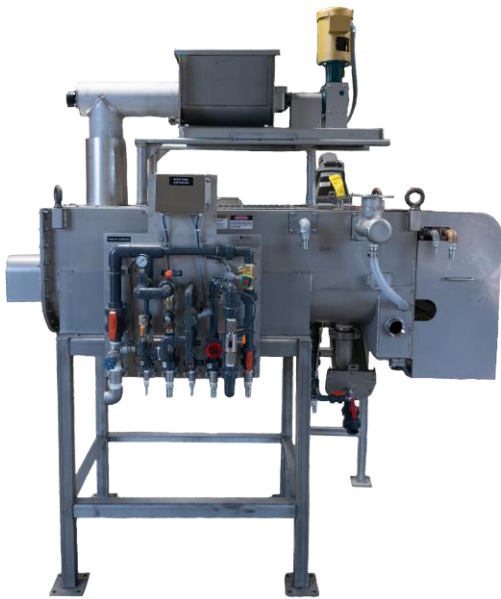


LIME PASTE SLAKERS

BULK CHEMICAL STORAGE
& FEED SYSTEMS FOR
QUICKLIME



Paste-Type Lime Slaker System



Bulk Chemical Storage and Feed System

Bulk Chemical Storage and Feed Systems

Integrity Municipal Systems LLC (IMS) Bulk Chemical Storage and Feed System is used to store and feed dry Hydrated Lime, Quicklime, Powdered Activated Carbon (PAC), or Soda Ash in a silo, dissolve it in a tank, and pump the chemical solution to the point of application. Each system's design is tailored to the project's needs. Systems typically include a storage silo with accessories and an integral chemical feed equipment room with instrumentation and controls to make a complete and functional system.

Silo Storage Benefits

- Pre-Assembled, Piped, Wired and Factory Tested
- Fully Engineered and Integrated Systems
- Single-Piece Welded Silo Construction (up to 14'-0" in diameter)
- Skirted Interior with Insulation, Lighting, Fans, Dampers, Louvers, and Heaters
- Completely Automatic Control System with PLC
- Flexible Configurations and Options for Differing Installation Requirements



Basic Silo Components

- SIZES UP TO 14' DIAMETER
 - Painted Carbon Steel
 - Single-Piece Welded Construction
- LADDER, CLIMBING PROTECTION SYSTEM AND TOP RAILS
 - Galvanized Carbon Steel or Aluminum
 - Per Current OSHA Standards
- TRUCK UNLOADING OPERATOR STATION CONTROL PANEL
- FILL LINE
 - 4" SCH. 40 C/S with Quick Connect and Limit Switch
- TARGET BOX WITH CLEANOUT PORT (ON ROOF)
- MANWAY WITH INTEGRAL PRESSURE & VACUUM RELIEF VALVE (ON ROOF)
- DUST COLLECTOR, AIR PULSE OR MECHANICAL SHAKER (ON ROOF)
- LEVEL SWITCHES
 - High, Re-Order, Low - Rotating Paddle Type
- DEHUMIDIFIER (ON ROOF) - Soda Ash Only

Silo Skirt Interior

- SILO DISCHARGE
 - Bin Activator
 - Solid Cone with Vibrator
- KNIFE GATE SHUTOFF VALVE
- GRINDER/LUMP BREAKER - Soda Ash Only
- ROTARY AIRLOCK FEEDER - PAC Only
- FLEXIBLE FEEDER CONNECTOR
- FEEDER
- SLAKER, GRIT REMOVER AND SLAKER CONTROL PANEL
 - Quicklime Only
- SLURRY TANK WITH MIXER & LEVEL CONTROL
 - Optional for Quicklime System
- FEED PUMP
- WATER SUPPLY PANEL
- MAIN SYSTEM CONTROL PANEL
- SILO SKIRT ACCESSORIES INCLUDING:
 - Double-Doors, Heater, Lights, Convenience Outlet, Vent Fan and Louver

Options

- ANCHOR TEMPLATE
- METAL FLOOR
 - In-floor drain
- INTERIOR INSULATION
- RADAR CONTINUOUS LEVEL DETECTION
- TRANSFER PACKAGE TO REMOTE DAY TANK
 - Surge Hopper, Rotary Feeder, Blower, and Day Tank
- PLC CONTROL
 - Ethernet Communication With Plant Control System - Single Pushbutton System Start and Stop
- STRUCTURAL LEG SUPPORT OPTION

How It Works

The typical operation of the storage silo and solution feed system involves several basic steps:

1. Dry chemical is fed by pneumatic transfer into the silo.
2. Dry chemical is then fed to a solution tank.
3. Water is added to the solution tank for mixing and conversion of the dry chemical into a solution.
4. Chemical solution is pumped to the process as required by the site operating conditions.

*Steps 2-4 are concurrent, and in the case of quicklime, Step 2 includes feeding dry quicklime to a paste-type lime slaking system. There, lime slurry is produced after slaking, then fed to a solution tank for storage.

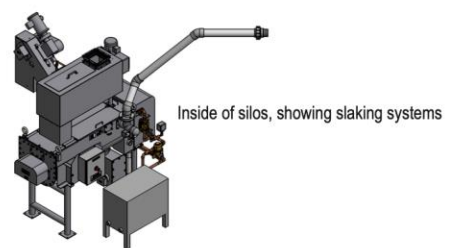
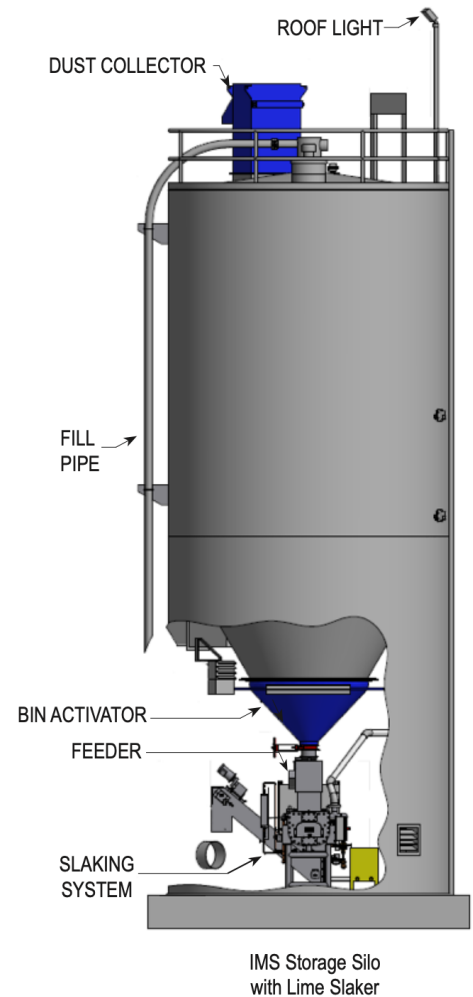
The dry chemical is delivered to the jobsite by self-unloading, pneumatic bulk trucks. The truck connects to the inlet adapter on the silo fill pipe. The chemical is pushed up through the silo fill line by a pneumatic truck to the target box at the top of the silo to ensure even filling. The dust collector runs continuously to discharge the air and filter the dust to prevent dust emissions from leaving the silo.

Rotating paddle-type level switches monitor the chemical material level in the silo (High, Re-Order, Low). A truck unloading operator panel on the exterior of the silo provides controls for the silo fill operation.

The dry chemical is discharged by gravity through the silo. A bin activator at the bottom cone of the silo aids material flow and transfers vibrations to the material column without shaking the silo structure. A knife gate valve on the outlet of the bin activator allows positive cut-off of material flow between the bin activator outlet and the chemical feed equipment.

The feeder meters the dry chemical to the solution tank. The water addition is initiated by the system start signal: the water supply solenoid valve on a water panel opens, the feeder starts operating, and the solution tank mixer starts.

Solution production is controlled by a PLC with operator controls, a touch-panel mounted in the door of the chemical feed system control panel. After the solution has been completely mixed, a feed pump draws solution from the solution tank and meters the solution to the process.



Lime Slaker Systems (A-758™ & A-758 Plus™)

The IMS Lime Slaker Systems provide continuous high volume lime slurries (up to 8,000 lbs/hour) for industrial and municipal process pH adjustment, flocculation, and chemical reaction. The superior paste-type slaking technology consistently produces a higher strength and more reactive lime slurry resulting in more efficient and more economical use of the quicklime. Systems are factory assembled and tested for quick and easy installation and include options for lime feed and grit removal.

IMS has built an inventory of 2,000 slaker parts. 90% of incoming orders are shipped within 24 hours.

Slaker Systems - A-758™; A-758 Plus™

- 2:1 Water-to-Lime Slaking Ratio
- Robust Design - Built to Last
- Conveyor-Type, Screw-Type, or Vibrating Screen Grit Remover
- Volumetric or Gravimetric Belt-Type, or Volumetric Screw-Type Feeder
- Capacities: 1000, 2000, 4000, 8000 lb/hr
- Manual or Automatic Control
- Continuous or Batch Operation
- Pre-Assembled Water Panel Option
- More than 2,000 Parts in Inventory



Lime Slaker System: Feeders

Series 31-165 Gravimetric Feeder

- Accurate and reliable feeder operation
- Microprocessor controlled gravimetric feeding
- Accuracy better than 1% of feed rate
- Simple, straightforward man-machine interface
- Easy to install and maintain



Series 32-215 Volumetric Feeder

- Manual or automatic control
- Simple and straightforward volumetric feeding to 840 cu ft/hr (24 m³/hr)
- Easy to install and maintain
- Self-adjusting belt tracking



Series 32-300 Volumetric Feeder

- Heavy gauge construction
- Simple design
- Convenient controls and readouts
- Smooth handling of difficult material flows
- Easy to install and maintain



Lime Slaker System: Grit Removers

Conveyor Type Grit Remover

- Specific gravity classification of grit after water introduction
- Grit removal with chain and flight scrapers
- Fine degree of grit size control (10 mesh)
- Slurry concentrations up to 18% achievable
- Simple, reliable, and low maintenance



Screw Type Grit Remover

- Only one moving part
- Fine degree of grit size control (10 mesh)
- Slurry concentrations up to 18% achievable
- Low maintenance and simple service
- Simple and efficient operation

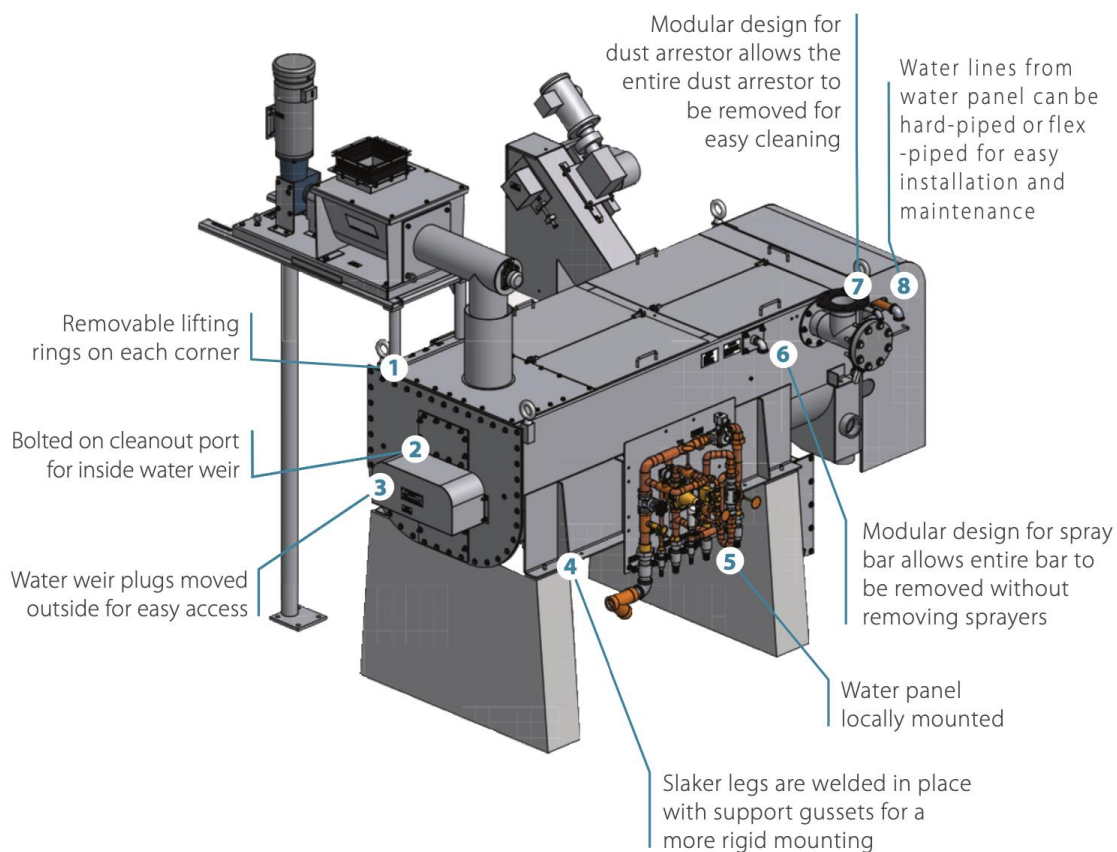


Screen Type Grit Remover

- Vibrating screen separator
- Positive grit removal by size (20 or 40 mesh)
- Slurry concentrations up to 20% achievable
- Optional (high) slurry concentration up to 28% available
- Small footprint and low profile



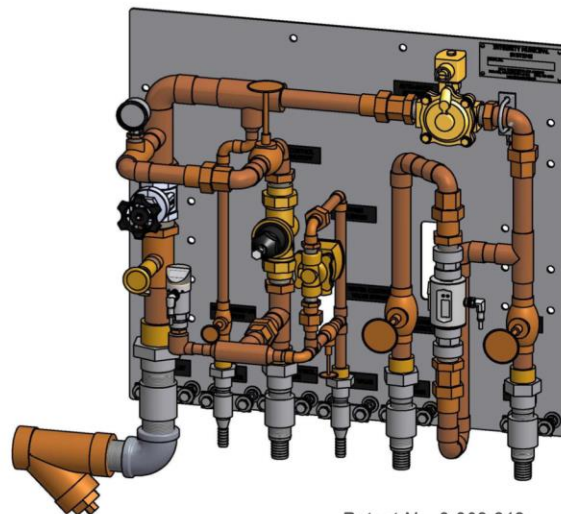
Lime Slaker System Improvements



Pre-Assembled Water Panel

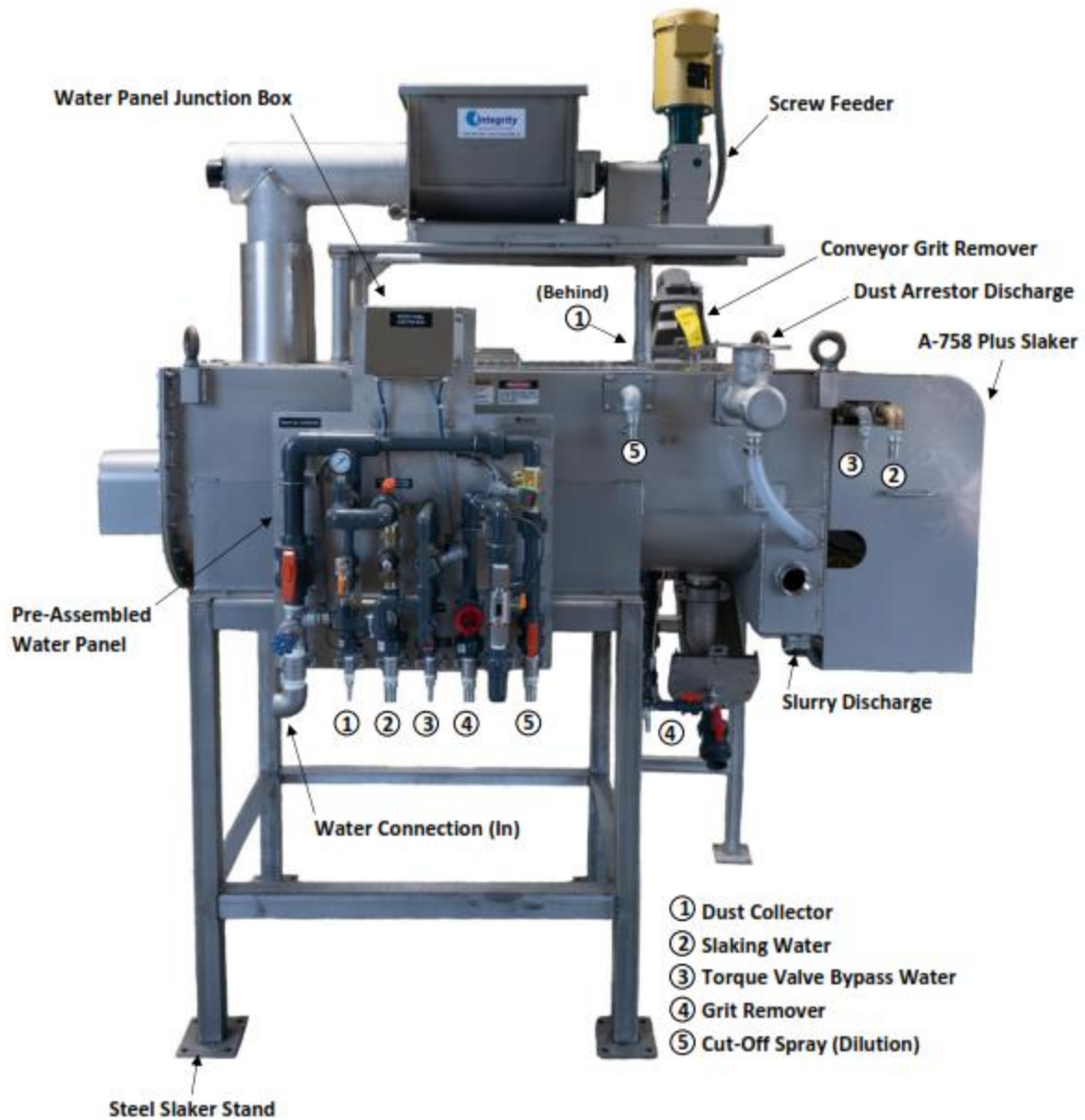
- Minimizes installation time
- Reduces manufacturing lead time
- Enables remote installation of water panel
- Makes maintenance easier
- Eases connection complexity
- Enhances slaker access
- Decreases risk of damage

PVC or Copper Construction



*Patent No. 9,908,812
Patent No. 10,494,297*

Hose Connection Diagram for Paste-Type Lime Slaker System



Pre-Assembled Water Panel

Patent No. 9,908,812

Patent No. 10,494,297

SGC-2000™ and SGC-2000 PLUS™ Gravimetric Feed Controllers

Features & Benefits

- Accurate and reliable gravimetric feeder control
- Allen-Bradley based industrial control hardware and software
- Limited number of interconnecting wires for easy installation and maintenance
- Simple and intuitive touchscreen interface
- Ethernet communications
- Optional Feeder AC motor use for reduced transformer size, heat generation, and energy consumption
- Optional VFD ODVA communication eliminates analog signal inaccuracies



The SGC-2000™ and SGC-2000 PLUS™ Gravimetric Feed Controllers control the feed rate for the Series31-165 gravimetric feeder. The feeder controls include a touch screen for entering commands and parameters. Its menu driven software provides information regarding status, operational parameters, and alarm conditions. Alarm conditions displayed include: low and high feed rate, low and high belt load, low and high belt speed, setpoint and fault condition. The controller can be provided as a standalone controller (SGC-2000™) or as a complete package with VFD or SCR (SGC-2000 PLUS™).



Standalone Gravimetric Feed Controller with Load Cell Amplifier

- 24V DC, 120V, or 480V Options
- AC or DC Motor
- 16"x 16"x 8"NEMA 4X Box



Standalone Gravimetric Feed Controller with Load Cell Amplifier and VFD or SCR

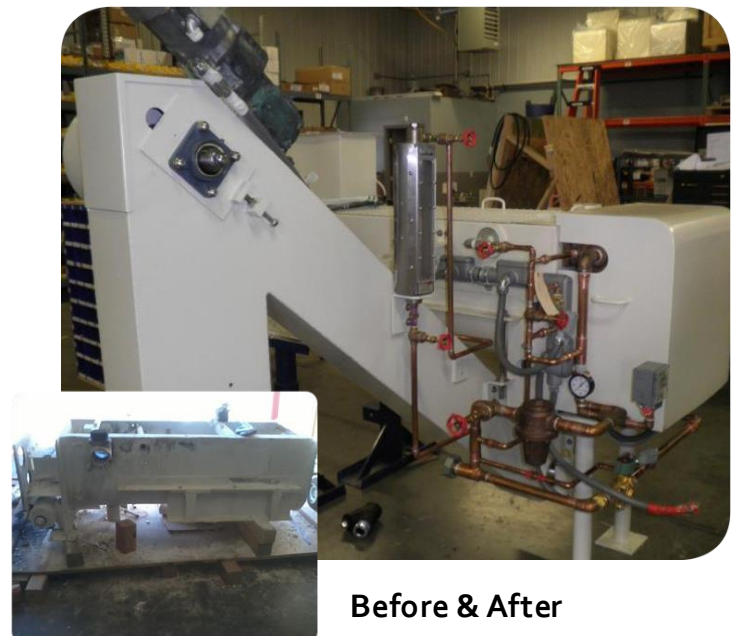
- 120V or 480V Option
- AC or DC Motor
- 20"x 16"x 8"NEMA 4X Box

A-758™ and A-758 Plus™ Paste-Type Lime Slaker Refurbishment Service

IMS provides A-758™ and A-758 Plus™ Paste-Type Lime Slaker refurbishment services to restore the slaker to its original condition. The refurbishment consists of reassembling and replacing components to restore the slaker to its originally manufactured state. Refurbishment of an old slaker provides significant cost savings compared to the purchase of a new slaker system. IMS can review a particular application to determine whether the slaker is a good candidate for refurbishment. Please visit our website for project case studies.

Slaker Refurbishment Process:

- Visual inspection of unit
- Photographic documentation of initial condition of unit
- Complete unit disassembly and tear-down
- Documentation of all reusable parts prior to cleaning
- Preparation of cost estimate for all parts that cannot be reused
- Cleaning, sandblasting, and repainting of reusable parts as needed
- Reassembly of unit using reconditioned reusable parts and new replacement parts
- Reassembly of unit using new hardware, plumbing, and conduit/wiring to match existing unit
- System Testing: complete system testing, if applicable
- QC inspection
- Supply of shipping crate
- Packaging of unit for shipment
- Shipment of unit to jobsite



Project Profile: Dallas, TX

Integrity Municipal Systems Restores Eight Lime Slakers for the Bachman Water Treatment Plant in Dallas, TX: Almost \$1M Saved Compared to New Systems

Dallas Water Utilities (DWU) provides approximately one billion gallons per day of clean drinking water to more than 1.2 million residents from three processing facilities. Reliability is vital to DWU and its customers. To ensure 24/7 reliability, DWU continuously maintains and upgrades its capabilities and equipment – all while maintaining stewardship of critical financial resources.

Since opening in 1930, the Bachman Water Treatment Plant has increased its processing capacity from 30 million gallons per day to 150 million gallons per day, with the latest upgrade in 2007. Located just northwest of Dallas Love Field, the facility takes its feed water from Bachman Lake, and cleans, polishes and disinfects the water before distribution to DWU's customers.

A crucial first step in the process is the addition of lime to react with and separate organic contamination from the water. The most cost-effective way to achieve this step is to mix dry lime with water in a process called slaking. By 2012, the eight slakers at the facility had been operating efficiently for more than 12 years but were in need of refurbishment.

DWU's Operations and Management staff had to devise a way to rapidly perform the system upgrades without disrupting plant operations and at the lowest possible cost to the agency.

Consulting with Environmental Improvements, Inc. (EI2) and its manufacturer,

Integrity Municipal Systems, LLC (IMS), the Bachman team determined that factory refurbishment by EI2/IMS met all three primary criteria: 1) low-cost, 2) minimal system disruption, and 3) rapid turn-around-time.

DWU selected industry leading contractor Archer Western to work with EI2 and IMS to complete the project. Archer Western Project Manager, Benjamin Martin, said "IMS did a fantastic job. If I didn't know better, I would have thought the units were new – not rebuilt."

The Archer Western crew re-moves two slakers at a time, sends them to IMS' Zeeland, MI factory where they are refurbished and returned

to be reinstalled, with four cycles required to complete the project.

Upon receipt of the slakers in Zeeland, the parts are inspected, disassembled and specific work orders created to ensure that no part is overlooked.

Chaise Holmgren, Operations Manager of Bachman Water Treatment Plant, said of the project: "The restored units performed just as well as new units, without the added costs. Our Operations and Maintenance personnel are satisfied with the rehabilitation."



Restored Slaker Ready for Return



Poway Facility

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