WHAT IS GRIT?

Inert material, both organic and inorganic, that is not benefitted by secondary treatment or sludge processing.
WHAT IS GRIT?

Majority of particles fall in 75-150 micron range.
HOW SMALL IS THAT?

• Grit Particles: Majority 75-150 micron
• Typical Raindrop: 2000 microns
HOW SMALL IS THAT?

• Grit Particles:
  Majority 75-150 micron

• Human Hair:
  70-100 microns
EXAMPLES OF GRIT

Inorganic
  Sand
  Gravel
  Cinders
  Asphalt
  Concrete
EXAMPLES OF GRIT

Inorganic
Sand
Gravel
Cinders
Asphalt
Concrete

Organic
Eggshells
Seeds
Bone Chips
Coffee Grounds
CHARACTERISTICS OF GRIT

• Higher specific gravity than treatable organic solids.

• Particle shape can be spherical, flat, or angular.
WHERE DOES GRIT COME FROM?

The Collection System

- Materials that are flushed by homeowners
- Infiltration/Inflow
WHERE DOES GRIT COME FROM?

Diagram showing the comparison of sand and coated grit particles in terms of their physical size and velocity for sand with the same physical size as grit particle.
WHERE DOES GRIT COME FROM?

Within the Plant

• Fixed film predators
• Wind blown sand and dust
• Damaged piping
HOW DOES GRIT AFFECT MY PLANT?

Disrupts biological processes and reduces effluent quality
How does grit affect my plant?

Disrupts biological processes and reduces effluent quality

• Wear and tear on mechanical equipment
HOW DOES GRIT AFFECT MY PLANT?

Disrupts biological processes and reduces effluent quality

- Increase in energy demand
HOW DOES GRIT AFFECT MY PLANT?

Disrupts biological processes and reduces effluent quality

• Reduction of treatment capacity
HOW CAN GRIT BE MANAGED?
Removal, Mitigation, or Both
WHERE SHOULD GRIT BE REMOVED?

Option 1: Head of Plant
- Better protection of process equipment
- Larger unit required to handle full flows
- Additional protection or removal may be needed after fixed film treatment processes
WHERE SHOULD GRIT BE REMOVED?

Option 2: Sludge Stream
- Located prior to thickener or digester
- Solids concentration should not exceed 2% TS
- Protection of upstream process equipment and tanks may be required
WHERE SHOULD GRIT BE REMOVED?

Option 3: Multiple Locations
- Protects upstream process equipment and basins
- Removes grit generated within the plant prior to sludge digestion
- Cost may be prohibitive
WHERE SHOULD GRIT BE REMOVED?

No matter which option is selected, bar screening is required.
SELECTING GRIT REMOVAL OPTIONS

PLANT FACTORS

- Range of Flow
- Type of Treatment Process
- Location of Grit Removal
- Allowable Headloss
- Grit Testing Results
- Other Benefits to Treatment
SELECTION GRIT REMOVAL OPTIONS

REMOVAL SYSTEM FACTORS

- Particle Size Range
- Equipment and Energy Requirements
- Maintenance Requirements
SELECTING GRIT REMOVAL OPTIONS

OTHER FACTORS

GRIT
- Source of Grit
- Size of Particles

OPERATIONAL
- Maintenance Requirements
- Construction Cost
- Age and Maintenance of System
GRIT REMOVAL

OVERVIEW OF REMOVAL OPTIONS

• Detridus Tank/Channel
• Aerated Chamber
• Hydraulic Vortex/Stacked Tray
• Mechanical Vortex
GRIT REMOVAL

OVERVIEW OF SYSTEM ELEMENTS

Influent

Grit separation

Slurry

Wastewater with depositable grit removed

Grit washing

Slurry

Water containing organic matter removed from grit

Grit dewatering

Slurry

Excess water removed from grit

Grit
OVERVIEW OF SYSTEM ELEMENTS

- **Influent**
  - **Grit separation** → **Wastewater with depositable grit removed**
  - **Slurry**
  - **Grit washing** → **Water containing organic matter removed from grit**
  - **Slurry**
  - **Grit dewatering** → **Excess water removed from grit**

**Diagram Details**:
- **Top mounted grit pump (floated suction option not shown)**
- **Chamber drive motor and gear reducer**
- **Suction lift weld assembly (extends through drive tube)**
- **Bull gear**
- **Upper internal baffle (if applicable)**
- **Lower internal baffle (if applicable)**
- **Propeller blades**
- **Drive tube**
- **Fluidizer vanes (replaces NPW water line)**
- **Hopper cover plates**
OVERVIEW OF SYSTEM ELEMENTS

Influent

Grit separation

Wastewater with depositable grit removed

Slurry

Grit washing

Water containing organic matter removed from grit

Slurry

Grit dewatering

Excess water removed from grit

Grit
OVERVIEW OF SYSTEM ELEMENTS

Influent → Grit separation → Wastewater with depositable grit removed → Slurry → Grit washing → Water containing organic matter removed from grit → Slurry → Grit dewatering → Excess water removed from grit → Grit
GRIT REMOVAL

DETRITUS/ SEDIMENTATION TANK OR CHANNEL
GRIT REMOVAL

HYDRAULIC VORTEX

Stacked Tray

Teacup
GRIT REMOVAL

MECHANICAL VORTEX

- Chamber drive motor and gear reducer
- Suction lift weld assembly (extends through drive tube)
- Bull gear
- Upper internal baffle (if applicable)
- Lower internal baffle (if applicable)
- Drive tube
- Propeller blades
- Hopper cover plates
- Fluidizer vanes (replaces NPW water line)
- Top mounted grit pump (flooded suction option not shown)
There are several ways to mitigate the effects of grit in the wastewater stream.
WHAT IF REMOVAL ISN’T AN OPTION?

Hardening of Exposed Equipment

- Pump Impellers
- Clarifier Scrapers
WHAT IF REMOVAL ISN’T AN OPTION?

Frequent Basin Cleaning
- Manual Removal/Liquidization
- Combination Trucks
WHAT IF REMOVAL ISN’T AN OPTION?

Aeration: Fine Bubble vs Coarse Bubble
- Grit migration into diffuser heads
WHAT IF REMOVAL ISN’T AN OPTION?

Predator Control for Trickling Filter/Fixed Film Treatment

- Toxic chemicals (short term) or adverse environmental conditions
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