



Advanced Grit Management™

A Scientific Approach to Grit System Design

Relative Performance of Grit Removal Systems



Choosing a grit removal technology has often been based on equipment price with little regard for overall system performance. Selecting a grit removal technology based on removal efficiency can be challenging due to the lack of comparative performance data available within the wastewater industry. Owners and engineers are forced to navigate a field of, what can be conflicting, performance claims made by various equipment manufacturers. This situation is perpetuated by the fact that there is no accepted, peer reviewed test standard for grit sampling and analysis.

Key Considerations

- Increasing efficiency in wastewater processes leads to the need for increased grit system performance
- Grit testing methods vary widely, so it is critical to compare performance based on the same testing methodology
- Performance during Wet Weather events and at peak flows can be significantly different than average flow performance

Grit Testing Methodology

Effective test methodology must provide accurate, consistent, repeatable and reproducible results. One of several grit sampling methods used by owners and engineers is the vertical slot sampler (VSS)¹. The VSS is designed to draw off a known vertical segment of the influent water to provide an accurate sample of incoming solids. Although not detailed in ASTM manuals, sampling using the VSS has been found to produce results that are accurate, repeatable, and effective for system removal efficiency comparisons at different treatment plants¹. This same test methodology has been used for comparison of grit removal efficiency of various types of technologies.

Using this testing as a common method allows comparison of performance of various grit removal technologies and can assist in improving grit system design and justifying advanced processes.



VSS

1. McNamara, Griffiths & Book. (2009) True Grit. A Grit Removal Efficiency Investigation at Five Wastewater Treatment Plants. WEFTEC Conference Proceedings



Results

Decreased Performance at Peak

The observed decrease in performance with increased flows provides strong evidence that the tested technologies are strongly influenced by surface loading rate and gravity to capture and retain grit. A better understanding of in-situ grit settling velocity will allow for more efficient design which would afford the plant increased protection from abrasive wear and deposition.

The Wet Weather Effect

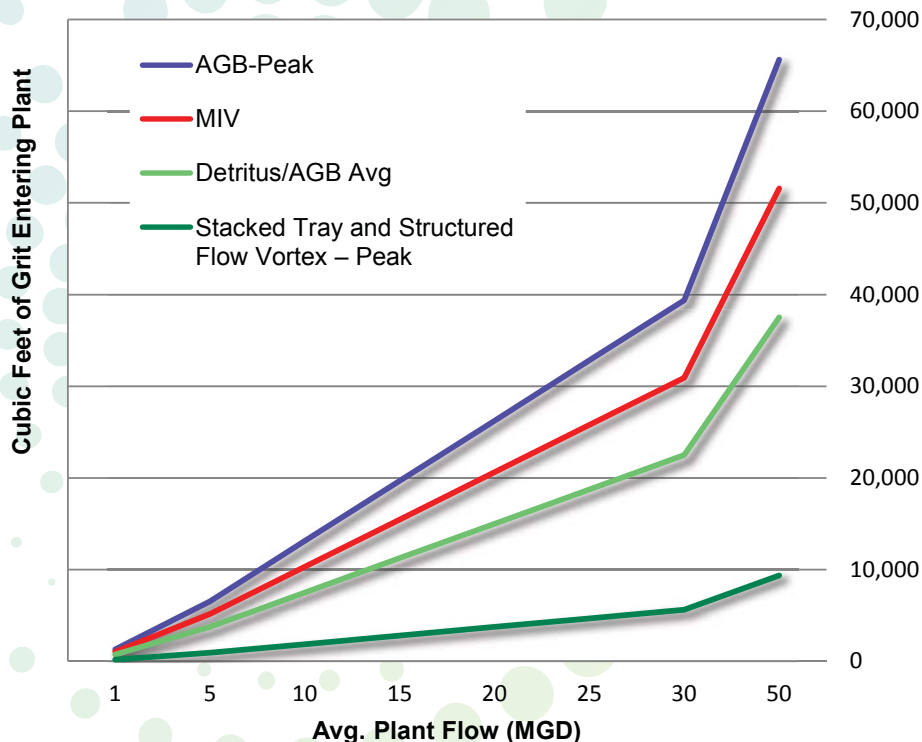
Significant increase in grit volumes during wet weather events is a common phenomenon and indicates the need to design the grit system for effective removal at peak hydraulic loadings. Designing the grit removal system for high removal efficiency at peak hydraulic loadings will protect the plant from the negative impacts of grit. Advanced, compact, high-efficiency grit removal processes are therefore the most appropriate proven choice to protect plants from deposition, abrasive wear, and associated costs of this nuisance material.

To download a copy of the full paper, *Relative Performance of Grit Removal Systems*, originally presented at the Western Canada Water conference in 2013, please visit the Resources Section of the Advanced Grit Management website.

Table 1. Relative Performance of Grit Removal Devices

Technology	% of Design Flow	Manufacturer's Stated Removal Efficiency at 100% Flow	Measured Total % Removal 150 µm & up	Measured Total % Removal 106 µm & up
Mechanically Induced Vortex (MIV)	27 - 90	95% removal of 270 µm, 2.65 SG 65% removal of 150 µm, 2.0 SG	43 - 52	43 - 50
Detritus Tank	66	150 µm and larger, 2.65 SG	66 - 71	57 - 68
Aerated Grit Basin (AGB)	66 - 100	Unknown	35 - 70	32 - 67
Stacked Tray	100	95% removal of 75 µm, 2.65 SG	91 - 92.5	89 - 90
Structured Flow Vortex	66 - 100	95% removal of 106 µm, 2.65 SG	90 - 95	87 - 93

Annual Grit Volume Passed by Grit Removal System



The amount of grit that will pass through an existing grit removal system and enter downstream processes.