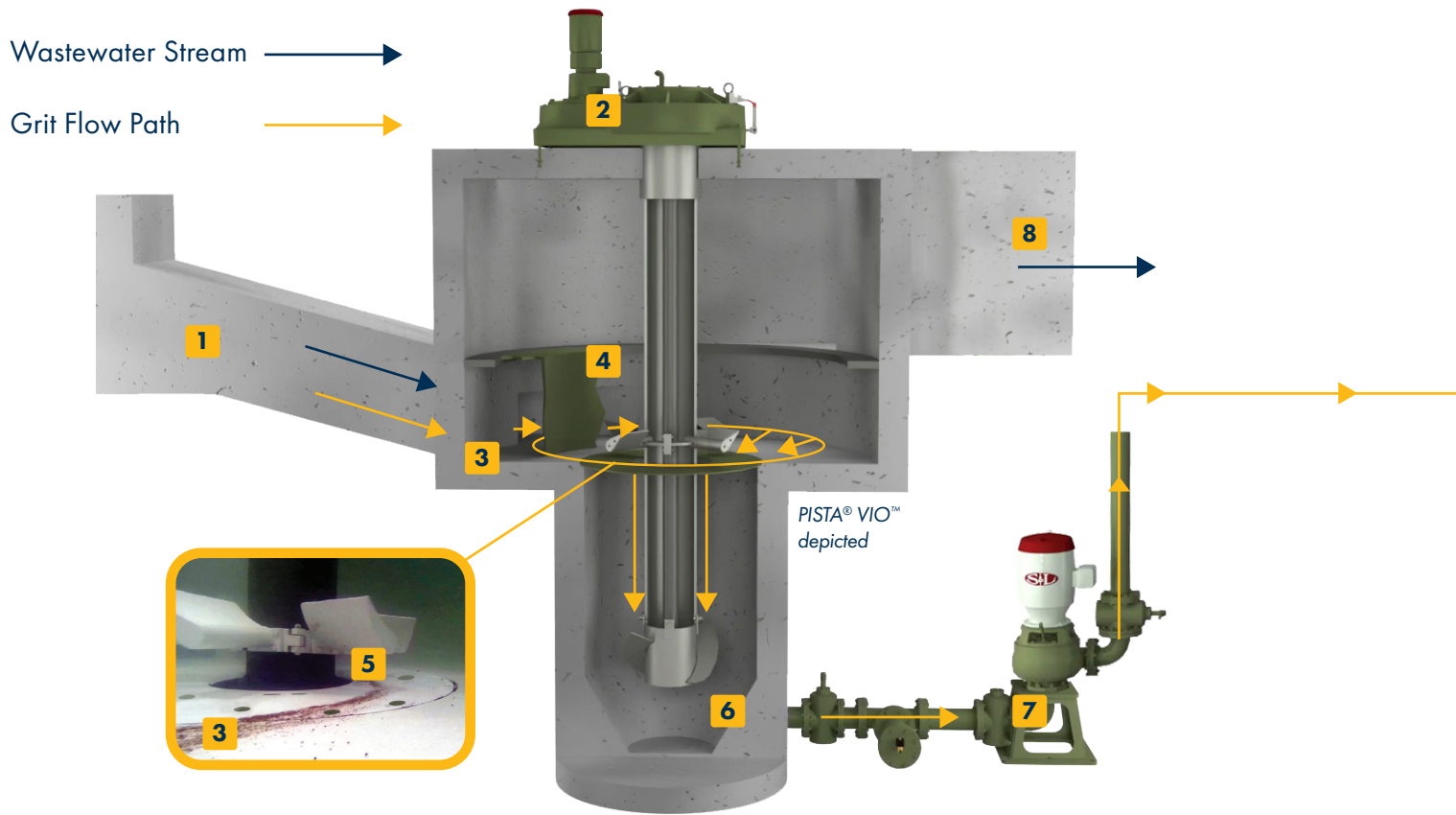
*At All Flows

Not Available for **INVORSOR®

Complete System Flow Scheme and Features

Grit Chamber

Grit Pumping



1 Inlet Ramp into PISTA® Grit Chamber
Conditions incoming flow velocity and incoming grit for travel along chamber's flat-floor. Optional stainless steel construction available.

2 Robust Grit Chamber Synchronous Belt Drive
New standard design turns Chamber paddles and Grit Fluidizer < 25 RPM | < 2 Hp [1.5Kw] | No oil and associated maintenance

3 Flat-Floored Grit Chambers with New PISTA® iPLATES™
The forced vortex moves grit along the exclusive flat-floor toward the center grit hopper opening and new CFD hopper cover plate perforations.

4 Internal Flow Baffling in Upper Chamber
Aids in flow velocity control, turnaround for varying inlet flows, and overall grit removal efficiency. Varies based on chamber model.

5 Propeller
Primary function is lifting and separating lighter organic particles apart from the grit heading into the storage hopper openings.

6 PISTA® Grit Fluidizer in Lower Grit Storage Hopper
Uniquely designed rotating blades prevent grit compaction in the lower grit hopper so that the slurry can be pumped for washing/dewatering.

7 Heavy-Duty PISTA® TURBO™ Grit Pump
Designed exclusively to convey collected grit slurries to second-stage grit washing and dewatering phase. | Remote-mounted or top-mounted

8 Outlet
Wastewater stream exits grit chamber through upper shelf outlet; positioning can be at any degree rotation from the inlet with **PISTA® VIO™** and **INVORSOR™** models, 360 degrees with the **PISTA® 360** with **V-FORCE Baffle™** and 270 degrees with a **PISTA® 270™**.

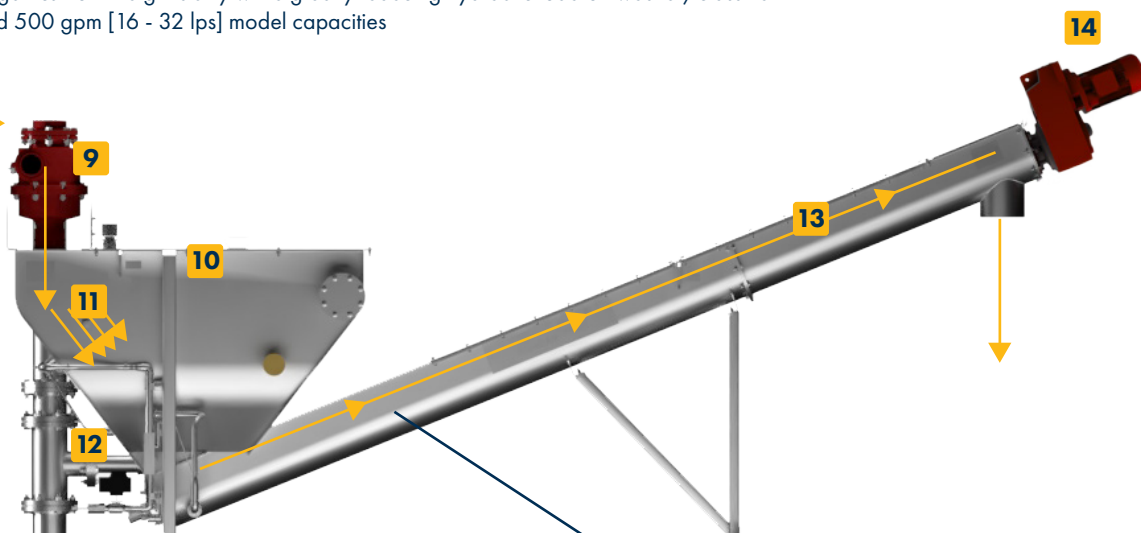


S&L QUICKSMART™ System Touchscreen Controls provide the easy ability to monitor and adjust all your grit removal system functions with a simple touch.

Grit Concentrator [Cyclone] → Grit Washer / Conveyors

9 PISTA® Grit Concentrator [Optional 2-Piece or 1-Piece]

Separates organics from the grit slurry while greatly reducing hydraulic load on washer/classifier
250 gpm and 500 gpm [16 - 32 lps] model capacities



10 PISTA® TURBO™ Grit Washer [or Select Screw Conveyor]

Select desired size of compatible grit washing and dewatering units.
250 gpm and 500 gpm [16 - 32 L/s] capacities with varying auger lengths.

11 Inclined Plates for Enhanced Separation

Parallel plates located in the settling zone of the hopper improve the retention of fine grit | Available on all PISTA® grit washers and screw conveyors.

12 TRI-CLEANSE™ Technology [only with TURBO™ Grit Washer]

Exclusive triple action cleaning and separation with intense hydro-flushing and air infusion into lower trough/hopper prior to final agitation by the auger.

13 Rotating Screw Auger

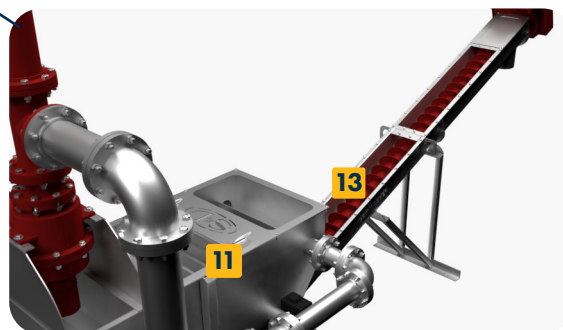
The custom-engineered, shafted auger design prevents contact with the trough, eliminating need for hardened edges and associated O&M.

14 Auger Drive Motor

Direct drive Auger motor [1 - 5 Hp/ 0.75 - 2.25 Kw typical] turns auger for final grit agitation/separation | Typically runs 4 times per day for 30 min.

15 Dry, Clean Grit Exits for Collection

PISTA® washing and dewatering equipment matches the 95% grit removal efficiency of the corresponding PISTA® grit chamber, down to 75 microns.



PISTA® Turbo Grit Pump

Smith & Loveless' rugged **PISTA®** Turbo Grit Pump is the only pump in the industry exclusively designed for pumping grit separated from wastewater. Available in both remote-mounted flooded-suction and top-mounted vacuum-primed configurations, this durable grit pump features the exclusive staples of renowned S&L wastewater pump design. S&L is the ONLY grit removal system manufacturer that actually manufactures its own grit pumping equipment. At S&L, it's a crucial element in grit removal system success.

PISTA® TURBO™ Grit Pump Data

Capacity	Up to 500 GPM [32.5 L/s]
Sizing	4" and 6" [100 and 150 mm]
Materials	Ni-Hard Impeller and Volute

PISTA® TURBO™ Grit Pump Advantages

- Eliminates grit accumulation in self-priming pumps
- Vertical construction makes access to volute and impeller easy
- Eliminates sewage spills experienced in horizontal pumps
- No V-belts or wear plates, eliminating related maintenance
- Designed exclusively for grit pumping



The PISTA® TURBO™ Grit Pump shown above in its remote-mounted configuration is the industry's only true pump designed exclusively for wastewater grit handling.



Optional Storm Mode design allow dual PISTA® TURBO™ Grit Pumps to pump to dual Grit Concentrators in the dewatering devices for cost-effective redundancy

Exclusive Features

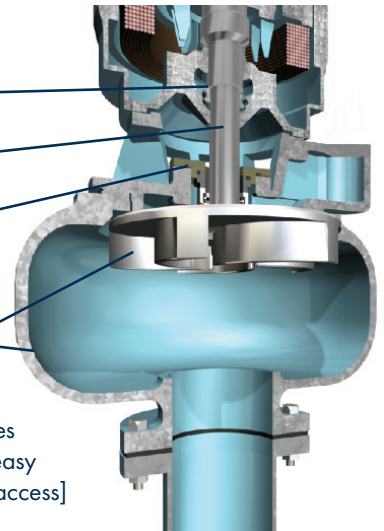
Oversized thrust bearing
(locked for no end play)

Oversized stainless
steel shaft

Mechanical seal with Heat
dissipating bronze housing

Recessed Ni-Hard impeller
and Ni-Hard volute

Vertical pump construction makes
removal of motor and impeller easy
[just remove 4-8 cap screws to access]



The **PISTA® TURBO™** Grit Pump is a vertical, direct-coupled pump — not a maintenance-intensive, belt-driven, horizontally-constructed pump. S&L's legendary pump design is marked by oversized bearings and an oversized solid stainless steel pump shaft which is significantly thicker, more robust and longer-lasting than the typical water industry solids-handling pump.

S&L's pump volute and impeller are constructed of Ni-Hard alloy opposed typical cast iron by others—it is designed exclusively for pumping wastewater grit slurries—and nothing else.

PISTA® Grit Washing and Dewatering Solutions

Smith & Loveless' **PISTA® TURBO™** Grit Washer features **TRI-CLEANSE TECHNOLOGY™** to produce clean grit while minimizing the odor caused by putrescible organics. It boasts a sleek, compact stainless-steel design with a similar footprint to S&L's **PISTA®** Grit Screw Conveyor. Select from either technology with auger lengths that meet your grit handling and disposal needs. The **PISTA®** grit handling system includes the 2-piece **PISTA®** Grit Concentrator [hydro cyclone] which reduces the flow into the grit washer / screw conveyor by separating moisture from the grit slurry through vortexing.



Sleek in design, the PISTA® TURBO™ Grit Washer with TRI-CLEANSE Technology™ works in concert with the PISTA® Grit Concentrator to produce clean, dry grit.

Superior Grit Washing Performance

- Superior 95% grit retention of particles down to 75 micron [CFD and field-proven vs. less than equal competitor specs]
- ≤ 5% putrescible organic material in washed grit
- ≤ 10% water content in washed grit; passes paint filter test

PISTA® TURBO™ Grit Washer Advantages

- Exclusive triple-action cleansing for high organic separation
- Drier, cleaner grit with less putrescible organic material
- Significantly reduces odor
- Energy dissipation + inclined plate zones aid fine particle retention
- Easy O&M: only one motor and drive to maintain; no wear shoes
- Designed and manufactured in the USA [unlike most other washers]

Model	Shaft Length	Grit Slurry Capacity
15	15 ft. [4.5 m]	250 GPM [16 L/s]
17	17 ft. [5.2 m]	500 GPM [32 L/s]
19*	19 ft. [5.8 m]	1000 GPM [64 L/s]

*Only available in Screw Conveyor form

The Grit Dewatering Pre-Step: PISTA® Grit Concentrator

Durable hydrocyclone effectively separates organics from the grit slurry. Offers longer service life than units with wearing liners. Lower cone allows for easy removal without disconnecting the piping. Aids in 95% removal efficiency.

Model/Capacity	Ample Thickness	Large Orifice Size	Light Weight
250 GPM [16 L/s]	0.75" [1.9 cm]	3.5" [8.9 cm]	60 lb. [28 kg]
500 GPM [32 L/s]	1.5" [3.8 cm]	3.75" [9.5 cm]	215 lb. [94 kg]



Rugged 2-piece Ni-Hard Cone

Upgrades, Options and Packages

PISTA® WORKS™

The custom-engineered **PISTA® Works™** is a fully automated packaged headworks system integrating screening with the complete **PISTA®** Grit Removal System.

- ✓ Coarse or Fine Screens
- ✓ **PISTA®** Grit Chamber
- ✓ **TURBO™** Grit Pump [Flooded Suction]
- ✓ **PISTA®** Grit Concentrator
- ✓ **TURBO™** Grit Washer/Screw Conveyor
- ✓ **QUICKSMART™** PLC Controls Option



4.0 MGD PISTA® WORKS™
with dual fine screens and
Model 15 grit screw conveyor
with grit chamber bypass.

PISTA® PRO-PAK™

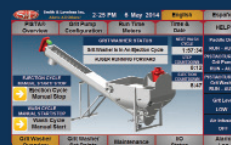
- ✓ Weather Protection for **PISTA® TURBO™** Grit Pump and Control Panel
- ✓ Economical Alternative to Building a Housing Structure
- ✓ Factor-Assembled & Pre-Wired

The custom-engineered **PISTA® PRO-PAK™** features a factory-assembled **PISTA®** drive assembly, vacuum priming system and controls mounted to a stainless-steel base and housed within an easy-access fiberglass enclosure. Allows for maintenance without need to remove heat trace and insulation.



S&L's touchscreen **QUICKSMART™** System Controls makes operating your entire **PISTA®** Grit Removal system easy with complete monitoring, data collection, and adjustments at the touch of your finger.

Grit Washer Overview



I/O Status Overview



- PLC Touchscreen Control
- Alarm Management
- Graphical System Notifications
- Grit Pump and Washer Operation
- Help/Troubleshooting
- English/Spanish Toggle

How Does PISTA® Compare?

PISTA® Performance Capability	vs. Stacked Tray Settling Device	vs. Aerated Grit with GW Inserts
95% Grit Removal Down to 75 Micron For All Flow Conditions	95% Down to 75 Micron; Must Derate Efficiencies for Peak Conditions	90-95% Down to 75 Micron; Derated to 105 Microns for Peak Conditions
95% Removal Down to 75 Micron Across Entire Grit Washing/ Dewatering Components	95% Down to 75 Micron; Must Derate Efficiencies for Peak Conditions	Very Large Footprints are Required In Order to Achieve 95% Removal Down to 75 Micron
PISTA® Design and Installation Factors	vs. Stacked Tray Settling Device	vs. Aerated Grit with GW Inserts
Grit Chamber Unit Capacities: 75 Micron Removal — 50 MGD [2.190 L/s] 105 Micron Removal — 100 MGD [4.380 L/s]	Largest Grit Unit Capacity is Only 13.4 MGD [587 L/s] for 75 Micron Removal 23 MGD [1.008 L/s] for 105 Micron	Largest Grit Unit Capacity is Only 20 MGD [876 L/s] for 75 Micron Removal 20 MGD [876 L/s] for 105 Micron Removal
Inlet-Outlet Can Be Arranged For Any Angle from 0 - 360° [INVORSOR® + VIO™]	Arrangements Set Only for 90°-180°- 270°- 360° Inlet-Outlet Directions	(Non-Circular) Arrangement Set Only for 180° [Straight-thru] Outlet
4,000+ Installations in North America Alone; 5+ Decades Experience	Less than 500 Installations in North America; Foreign-owned	Less than 20 Installations in North America; Foreign-owned
PISTA® O&M Factors	vs. Stacked Tray Settling Device	vs. Aerated Grit with GW Inserts
Low O&M Overall; No Wearing Submerged Parts or Wear Liners Requiring O&M	Requires 65,000 gpd [2.9 L/s] of Pumped Utility Water Adding to Hidden Operational Costs	Submerged Auger Bearings & Wear Liners Invite Time-Consuming and Costly O&M; Plate Packs Must Be Crane-Lifted to Access
Intermittent Grit Pumping by Ni-Hard Pump Designed by S&L Exclusively for Grit Removal	Must Pump Continuously from Sump, Raising Energy Costs; Uses Buyout Flooded Suction Pump	Typically Uses Buyout Flooded Suction Pumps with Motor that Controls Auger and Pump Simultaneously; Requires Two Seals

Performance at peak flows is critical because wet weather events can deliver more than 40x the grit load than dry weather days.

Design, Installation and O&M time and costs are much lower when fewer total units can meet project requirements in a smaller total footprint. The PISTA's larger capacities and higher turndown ratios (as great as 10:1) can dramatically reduce the grit system components and area required and the associated O&M time and costs when compared to the competition.

As projects get more complex, S&L is your trusted grit removal partner from pre-design to installation to years after start-up.

How much is grit costing you?

High efficiency grit removal is proven to be a smart investment. The following chart represents the analysis of one sewer district's cost savings between a **PISTA®** Grit Removal System with 95% grit removal for particles down to 105 microns compared to a lower efficiency, conventional system based on the regional U.S.G.S. grit profile¹ and the plant's annual grit handling costs².

Cost of Grit Analysis					
Grit	300 micron	210 micron	150 micron	105 micron	Total
Regional Profile	83.4%	8.0%	5.2%	3.5%	
Incoming to Plant (lb/day) ^{3,4}	11,726.1	1,121.3	727.6	485.1	14,060.1
Conventional Vortex Performance					Total
Conventional Vortex ⁵	95%	85%	65%	45%	87%
Grit to Dumpster (lb/day)	11,008.6	849.9	290.3	68.9	12,217.7
S&L Baffled Vortex Performance					Total
Baffled Vortex ⁶	95%	95%	95%	95%	95%
Grit to Dumpster (lb/day)	11,104.9	1,060.1	687.1	456.7	13,308.8
Additional Grit (ft ³ /day)	6.6	Additional Grit (lb/day)			1,091.1
Additional Grit (yd ³ /year)	89	Additional Grit (ton/year)			199
Based on the ADF of 17 MGD, the sewer district's projected yearly savings is:				\$111,779	

¹ Rippon, D., et al. "Grit Characterization and the Impact on Grit Removal Systems", WEFTEC, Oct. 2010, New Orleans

² Bachman, M., et al, "In-House Grit Removal System...", WEFTEC, Oct. 2019, Chicago

³ According to WEF MOP8, there is 5 – 10 cu. ft. of grit for every one (1) MGD of ADF for sanitary and combined sewers

⁴ Nominal 2.65 specific gravity as per the Wastewater Technology Factsheet, U.S. E.P.A., 2003

⁵ Based on published values and field-testing data

⁶ Values based on advanced CFD Modeling, full-scale factory-testing and published field-testing data



WE GET GRIT.

Superior 95% Grit Removal. At All Flow Conditions. Never Derated.



PISTA 360
VORFORCE BAFFLE



Smith & Loveless Inc.