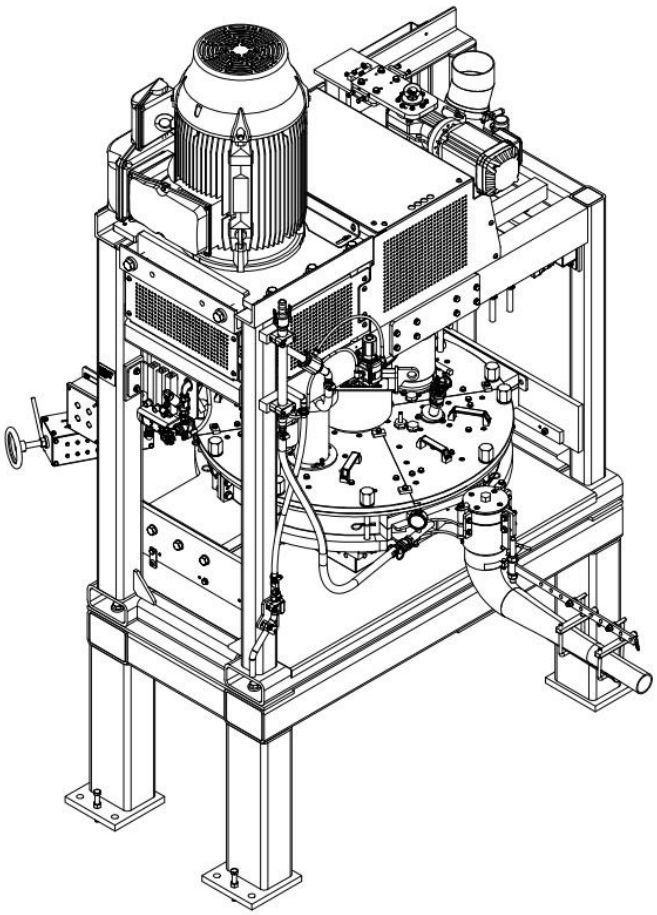
Pin Mixer

Maintenance Manual



Gyptech

Proven Technology Worldwide

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Introduction

This manual contains **Original Instructions** written to provide detailed technical information to assist in the maintenance of the Gyptech Pin Mixer. For information regarding normal operation please refer to the Area Operator's Manual. Maintenance should only be performed by qualified, trained personnel.

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1 Safety Overview

Never put yourself at risk.

Many pieces of equipment have the potential to cause serious injury or even death. Be sure to understand the safety concerns related to a piece of equipment before undertaking or performing any maintenance or clean out procedure. Work with your supervisors to address any safety concerns prior to undertaking work.

The Pin Mixer has specific hazards that must be taken into consideration when cleaning or servicing this machine. Some safety hazards that are specific to this machine are:

- Lid Removal
- Manual Rotation of Rotor
- Inspection and Cleaning of Underside of Mixer

1.1 Lid Removal

Removal of the lid sections for servicing or cleaning requires the use of proper lifting techniques and tools. Do not attempt to remove the lids without proper training. Do not attempt to lift the lid by any point other than by the lifting handles provided by Gyptech. Ensure lids are safely out of the way before beginning any work inside the mixer.

1.2 Manual Rotation of Rotor / Adjustment of Rotor

During periodic cleaning of the mixer, it is common practice to remove one or more lids and rotate the rotor by hand. Ensure that you are trained on the proper use of the Gyptech Rotor Rotation tool to avoid the crushing hazard that exists between mixer pins and lid sections. Failure to use the proper tools may result in serious injury. Ensure that Gyptech supplied rotor height adjustment tools are used when adjusting the rotor.

1.3 Inspection and Cleaning of Underside of Mixer

During periodic cleaning of the underside of the mixer, care must be taken to avoid sticking objects of any kind into the base vents located on the bottom of the mixer insert (see Figure 3: Mixer Bottom View). The vents allow pre-set gypsum to be purged from the underside of the rotor. These openings expose the bottom of the rotor so care must be taken to avoid these areas and ensure that proper lockout procedures are being followed during any inspection or cleaning.

1.4 General Safety

Refer to section **General Safety** in the Safety System manual.

2 Equipment Overview

The pin mixer's purpose is to blend together the various wet and dry ingredients used in drywall production into consistent, homogenized slurry which is then discharged onto the paper to be formed into board. The blending process is continuous, with the amount of wet and dry materials entering the mixer controlled by the input machinery and the plant control system.

A key factor in producing consistent slurry is mixer cleanliness. Many variables impact the mixing dynamics inside each mixer and may impact the tendency for the mixer to 'run dirty' or build up lumps and/or layers of set gypsum. This is to be avoided, as buildup will accelerate the set of new slurry in an inconsistent way and compromise the quality of the board produced, as well as the board's set control.

The mixer is designed in two major components, the frame, which mounts to the support table, and the insert, which contains the main components of the mixer responsible for blending. The insert can be removed from the frame to allow for a quick change over to a spare insert in the event that major maintenance is required on the mixer insert.

The mixer interior is divided into two chambers. The chambers are divided by the lump rings. The inner chamber is where the majority of the blending between the wet and dry ingredients takes places. The outer chamber is where the final blending occurs, and where the material is discharged through the tangential gate and extractors.

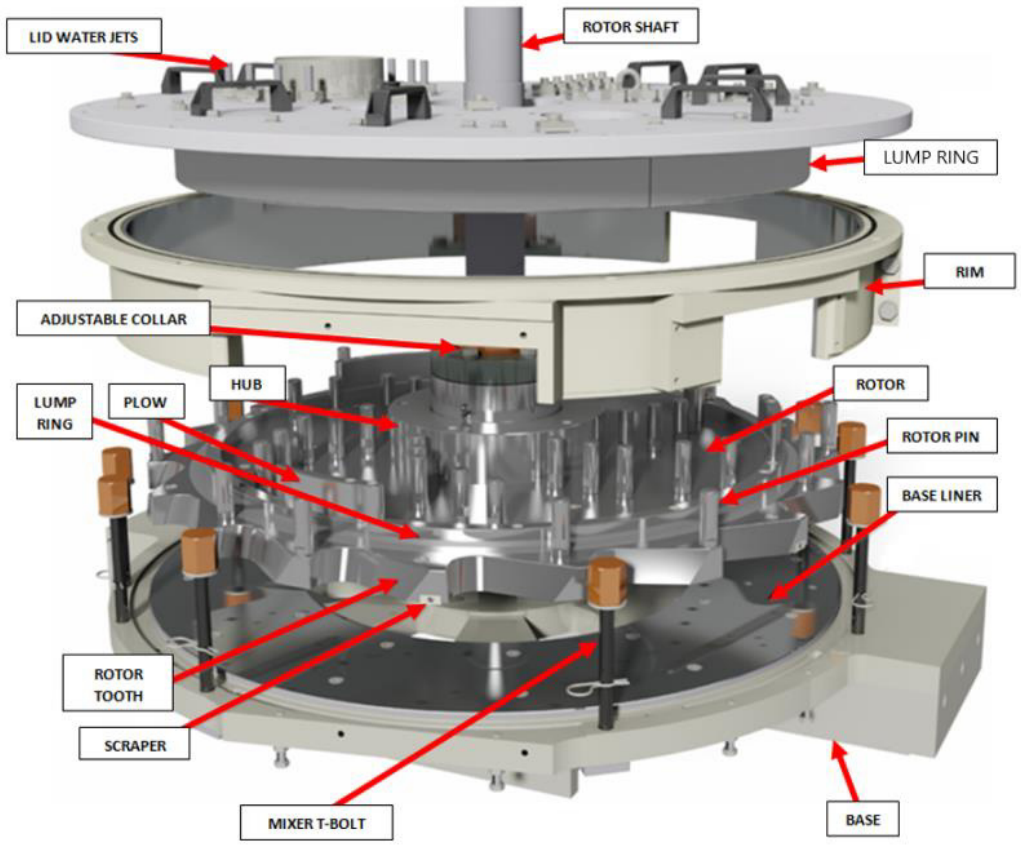

Figure 1: Exploded View of a typical Pin Mixer

2.1 Major Components

2.1.1 Rotor

The rotor provides the main mixing surface. As it spins it creates the centrifugal force that helps mix the ingredients and pushes the slurry to the outer edges where the lump rings and discharges are located. The teeth create a rolling action which combines with the spin to carry out the final mixing before the slurry is discharged.

2.1.2 Rotor Pins

The rotor pins are attached to the rotor and project upwards to just below the lid liner. As the rotor spins around the chamber the pins create turbulence in the slurry, mixing the ingredients. As the moving rotor pins pass between the stationary lid pins, the larger lumps are broken up. Rotor pin height achieves cleaning of the lid liner.

2.1.3 Rotor Hub Ring

This ring surrounds and protects the rotor hub and shaft. It creates the innermost side of the mixer and keeps the slurry away from the shaft

2.1.4 Rotor Lump Ring

The rotor lump ring is attached to the rotor and works in conjunction with the lid lump ring, limiting the size of the material that can pass from the inner to the outer chamber of the mixer. The plows are attached to the top surface of the rotor lump ring.

2.1.5 Plow

Plows are mounted to the rotor lump ring at evenly spaced intervals. The plow is wedge shaped to force slurry through the gap created by the lid and rotor lump rings. The thin end plows through the slurry, as the slurry is forced to the back of the plow between the plow and the lid lump ring. This narrowing of the gap helps crush lumps before going into the outer chamber.

2.1.6 Rotor Drive Shaft

The rotor drive shaft connects the motor to the rotor. The mixer is powered through an electric motor located above the mixer. It is keyed to the rotor hub. The shaft is held steady with flange bearings located at the top and bottom of the mixer.

2.1.7 Adjustable Collar

The bronze collar is used to raise and lower the rotor. Even though the collar has a seal there is a grease nipple to keep the threads from seizing if slurry or water gets past the seal. One full turn of the collar raises or lowers the rotor .083 in [2.1mm].

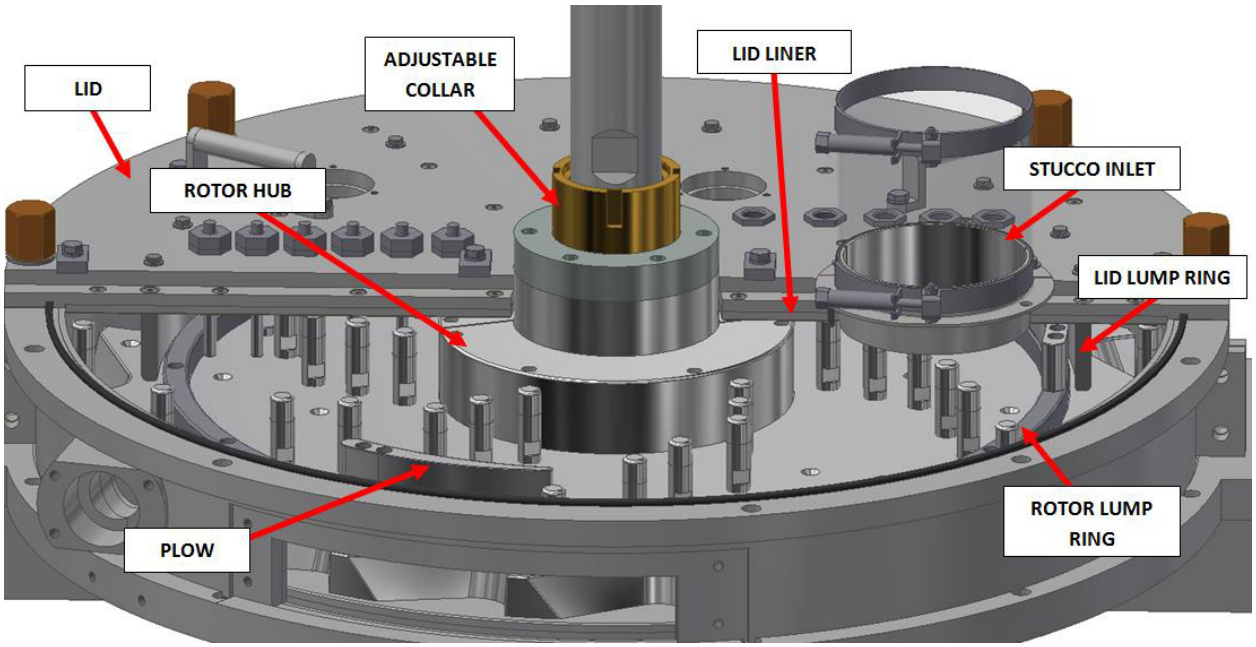

Figure 2: Mixer Interior Components

2.1.8 Lid

The lid is constructed in three pieces, a small and large quarter section both located at the front of the mixer, and a half section at the rear of the mixer. The three pieces are grooved near the outer edge to hold the outer wall and inner wall liner in place. The lid has openings for all the additive inlets. The lid pieces are clamped against the outer wall by a series of lid t-bolts around the perimeter of the mixer. The lid itself does not come into contact with slurry in the mixer.

2.1.9 Lid Liner

A chrome plated stainless-steel liner is attached to the underside of the lid. This liner comes in contact with the slurry in the mixer. The liner is constructed in three separate pieces, the same as the lid. The replaceable liner protects the lid from becoming worn. There are openings in the liner that corresponds with the openings in the lid.

2.1.10 Lid Pins

The lid pins operate in the same way as the rotor pins, but project downwards from the lid. Lid pin length achieves cleaning of the top of the rotor.

2.1.11 Lid Limp Ring

The lid lump ring is attached to the lid and extends downwards to the rotor. Along with the rotor lump ring, the lid lump ring obstructs the slurry path through the mixer, preventing lumps that form in the inner chamber of the mixer from exiting, causing paper breaks. The lump rings are the dividing point between the inner chamber and outer chamber.

2.1.12 Lid T-Bolts

These bolts clamp around the outer edge of the mixer, holding the lid and base together and sandwiching the mixer rim tightly in between them. They thread into oversized brass nuts which sit on top of the mixer.

2.1.13 Rim

The rim is sandwiched between the lid and the mixer base. It has the discharge openings for the extractors and tangential gate. It is composed of two halves clamped together at the sides of the mixer. The rim itself does not come into contact with slurry in the mixer.

2.1.14 Rim Liner

A chrome plated stainless-steel liner is situated inside the outer wall of the mixer, with corresponding openings for the discharges. The liner comes into contact with the slurry in the mixer. It is manufactured as one piece and is fitted inside the rim.

2.1.15 Base

The base and base liner complete the mixer insert. Most of the slurry is swept back to the outer rim by the scrapers that are attached to the outer portion of the underside of the rotor. Any slurry that does not get swept back will spill over to a spill tray below the mixer, through base vents cut through the base. At the center of the base there is a housing for two tapered roller bearings which locate the mixer shaft.

2.1.16 Base Liner

A chrome plated stainless-steel liner is attached to the base plate between the base vents and the inner wall liner, with corresponding openings for the base water jets. This base liner protects the base plate from any slurry that seeps under the rotor and is the surface that the rotor scrapers sweep over.

2.1.17 Rotor Scraper

Six scrapers are located on the bottom side of the rotor. They are attached to the rotor with bolts from the top side of the rotor. Their purpose is to push any slurry that has worked its way under the rotor back out towards the discharge; this stops any build up of gypsum under the rotor.

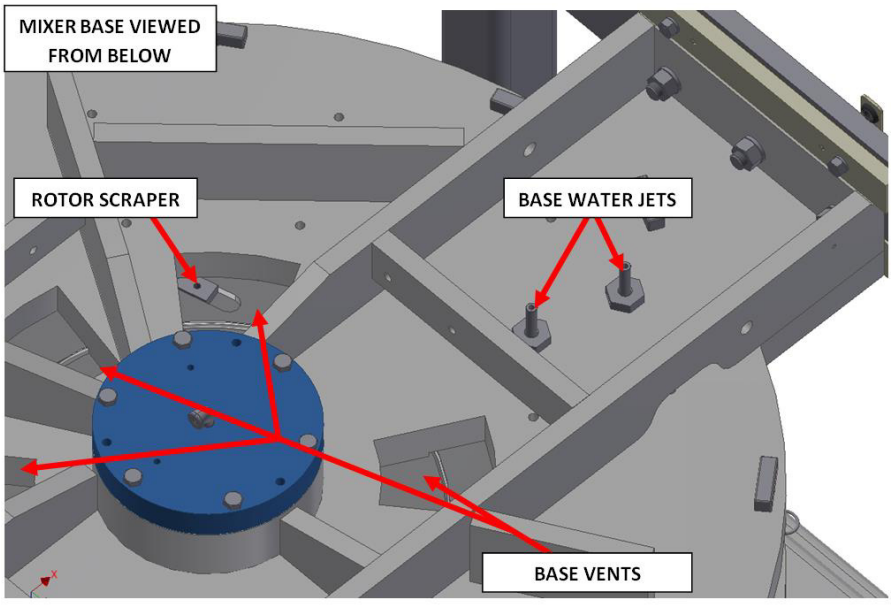

Figure 3: Mixer Bottom View

2.1.18 Mixer Vent

The mixer is vented through an opening on the lid near the mixer discharge. This vent is continuously flushed with water from the water manifold to prevent material from building up inside the vent. The flow rate of the water to the vent is controlled by a rotameter.

The function of the mixer vent is to remove air from the mixer body. As air is released the vent will also release a certain amount of stucco dust and water droplets. A flexible suction hose is situated to the side of the vent and should be used to remove the dust and droplets. If, over time, the hose builds up with set gypsum the operator can remove the hose temporarily for cleaning.

2.1.19 Water Manifold

Process water enters the mixer through the water manifold and is distributed to the mixer through water jets located at the top and bottom of the mixer, overflow line and mixer vent. The manifold also supplies any other mixer water requirements that are necessary to the process. A pressure gauge monitors the pressure to the manifold. Each water inlet has a valve that controls its flow. This allows precise control of water addition at various stages of the process.

2.1.20 Water Jets

Lid water jets introduce water into the mixer on top of the slurry. They are threaded into the lid and sit flush with the bottom of the lid liner. These jets both add water to control the stucco and help keep the inside of the mixer clean.

There are also two water jets located in the base of the mixer. One is positioned to clean the root of the rotor teeth and the other to lay down a small film of water under the rotor to help keep the underside of the rotor clean. Water meters (rotameters) are provided to set and monitor the flow to these jets.

The mixer is designed for optimal slurry mixing performance; however, the water added to the mix can be fine tuned via the overflow valve. As the overflow valve is closed, less water is diverted to the overflow, and the water pressure through the jets to the mixer is increased. Adjusting the pressure through the water jets can improve the cleanliness of the mixer.

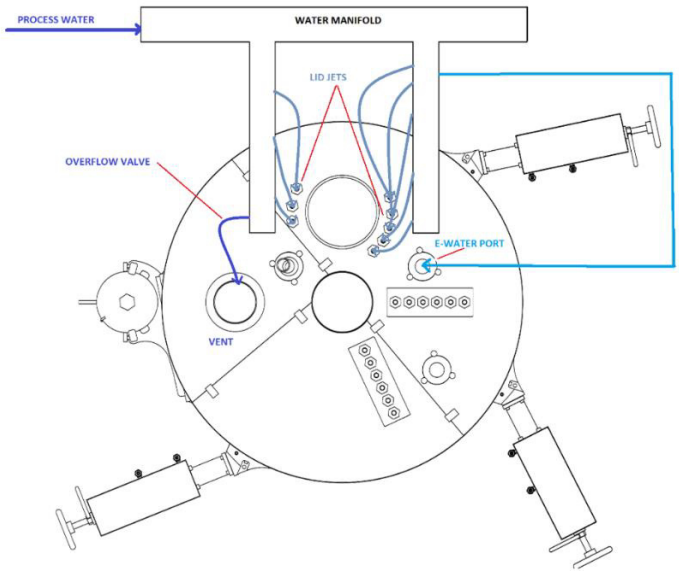

Figure 4: Mixer Manifold Connections (equipment may not be exactly as shown)

2.1.21 Mixer Discharge Gate

The main slurry exits the mixer through the tangential discharge gate, spiral and boot. At optimal slurry discharge rate, there will be minimal spitting at the mixer vent and close to a smooth splash-free discharge through the mixer discharge boot onto the paper. The tangential discharge gate discharge rate / backpressure can be adjusted through the rotation of the spiral. Rotation of the spiral changes the cross-sectional area of the discharge opening.

2.1.22 Extractor

The extractor controls the volume of slurry moving from the main mixer to the roller coater. A controlled amount of water is added to the slurry through the water manifold using a rotameter to minimize lump formation. The extractor plunger is controlled by a pneumatic cylinder and frequently cycles from a fully closed to an adjustable open position to dislodge any buildup inside the extractor and along the mixer wall. The open position is adjusted using the threaded rod and handle at the back of the extractor. In the closed position, the plunger is designed to sit flush with the ID of the rim liner.

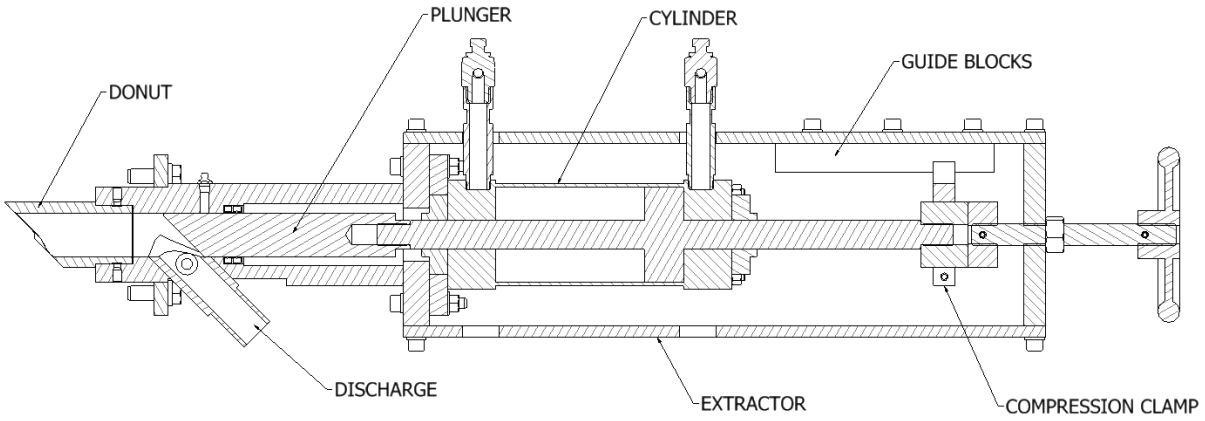

Figure 5: Extractor Components

2.1.23 Stucco Chute

Dry stucco is added to the mixer through a chute that is attached to the mixer feed screw. It houses the stucco chute scraper assembly. The chute is not directly attached to the mixer insert but is joined to the inlet with a plastic or rubber section to allow for movement between the two systems.

2.1.24 Stucco Chute Scraper

The scraper is inserted through the stucco chute, stucco inlet and lid. It helps keep the dry stucco flowing through the inlet and scraps off any slurry that may be pushed up the inlet. It is driven by a gear-motor on the mixer frame. The scraper shaft can be raised to allow for the removal of the mixer insert. By design, the stucco chute scrapper should sit flush with or slightly above the bottom surface of the lid liner during operation.

2.1.25 Stucco Inlet

The stucco inlet is located downstream of the mixer discharge, flanked on each side by the water inlets. The stucco chute scraper slips into the inlet and a clear vinyl wrap is clamped on the inlet and the stucco chute above.

2.1.26 Make-Up / Waste Water Inlet

The make-up / waste water inlet, alternatively referred to the fibre water inlet in systems that wet-add fibreglass to the mixer, is an angular inlet located upstream of the stucco inlet. This inlet is angled to allow for adjustment to how the water enters the mixer. This impacts the stucco mix and the mixer cleanliness.

2.1.27 Emergency Water Inlet

Each mixer has an emergency water (E-water) inlet in which water is added to flush out the mixer in an upset condition. The water flow is controlled by a solenoid valve. During operation, the solenoid valve is normally shut. The E-water prevents the mixer from seizing if an upset condition occurs (process water flow loss, stucco surge, power loss). During normal operation, the E-water valve is automatically opened when a) the load on the mixer motor exceeds a pre-set value b) the solenoid stops receiving a signal or air pressure loss or c) there is a power failure. In the case of a high load condition the E-water valve opens until the load returns to normal. In the case of power loss or system fault the E-Water remains on until the manual valve is closed. The manual valve is provided with a proximity switch to prove the valve is open before starting up production. The E-Water can be manually turned on to flush the mixer after cleaning, maintenance or during upset conditions.

2.1.28 Foam Inlet

The Foam Inlet is located on the lid downstream of the E-Water Inlet. The foam inlet is connected to a diverter valve to the gate, and a foam sample port located on the mixer frame, to direct some of the foam to an outlet at the base of the mixer frame for quality testing.

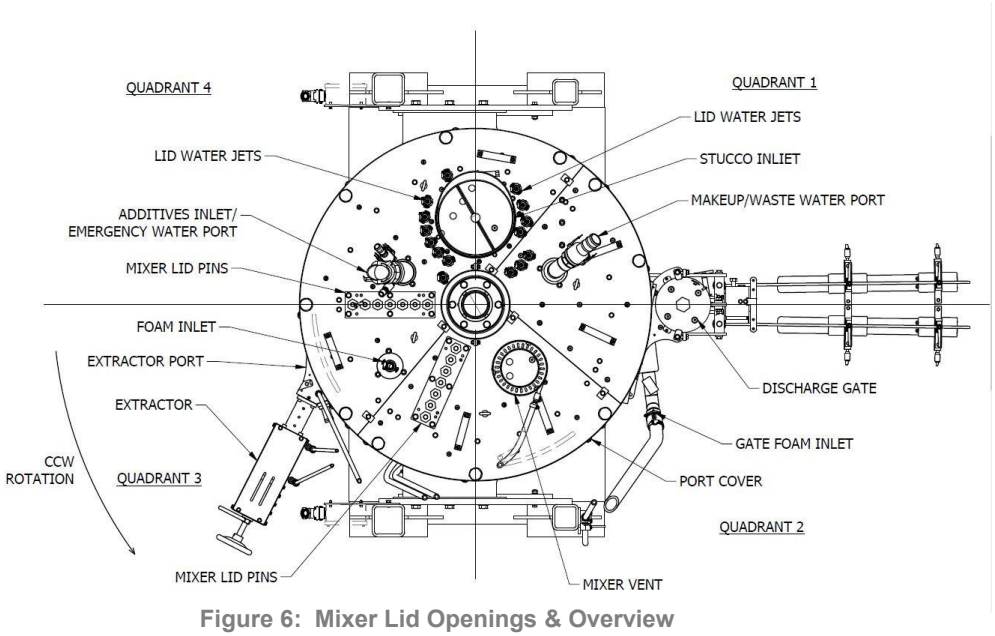

Figure 6: Mixer Lid Openings & Overview

2.2 Technical Data

All of the following values are general recommended values. These values may be adjusted based on plant operating conditions and mixer performance.

2.2.1 Manifold Pressure

The mixer manifold pressure is regulated by the flow of water out from the manifold through various ball valves leading to both the water jets and the overflow to the E-Water wet additives tree. By adjusting the amount of water diverted to

the overflow, you can increase the pressure inside the manifold. Gyptech recommends operating at a pressure of between 30 to 50 PSI.

2.2.2 Vent, Base Jet, and Extractor Rotameters

Water flows to the vent, both base water jets, and any installed extractors through rotameters located on the side of the mixer. To ensure proper cleanliness inside the mixer, Gyptech recommends running at 10 L/min (2.6 gal/min) to the vent, base jets and extractors. The flow rate can be adjusted using the dials on the rotameters.

2.2.3 Extractor Air Pressure and Cycle Rate

Gyptech recommends using pressure no greater than 80 psi to cycle the extractor. Gyptech also recommends cycling the extractor one to three times a minute (or every 20 to 60s). The cycle time can be adjusted as required to maintain a clean extractor and a consistent output flow. The extractor cycle pressure should be set during commissioning.

3 Maintenance Procedures

3.1 Lockout Procedures

As equipment may start automatically, always lock out any source of motive power (electric, hydraulic, steam, compressed air, etc.) before performing maintenance or cleaning functions. Note that potential energy may also be stored in some equipment such as those held in a raised position by hydraulic or air pressure and that such equipment may move or fall suddenly if pressure is removed.

Depending on the equipment layout, electrical locked out may be performed at the electrical panel or locally with a safety switch or disconnect. Air pressure is removed at locked out at the manual air disconnect switch. As a further safeguard, you must confirm that any equipment in the system being worked on is not operational after being locked out. Test for this by using the normal means of starting, i.e. the operator controls on the HMI station or the manual HOA switch.

The above procedure is a general recommendation. Operating and maintenance staff must follow lockout procedures and operate in compliance with their company policy and local regulations.

3.2 Recommended Tools & Materials

For basic mixer maintenance, we recommend the use of the following tools:

- Feeler/shim gauges
- Adjustable Pipe Wrench
- Crow Bar
- Wrench Set
- Allen Key set
- Gyptech Rotor Pin Removal Tool, Socket and Clip
- Gyptech Rotor Rotation Tool
- Gyptech Rotor Nut Wrench
- Gyptech Rotor Shaft Wrench
- EP Lithium Grease NGLI #2 or equivalent
- Medium Strength Adhesive Thread-locker (Loctite Blue #242 or equivalent)
- Copper based anti-seize
- Silicone sealant

3.3 Lubrication

Gyptech recommends the use of an EP Lithium Grease NLGI #2 or equivalent for all grease nipples located on the mixer.

Lubrication is required at the following locations:

- The grease nipple located on the side of the adjustment nut. Note that keeping this location greased prevents slurry from working its way into the nut, causing it to seize and hindering rotor adjustment.
- The grease nipple on the mixer rotor hub, which lubricates the mixer shaft seals and prevents slurry from workings its way up the shaft.
- The grease nipple located on the upper mixer shaft bearing.
- The grease nipple located on the back side of the mixer base frame which runs to the lower mixer shaft bearing and seals.
- The grease nipple located on the side of the barrel of each extractor.

3.4 Tangential Discharge Gate Removal and Disassembly

Warning: Ensure the gate is adequately supported prior to removal to prevent it from suddenly dropping

Note: Only disassemble the mixer gate as much as required for the work being done.

1. Remove the gate mounting bolts in the gate flange holding it to the rim.

2. Pry off gate. Gate is sealed in place with the use of silicone.

3. The outlet spiral plug is removable for inspection by loosening the two bolts securing the spiral retaining clips to the gate, then lifting the plug. O-rings are used to seal the plug and should be inspected at this time and replaced as required.

4. The outlet vortex may be removed by loosening the bolts around the circumference of the discharge tube.

5. The discharge canister is held to the body by four hex head bolts. This joint is sealed using silicone. If tube is removed, all of the old silicone needs to be removed and replaced with fresh silicone at assembly. When re-assembling the discharge canister to the gate body, carefully tighten each bolt to ensure that the opening on the canister aligns with the gate body such that the transition between the two is seamless.

6. To reinstall outlet remove old silicone. Replace with fresh silicone. Position gate in place and secure bolts.

3.5 Rotor Adjustment

Gyptech recommends maintaining a 0.010in to 0.025in gap between the bottom of the scraper and the top of the base liner to maximize the life of the scraper and the base liner. Gyptech does not recommend running the mixer with the rotor hard against the base liner.

1. Remove the discharge gate (see 3.4).
2. Loosen the six hex head bolts holding the locking collar.
3. Using the Gyptech Rotor Nut Wrench, turn the adjusting nut in clockwise rotation to lower the rotor. Counter clockwise rotation will raise the rotor. One full turn will move the rotor 0.083in. To prevent the shaft from rotating use the Gyptech Rotor Shaft Wrench across the flats of the mixer shaft.
4. Tighten the bolts to secure the locking collar.
5. Rotate the rotor to check for clearance by using feeler gauges under the scrapers through the discharge gate opening.
6. Replace the discharge gate.

3.6 Replacing of Motor Drive Belt

1. Remove as many sections of guarding as necessary to access the drive belt.
2. Remove tension from belt by loosening the horizontal square head set screws from the motor mounting plate.
3. Remove the drive belt from the sprockets.
4. Set the replacement belt so that the 'teeth' on the belts align with the groves on both sockets, and then tension using the horizontal set screws. Adjust belt tension based on belt wear. **DO NOT USE JACKING BOLTS ON THE MIXER SHAFT BEARING TO ADJUST THE BELT TENSION.** Use the install drawing MX-IN01 for re-installing the drive belt and setting the belt tension.
5. Re-install all removed guarding.

3.7 Replacement of Top Bearing

1. Loosen and remove the drive belt and guarding (see 3.6).
2. Remove the sprocket and key from the top of the mixer shaft.
3. Loosen and lower rotor so that is sits on base liner (see 3.5).
4. Loosen the four hex head boots used to secure the top bearing to the bearing mounting plate. Slide the bearing off of the drive shaft.

5. Install the new bearing on the bearing mounting plate. Use the four jacking bolts to reposition the top bearing plate to ensure that the rotor drive shaft is vertical, if necessary. Reverse assemble all removed components.

6. Reset gap between rotor scrapers and base liner.

3.8 Replacement of Bottom Bearings & Seals

1. Loosen and lower rotor so that it sits on base liner (see 3.5).

2. Remove the mixer drip tray.

3. Remove the six hex head bolts securing the bearing housing to the bottom of the mixer. Remove the bearing housing. If required, use the threaded holes in the bearing-housing to push the bearing housing off the shaft.

4. Remove the lock nut and lock washer from the bottom of the mixer drive shaft.

5. Remove old bearings and bearing spacer.

6. Remove the socket head bolts securing the seal housing to the base. Remove the seal housing and replace the seals. Re-install seal housing.

7. Install the new bearings with the bearing spacer located between them. Re-install the bearing housing.

8. Reset gap between rotor scrapers and base liner.

3.9 Lid Removal

Note: If only the front lid sections need to be removed, then only disconnect the inlets directly affected.

Warning: Removing the lids improperly can result in serious injury. See 1.1 for more details.

1. Disconnect water and additive inlets from the sections to be removed by removing the hex head bolts and washers holding the additives in place. Disconnect all water jets from the manifold.

2. Remove the vent from the mixer lid by loosening the hex head bolts on the tabs holding the vent in place.

3. Remove the plastic wrap from the stucco inlet.

4. Remove all drop-in pins from the lid.

5. Unthread nuts from t-bolts around the lid sections to be removed using an adjustable wrench capable of opening at least 1-3/4” wide. Loosen the tabs along lid seam between the lid sections using a wrench for hex head bolts. Rotate the tabs so that they do not overlap the seam.

6. Using the handles provided on the lid, carefully lift the lid off of the mixer.

7. The small quarter front lid must be removed first, then the other front quarter lid, before the back half lid.

8. O-ring should be inspected before re-installing lids to ensure proper seal.

9. To replace, reverse steps 7 to 1 above. When re-installing each lid section, align and re-install the t-bolts around that section without tightening them to ensure that it is properly located. Once all lid sections are installed, secure the lid to the mixer. Do not over-torque lid nuts.

Note: When re-installing the plastic wrap around the stucco inlet, ensure that the wrap is oriented such that the stucco chute scraper rotates 'off' of the inside end of the plastic wrap, as shown below.

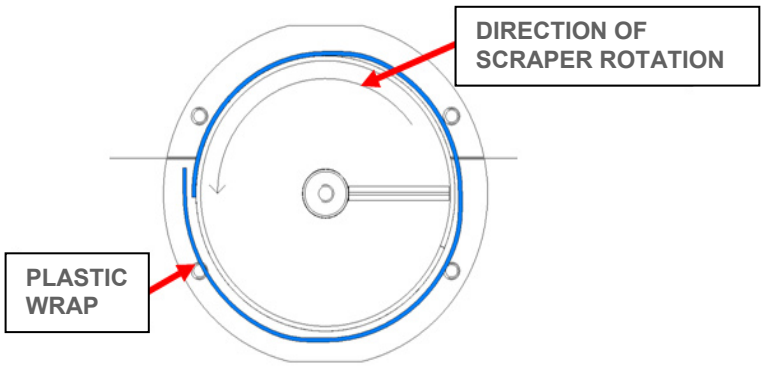

Figure 7: Stucco Chute Scraper Wrap Orientation

3.10 Lid Pin & Lid Water Jet Replacement

1. Disconnect any water connections as required.

2. Unthread pin or jet in counter clockwise rotation.

3. Install new pin or jet in clockwise rotation.

4. Ensure that all lid jets are flush with the lid liner. Ensure that the rotor can rotate freely without contacting any lid pins.

3.11 Lid Lump Ring Replacement

1. Remove all lid sections (see 3.9).

2. Remove the hex head bolts securing lump ring to lid.

3. Carefully align threaded holes on new ring to holes in lid and slowly secure into place.

4. Install washers and bolts, evenly tighten bolts to seat lump ring to lid.

5. Re-install lid sections one at a time.

3.12 Lid Liner Replacement

1. Remove all lid sections.
2. Remove lid lump ring (see 3.11).
3. Remove the flat head bolts securing liner to lid.
4. Align new liner to lid.
5. Reverse steps 3 and 2.
6. Ensure that all lid jets sit flush with the lid liner.
7. Re-install lid sections.

3.13 Rotor Pin Replacement

1. Remove front lid section.
2. Using the Gyptech Rotor Pin Removal Tool, rotate the pin in counter-clockwise to remove it. Medium strength adhesive thread locker was used on installation, so some force will be required to dislodge pin.
3. Use the Gyptech Rotor Rotation tool to rotate the rotor as necessary to access additional pins to remove.
4. Apply medium strength adhesive thread locker to new pin. Turn in clockwise direction until pin is securely sealed against shoulder.
5. Re-install front lid section.

3.14 Rotor Plow Replacement

1. Remove front lid section.
2. Remove two socket head bolts per plow.
3. Grind off weld at plow tip. Use care not to damage the rotor lump ring if it is not being replaced.
4. Align new plows and secure using bolts. Using stainless weld rod, secure plow tip to rotor lump ring.
5. Re-install front lid.

3.15 Rotor Lump Ring Replacement

1. Remove all lid sections (see 3.9).
2. Remove rotor plows. If not replacing plows, take care not to damage plows when grinding off the weld at the plow tip if welds are present.
3. Remove socket head bolts holding the lump ring to the rotor.
4. Remove rotor lump ring. You may be required to cut the rotor lump ring to remove it from the mixer.
5. Install new rotor lump ring.
6. Install the plows.
7. Replace all lid sections.

3.16 Rim Liner Replacement

1. Remove all lid sections (see 3.9).
2. Remove any extractors or extractor port plugs from the rim (see 3.20).
3. Remove the bolts holding the rim halves together.
4. Remove the old rim liner and install the new rim liner. Ensure that all cut-outs on the rim liner and rim align. Grind at joint face if required to obtain proper fit. In addition, some grinding may be required around cut-outs for discharges. Do not grind any chromed surfaces.
5. Bolt together outer rim halves.
6. Replace lid sections.

3.17 Scraper Replacement

Note: After replacing the Rotor Scrapers, the gap between the bottom of the Rotor Scrapers and the Base Liner may need to be adjusted more frequently as the new scrapers “wear in”. See 3.5 for details on how to set the scraper to base liner clearance.

1. Remove small front quarter lid section.
2. Remove tangential discharge gate (see 3.4).
3. Raise the rotor (see 3.5).
4. Rotate rotor until scraper is aligned with opening for tangential discharge gate outlet.
5. Remove the three flat head bolts holding the scraper to the rotor. These are located on the rotor’s top surface.

6. Slide out the old scraper through opening for outlet and insert new scraper and secure in place with bolts. If required, install a bolt into the threaded hole on the tip of the scraper to assist with scraper removal.

7. Repeat steps 4 to 6 for each of the six scrapers.

8. Carefully lower rotor until scrapers touch the bottom liner, then raise the rotor approximately .010in to 0.025in, or 3/16 of a full turn on the adjusting nut. Check clearances using feeler/shim gauges.

9. Replace tangential discharge gate and extractors.

10. Replace removed lid sections.

3.18 Extractor Preventative Maintenance

These checks are to be performed during scheduled downtime, or any time that an extractor is removed from service for any reason.

1. Ensure that all components of the extractor and all connections to the extractor are secure.

2. Clean any stucco that may have accumulated on the extractor.

3. Visually inspect extractor donut and plunger to look for signs of excessive wear. Look for scoring along the inside of the extractor donut. Some scoring is typical, but heavy scoring indicates that material is entering between the donut and plunger. If showing signs of heavy wear or heavy scoring, remove the extractor from service and flag it to be rebuilt.

4. Check the vents on the extractor barrel for signs of stucco buildup. Stucco buildup in the extractor vent may indicate damage or wear to the extractor donut/plunger/seal, and will eventually lead to the extractor jamming. Clean any stucco buildup near the vents.

5. Check to ensure that the donut and plunger are properly oriented with respect to the extractor rim liner. The donut and plunger should sit flush to the rim liner. If the plunger has rotated, it indicates that the extractor is heavily worn or damaged. **If the plunger has rotated, immediately remove the extractor from service and flag for a complete rebuild. Do not operate an extractor if its plunger has rotated out of the correct orientation.**

3.19 Extractor Pre-Installation Checks

When preparing to install an extractor, complete all of the following checks to ensure the extractor is in serviceable condition. If the extractor was previously in service, additionally perform a preventative maintenance check (see 3.18).

Warning: In order to properly complete an extractor pre-installation check, the extractor must be cycled while removed from the mixer. Take proper precautions to minimize the risk of harm to yourself and others.

1. Ensure all components are securely bolted together.

2. Ensure that the extractor is clean.

3. Visually inspect extractor donut and plunger to ensure that all edges are rounded off and smooth. Additionally verify that there is no damage to these components.

4. Check to ensure that the plunger and donut are properly aligned such that they will sit flush with the rim liner when installed.

5. Test the extractor to ensure that it cycles properly. **During this test, the extractor will cycle without being fully guarded, and can cause serious harm if proper safety precautions are not followed.** To test the extractor, lay it on a secure surface with the extractor air fittings facing up and easily accessible. Connect a two way valve with a pressure regulator to the extractor air fittings. Connect the pressure regulator to an air supply fitted with a ball vale and set the regulator to 10-20 psi (70-140 kPa). **At this time, the extractor should be assumed to be live, and should be isolated as much as possible. Do not touch the extractor at this time, as the motion of the air cylinder may crush any body parts in the path of the cylinder.** Open the ball valve and cycle the two-way valve and observe how the extractor cycles. There should be no hesitation or chattering of the air cylinder and plunger when moving in either direction. If there is, or if the extractor fails to cycle at 10-20psi, the entire system needs to be inspected to determine the cause of the issue. Common causes include the extractor plunger not being properly aligned, or wear/damage to the extractor assembly.

3.20 Extractor Removal and Re-Installation

1. Loosen the four stainless steel hex head bolts securing the extractor to the mixer. Carefully remove the extractor from the mixer.

2. Once all work has been completed on the extractor, ensure that the extractor donut and plunger are aligned so that they sit flush with the rim liner when re-installed. If the plunger requires adjustment, the top cover of the extractor body, loosening the clamp holding the cylinder rod to the guides so that the cylinder rod rotates freely, positioning the extractor plunger, and then tightening the clamp. If the donut requires adjustment, remove the extractor from the mixer, loosen the set screws securing the donut in place, rotate it until it is aligned, then tighten and re-install.

3. Apply anti-seize to the four stainless steel hex bolts previously removed and secure the extractor to the mixer.

4. Adjust the extractor support bolts located underneath the extractor to ensure that the extractor is level.

3.21 Extractor Donut Replacement

1. Remove the extractor from the mixer (see 3.20).

2. Loosen the set screws surrounding the donut.

3. Remove the old extractor donut.

4. Install the new donut. Orient the donut so that the donut will sit flush with the rim liner when re-installed with the extractor. Check that the plunger sits smoothly inside the replacement donut with no binding. Sand/polish as necessary until any binding is eliminated. There should be no force required to fit parts together. Tighten the set screws holding the extractor in place.

3.22 Extractor Plunger and Seal Replacement

1. Remove the extractor from the mixer (see 3.20).

2. Unbolt and remove one of the covers of the extractor body.

3. Loosen the four socket head bolts securing the extractor barrel and remove it from the cylinder by sliding it forward and off the front of the plunger. If necessary, replace the seals inside the extractor barrel.

4. Loosen the compression clamp securing the far end of the extractor cylinder rod to the guide blocks until the cylinder rod is able to rotate freely.

5. Slide the extractor cylinder rod so that the plunger end of the rod is fully extended.

6. Hold the extractor cylinder rod by the flats across the plunger end of the rod. Hold the plunger by the flats on the plunger and remove it from the cylinder rod. **Do not attempt to hold the cylinder rod by the flat on the far end of the rod, as this may lead to the interior connections of the cylinder becoming damaged when you remove the plunger.** After removal, clean the thread of the extractor cylinder rod.

7. Apply a medium strength adhesive thread locker to the replacement plunger and the cylinder rod. Hold the cylinder rod by the flats on the plunger side of the rod, and install the replacement plunger. **Do not attempt to hold the cylinder rod by the flat on the far end of the rod, as this may lead to the interior connections of the cylinder becoming damaged when you install the new plunger.** Torque the plunger to 60ft-lbs (80N-m).

8. Re-install the extractor barrel onto the extractor body. Check that the plunger sits smoothly inside the donut with no binding. If required, sand/polish as necessary until the binding is eliminated. There should be no force required to fit parts together.

9. Rotate extractor plunger so that when installed it will sit flush with the ID of the rim liner. Once in position, tighten the clamp securing the cylinder rod to the guide blocks.

10. Perform an extractor pre-installation check (see 0).

11. Re-install the top cover of the extractor body. Ensure all hardware is properly secure.

12. Re-install the extractor into the mixer. Ensure that the donut and plunger are flush with the rim liner. Reconnect all air and water connections to the extractor. Test all connections.

13. Ensure all other work done on the mixer is complete. Close the mixer. Remove the lock from the pneumatic connections **ONLY** and jog the extractor to ensure that it is cycling properly and without rotation. Once confirmed, remove locks from the electrical disconnect.

4 Maintenance Schedule

The following table summarizes the optimal maintenance intervals.

The frequency of inspections will need to be adjusted to suit operating conditions and mixer performance.

Most internal parts can be inspected by removing the front lid half only. If there is consistently low wear to the lid pins and water pins, the frequency of removing the back lid for inspection can be reduced.

4.1 Daily Tasks

Task	Notes
Check all connections to mixer.	
Check for excess noise from mixer components.	Excess noise may be caused by a misalignment of components causing moving parts to rub against each other, or by a failure in one of the components. Unusual noises from the mixing chamber may indicate damage or foreign material in the mixer.
Check manifold pressure.	High pressure may indicate plugged pins.
Check rotameter flow rates.	Changes to flow rates may indicate plugged pins, or variation in the supplied water pressure. Ensure that flow rates match the values set during commissioning to ensure proper mixer performance.
Check to ensure that the extractor cycles properly.	If the extractor is not cycling properly, it may indicate that something is jammed inside the extractor or that components be worn or have been damaged.

4.2 Weekly Tasks

Task	Notes
Check all bearings and components requiring lubrication (see 3.3).	Amount of lubrication required and frequency of lubrication to be adjusted to suit operating conditions. Some parts of the mixer will require more frequent lubrication than others.
Inspect for wear on all wetted parts in the mixer.	Document and monitor any wear in the mixer.
Check that the gap between the mixer lid lump ring and rotor is consistent around the mixer and is within tolerances.	
Check that the gap between the rotor lump ring and the lid lump ring is consistent and within tolerances.	
Check for wear on the rotor pins.	Replace if necessary.
Check for wear on the lid pins.	Replace if necessary.
Check for material build up on stucco scraper, in stucco chute, and around vent.	Remove all build-up. If build-up is excessive, look for root cause.
Check that the gap between rotor pins and lid is within tolerances.	
Check for wear around edges of inlets.	Replace wear components if wear is excessive.
Check for wear around the tangential outlet ports.	Replace wear components if wear is excessive.
Check the rotor scrapers for wear.	Scrapers should be replaced after 1/16” (2 mm) of wear or less.
Perform the extractor preventative maintenance inspection.	See section 3.18.
Clean the interior of the mixer.	Remove all built-up/set stucco from the inside of the mixer.

4.3 Monthly Tasks

Task	Notes
Perform full performance inspection on extractors.	Remove the extractor from service and perform the checks as per sections 3.18 and 0.

5 Troubleshooting

Due to the intricate nature of the equipment, this section will outline only basic mechanical approaches to problem solving. Should the maintenance steps outlined below fail to fix the issues, we recommend contacting a Gyptech representative.

5.1 General

Problem	Possible Cause(s)	Possible Solutions
Leaks – Where the mixer lid meets the rim	-O-ring is excessively compressed, preventing proper sealing. -O-ring is damaged. -The lid liner is worn down near the rim liner.	-During down time, loosen T-bolts, then re-tighten, taking care not to over-tighten. -Replace o-ring. -Replace worn liners.
Leaks – Mixer lid around the mixer drive shaft	-Mixer vent is blocked, increasing internal pressure. -Flow is restricted at mixer discharge. -Mixer is over-full.	-Ensure the mixer vent is running clean. Level and adjust water flow to the vent as needed to prevent/eliminate buildup. -Inspect boot/discharge gate for blockages. -increase boot and/or gate donut ID.
Leaks – Mixer at extractors	-Extractor-Mixer connection not properly sealed.	-Add silicone sealant around extractor connection. Keep in mind silicone will only work properly if it is dry, dirt free, and has had enough time to cure.
Leaks – Extractor vent holes	-Extractor plunger, donut, or seals are worn.	- Inspect extractor. Replace all worn components.
Leaks – Discharge Gate	-Fit of gate to mixer is distorted. -Improper sealant used. -O-ring is damaged.	-Ensure that gate is properly fitted to the mixer. -Remove existing sealant. Add silicone sealant around the gate connection. Keep in mind silicone will only work properly if it is dry, dirt free, and has had enough time to cure. -Replace O-ring.
Lumps in mixer discharge	-Lumps forming in mixer boot. -Lumps are forming inside the mixing chamber (behind rotor teeth, pins, etc). -Lumps are forming in the vent.	-Change mixer boot size. -Check to see if the mixer is running dirty. Look for buildup, particularly outside of the lump rings. See 'Troubleshooting a mixer that is running dirty'. -See 'Material Building Up in the Mixer Vent'.

Extractor slurry is not dense enough	-Flow through extractor may be inadequate.	-Check extractor and connections to hard edge mixer for any lumps/blockages that are restricting flow.
Mixer is spitting at the vent	-The mixer is having trouble discharging slurry.	-Open the lid and check that no lumps or obstructions are forming around the lump rings. Clean if necessary -Change the spiral type/adjust how open the spiral is. Impacts the downward force on the slurry -Change the outlet boot donut inner diameter. Different inner diameters impact the slurry pressure exiting the mixer.
There is excessive buildup in the stucco inlet	-Water is splashing up the stucco inlet. -Water vapor is being drawn up the stucco inlet by the dust collection system. -Excessive moisture is making its way into the dry additives.	-Reduce the water pressure in the manifold. -Reduce the flow through the lid jets upstream of the stucco inlet. -Adjust the makeup/fibre water inlet to aim farther away from the stucco inlet. -Reduce the amount of dust collection in the stucco inlet chute. -Inspect the dry additives for moisture/clumping.
Material is building up in the mixer vent	-Water is not evenly cascading around the inner edge of the mixer vent. -There is excessive suction on the mixer vent.	-Ensure that the mixer vent is sitting level on the mixer lid. -Ensure that the correct amount of water is running to the vent. Too little water will prevent it from cascading over the entire diameter of the vent. Too much will create turbulent 'dry spots' around the ID of the vent, giving material a place to accumulate. -Ensure that there is no material in the outer chamber of the vent which could disrupt the flow of the vent. -Adjust the suction valve to reduce the air pressure at the vent.
Slurry is leaking out of the bottom vents	-The scrapers and/or base liner are worn. -The pressure inside the mixer is too high. -The mixer is over-full.	-Inspect the scrapers and base liner. Replace as required. -Inspect the mixer vent for blockages. If the vent is blocked off, air will push material between the rotor hub and the lid liner, and out of the bottom vents.

Extractor is not cycling properly	-The extractor is jammed/clogged with set slurry. -The extractor is damaged/worn.	-Attempt to manually cycle the extractor repeatedly to break the set slurry around the extractor. Slightly increase the air pressure to the extractor, and then return to normal. -Remove extractor from service for repairs.
Dust is spewing from the mixer vent	-Suction on the vent hose is too low. -The suction hose is clogged.	-Increase suction on the hose. -Temporarily remove the hose from the mixer. Empty any buildup into a solid waste disposal bin.

5.2 Mixer – Troubleshooting a dirty mixer

Problem	Possible Cause(s)	Possible Solutions
Buildup in mixer inner chamber	-The pins are worn and not adequately scrapping buildup. -The water jets are blocked and not properly cleaned. -The water delivery to the mixer is not fine tuned. -The slurry is setting too quickly. -Build-up from the stucco inlet or vent is 'creeping' onto the lid.	-Inspect the inside of the mixer for damaged or worn pins. Replace as needed. -Remove any plugged jets so that they can be cleaned. If a jet is plugging repeatedly, increase the flow through that jet. If a large number of jets are plugging, increase the manifold pressure. -Adjust the amount of water entering the mixer at certain locations. Reposition the make-up/fibre water entry. -Increase the amount of retarder/decrease the amount of accelerant in the mix. -Check stucco inlet/vent for buildup. Take corrective action as needed.
Buildup in the outer chamber of the mixer	-The mixer is not properly discharging material. -The slurry is setting too quickly. -The base jets are clogged. -Components in the outer chamber are worn.	-Check the discharge gate for obstructions. Take corrective action if necessary. -Increase the amount of retarder/decrease the amount of accelerant in the mix. -Remove the plugged jet and clean it. If the jet repeatedly plugs, increase the flow through the jet. -Check the components for wear. Replace as needed.

Buildup in the mixer discharge	-The slurry is setting too quickly. -The mixer is not properly discharging material.	-Increase the amount of retarder/decrease the amount of accelerant in the mix. -Adjust the discharge gate spiral position. The spiral position impacts the downward force of the slurry, as well as restricting the flow of slurry through the gate. -Adjust the gate donut. A donut with a smaller ID improves the mixing of the slurry but restricts the discharge of the mixer. -Adjust the boot size.

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