VOGELSANG

Solids Handling and Reduction Choices for Wastewater Applications



Summary of Presentation

1. Why do we need Solids Reduction Equipment, and what kind of problems are common in wastewater?
2. What types of Solids Reduction Equipment is available?
3. Which type of Solids Reduction Equipment should I use?
4. What applications for Solids Reduction Equipment do you have?

Why do we need Solids Reduction?

Although technology has changed in wastewater over the years, we still continue to have debris in wastewater streams. Inevitably, this leads to increased downtime and labor costs. However, there is specially designed equipment to protect your pumps and systems against foreign debris including:

- Flushable Wipes
- String
- Rags
- Hair
- Plastic Fragments
- Applicators
- Plastic Pens
- Bags
- Wood
- Bones
- Rubber
- Much, Much More!

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What kind of problems are common in wastewater?

Debris in the liquid streams leads to clogging, blockages, and damage to downstream pumps, valves, and processing equipment. Reduce your overall maintenance time, and labor costs by installing equipment to keep pumps from plugging!

Why do we need Solids Reduction?

Most wastewater treatment plants have installed fine screening in the form of step, perforated, drum etc. in order to remove the overwhelming debris coming into the plant. This new equipment definitely assists in removal of a majority of the debris, but it still doesn't collect everything that is contained in the influent.

What types of Solids Reduction Equipment available?

Macerator

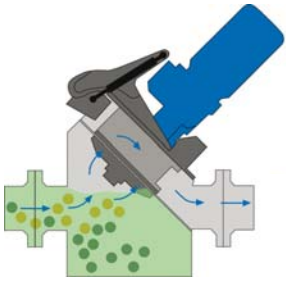
Twin Shaft Grinder

Macerators

Solids Reduction Equipment – Macerators

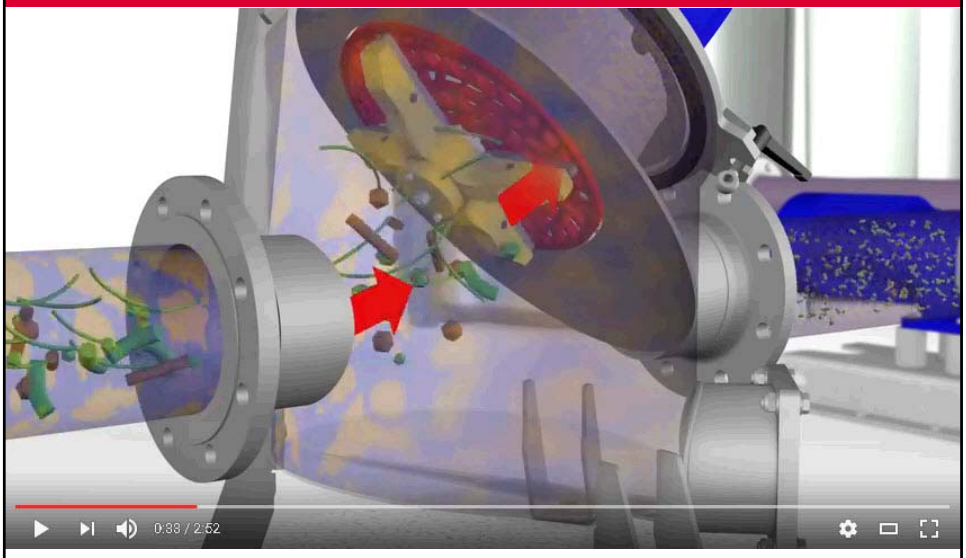
Maceration technology provides the best results when installed after primary screening or headworks systems. They are specifically designed to sheer cut any solid material suspended in the liquid stream. Certain designs provide heavy debris removal traps along with them, as Macerators are not designed to cut hard solids like rocks, metals, etc.

How does a Macerator work?



****Macerators can not run dry!****

How does a Macerator work?



Standard Macerator Features

Auto Reverse Control Panel

Macerators are designed to cut solids and objects as they passes through the cutting assembly, but sometimes an object becomes lodged in the screen and cannot be cut on the first pass.

When this occurs, an Amp increase is detected by the control panel and causes the Smart Relay to initiate the Auto Reverse program in an attempt to eliminate the lodged object.

Auto Reverse can operate up to 5 times prior to the control panel tripping out protecting the motor and Macerator from damage.

Macerators typically run in both directions for a few hours, and switch to keep the blades sharp at all times.

Standard Macerator Features

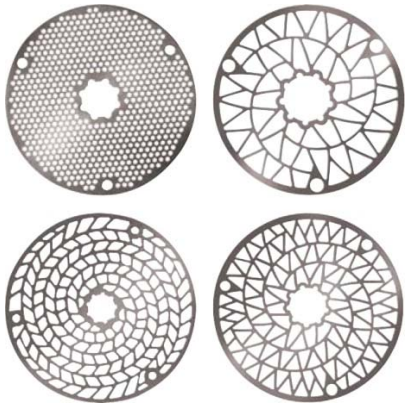
Cutting Screens

Macerator screens come in several cutting patterns that will produce a designated solid size. Rotational speed of the cutting head also influences the end solid size.

The average particle size output from the Macerator screen depends on the hole size, but also velocity. Approximately 80% of the cut material will be half the size or smaller than the opening size of the cutting screen.

The examples shown will produce different solid sizes and can be in several material options for high-wear or corrosive applications.

Macerator screens are reversible to allow for a fresh cutting surface without purchasing a new spare part.



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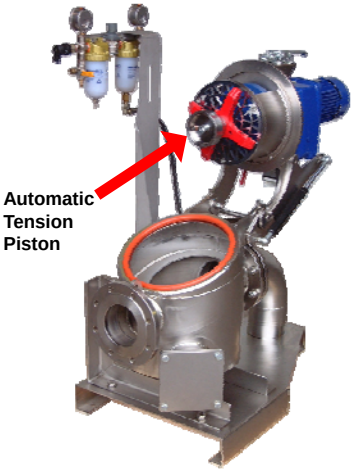
Standard Macerator Features

Macerator Tension Control

All Macerators require a direct contact between the blades and the cutting screen. This is how a scissor-like cut can be achieved to reduce solids passing through.

Blades are designed to wear over time, but in order for them to wear evenly, they require a pre-set pressure. To achieve maximum lifecycle between routine replacements, Macerators include a standard feature for tensioning the blades. Most of these systems are fully automatic requiring little to no user intervention, however some manufactures do not have automatic tension control.



Standard Macerator Features

Tension / Pressure Controls

There are many different styles of blade tension control available on the market. The most reliable and simple is air over hydraulic due to its simplicity over:

- Springs – Loose Tension over time
- Rubber Discs – Tension is not the same continuously, and too flexible.
- Self Tensioning Nuts – Different pressures depending on what is being cut, not adjustable.

If the tension is not correct, a macerator will not cut.

Standard Macerator Features

Standard features not found on many macerators include Auto Reverse, Auto Cut Control,

Self Sharpening Blades, and Reversible Cutter Screens**.**

A Macerator is 100% re-buildable inline which eliminates the need to send out cutter cartridges for reconditioning.

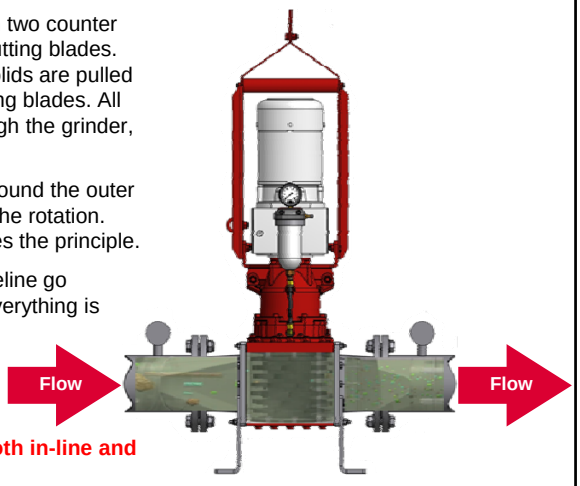
Twin Shaft Grinders

Solids Reduction Equipment – Twin Shaft Grinder

Operating Principle
Twin Shaft Grinders operate with two counter operating shafts with attached cutting blades. As the cutting blades turn, the solids are pulled into the center between the cutting blades. All solid material is processed through the grinder, without a debris trap.

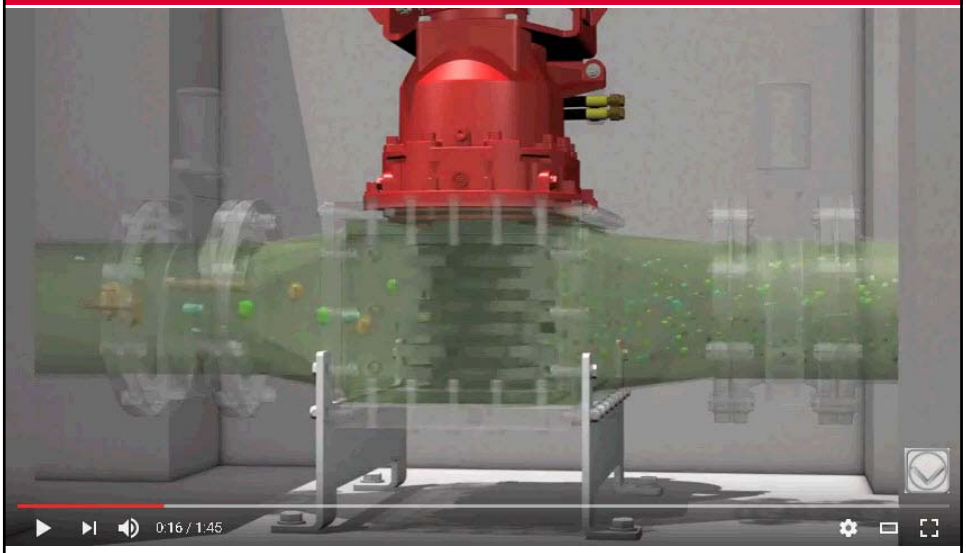
The liquid, however, still flows around the outer opening of the housing, against the rotation. The diagram to the right illustrates the principle.

All fluids coming through the pipeline go through the grinder blades, so everything is ground to small particles.



****Twin Shaft Grinders come both in-line and channel configurations**

How does a Twin Shaft Grinder work?



Solids Reduction Equipment – Twin Shaft Grinder

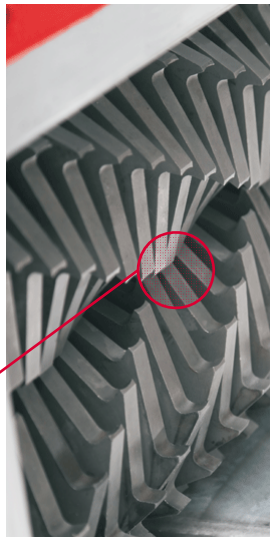
Operating Principal
The cutting rotors operate at low-speed in order to create high torque required for twin shaft grinder applications.

The clearance is very slight, but it is enough to allow each cutting blade to spin without causing any wear to the other blade. The slight clearance does not allow material to bypass the cutting blades.

The cutting blades perform two types of solids reduction:

- The sharp tips help pull and chip large solids down to a size as they are drawn in between the cutting blades
- The sharp sides of the blades grind the solids through the cutting blades for size control.

****Twin Shaft Grinders can run dry indefinitely ****



Standard Twin Shaft Grinder Features

Auto Reverse Control Panel

Twin Shaft Grinders are designed to grind solids and objects as they passes through the cutting assembly, but sometimes an object becomes lodged in the cutting blades and cannot be cut on the first pass.

When this occurs, an Amp increase is detected by the control panel and causes the Smart Relay to initiate the Auto Reverse program in an attempt to eliminate the lodged object.

Auto Reverse can operate up to 5 times prior to the control panel tripping out, protecting the motor and Twin Shaft Grinder from damage.

Standard Twin Shaft Grinder Features

Grinder Cutting Blades

There are many different cutting blade designs on the market, most designs include separate cutting blades and spacers to make their cutting assembly which can be 12-24” long.

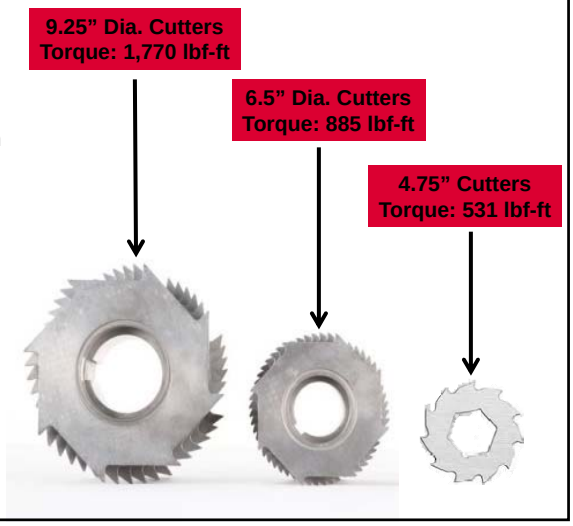
Other manufactures use a solid single piece cutting assembly, as shown to the right. The single solid cutting element has gained popularity because it requires far less maintenance and extends the life of the cutting assembly. The solid single cutting assembly also has many more options in terms of blade size, higher torque ranges, and higher tolerances.

Standard Twin Shaft Grinder Features

Grinder Cutting Blades, Not all Twin Shaft Grinders are the same!

A majority of the Twin Shaft grinders on the market use a smaller cutter blade diameter with little surface contact with the shaft.

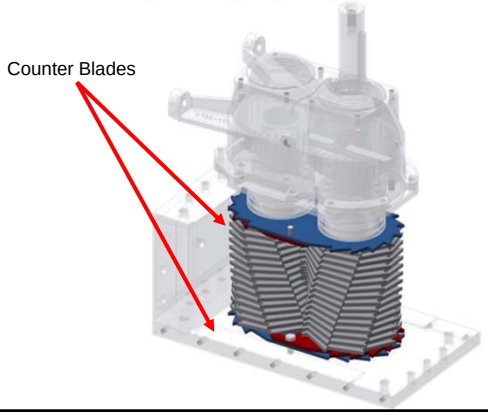
Designs that use a single cutter blade assembly have higher torque for high solids, and longer service life. These designs also use larger shafts for powerful torque.

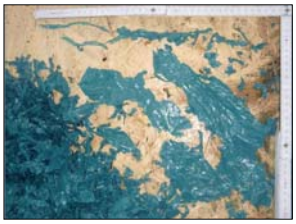


Standard Twin Shaft Grinder Features

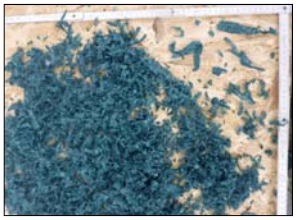
Not all Twin Shaft Grinders are the same!

Some Twin Shaft grinders have advantages by utilizing additional stationary blades to counter more stringy debris and plastics. This is a major advantage due to the common use of plastic bags in grocery stores.





Without Counter Blades



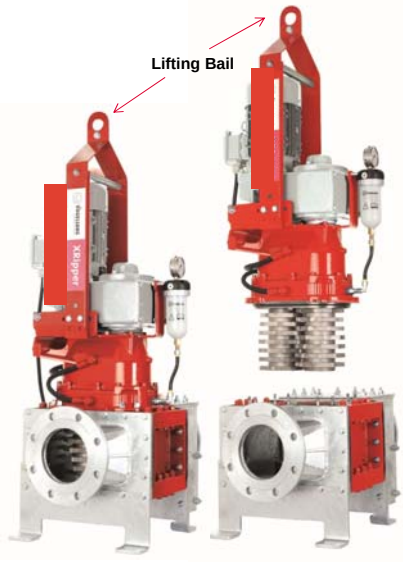
With Counter Blades

Standard Twin Shaft Grinder Features

Not all Twin Shaft Grinders are repairable in the field!

A majority of the grinders on the market feature a lower bearing and separate blades and spacers. These designs typically require that they be returned to the manufacturer for refurbishment at the factory. This is why other designs have gone away from a lower bearing design, while using a solid single blade so they can be easily refurbished in the field if desired.

- Designs with solid single blade assemblies are simple to repair in the field, with no exchange or return required, meaning less down time at a lower cost. Some require 3-week minimum for factory repairs.
- Lower bearing & mechanical seals are susceptible to grit causing premature seal failures.



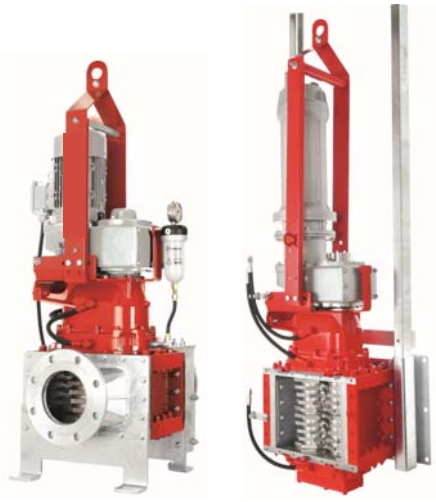
Standard Twin Shaft Grinder Features

Twin Shaft In-Line

Designed for in-line pipe installations, with 4” – 12” Flanges. Simple for in-pipe applications where you need to protect against solids and damage to downstream pumps and equipment.

Channel Grinders

Easy slide rail systems for removal from channels and wet wells. Mounts directly in the channel, or wall mounting for wet well influent lines. Motor designs can be electric, submersible, immersible, or hydraulic.

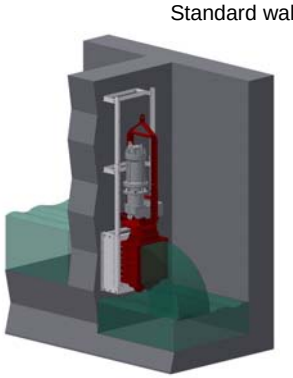


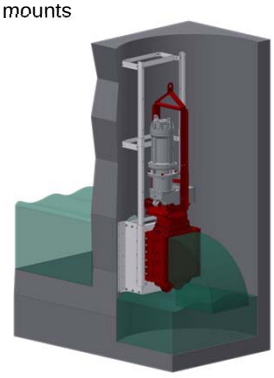
Standard Twin Shaft Grinder Features

Channel Grinders

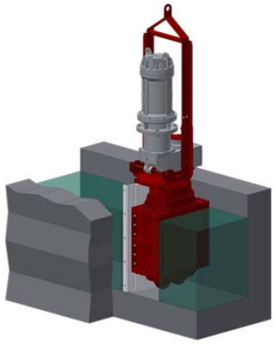
Easy slide rail systems for removal from channels and wet wells. Mounts directly in the channel, or wall mounting for wet well influent lines. Motor designs can be electric, submersible, immersible, or hydraulic.

Standard wall mounts





Standard In-Channel mount



Which type of Solids Reduction Equipment should I use?

Macerator

Twin Shaft Grinder

Which type of Solids Reduction Equipment should I use?

Macerator

Designed for in-line pipe installations. Simple for in-pipe applications where you need to protect against solids and damage to downstream pumps and equipment. Macerators need to have liquid flowing though the pipe, as they can not run dry. They tend to do better with small solids like hair, rags, plastics, etc.

Twin Shaft

Designed for both in-line pipe installations and channels. Twin Shaft Grinders can run dry continuously, and can handle both medium/ large solids where you need to protect against solids and damage to downstream pumps and equipment

Macerator

Twin Shaft Grinder

Solids Handling and Reduction Choices | Wastewater Applications

Objective #3: Which to Use: Twin Shaft Grinder or Macerator?

Twin Shaft Grinder

Twin Shaft Grinders are frequently chosen for raw sewage, primary sludge, thickened sludge and digested sludge in municipal wastewater. It is often used prior to dewatering to get as much water out of the waste as possible.

In-Line Macerator

The advancements to screen technology and the ability to remove the larger materials in the wastewater has increased the use of macerators in municipal wastewater treatment plants and has made them the preferred equipment choice for solids handling and reduction. Macerators achieve the smaller particle size required for the more advanced treatment process. The breakdown of hair and fibrous material is starting to become a requirement in all wastewater treatment plants.

Which type of Solids Reduction Equipment should I use?

Now that we have discussed two viable products in the market made for solids reduction, it's important to define what each does and why we will recommend one over the other.

Twin Shaft Grinder

- Rips & Tears solids apart
- Rotation of the cutter blades pull solids into cutting elements
- Wet or Dry Solids, Runs Dry!
- No possible solids separation such as rocks, metal fragments, etc.
- Coarse to Medium Coarse grinding
- Pressure to 232psi
- Higher Torque Required

Macerator

- Defined Scissor-Like Cut
- Liquid stream moves solids through cutting element
- Solids must be suspended in liquid stream. No Dry Running!
- Heavy solids separation
- Medium Coarse to Fine Cutting
- Pressure to 87psi
- Lower Torque Required

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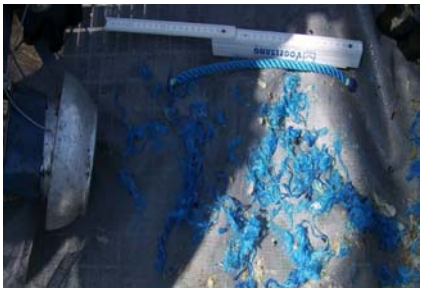
Which type of Solids Reduction Equipment should I use?

Examples of cutting results between our two solids reduction products.

Solid: 10mm Nylon Rope: The Twin Shaft Grinder shredded the rope where the Macerator exposed and cut the inner filament.

Twin Shaft Grinder

Macerator



Which type of Solids Reduction Equipment should I use?

Examples of cutting results between our two solids reduction products.

Solid: Q-Tips: The Twin Shaft Grinder cut most of the shafts and shredded the cotton where the Macerator produced fine consistent pieces.

Twin Shaft Grinder

Macerator

Solids Handling and Reduction Choices | Wastewater Applications

Which type of Solids Reduction Equipment should I use?

Twin Shaft Grinders excel when presented large solids.

Example: The Twin Shaft Grinder cut the large rag solids down to small sizes, easily passed through pumps and downstream equipment.

BEFORE

AFTER

Which type of Solids Reduction Equipment should I use?

Twin Shaft Grinders excel when presented large solids.

Example: The Twin Shaft Grinder cuts textile solids down to small sizes, easily passed through pumps and downstream equipment.

BEFORE

AFTER

Which type of Solids Reduction Equipment should I use?

Twin Shaft Grinders excel when presented large solids.

Example: The Twin Shaft Grinder cuts flushable wipes down to small sizes, easily passed through pumps and downstream equipment.

BEFORE

AFTER

Which type of Solids Reduction Equipment should I use?

Twin Shaft Grinders excel when presented large solids.

Example: The Twin Shaft Grinder cuts textile solids down to small sizes, easily passed through pumps and downstream equipment.

BEFORE

AFTER

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Which type of Solids Reduction Equipment should I use?

Twin Shaft Grinders excel when presented large solids.

Example: The Twin Shaft Grinder cuts plastics and wood solids down to small sizes, easily passed through pumps and downstream equipment.

BEFORE

AFTER

What applications for Solids Reduction Equipment do you have?

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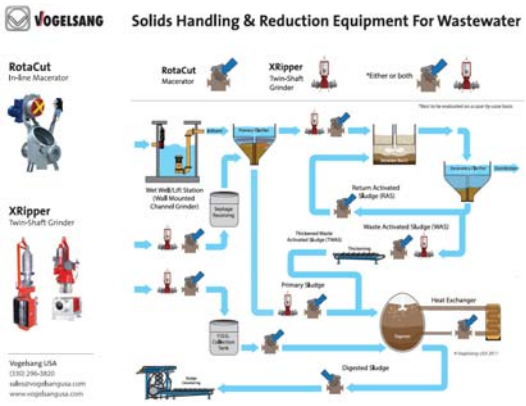
What applications for Solids Reduction Equipment do you have?

Applications for Solids Reduction Equipment – Twin Shaft Grinders

In wastewater treatment plant applications, twin shaft grinders and in-line macerators can be added or be retrofitted into several applications. Some of these applications include:

- Headworks
- Alternative to two-stage screening
- Pump stations
- Septage Receiving
- Grease Receiving
- FOG Receiving
- Primary Scum
- Primary & Secondary Sludge
- RAS, WAS, TWAS Sludge
- Pump Protection

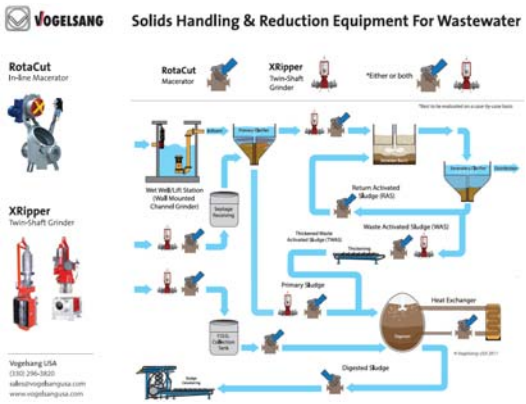


What applications for Solids Reduction Equipment do you have?

Applications for Solids Reduction Equipment – Macerators

In wastewater treatment plant applications, twin shaft grinders and in-line macerators can be added or be retrofitted into several applications. Some of these applications include:

- Grease Receiving
- FOG Receiving
- Digested Sludge
- Heat Exchanger Protection
- Alternative to two-stage screening
- Septage Receiving
- Primary Scum
- Primary & Secondary Sludge
- RAS, WAS, TWAS Sludge
- Dewatering Equipment Protection
- Pump Protection



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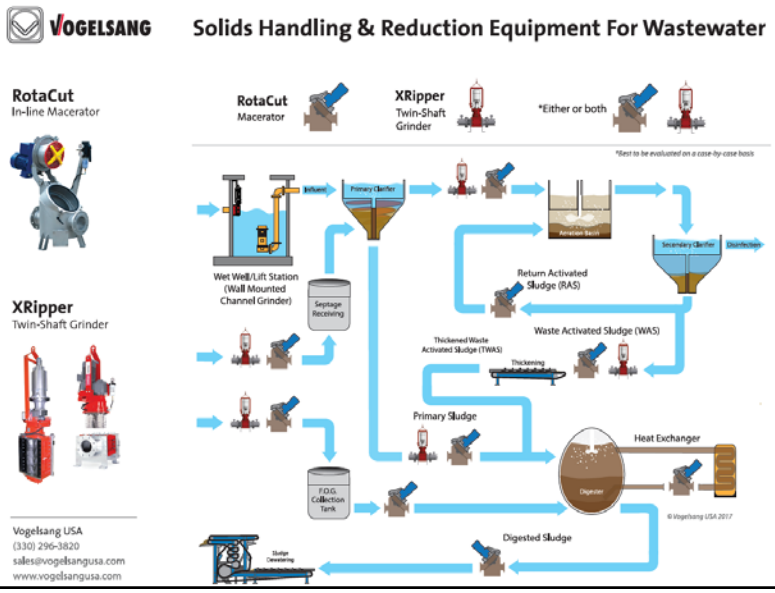
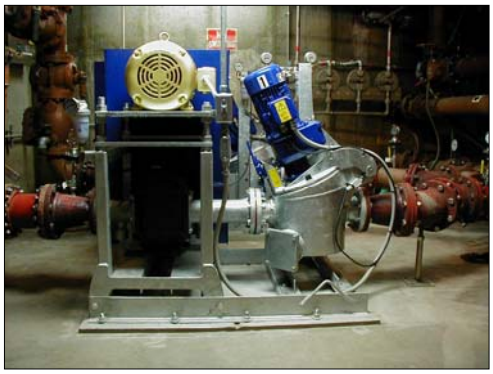


What applications for Solids Reduction Equipment do you have?

Applications for Solids Reduction Equipment

Twin shaft grinders and in-line macerators are designed with operation and maintenance in mind. In-line grinders are simple to install in front of pumps or simply in a pipeline run where they can protect downstream equipment.

Primary Sludge



Waste Activated Sludge

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What applications for Solids Reduction Equipment do you have?

Applications for Solids Reduction Equipment

Twin shaft grinders and in-line macerators are designed with operation and maintenance in mind. In-line grinders are simple to install in front of pumps or simply in a pipeline run where they can protect downstream equipment.

Blended Sludge

Raw Sewage Channel

What applications for Solids Reduction Equipment do you have?

Applications for Solids Reduction Equipment

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Digested Sludge

Waste Activated Sludge

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What applications for Solids Reduction Equipment do you have?

Applications for Solids Reduction Equipment

Twin shaft grinders and in-line macerators are designed with operation and maintenance in mind. In-line grinders are simple to install in front of pumps or simply in a pipeline run where they can protect downstream equipment.

What applications for Solids Reduction Equipment do you have?

Applications for Solids Reduction Equipment

Twin shaft grinders are preferred in headworks and lift station wet wells due to their ability to run entirely dry without damage. Channel grinders can be installed even after the headworks to keep solids from damaging equipment downstream.

Wet Well Grinder

Headworks Grinder

Advantages / Features:

Most solid particle size reduction equipment is designed to be easily retrofitted or to replace existing equipment.

- Small footprint / flange to flange dimension
- Easy-to-integrate controls

Advantages / Features:

Ease of maintenance!

- Easy in-place access to all wet end parts for maintenance and repair
- Complete rebuilds can be done on-site
- No need to remove existing piping connections
- On-site maintenance and repairs cut down on time (and downtime) and overall costs

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QUESTIONS?

Thank You for Attending!