What is Grit?

INORGANICS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Sand</td>
<td>Cinders</td>
</tr>
<tr>
<td>Soil</td>
<td>Coal</td>
</tr>
<tr>
<td>Glass</td>
<td>Stone</td>
</tr>
</tbody>
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Specific Gravity of 2.65 & above

What is Specific Gravity?

- Correlates to a particle’s settling velocity, which measures the speed or time a particle will settle in the water.

GRIT SIZES

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Sand</td>
<td>0.1 mm to 2.0 mm</td>
</tr>
<tr>
<td>Soil</td>
<td>0.002 mm to 0.1 mm</td>
</tr>
<tr>
<td>Stone</td>
<td>Varies</td>
</tr>
<tr>
<td>Glass</td>
<td>Varies</td>
</tr>
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</table>
Variables Influencing Quantity of Grit

- Type of Collection System
  - Combined
  - Separate

- Condition of Sewer System

- Geographic Location

Rule of Thumb

<table>
<thead>
<tr>
<th>Type of Sewers</th>
<th>Average</th>
<th>Peak</th>
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<tbody>
<tr>
<td>SEPARATE SEWERS</td>
<td>2 to 4 ft$^3$ per MGD</td>
<td>8 ft$^3$ per MGD</td>
</tr>
<tr>
<td>COMBINED SEWERS</td>
<td>8 to 20 ft$^3$ per MGD</td>
<td>40 ft$^3$ per MGD</td>
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</table>

Grit System Location
Grit System Location

Bar Screen  Grit Removal  Aeration

Purpose of Grit Removal?

Grit Removal Prevents:

• Extra Maintenance for Excessive Wear of Mechanical Equipment
• Clogged Channels and Pipes
• Accumulation of Grit in Digesters, Aeration Basins and Clarifiers

Grit Removal System Components

• Grit Removal Chamber
• Grit Slurry Conveyance (Pumping)
• Grit Slurry Concentration
• Grit Cleaning, Washing, Dewatering
• Grit Disposal
Vortex Grit Chambers

Advantages of Flat Bottom
- Flat floor uses forced hydraulic, vortex movement - not gravity
Low Flows Impact Vortex Grit Chambers

- Never meeting future design points
- Local areas working on solving I&I problems in the collection system.

Grit Removal System Components
Grit Pumping

SONIC START™

Replaces Electrode's Cleaning Issues
Minimize Grit Piping

The More Complicated the Grit Piping, the Greater Likelihood of Grit Handling Problems
Grit Piping Rules

• Suction Piping Should be Kept to a Minimum (Less than 10’)
• Never Use Check Valves, instead use Pinch Valves
• Use Good Screening Equipment Ahead of Grit Process (3/4” max. opening)

• Remove All Grit From Basin Every Cycle
• Use Water Flush Into Suction Line (Flooded Suction Applications-Air Not Recommended)
• May Run Flush Water While Pumping (Flooded Suction Applications-Air Not Recommended)

Grit Piping Rules

• Use Dedicated Suction & Discharge Lines for Dual Pumps
• Eliminate Unnecessary Elbows
• Use 45° Elbows if Necessary

Grit Dewatering Equipment
Custom-Engineered and Patented Screw to Further Clean the Grit Through Additional Agitation

Intense Flushing with Water Aids in Organic Separation

High Air Infusion Aids in Organic Separation
Why a Grit Washer?

- Growing Landfill Restrictions.
- Growing Concerns About Odor & Disease Conveying Insects.
- More Stringent Regulations, particularly internationally and we perceive those to be heading to the U.S.

Specifications

- Grit retention of 95%, down to 140 mesh particle size
- Less than or equal to 5% putrescible organic material in washed grit
- Less than 10% water content in washed grit - Passes paint filter test

Issues Impacting Your Grit Chambers

- Older design units that don’t have the newest innovations

Alexandria, LA - side-by-side units, 1 with, 1 without FLUIDIZER

Issues Impacting Your Grit Chambers

- Not operating correctly due to missing parts

Does the unit still have the hopper plates in place?

Is the pinch valve set correctly?

Are the Axial Flow Propellers still intact?
Issues Impacting Your Grit Chambers

- Low Flows - Never met future design points, local areas working on I&I
- Low flows do not provide enough velocity to carry grit into chamber
- After I&I work, installations going from average daily flow of 12 MGD, to 8 MGD

Submerged Weir

<table>
<thead>
<tr>
<th>Flow Rate (MGD)</th>
<th>H1 (ft)</th>
<th>Vel (ft/sec)</th>
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<tbody>
<tr>
<td>70</td>
<td>5</td>
<td>3.5</td>
</tr>
<tr>
<td>29</td>
<td>3.3</td>
<td>2.3</td>
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<tr>
<td>13</td>
<td>2.7</td>
<td>1.2</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>0.9</td>
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</table>

H1 = inlet channel water elevation

V-FORCE BAFFLE

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<th>Flow Rate (MGD)</th>
<th>H1 (ft)</th>
<th>Vel (ft/sec)</th>
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<tbody>
<tr>
<td>70</td>
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<tr>
<td>29</td>
<td>2.8</td>
<td>2.6</td>
</tr>
<tr>
<td>13</td>
<td>1.6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>1.1</td>
<td>1.6</td>
</tr>
</tbody>
</table>

H1 = inlet channel water elevation

Grit Testing

Why is Grit Testing Knowledge Important?

- The influx of new testing methodologies are yielding significant differences in results
- Established performance grit testing protocols have been practice for decades

Purpose of Grit Removal Testing and Grit Characterization

- To determine the actual operating performance by testing inlet and outlet
- Knowing the volume of individual grit particle sizes (50, 70, 100, & 140 mesh)
Testing Parameters

- Tests were performed on the same vortex grit tank
- Dry weather conditions
- Samples taken at the same location in the flume
- Each sample was taken with the unit running at design flow

Side by Side Testing

Cross-Channel Sampling (CCS)
Vertical Integrated Sampling (VIS)

Sampling Probe Review

CROSS CHANNEL SAMPLING PROBE DIAGRAM
VERTICAL INTEGRATED SAMPLER DIAGRAM

Testing Equipment and Number of Samples

CCS VELOCITY PROFILE DIAGRAM
VIS VELOCITY PROFILE DIAGRAM

Results

Elevation View of Influent Flow
Cross-Channel Sampling with Probe Velocity in Round Bottom Chart
8639.4 grams of grit

Results

Elevation View of Influent Flow
Cross-Channel Sampling with Probe Velocity in Round Bottom Chart
404
Results

Competition: Tournament
Vertical Segregation
Sample vs Close/Channel Sampling

THANK YOU