



WICHITA WATER UTILITIES

Sewage Treatment Plant
2305 E. 57th St. S.
Wichita, KS 67216

2016

Grit King

This simplified manual focuses on the operating variables and the troubleshooting guides needed to facilitate the operation of our facility in a cost-efficient and effective manner. It is not meant to cover every aspect of our equipment. It is a quick reference, designed to be used as a working tool for both new and experienced operators. It is also available in electronic format for editing, as the need arises, to keep it always current.

Grit King. For equipment that has been stored long term, confirm that the valving, pumps and controls have been stored in a dry, protected area.

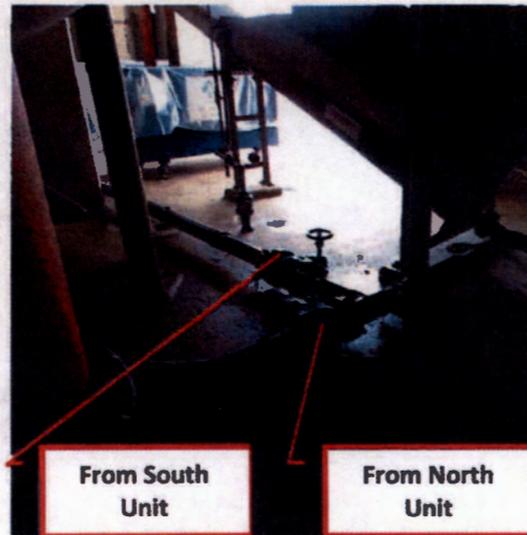
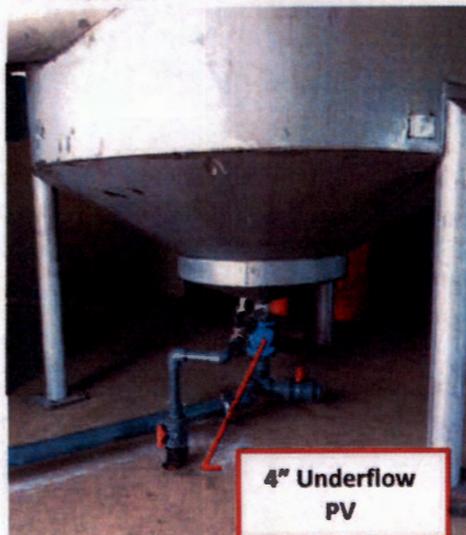


Unit	Valve/Gate Number	Start-Up/Normal Operating Condition	Shutdown	Shutdown w/Bypass	Fluidization
South Grit King	SLG-31202	Open	Closed	Closed	Open
	PGV-31302	Closed	Closed	Open	Closed
	PGV-31202	Open	Closed	Closed	Open
	PGV-31203	Open	Closed	Closed	Open
	SV-31202	Closed	Closed	Closed	Open
	BLV-31202	Closed	Closed	Closed	Open
North Grit King	SLG-31201	Closed	Open	Closed	Closed
	PGV-31301	Closed	Closed	Open	Closed
	PGV-31201	Closed	Open	Closed	Closed
	SV-31201	Closed	Closed	Closed	Closed
	BLV-31201	Closed	Closed	Closed	Closed

*Opening the North Influent Channel 18" Sluice Gate will introduce flow to the North Grit King; ensure that the North Grit King is operational.

II. GRIT KING STARTUP

- Verify that all the downstream processes and the grit hydro-cyclone and grit classifier are ready to receive flow from the Grit King effluent pipe and underflow connection.
- Verify that all 4" valves (PGV-31202 and PG-31203) on the underflow piping to the grit classifier are fully open.

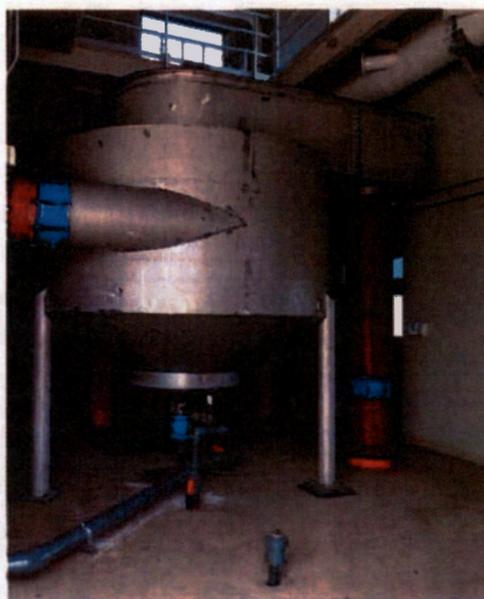


- Introduce plant flow or grit slurry to the South unit at the design flow rate by closing the North Influent Channel 18" Sluice Gate (SLG-31201) and opening the South Influent Channel 18" Sluice Gate (SLG-31202).

General Process Description



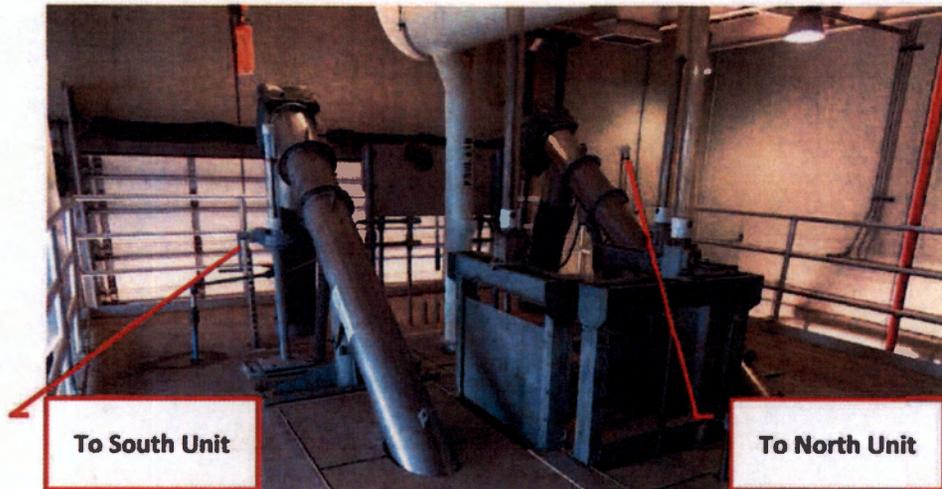
Each Grit King is rated to remove 95 percent of grit down to 150 microns at 3MGD, although each Grit King is capable of passing up to 6 MGD hydraulically at reduced removal efficiencies. City staff has indicated that due to current average flows, only one Grit King will be used at a time. Flow enters the Grit King through an 18-inch tangential inlet causing a rotational flow within the unit. Solids settle out and collect in the grit pot at the bottom of the unit – these solids are discharged from the bottom of the vessel via grit suctioning. A 2-inch fluidization line is provided to fluidize built-up or dense solids in the discharge line. Flow discharges from the unit through the upper overflow channel and into a 20-inch pipe connected to a 36-inch pipe in the headworks building floor. Each Grit King is equipped with a grit removal line located at the bottom of the unit. Both grit removal lines are piped to a common Krebs hydro-cyclone and grit classifier. Flow through the grit removal lines is controlled by a manual plug valve. Grit removal should only take place from one Grit King at a time as the hydro-cyclone and classifier do not have the capacity for both units to discharge simultaneously. The grit removal process is manually controlled by plant operators.



Grit King Start-Up Checklist

I. PRE-START CHECKLIST

Verify that all equipment has been installed in accordance with instructions and drawings contained in the Grit Separation Equipment submittal package and that all extraneous material is removed from the



- Verify that there is a steady flow out of the effluent pipe.
- Check the vessel and piping for any leaks, movement and vibrations.
- If the system operates as desired, place influent controls in normal operating mode.

III. NORMAL OPERATIONS

Influent flow is introduced tangentially into the side of the Grit King which is designed to rotate flows at a controlled velocity about its vertical axis. The flow spirals down the perimeter allowing the grit particles to settle to the bottom. The flow structuring internal components direct the main flow away from the perimeter and back up the middle of the vessel as a spiraling column which rotates at a slower velocity than the outer downward flow. A shear zone of near zero velocity is established between the downward spiraling flow near the vessel wall and the upward spiraling flow near the center of the unit encouraging grit to fall out and be captured in the grit sump at the bottom of the unit. During normal operating conditions, effluent flow exiting the top of the Grit King should be virtually free of grit and the captured grit is consolidated in the sump of the device which is then sent to a grit classifier. For heavy accumulation of captured grit particles in the grit sump, a fluidization line can be manually operated to fluidize the grit and remove unattached organics. Manual backwashing operations should occur weekly or on an as needed basis to remove buildup, whichever is in greater frequency.

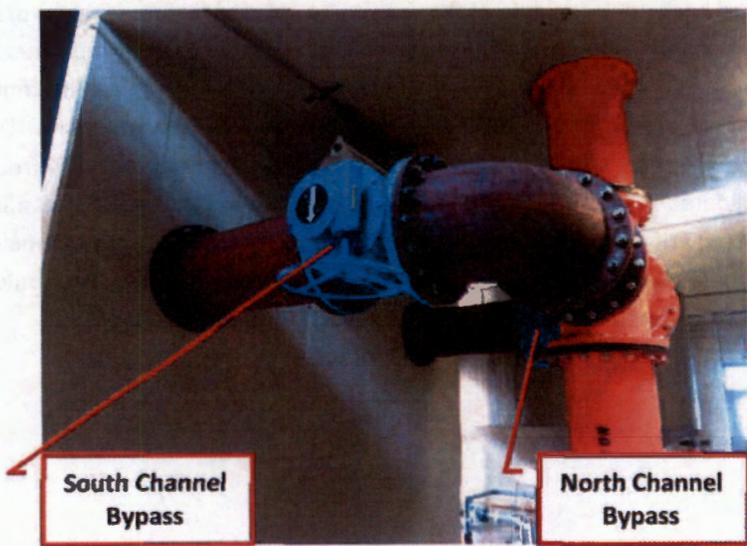


Grit King® Flow Pattern

http://www.hydro-int.com/UserFiles/downloads/WW_App_GK_vs_MIV_V13.1.pdf

IV. EMERGENCY OPERATIONS

During periods of high flow or heavy grit loads entering the plant the equipment will continue to be run in hand mode. If the south unit is overwhelmed, do **NOT** run the north unit to accommodate flows. If flows or grit loads are too great for the south unit, the 16" bypass plug valves (PGV-31302 and PGV-31301) can be opened temporarily to avoid overtopping. Observe the volume of grit during normal operations, and proceed with adjustments during emergency operations if necessary. High flows are considered flows over the rated 6 MGD, while heavy grit loads can only be characterized visual observation of loads in the classifier.



V. SHUTDOWN

- Stop the flow of plant influent to the south Grit King by fully closing the South Influent Channel 18" Sluice Gate (SLG-31202) using the hand-crank actuator and fully opening either the North

Influent Channel 18" Sluice Gate (SLG-31201) or opening the bypass 16" plug valve (PGV-31302 and PGV-31301) if the North Grit King is not in operation.

- Allow the channel to drain through the unit to until there is no flow through the underflow pipe.
- Any time a Grit King is to be shut down for an extended period (longer than 5 days) or to perform any type of maintenance inspection, hose down the inside of the Grit King to flush out any residual solids. Continue hosing until the underflow pipe and is thoroughly flushed.
- Before starting the north Grit King unit, the south Grit King Discharge 4" Plug Valve (PGV-31202) and the 4" Plug Valve (PGV-31203) south of the process pipe tee to the classifier should be fully closed using the hand-wheel actuators.

VI. MAINTENANCE

The nature of the grit separation method is such that the Grit King has no moving parts; consequently, maintenance is reduced to a minimum.

Following installation of the Grit King, it is important that any extraneous material be removed from the unit before it is commissioned. After commissioning the Grit King, the inspection should be carried out thus:

Step	Procedure	Time Interval
1	Initially check to see that the flow regime is as designed.	To begin all inspections
2	Inspect the valves and pipe work. Visually check Grit King equipment.	Each week for one month then monthly
3	Exercise all valves ad gates.	Monthly

The internal components for the unit can be inspected from the top of the unit. The contents of the unit should be drained out before inspection.

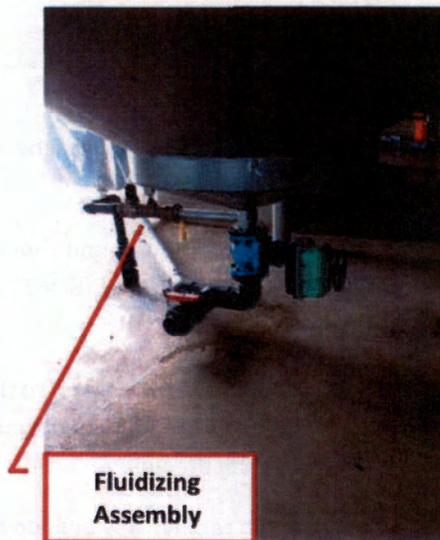
Following malfunction of equipment other than the Grit King, the unit should be isolated, the plug valve (PGV-31202 and PGV-31203) can be closed and fluidizing ball valve (BLV-31202) can be closed without damaging the Grit King.

Once the equipment is functioning properly, flows can be reintroduced to the unit; both plug valves (PGV-31202 and PGV-31203) can be opened and grit removal can be recommenced. All the accumulated grit should be removed via fluidization before activating the unit.

The unit may require periodic internal hosing down to remove any buildup of grease. Special attention should be paid to the accumulation of grease within the grit removal pipe which could lead to plugging problems.

Troubleshooting Guide

Problem	Observation	Recommended Solution	Adjustments
Too much grit accumulation in grit sump	Visual observation of low/no flow or overflow of Grit King Unit.	<ol style="list-style-type: none"> 1. Increase fluidizing pressure. 2. Inspect all underflow valves for proper operation. 	<ol style="list-style-type: none"> 1. Increase the % open of the fluidizing valve by adjusting the wheel handle (SV-31202 and BLV-31202). 2. Exercise 4" plug valves (PGV-31202 and PGV-31203) on underflow line.
Underflow density too high	Visual observation of low flow or high density material in classifier.	<ol style="list-style-type: none"> 1. Increase fluidizing pressure. 2. Increase fluidizing duration. 	<ol style="list-style-type: none"> 1. Increase the % open of the fluidizing valve (SV-31202 and BLV-31202) by adjusting the wheel handle. 2. Leave fluidizing valve open for a longer duration of time.
Influent velocity low	Visual observation of south channel.	<ol style="list-style-type: none"> 3. Isolate unit and open bypass to direct flows into the system. 	<ol style="list-style-type: none"> 3. Close south 18" sluice gate (SLG-31202) and open 16" bypass valve (PGV-31302 and PGV-31301).



Technical assistance can be had by contacting the project engineering department of Hydro International at (503) 615-2906.