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High Intensity Mixer
VFM Lab 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 40 liters total capacity.

All models are available with hinged or swivel lids, a hinged lid being standard for smaller models. The hinged lid is provided with a chained pin to keep the Lid from dropping. A magnetic or locking lid limit switch is provided to turn the motor off or prevent it from starting if the switch is not made.

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 inside of the mixing bowl is made entirely of corrosion & acid resisting steel and is highly polished. The bowl can be 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.

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 it leading edges are hard surfaced with hardness of Rockwell RC 58. Rings Tools and 'S' Shaft Tools can also be supplied.

Lab units are provided with inverted motors and shaft extensions for the tools to mount on. In most applications a Variable Frequency Drive can be used to control the mixer.

The deflector has a streamlined cross-section. The height can be 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.

Special seals are utilized for assurance of long trouble free operation of mixer. A purging port is provided between seals where 2-3 PSI air should be supplied to obtain maximum life of seals.

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 is opened while the machine is running.
d. The discharge valve is in its closed position.
e. All bolts are tightened, as during transit some bolts may have become loose.

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 tools should rotate clockwise**, so that the hard coatings on the tools are on the leading edge. If unit is a convention design and the motor is inverted or if the unit is a direct couple design, ensure that there is adequate air circulation within the Baseframe. The mixer Bearings and the motor Bearings should be kept cool and if adequate air circulation is needed an addition fan may need to be installed within the Frame.

a. Connections for bowl heating

Being equipped with a heating jacket, the mixer container can be heated with steam, hot water or oil in order to reach optimum operating conditions within short time and to maintain them throughout the production cycle. On the mixing bowl, the inlet is at the bottom and outlet is at the top. In case of steam, connections are reversed. If steam is used, check the allowable pressure with manufacturer.

1. Heating with oil

The following grades of oil (or equivalent) are recommended.

Volute 45	Shell Oil

Heat transfer Oil 57
Mobil or International Mobiltherm Light

Texaco USA Oil P 30 DEA Viscobil Sera 9

2. **Heating with steam**

   If steam is used for heating the container jacket, connections are to be made as follows:

   Steam inlet at the top of the container, condense outlet at the container bottom, beside the discharge.

   Permissible steam pressure in the heating jacket (consult manufacture)

   FM 10-40 Maximum 32 psi

3. **Heating with hot water and oil**

   The inlet will be at the bottom and the outlet at the top, opposite 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 (2-3 psi in lab units), if this pressure is exceeded the shaft seals may fail. ***Exhaust valves to remove air from Air Cylinder must be locked out when cleaning the bowl or replacing seals or tool. Failing in doing so may cause injury.***

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

Texaco Marfak Multipurpose 2 DEA Glissando FT 42: Texaco

1. **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.

2. **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.

3. **Motor anti-friction bearings**
   For the lubrication of these bearings, please refer to the motor maintenance instructions.

4. **Shaft Sealing**

   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

5. **Belt Maintenance**
   Shifting of the motor allows the tensioning of the narrow V-belts when they are used. 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.

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. On smaller/lab units it is better to remove the air supply to the mixer prior to removing the tools.
2. Unscrew the cap nut (left hand thread) and remove the Capnut or Clamping Cup, Clamping Plate, and Spacers
3. Remove the different mixing tools and components. In the case of the "Variant"- type tools: the horn tool, fluidizing tool, and the bottom scraper, spacers, clamping plate.

b. Removal of the shaft seals

1. Turn off air supply to Mixer.
2. Unscrew the two mounting bolts of the sealing ring support below the container bottom. (In some cases the bolts are inside the bowl)
3. On smaller units, a threaded housing maybe installed. Unscrew the lock nut.
4. Rotate the elbow so that it points towards the shaft in order to permit free passage through the container bottom.

5. Press the Housing upward into the mixing container. Place the two bolts into the tapped holes in the bowl. This will push the seal housing upward into the bowl. If holes are not present, press the housing into the bowl. Top shaft sleeve may come out with housing, replace sleeve so.

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.

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. Keep in place on smaller units if required.
4. Unscrew the mounting bolts on the mounting flange
5. Lift the bowl up by means of a hoist. If the shaft has not been removed be sure to protect it during removal of the bowl.

f. Replacing the V-Belts (If Applicable)

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.

g. Removal of the motor

1. Disconnect the electric cables in the motor terminal box.
2. Remove tools and Seal Housing.
3. Loosen motor mounting bolts and slowly lower motor down. If adequate space is not available, then remove bowl as stated previously. The unbolt main plate from pedestal and remove Motor/Bowl Mounting Flange Assembly with the main plate. Motor is bolted to Motor/Bowl Mounting Flange Assembly and will also come out.

h. Removal of the mixer shaft

1. Disconnect the electric cables in the motor terminal box.
2. Remove tools and Seal Housing.
3. Loosen motor mounting bolts and slowly lower motor down.
4. Unbolt Shaft Extension

j. Removal of Discharge Plug

1. Unscrew the mounting bolts from the discharge-air cylinder-mounting flange.
2. Remove Hinge Pins if required
3. Withdraw the air cylinder from the discharge chute; remove the dowel pin, and remove discharge plug from the piston rod.

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.

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.