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High Intensity Mixer VFM Series

ASSEMBLY AND OPERATING INSTRUCTIONS



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RELIANCE'S HIGH INTENSITY MIXER

A. Introduction

The Reliance Mixer is a high-performance machine, which can be used for a variety of applications. The main features of the Reliance Mixer, as compared to conventional mixing systems are its very short mixing cycles and the ease with which the container can be cleaned.

B. Description of the Machine

Reliance Fluidizing Mixers are manufactured in many different sizes ranging from 10 to 2000 liters total capacity.

All models are available with a swivel lid or a hinged lid, a swivel lid being standard for the larger models and a hinged lid for the smaller models. After the lid holding clamps have been loosened, a pneumatic cylinder lifts the swivel lid so that it can be swung sideways around its vertical axle to uncover the mixing bowl. The hinged lid is also operated pneumatically (except on smaller units) and comes equipped with a pneumatic or spring loaded locking mechanism. In case of Pneumatic Locking pin design, a limit switch is mounted on the bottom of the Lid Lifting Cylinder. When the limit switch senses the magnet on the Lid Lifting Cylinder piston when the lid opens, the Pneumatic Locking pin Cylinder will automatically Open and lock the lid into position. To close the lid, disengage the (close) the Pneumatic Locking pin Cylinder by using the HMI or Selector Switch provided. The lid openings are standardized and serve for the loading of the mixer and the mounting of the deflector. Special lid designs are available.

The discharge is formed to match the interior of the mixing bowl. The discharge valve is operated by one centrally arranged non-rotating pneumatic air cylinder. Control of this air cylinder is from a solenoid valve that is located on the pedestal of the machine. The cover of the discharge housing is hinged and can be equipped with blow off nozzles, to clean particles of the mix liable to be stuck to the discharge neck or plug.

The inside of the mixing bowl is made entirely of corrosion & acid resisting steel and is highly polished. The bowl is jacketed to allow heating/cooling media to be circulated during mixing. Heat-transfer oil, hot water or steam may be used as heating medium. Special guide plates and flow bars cause the heating medium to pass first along the dished container bottom and then in several spirals round the cylindrical shell before it leaves the jacket at the highest point. A split bowl feature is also available to allow for easy cleaning and access to the mixing tools. This feature is actuated by a pneumatic cylinder and guide bearings.

Mixing tools are supplied in different shapes and materials to suit the different types of application. The standard-version "Variant" type-mixing tool consists of a bottom scraper, a height-adjustable Fluidizing tool and a horn-shaped tool. Mixing tools are made of stainless steel and its leading edges are hard surfaced with hardness of Rockwell RC 58. Rings Tools and 'S' Shaft Tools can also be supplied.

V-belts are used to transmit power from the motor, which is typically mounted vertically, with the shaft facing down, on the pedestal. Upon request the motor can be inverted. In some applications a Variable Frequency Drive can be used to control the mixer.

The deflector has a streamlined cross-section. It can be pivoted and the height adjusted within the bowl. It is held in place by a clamp, which is tightened from the outside. A stop, limits the amount of downward adjustment so that it will not interfere with the mixing tools. The deflector is used to influence the circulation of the material in the bowl. Its most effective position must be determined according to the material being mixed. Also, a fixed baffle or removable baffle can be supplied upon request. A fixed baffle is one that is welded to the inside of the mixing bowl.

Special seals are utilized for assurance of long trouble free operation of mixer. A purging port is provided between seals where 7-10 PSI air should be supplied to obtain maximum life of seals. These shaft seals are specifically designed and manufactured for this application.

C. Putting the machine into Operation

The Reliance Fluidizing Mixer comes ready for operation. Field connections such as power, air, etc. are required.

Prior to putting the mixer into operation, make sure that,

- a. There are no foreign or loose parts in the mixing container.
- b. The mixing tool cap nut is tightened (Left Hand Threads).
- c. The container lid is closed and the safety switch is electrically connected.
This is important to ensure that the motor is automatically stopped if the lid or access panel is opened while the machine is running.
- d. The discharge valve is in its closed position.
- e. Belts are properly tightened.
- f. All bolts are tightened, as during transit some bolts may have become loose.
- g. The sheaves are properly aligned and tightened to the shaft as shifts can occur during shipping.

When starting the mixer for the first time, check if the mixing tool rotates in the direction of the arrow shown on the mixing container. When you look through one of the openings in the lid, **the mixing tool should rotate clockwise**, so that the hard

3. Heating with hot water and oil

The inlet will be at the bottom and the outlet at the top, opposite as that of steam. In special cases, combined use of steam and water for heating or cooling respectively may be desirable. In order to allow for the two flow directions described further above, two each changeover valves will be required at the top and bottom of the container. Moreover each feed pipe has to be fitted with an additional shut-off valve to prevent steam from passing into the water circuit (or the other way round, depending on the operating pressure); a condense trap and the water discharge hopper will be required. Do not use the media above its boiling point.

b. Compressed - Air Connection

The compressed air pipe must be led from the plant air system to the supply valve on the base frame. The supply valve, manifold, and solenoids will divert air to all ports of the mixer. Air pressure required: 75-100 psi. (3-4 kg/sq. cm).

The shaft seal air pressure is supplied by a solenoid and goes thru a regulator. This regulator should be set from 5-10 psi, if this pressure is exceeded the shaft seals may fail.

Air consumption: Will vary according to the size of mixer and number of pneumatic cylinders installed.

D. Maintenance and Servicing

Note: As do all efficient machines, the Reliance Fluidizing Mixer requires a certain amount of maintenance. Regular inspections of these maintenance instructions will considerably extend the operational life of the mixer.

THE MANUFACTURER WILL NOT ACCEPT ANY CLAIMS UNDER WARRANTY FOR ANY DAMAGE OCCURRED THROUGH NON-OBSERVANCE OF THE MAINTENANCE AND OPERATING INSTRUCTIONS.

a. Cleaning

For cleaning of the mixer, it is generally sufficient to blow through the mixing container with compressed air. The mixing tool can be quickly removed by unscrewing the cap nut, left hand thread, with a socket wrench. Be careful during removal of the tools, as not to damage the hard coating.

b. Inspections

1. Discharge Plug Seal

Visual inspections should be made weekly on the bowl discharge neck. If excessive wear or improper sealing is visible then replacement of the seal is recommended. If the seal wears beyond its limits, the plug may over travel in to the mixing bowl, causing sever damage to the plug, bowl, tools, shaft, bearings, etc.

2. Bearings

The bearings should be checked periodically for high temperature or greasing as under greasing or over greasing could cause premature failures.

c. Lubrication Instructions

*Refer to the lubrication chart for type and amount of lubricants.

1. Shaft Bearings

(Only applicable to FM 75-2000 machine)

The anti friction bearings are lubricated through the flat head grease nipple on the bearing housing; here again anti friction bearing grease is to be used.

When doing this, it should be remembered that the lubricant consumption of anti friction bearings is extremely low and that excessive lubrication is rather harmful and may destroy the bearings. In co-operation with the bearing manufacturers it has been established that the bearing should be lubricated after the first 100 operating hours and thereafter every 500 operating hours. Smaller units typically have bearings that cannot be greased.

For the Fluidizing mixer, we recommend the use of any of the grades of grease (or equal) mentioned below. They are suitable for all lubrication points on the mixer.

- **Mobilith SHC 220 (Recommended Type)**
- **Mobilux 3: Mobil Oil**
- **Shell-Alvania grease R3: Shell Oil**
- **Texaco Marfak Multipurpose 2 DEA Glissando FT 42: Texaco**

2. Discharge valve

After every 100 operating hours, slightly lubricate the discharge valve rod bearing in the case of manual valve operation, or the compressed air cylinder in the case of pneumatic operation.

3. Deflector mounting

The oil seals of the deflector mounting have to be lubricated from time to time with vacuum grease if the machine is operated under vacuum, so that the vacuum tightness of the mixer is guaranteed.

4. Lubrication intervals

At 8-hours operation 1 X a week

At 16-hours operation 2 X a week

At 24-hours operation 3 X a week

Lubricate more often if heat, dust or humidity affects the operation.

5. Lid-swiveling/pivot axle

(Applies only for VFM 75-2000 machine)

The lid-swiveling axle has to be lubricated as required. On the pivot lid design, the main pivot shaft should be lubricated occasionally so that the rotation of the lid is smooth.

6. Motor anti-friction bearings

For the lubrication of these bearings, please refer to the motor maintenance instructions.

7. Shaft Sealing

No lubrication is required for pressure application.

After every 100 operating hours, lubricate the shaft seals with vacuum grease in the case of vacuum operation.

In case of vacuum operation:

- Vacuum grease S 4100: Shell Oil
- BP Energrease HTE 2: BP Benzin und Petroleum
- Mobilux 3: Mobil Oil
- Texaco Marfak Multipurpose 2 DEA Glissando FT 42: Texaco

8. Belt Maintenance

Shifting of the motor allows the tensioning of the narrow V-belts. Loosen the four clamping bolts and adjust the belt-tensioning bolt by means of the tightening screw(s). After the tensioning of the belts, the clamping screws are to be re-tightened. Make sure that the belts are clamped adequately but not excessively. If needed, please contact the manufacturer for more information.

Apart from the V-belt tension check, no other maintenance work is required on the V-belts.

IMPORTANT: The V-belts should be checked periodically and re-tightened if required.

9. Motor Coupling

Large-scale production mixers are furnished with a flexible coupling. These couplings are furnished with an insert and element. There is no maintenance required for these couplings but periodically the element should be checked. The element is a split design so it can be replaced without having to lift the motor or remove the coupling. If the element has to be replaced, there is no

need to lift the motor or remove the coupling.

10. Split Bowl

The split bowl is actuated by a pneumatic cylinder. Sealed roller bearing are used to guide the upper bowl during actuation. As these bearings are sealed they do not require lubrication. If movement of the bowl becomes to jerk or is sluggish the guide bearings may need replacing. The channel where the bearings ride between may need occasional lubricating if the excessive dust or debris is present.

E. Dismantling and Reassemble Instructions

a. Removal of the mixing tool

Prior to the removal of tools, please note the location/position of each blade.

1. Unscrew the cap nut (left hand thread) and remove the capnut.
2. Remove the different mixing tools and components. In the case of the "Variant"- type tools: the horn tool, fluidizing tool(s), and the bottom scraper, spacers, clamping plate.

b. Removal of the shaft seals

1. Unscrew the two mounting bolts of the sealing ring support below the container bottom. (In some cases the bolts are inside the bowl)
2. Loosen the air purge seal on the seal housing; rotate the elbow so that it points towards the shaft in order to permit free passage through the container bottom.
3. Press the lower sealing ring upward into the mixing container using the two expelled screws. Place the two bolts into the tapped holes in the bowl. This will push the seal housing upward into the bowl.

c. Removal of the container lid

1. Hinge Lid

- (1) Remove pivot pin and clevis pin from the hinge.
- (2) Remove lid.

2. Swivel Lid

- (1) Loosen the setscrews, which attach the lid to the shaft.
- (2) Remove lid from the swivel axle.

3. Pivot Lid

- (1) Remove the (4) bolts which attach the lid to the pivot shaft.
- (2) Remove the lid from the bowl.

d. Replace the lid gasket

1. Remove old gasket.
2. Install new gasket making sure that its fits loosely in the groove. Note: do not stretch the gasket when measuring its length.
3. Cut the joint ends of the gasket at an angle of 45 degree.
4. Roll the gasket into the groove using a round object and glue both ends.

e. Removing the mixer bowl

1. Disconnect the electric cables and the compressed air and heating or cooling medium pipes.
2. Remove the cap nut, clamping plate, and mixing tools.
3. Remove the seal housing for the bowl.
4. Unscrew the mounting bolts on the bearing housing.
5. Lift the bowl out by means of a hoist. If the shaft has not been removed be sure to protect it during removal of the bowl.

f. Removing the split mixer bowl

1. Remove the lifting cylinder by unbolting it from the mounting channel and unscrewing the cylinder shaft from the lifting lug.
2. Prior to this step, support the split bowl shaft so that it doesn't drop. Remove top retaining ring, which is located at the very top of the shaft on the upper section of the split bowl.
3. Unbolt the safety mechanism which is bolted to the lifting assembly.
4. Unbolt the plate which is attached to the shaft. This plate is where the safety pin is normally engaged into.
5. Remove the upper and lower cover plates (which trap the wiper gaskets) on the lifting assembly.
6. The split bowl shaft can be lowered and removed.

g. Replacing the V-Belts

1. Loosen the motor mounting assembly by unscrewing the four bolts.
2. Loosen the V-belts by turning the belt-tensioning bolt(s) fully to the left.
3. Remove the belts by drawing them downwards or upwards as the case may warrant.
4. Fit the new V-belts by placing them first on the large pulley and then by turning them on to the motor pulley.
5. Tension the V-belts by turning the tightening bolts clockwise. Make sure that the V-belts are not tensioned excessively because this would be detrimental to the bearings and motor.
6. Re-tighten the clamp of the motor mounting assembly, as well as the screws in the V-belts pulleys.

h. Removing and replacing Mixer/Motor Pulley

1. After the V-belts are removed, support the pulley so that it will not fall.
2. Mark the pulley location on the shaft with a marker so that when it is re-installed it can be lined up easier with the opposite pulley.
3. Remove the bolts that are tightening the bushing to the pulley and shaft.
4. Use the removed bolts as jackbolts to lift the pulley away from the bushing by screwing them into non-used threaded holes. This will loosen the bushing from the pulley and free it from the shaft.
5. When the pulley is free, remove the key to help remove the pulley easier.
6. To replace the pulley, insert the bushing into the pulley, line up the bolt holes, and lightly tighten bolts by hand. Keep loose as you will fully tighten when pulley is on shaft with key in place. Line up pulley at marked location. Tighten bolts.

i. Removal of the motor

1. Disconnect the electric cables in the motor terminal box.
2. Loosen the motor mounting assembly and V-belts.
3. Unscrew the flange bolts of the motor.
4. Lift the motor upwards.

j. Removal of the mixer shaft

1. FM75-FM250

- (1) Remove the mixing tools and seal housing.
- (2) Remove the mixer pulley which is attached to the mixer shaft.
- (3) Remove all electrical cables and air line which are connected to the discharge chute, bowl, and lid.
- (4) Remove the bowl assembly with the discharge and lid attached.
- (5) Unbolt the bearing housing from the mounting plate.
- (6) Remove the upper and lower shaft sleeves as well as the slinger ring.
- (7) Loosen and remove both the upper and lower bearing covers.
- (8) Loosen the lower retaining ring.
- (9) Press the mixer shaft downward, this will detach the lower bearing from the housing.
- (10) Remove the lower bearing from the mixer shaft.
- (11) Remove the set screws which attach the lower bearing slinger ring to the mixer shaft.

2. FM350-FM600

- (1) Remove the mixing tools and seal housing.
- (2) Unbolt the bearing socket from the bearing housing.
- (3) Lower the bearing socket out from the base frame, leaving the bearing housing, bowl and other components in place.
- (4) Remove the mixer pulley which is attached to the mixer shaft.
- (5) Remove the upper and lower shaft sleeves as well as the slinger ring.
- (6) Loosen and remove both the upper and lower bearing covers.

- (7) Loosen the lower retaining ring.
- (8) Press the mixer shaft downward, this will detach the lower bearing from the housing.
- (9) Remove the lower bearing from the mixer shaft.
- (10) Remove the set screws which attach the lower bearing slinger ring to the mixer shaft.

3. FM800-FM2000

- (1) Remove the capnut, clamping plate, spacers, mixing tools and seal housing.
- (2) Unbolt the bearing socket from the bearing housing.
- (3) Lower the bearing socket out from the base frame, leaving the bearing housing, bowl and other components in place. Bearing socket, shaft, slinger ring, bushings, and pulley will lower.
- (4) Remove the mixer pulley which is attached to the mixer shaft.
- (5) Remove the upper and lower shaft sleeves as well as the slinger ring.
- (6) Loosen and remove both the upper and lower bearing covers.
- (7) Loosen the lower retaining ring.
- (8) Press the mixer shaft downward, this will detach the lower bearing from the housing.
- (9) Remove the lower bearing from the mixer shaft.

j. Removal of the discharge plug and seal ring (if applicable)

1. Unscrew the mounting bolts from the discharge-air cylinder-mounting flange.
2. Remove the air cylinder, flange, and plug together.
3. Add air to extend plug fully out if not already extended.
4. Remove pin from stem of discharge plug to remove plug from air cylinder rod.
5. Unbolt back plate to replace seal ring.

k. Removal of deflector (if applicable)

- a. Remove the cover in the connection head of the deflector, and disconnect all electric cables.
- b. Draw off the connection head after removing the set pin.
- c. Loosen the lock nut of the clamping device and draw out the deflector from below with the container lid being open.
- d. Remove the thermocouple by disconnecting the screwed union on the bottom of the deflector, turning at the shank of the deflector. Pull out the thermocouple downward together with its connecting wires.

l. Removal of coupling element (if applicable)

This only applies if a coupling is used to connect the motor with a jack shaft

bearing housing. The coupling is made in three parts (1) two halves (2) flexible element and (3) cover /ring. Depending upon the size of coupling, they are manufactured with either clearance fit or interference fit.

To replace the element:

1. Remove the cover fasteners. There are two fasteners 180° apart. Cover will now slide down.
2. Remove the coupling element.

m. Disassembly of jack shaft (if applicable)

To remove Bearing Housing first remove belts and motor as stated above. If there is a fan to circulate air inside of the Baseframe then remove the fan or ensure that it will not be in contact when Jackshaft is lowered or raised out of the Baseframe. Make sure Bearing Housing is clear on all sides and lower the bottom section out of the Baseframe. For an inverted design the Bearing Housing will need to be pulled up from the Baseframe with the motor with the use of the provided eye-bolts. To remove shaft follow below instructions.

1. Remove the coupling element as per instructions.
2. Remove the pin which connects the adjustment shaft to the lower housing.
3. Unbolt the lower half of the bearing housing, which includes the socket and pulley.
4. Remove the lower cover from the housing.
5. Remove the retaining ring below the lower bearing.
6. Remove the sleeves, slinger ring, and cover which sit on top of the bearing socket.
7. Press the jack shaft out from the bottom so that the bearing socket, shaft and pulley are removed as one piece.
8. Remove the bearing socket, which holds the upper bearing, from the shaft.
9. Remove the lower bearing from the lower bearing housing.
10. Remove the upper bearing from the socket.

F. Temperature Measuring Equipment

'J' type thermocouple sensor is calibrated according to ASMC PTC 19.3 standard. R.T.D. sensor is calibrated according to ASPM E 1138. Digital indication type 'J' thermocouple and RTD can be readjusted by means of an adjusting screw on the back of the unit.

G. Principle of Operation and Application

The principle of operation of the Fluidizing Mixer is based upon the high speed of the mixing tools. When the rotational speed of the mixing tool is high enough, thrust and frictional forces are transmitted to the material being mixed in a tangential direction, and centrifugal forces are so in a radial direction. The resultant of these forces drives

the mixed material against the wall where it can flow only upwards. The upward acting forces loosen the material into individual particles in such a way as if these particles were carried by air. This is the Fluidized condition. At the same time, the material adopts the form of a vortex, i.e. it moves around similar to a whirling movement, which normally is only known to occur in liquids.

Therefore the Fluidizing Mixer permits two or more substances, which are at first separated from each other to be intimately mixed into a homogeneous compound. These substances can be dry powder, granules, or liquids. Utilizing heat or mechanical energy under controlled conditions, the mixer can be used to agglomerate, dry, size-reduce or slightly gel a variety of materials.

The Fluidizing Mixer serves such diverse fields as plastics-processing, food processing, the pharmaceutical, cosmetic, ceramic industries, and rubber, paint, and varnish industries as well.

H. Air purge cleaning of bowl bottom

This design allows for the cleaning of the bowl bottom near the shaft, using a burst of air. A rotary coupling is attached to the bottom of the shaft using a special mounting bolt. Air is supplied through the union and is carried through the shaft to the bottom tool, where it is purged into the bowl, thus cleaning the bottom surface of the bowl near the shaft.