AH SERIES PLANT (AH-15)

Operation, Service, and Maintenance Manual

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IMPORTANT NOTE

THE DATA'S INDICATED IN THIS OPERATING INSTRUCTION MAY DIFFER FROM PLANT TO PLANT IN ACCORDANCE WITH CONSTANT IMPROVEMENT, WE RESERVE ALL RIGHT TO CHANGE OR MODIFY ANY PARTS AT ANY TIME WITHOUT

ATTENTION

THE NON-APPLICATION OF THE USE AND MAINTENANCE RULES MENTIONED WITH THE PRESENT MANUAL WILL ENTAIL THE AUTOMATIC LOSS OF ALL WARRANTY INSURANCE COVERINGS.

For Service or any other query, Call our Toll-free number: 1800-121-257-257

Visit us at: http://www.akonaindia.com/

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FOREWORD

Dear Customer,

We are happy to provide you Akona's Automatic Mobile Concrete Batch Mix Plant, Model AH-15.

Mobile Batch Mix Plant with control system, has been developed for wide range of application as per your requirements.

All necessary safety precautions and regulations have been adhered to in the design material and manufacturing of AH-15 series.

This manual provides technical specifications, operation guidelines, routine maintenance, and service maintenance procedure. The performance of Mobile Batch Mix Plant largely depends on its proper maintenance. Hence please maintain your machine properly as per the guidelines and schedules given in this manual. We recommend that only trained personal should perform the operation and maintenance task of the plant.

Continued improvements in the product design are incorporate from time to time which may not be included in this manual.

If you have any query or service call, fully equipped and well-trained team from Akona Customer care is always available to provide best services.

In case of any difficulty Please contact

Akona Engineering Pvt. Ltd.,

Customer Support
Hycon House, A-455, Hindon Vihar,
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Visit us as - www.akonaindia.com

NOTE: - All the information in this manual is based on the latest product information available.
A.E.P.L. reserves the right to make changes at any point of time without any notice & incurring any obligations thereof.

STANDARD WARRANTY FOR BATCH MIX PLANT AKONA MAKE AH-15 MODEL

This warranty applies to AH – 15.

WARRANTY CARD

In the event of any defective part being discovered within a period of one year from the date of delivery/commissioning (as per S.O.) then said defective part/s will have to be returned to dealer/workshop on freight basis. We shall inspect such part/s thoroughly. On satisfaction, if the defect is found due to faulty material or poor workmanship, the same will be repaired or replaced with a new one free of cost but freight charges will be borne by the customer. The defective part/s, which has been replaced or repaired, will be sole property of the A.E.P.L.
The benefit of warranty is given to the owner only and cannot be transferred if the machine is resold or send out.

Warranty is not applicable for:

1. Starter, Capacitor, electronic component, Belt, Pulleys, Chains, Gear, Couplings, Plumbing's accessories, tyres, tubes, & Bearings etc. However, the company will passion to the customer the benefit of any guarantee/warrantee of the electronic motors, pumps and engines given by the manufacturers and will on behalf of the customer take up with such manufacturers any complains which they may have regarding the workmanship.
2. Defect due to wear and tear, accident, improper adjustment, misuse, or lack of maintenance.
3. Spare manufactured by the party/customer and then fitted to concrete mixer supplied by the Akona Engineering Pvt. Ltd.

Limitations and Exclusions:

1. To fair wear and tear or to damage due to negligence or improper handling or incorrect application or improper handling or incorrect applications or incorrect installation by the purchaser, or his employees or agents or in the case of repairs or alterations carried out by the purchaser without or knowledge and written approval.
2. Any damage due to use of lubrication oil, fuel quality and grade not recommended by us.
3. Any damage resulting from improper shutdown.
4. Any failure to meet its obligations here under which are due to circumstances beyond its reasonable control including but not limited to industrial disputes, fire, severe weather conditions, government decisions, material shortage, epidemics, power or machinery breakdown/ failure or war.
5. We will not be responsible for loss or damage to goods beyond the delivery point and we will repair or replace free of charge goods damaged in transit up to the point of delivery (consignee location) as specified above.
6. Strike, Lockout, Fire, Theft, Accident during transit from consignee location to user end and anything by the act of God constituting the force Majeure.

OUR QUALITY POLICY

Akona Engineering Pvt. Ltd. is one of the leading Construction machinery manufacturers, renowned for its engineering expertise and after-sales support.

Akona is engaged in manufacturing and sale of Asphalt Plant, Concrete Plant, and other related segments.
The Asphalt plant segment provides asphalt, recycling, and Hot Mix plants (Drum type) in mobile and stationary setup.
The Concrete plant segment provides Concrete Batch Mix Plant (CBMP), Wet Mix Mortar (WMM) and Cement Treated Sub-Base (CTSB) plants.

Our qualified & well-trained engineers capable to manufacturer the equipment, plant as per customer specification, requirements.

"To Offer the Products and services to the satisfaction of the Customer and strive Continuously Upgrade Quality in all Respect Through the Joint Efforts of all Employee"

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OPERATION AND MAINTENNANCE MANUAL MODEL: AH-15 CAPACITY: 15 M^3

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1. INTRODUCTION

Batching

We use latest technology for operation as well as control. All ingredients of concrete, which are: aggregates, cement, water and admixtures, these ingredients are weighed and batched as per the recipe, following practice followed internationally. The special load cells used for weighing give batching accuracy of 2 percent.

Mixing

Reversible mixer is a machine, which is used to mix raw material required IN making Ready Mix Concrete. During clockwise rotation the raw material i.e., aggregates, sand, cement, admix and water get mixed & during anti-clockwise rotation mixed material i.e., ready mix concrete is discharged. The mixing drum revolves with the help of Electric motor. The pinion drive by the electric motor is used to drive the drum mixer which is rotating with the help of three set of rolling. The digital weighing system is incorporated with the help of load cells which generates the output signal according to the weight. The feeding of water is automatic and auto cut, with the help of digital flow meter. The water feeds automatically in every cycle. The batch capacity of the machine is 0.5 cum per two minutes right from unloading to loading under standard test conditions.

Control System

Fully automatic concrete batching plant is provided with PLC based control system, digital weigh displays, keyboard entry control panel and controls all the operations of aggregate feed chute gates, aggregate weigh hopper gate, cement screw conveyor, air compressor, water weigh batching & concrete mixer. All the controls are operated automatically though a single push button with limit switches and emergency cut off switch available. The various ratios and output etc are recorded though computer prints out. The control also has the provision of full manual override facilities.

Batch mix plant components

- ***a)*** *2+2 Aggregate Bin Feeders.*
- ***b)*** *Aggregate Weighs Batcher.*
- ***c)*** *Concrete Mixer Reversible Drum Type.*
- ***d)*** *Gathering Conveyor*
- ***e)*** *Cement Feeding System.*
- ***f)*** *Admixture system*
- ***g)*** *Water Weighing System.*
- ***h)*** *Air Compressor.*
- ***i)*** *Water Pump.*
- ***j)*** *Power Source.*

2. APPLICATION (PURPOSE) OF AH 15 BATCH MIX PLANT

The purpose of batch mix plant is:

To blend different size of aggregate in specification portion.
To mix the aggregate cement and admixture thoroughly and uniformly to produce a homogenous mix.
Carryout all tasks automatically, adhering closely to the recipe selected and producing best quality of mixture.
To run in a safe, environment –friendly and reliable manner to carry out the above tasks accurately and consistently.

3. CAPACITY OF AH 15 BATCH MIX PLANT

The capacity of Akona AH 15 Fully Automatic Mobile concrete batch mix plant is 15 m^3 per hour, The output of this plant is consistent, however, due to certain recipes selected or technical issues such as lack of maintenance, upkeep, etc, the plant may perform poorly.

4. SALIENT FEATURES OF AH 15

- Modern and latest batch mix technology.
- Produce high quality and high strength concrete mix
- High production rate.
- Robust frame structure
- Easy to operate.
- Highly accurate aggregate & Additive feeder.
- Modular Design for Containerized transport.
- Fully Automatic Control Panel.
- Electronic Weighing system with load cell.
- Easy to erect and dismantle.
- Latest technology of concrete batching & mixing plant available in **AH-15**.
- Bin feeder type design for ease of feeding continuously and making work easier.
- Mixer is made by hard and thick sheet of **M.S IS: 2062** thus mixer body does not meet concrete and wear & tear of the body is avoided.
- PLC, microprocessor-based control panel with integral computerized batch controller accommodates 99 different design mixes.
- Electronic weighing system having load cells for aggregate, cement, water and admixture.
- Plant can be erected and commissioned within 5 days.
- Complete plant can be transported in one 40 feet trailer.
- Plant only requires electric power supply water piping, civil foundation and aggregate, sand and cements feeding.
- Cement is conveyed in a vertical screw conveyor, discharging into the cement bucket then after in mixer. Hence, there is no loss of cement due to wind.
- Plant operation is very silent & with clean surroundings.
- Efficient Blade mixing technology.
- Password locking facility.
- Water and Ad mix pour by weight.
- Pneumatically operated gate for aggregate, sand, cement, water, and Ad-mix.
- Vibrators provided to consume complete batch precisely.
- Email & SMS facility (Optional).

5. Technical Description of Equipment

a) Aggregate Bin Feeders.

It is provided for storage and delivery of course and fine aggregate on the gathering conveyor. It has discharge gates which are operated by pneumatic cylinders for ensuring proper and estimated ratio of aggregate mix on the gathering conveyor.

b) Aggregate Weighs Batcher.

Aggregate weigh batcher consists of a weigh frame mounted on 4 load cells. The aggregate carrying is discharged one by one into the gathering/belt conveyor. The aggregate is weighed and carried to the mixer inlet point through gathering conveyor. There is a separate weigh batcher for cement, water and add mixers. These are suspended on load cells. The gathering conveyor has unobstructed path for discharging the complete aggregate into the mixer and is operated automatically.

c) Concrete Mixer Reversible Drum Type.

This module is solid structural steel frame construction, and it consists of high-speed RD mixer, feeder conveyor, cement weight batcher, and add mixer weigh batcher, water weigh batcher & electrical controls. There is estimated ratio of water, ad-mix, concrete and aggregate input according to the design mix.

d) Gathering Conveyor

It is provided for collection and transportation of batched aggregate from various bins to the mixer.

e) Cement Silo (Optional)

Cement silo of varying capacity of 60 to 100 tons is provided with all cement accessories such as pressure relief valve, aeration pads, filters, and discharge vales. A cement batch screw conveyor is provided for batching of cement. The inside of silo is coated for free flow of cement.

f) Cement Feeding System.

A cement feeding system is provided for feeding up of cement in mixer which includes horizontal or vertical screw conveyor with cement hopper.

g) Admixture system (Optional)

Complete setup for Admixture system is provided, this setup consists of a pump and an admixture weighing system, Admixture is transferred from the admixture drum provided by the customer to the admixture weighing system with the help of the pump provided, inside the weighing system, once the required amount admixture is recorded by a loadcell, the control panel turns off the intake electronic solenoid valve and then the pump, and after a moment turns on the discharge solenoid valve, which then dumps the weighed admixture into the mixer, This is an automated process controlled by the control panel.

h) Water Weighing System.

Weighing system complete with discharge pump for pressurized feeding of water into the mixer via special water spraying nozzle for better mixer & self-cleaning.

i) Air Compressor.

Air compressor is of sufficient capacity, provided for the pneumatic operations of pneumatic jacks and other related accessories.

j) Water Pump.

A water pump is important element for the feeding of water into the mixer and fulfilment of water requirements for making concrete.

k) Power Source.

The plant is equipped with one Gen Set of **62 KVA**. generating **62 KVA**, 415 volts, 3 Phase, 4 Wire, 0.8 PF, 50 Hz (conforming to **IS: 4722/ BS 2613)** complete with control panel mounted on a sturdy channel section steel base. The DG set is supplied with an acoustic enclosure and confirms to noise & air pollution norm of Govt of India Gazette Notification No 230 (17 May 02) and 293 (12 July 04).

6. Technical Specification.

MODEL	AH-15
MIXER UNIT	Reversible DRUM MIXER
GEO.VOLUME	1.55CUM
RMC OUTPUT/BATCH	0.5 CUM
FILLING PERCENTAGE	35%
BATCHES/HOUR	40
DISCHARGE HEIGHT	DISCHARGE INTO PUMP
CAPACITY(8HOUR)	160CUM
STORAGE BIN FEEDER	2+2 Nos.
CEMENT BATCHING	BY WEIGHT

7. POWER CONSUMPTION

Power Consumption	
MODEL	**AH-15**
MIXER MOTOR	**10 HP**
BELT CONVEYOUR MOTOR	**7.5 HP**
CEMENT SCREW FEEDER	**10 HP**
WATER PUMP	**2 HP**
COMPRESSURE MOTOR	**3 HP**
VIBRATOR MOTOR	**0.5 HP**
CHEMICAL MOTOR	**1.0 HP**
POWER SUPPLY	**415 X 3Ø X 50 Hz**
NET CONSUMPTION	**34 HP**

8. CALIBRATING WEIGHING EQUIPMENT

When, our site engineer performs the required calibration of weighing equipment, he generally follows the procedures given below.

Visual Inspection Prior to Test

- Clearance around hopper and lever system
- Dust curtain for slack - freedom
- Balance of scale
- Correct problems noted above, before proceeding on

Test Procedure

Testing of weighing equipment should be followed by step by step in the following manner.

1. Balance Indicator:
Check for repeatability. Note the hangers, materials used to hold weights, and the correction weights are included in the balance.

2. Sensitiveness:
Check on non-automatic indicating scales. Twice the value of the minimum graduated interval on the beam allowed.

3. Fractional Poise:
Check to capacity by 50 kg increments; tolerance 0.5%.

4. Balance Check:
Remove test weights and recheck balance device. This action should not change balance by more than one of the minimum graduations (plus or minus).

5. Empty Test:
Apply test weight to empty scale, minimum load of 500 kg, 1000 kg desirable (or to capacity of device, whichever is greater); tolerance 0.5%.

6. Balance Check:
Remove test weights and re-check balance. The device should not change balance by more than one of the minimum graduations (plus or minus).

7. Half Normal Batch Capacity Test:
Fill the hopper to about one-half the capacity of the device with batching materials, take reading, then apply test weights. Tolerance is applied only to the total of the test weights used; tolerance 0.5%.

8. Balance Check:

Remove test weights and recheck reading with materials. Reading should not change by more than one of the minimum graduations (plus or minus).

9. Full Normal Batch Capacity Test:

Fill the hopper with batching material to as near capacity that will still allow the test weights to be applied without exceeding the capacity and take reading. The test weights tolerance of 0.5% is applied only to the total of the test weights used.

10. Balance Check:

Remove test weights and recheck reading with materials. Reading should not change by more than one of the minimum graduations (plus or minus).

11. Electronic Indicators:

Check for environmental factors such as R.F.I. interference from other electronic elements in the environment. Interference must not affect the device by more than two of the minimum graduations (plus or minus).

9. OPERATION

SAFETY INSTRUCTIONS BRIEF

- Machine /plant is designed and constructed according to the state of art and the recognized safety rules. Nevertheless, its operation may cause damage to health of user or third persons. Or damage to the machine and other properties.
- The machine /plant shall be used only when in proper technical condition.
- The machine/plant is intended to produce concrete exclusively. Any other use different from or exceeding the purpose of machine /plant is not considered suitable. The manufacturer will not be liable for any damage resulting from the product misuse. The user accepts the risk.
- Before starting the work, the personal in charge of any activities relating to the use of machine must read the instruction manual and follow the safety rules.
- The personal must not wear long loose hair, or slack clothing or jeweler including rings, because of danger of injury.
- As far as necessary or mandatory by regulations use personal protection suits and other protective equipments.
- Observe and follow the safety and danger signs at the machine/plant.
- In case of safety related modifications to the machine / plant or to the performance of the machine/plant immediately notify the responsible body / person of the disorder.
- Do not make any modifications, extensions or rebuilding to the machine /plant, which would cause safety, without manufacturer's approval. It also includes the welding and cutting at supporting structure.
- Spare parts must correspond to the manufacturer's technical specifications.
- Do not change / alter machine programs (software) for programmable control systems
- Any work at machine /plant must be performed by reliable personnel only, Observe the minimum age admissible.
- trained or instructed personnel only, state clearly personnel competences for operation, set up, service / maintenance and repair.
- Make sure those personnel only in-charge of these responsibilities is working with the machine. State clearly the responsibilities of the machine operator an authorize him to refuse safety advise instruction by out sides
- All the electric work must be performed by trained electrician only.

- Danger may occur if the plant is used with carelessness. It is important that all personnel working in close range to the machine know the safety rules, if safety rules are not respected, you endanger body parts such as fingers and hands or in the worst case a fatal outcome.
- Try to stay away from the moving parts, make sure that all the safety guards and protection covers are provided and properly fitted.
- Carry out all maintenance work under observance of safety regulations.
- Condensed water during the night the cement might harden up. The inlet gate of cement screw conveyer is to be closed after finishing day work.
- Check the "emergency stop" button daily when starting the work. Start the system and the mixer motor, then press emergency stop button, if the mixer stops immediately, everything is OK. Please notice that there is still power in the power box even through the emergency stop is active.
- The connection cables should not be shortening anywhere.
- Ensure in your interest regular maintenance and lubrication of the machine.
- For faults which cannot be repaired by you kindly notify the "AKONA Service department.
- The operator of the machine should be trained only under the permanent supervision of an experienced person.
- During training the personal should be well known about the general education and how to operate with machine / plant.
- The personal should be well known about the regular maintenance of the plant.

PRINCIPLES FOR OPERATION

Following principles govern the operation of modern concrete batching and mixing plant:

1. The operation should be carefully planned, so that the final product is of a high quality.
2. The operation should be run by a competent manager, who with his supporting staff, are all fully conversant with the plant, its operation and maintenance.
3. The aim should be continuity in operation, avoid break-down and intermittent working.
4. The adequate stock of ingredients must be ensured.

Principles in Operation of Concrete Batching and mixing Plant

Following are the operations in the Concrete Batching and Mixing Plant:

1. Handling and Storage of the ingredients
2. Batching
3. Mixing
4. Monitoring and controlling the quality parameters through automation

Handling and Storage of Ingredients

Proper storage practices are critical to protect material from intermingling, contamination. Or degradation, and to maintain consistent aggregate gradation throughout a project. Aggregates have a natural tendency to segregate whenever loaded, natural deposits consist of gravel and sand that can be transported, or otherwise disturbed. Aggregates should be used in concrete after minimal processing. The aggregates should always be handled and stored by a method that minimizes segregation. To produce concrete of high quality, aggregates should be clean. hard, strong. durable and round or cubical in shape. Fine aggregates that are transported over
wet, unimproved haul roads can become contaminated with clay lumps. The source of this contamination is usually accumulation of mud between tyres and mud flaps that is dislodged during dumping of the transporting unit. Clay lumps or clay balls can usually be removed from the fine aggregates by placing a scalping screen over the batch plant bin.

keep storage bins as full as possible to minimize breakage and changes in grading as material is withdrawn. Oversize aggregate should not enter the bin.

Oldest cement should be used first. In case, the cement remains in storage for more than 3 months, the cement should be retested before use and should be rejected if it fails to conform to any of the requirements. Portland cement is a moisture-sensitive material that must be protected from damp air or moisture. Cement not protected when in storage sets more slowly because hydration has already begun; therefore, it has less strength than Portland cement that is kept dry. Cement compartment shall be watertight and provided with necessary air ventilation.

Water is generally stored in tanks located close to the plant. An adequate water supply should be provided and when stored on the plant, such storage facilities shall be designed to minimize the risk of contamination.

Most chemical admixtures are delivered in liquid form and should be protected against freezing. If liquid admixtures are frozen. they should be properly blended before they are used in concrete. Long term storage of liquid admixtures should be avoided. Evaporation of the liquid could adversely affect the performance of admixture. Tanks or drums containing liquid admixtures should be clearly labelled for identification purposes and stored in such a way to avoid damage. contamination or effects of prolonged exposure to sunlight (if applicable).

Batching

Batching is the process of measuring concrete mix ingredients either by volume or by weight and introducing them into the mixer. Accurate proportioning or batching of these material as per approved mix design is essential to produce concrete with satisfactory properties. The first step to achieve proper proportioning is to have all the weighing and measuring equipment properly calibrated. With the increasing use of computerized batching equipment, it is now possible to have the computer do the subtraction and print the weights of individual material in cumulative batcher including recognition of the zero reading or tare.

Check points during batching

The following points should be given due care while batching the ingredients.

1. calibration of batching equipment
2. Isolation of Batching equipment from vibration
3. Protecting batching controls from dust
4. Frequently checking and cleaning the scales and beam pivot points
5. Measuring of all the ingredients within the loadcell's tolerance
6. Wind protection sufficient to prevent interference with weighing accuracy

Mixing

The mixing operation consists of rotation or stirring, the objective being to coat the surface of all aggregate particles with cement paste, and to blend all the ingredients of the concrete into a uniform mass, this uniformity must not be disturbed by the process of discharging from the mixer. When it comes to improvements in concrete properties, mixing technology is as important as concrete composition. Some concrete is said to be adequately mixed if the samples taken from different portions of a batch will have essentially the same unit weight, air content, slump. And coarse-aggregate content within the permissible errors. It is decisive. that water, cement and admixtures are evenly dispersed and distributed to a fine scale and that agglomerate (jumbled mass) is sufficiently dispersed. Insufficient dispersing or deagglomeration results in inferior concrete properties. Mixing cycle consists of charging of mixer, mixing of all the components and discharging of the concrete.

Charging the mixer consists of transferring all the weighed or measured material from weigh hoppers and silos into the central mixer. Aggregates are loaded on conveyer belts. There are no general rules on the order of feeding the ingredients into the mixer as this depend on the properties of the mixer and mix.
In case of free fall mixers, the height to which the concrete climb against gravity overcomes friction and causes it to fall back towards the bottom of the drum depends upon following two factors:

1. **Linear Velocity:** The greater the linear velocity, the higher the breakaway point of the concrete. However, if the linear velocity is very high, break-away is prevented and the concrete spins full circle in contact with the drum.
2. **Workability of concrete:** The coefficients of friction both internal and between the concrete and drum surface. increase with reduction in workability. The lower the workability, the higher is the breakaway point.

As the concrete breaks away and rolls onto itself, highly efficient local mixing occurs. The efficiency of mixing operation depends upon the shape and size of vanes (blades) fixed inside the drum.

It is important to know the minimum mixing time necessary to produce a concrete of uniform composition, and of reliable strength. Longer mixing time increases the homogeneity of the concrete discharged up to a point. Also, mixing for long periods of time at high speeds, can result in damages to the quality of concrete. tends to grind the aggregate into smaller pieces.

increases the temperature of the mix. lowers the slump, decreases air entrainment, and decreases the strength of the concrete. A secondary effect is that of grinding of the aggregate. particularly if soft; the grading thus becomes finer and the workability lower. Of course. Shorter mixing times that still obtain an acceptable homogeneity for a given mixture are desired.
optimum mixing time should be determined for each concrete mixture before starting a large production. Mixing time generally depends on the workability of concrete mix. type of mixer and its size or capacity, working speed etc.

The discharge from the mixer should be arranged so that it increases productivity (fast discharge), and it does not modify (slow discharge) the homogeneity of the concrete. For instance, if the discharge involves a sudden change in velocity—as in falling a long distance onto a rigid surface—there could be a separation of the constituents by size or, in other words. segregation.

Mixer efficiency is defined as the adequacy of a mixer in rendering a homogeneous product within a stated period; homogeneity is determined by testing for relative differences in physical properties or composition of samples extracted from different portions of a freshly mixed batch. In any mixer, it is essential that a sufficient interchange of material occurs between parts of the chamber, so that a uniform concrete is produced. The efficiency of the mixer can be measured by the variability of the samples from the mix.

Check points during mixing

1. A non-uniform slump or air content in the concrete throughout the discharge is a sign of poor mixing either due to worn lips or blade or due to excessive build-up of hardened concrete inside the drum.
2. For increasing the output, concrete mixers should neither be overloaded nor be speeded up than the designed capacities and speed. For an increased output, the use of a larger mixer or additional mixers are recommended.
3. Blade wear may adversely affect the mixer performance. Extended mixing time and longer discharge of low slump concrete is usually an indicator of excessive blade wear or blades with excessive hardened build up. Therefore, for better mixing action the badly worn blades should be replaced to have uniform mixing. as per recommendation of the manufacturer and hardened concrete should be removed preferably after each day of production of concrete.
4. Mixers and agitators should always be operated within the limits of the volume and speed of rotation designated by the equipment manufacturer.
5. The central mixer is equipped with an approved timing device that will not permit the batch to be discharged until the specified mixing time has elapsed.
6. Mixers are free of hardened concrete.
7. All blades are greater than 90 percent of design height

Operation of Concrete Batching and Mixing Plant

1. Check all screws for tight fit and retighten, if necessary
2. Check the mixing elements and the locking of adjusting elements
3. check oil level of mixer gearing
4. lubricate all lubrication points in accordance with the lubrication chart
5. Make sure that there is no foreign matter in the mixer when it is put into operation
6. Re-check the limit switches at the point of discharge for proper functioning
7. The machine should be put into operation not before all the safety equipments have been fitted and is properly functioning

CHECKING BATCHING AND MIXING EQUIPMENT

There are two items of equipment to be always observed closely. These are the scales used for weighing the batch materials and the water measuring equipment. Check to make sure that this equipment meets accuracy requirements before the work begins. The operator should check and calibrate the scales periodically prior to starting production. **We recommend checking the weighing equipment on daily basis.** Spot-check the scale calibrations at least once each month. The operator should check the scales for zero balance and the effectiveness of the interlocking controls for the cement and aggregates at least twice each day and for sensitivity at least once each day. The operator shall report defective controls in the plant diary.

The most accurate weighing systems include load cells. A load cell uses a strain gauge to measure the direct stress that is introduced into a metal element when it is subjected to a tensile or compressive force.

Load cells are attached to digital displays for easy reading and zeroing. They also feature programmable high/low set points. Signals for the load cells are sent electronically to the computer for accurate documentation.

When weighing or measuring equipment is moved from one setup to another, the Operator shall completely recalibrate it after erection at the new site. Erratic and inaccurate operation of the measuring equipment due to mal-adjustment or damage may result from impact and shock during the move.

Sluggishness of the working parts or a marked change in the level of material in the weighing hoppers may indicate inaccurate operation of the scales. Providing the batch composition and other conditions remain constant, the water setting at the mixer should also remain relatively constant. A decided change in the required mixer setting following an extended period of uniform operation indicates that something is wrong with the equipment and that an immediate check is required. In such cases, a thorough checking of the equipment is required in addition to re-calibration. Investigate the cause of the trouble and eliminate it.

Spot Check Procedure

The usual procedure in making a spot check is to assure that the equipment is generally in good operating condition. The knife-edges or other working parts of the equipment shall have no binding or cramping. The Operator must have enough test weights. Fully load the storage hoppers prior to the spot check.

The first step is to balance the scale at a load of zero with the weighing hopper clean and empty. On single beam scales, obtain the zero balance with the adjustable counterweight provided. After zero balance is satisfied, one or more of the test weights is applied by means of varying weights. For example, if the scale is to operate with a normal working load of about 250 kg, apply the test weights in 50 kg increments until the calibration is carried up to 350 kg, including the mass (weight) of the hanger. For larger scales, fill the bins to within approximately 100 kg of the expected operating point, then test weights in 50 kg increments are applied until a point approximately 100 kg over the operating point is reached. Each time a weight increment is applied, balance the scales, and record a reading opposite the known applied load.

While carrying the spot check over the expected operating range, check the sensitivity of the equipment by temporarily applying an additional load equivalent to 0.2% of the load at that time. The additional load should throw the equipment out of balance.

SEQUENCE OF OPERATION

The working of the batch plants can be categorized into 4 parts:

- Aggregate feeding,
- Powder feeding (fly ash, cement and expanding agent),
- Water.
- Admixture for mixing the materials, conveyance, and storage.

When the control panel is connected to an electricity source, the operation interface of the man-machine interaction will appear and system will begin to process initialization which includes the weighing, batching and mixing of each recipe into concrete. Weighing hopper is tested according to weighing system. Its control system will output the signal of the amount of material to prompt the operator to decide whether to start the control program or not.

The feeding gate is initiated to transmit the aggregate to the gathering conveyor then after it is sent to discharge the aggregate into chute above the mixer. The valve of the fly ash and cement tank should be opened, and the screw conveyor and motor initiated to transmit them into the weighing hopper. The control valve of the water sump and admixture sump needs to be opened to make water and admixture flow into the weighing hopper.

Once the weight of all material types meets the needs of specific amounts, the doors of each weighing hopper is closed automatically.

The materials will then go to the mixer for mixing operations.

This process is conducted very carefully since concrete must not segregate and because the concrete must be ready and transported and then used before its preliminary setting time which is between 30-45 minutes. It can last up 2 hours when transported through transit mixer.

Erection and Transport

A normal civil work foundation is required for making plant stationary and so that it could bear the affecting load and sustain the occurred vibration. Material like aggregate, sand, cement should be of sufficient quantity; lack of material can cause reducing efficiency of the plant. Special attention should be taken where the ground soil is soft. In case of soft soil, concrete should be used to make the soil hard otherwise ground will sink and it can cause misalignment. Water pipe and power cables must be used with proper safety / shielding to avoid any damage that may occur during operation. Make certain that no loose objects are placed on the mixer before starting double check make certain that no unauthorized people are close to mixer. Make certain that all fuses are intact and free of dirt. It is important that the fuses fit the plug-in use. Check the phases properly before start. If phases are charged, then system can move in opposite direction. Hence change the phase accordingly.

Erection site

Check to ensure accuracy and dependable operation of the proposed equipment and methods prior to the start of concreting operations and after making any changes in the location or arrangement of the batching plant. Plant calibration and proper erection of the plant is the responsibility of Site Engineer

Check the general layout of the plant before the equipment is erected to ensure efficient operation and adequate space for stockpiling and handling materials in compliance with specified requirements. Whenever possible, avoid the arrangement and erection of batching plants in congested locations which are not conducive to proper handling of materials. Small stockpiles result in segregation and non-uniformity of materials and very poor control of the concrete. Once a batching plant is erected in such a location, it is difficult to improve conditions. Experience has demonstrated that the most uniform concrete is produced when the batching plant is favoured by adequate space for the maintenance of large stockpiles of materials.

When draining aggregates at the batch plant site, provide provisions for disposal of drainage water and for clear cut separation of drained from un-drained materials. Keep materials of different sources/classes or gradations separated.

Erect the weighing bins and hoppers on firm foundations to avoid settlement, which might affect the accuracy of the equipment.

At concrete batching sites, check that there is enough material in stockpiles to complete the concrete pour or the rate of aggregate delivery is sufficient to keep up with the required rate of concrete delivery. When using a collecting hopper for handling more than one size aggregate, empty entirely of one size material before placing another size material within. Check to assure that the conveyor and reflector chute used with the collecting hopper are clear of any accumulated materials. The discharge chute for deflecting the material into the various storage compartments must centre over the correct compartment while it is charged with aggregate.

TRANSPORTATION OF MACHINE.

A registered vehicle must be used when plant is transported on the public road and the speed limit must not exceed 40km/hr.

- Mixer must be empty during transport.
- Load cells must be free from any load during transportation.
- Make sure that nothing sticks out before transporting the mixer; make certain that all loose objects are securely fastened.
- Always drive slowly uneven ground and pay attention when turning.
- Only use cranes/elevator and loading equipments having sufficient carrying capacity.
- Determine a competent person to guide the lifting operation.
- Lift machine and parts properly with lifting equipment accessories.
- Use slinging point for loading equipments
- Use suitable transport vehicle having sufficient loading capacity.
- Do not unload the complete machinery at once, please unload one by one.
- Use red signal / red flag, at rear side of trailer, while transporting during right.

Personnel requirements

Personnel moving the machine require no special training. Nevertheless, we recommend that this operation be handled by someone who regularly uses lifting equipment in full respect of the safety standards currently in force. If this requirement cannot be implemented, contact **AKONA's** Service Department.

Instructions for lifting and moving the machine

The machine can be hoisted using a bridge crane, a mobile crane, a forklift or any other suitable means with a capacity of at least twice the weight of the machine. Anyone operating the hoisting equipment must stay a suitable distance away from the part being lifted. He must also make sure that people and property are not exposed to any possible risk if the machine should fall. Movements must be slow and constant to avoid breaking the cables, chains, etc. The machine comes with specifically designed gripping points that are indicated with hooks or slots given in the structure/frame of the machine/plant.

Important:

Ensure that the load is correctly balanced. In case of accidental collision, immediately verify the extent of any damage and contact the manufacturer if necessary

10. GENERAL MAINTENANCE OF CONCRETE BATCHING AND MIXING PLANTS

The most efficient batch plants produce more concrete with less waste of material, lower repair costs, less downtime, and fewer disruptions in employee productivity. Initiatives such as more thorough quality control, understanding modern needs. and installing and operating concrete recycling systems will reduce waste. Proper maintenance systems are to be followed for keeping the plant in efficient condition. The different types of maintenance schedule in concrete batching and mixing plant are as under:

Running Maintenance

1. Regular monitoring of the operation of plant/mixer, Conveyor, Feed Gates, Discharge Gates. Material transfer points, Batchers
2. Spot the problems - Listen to the changes in sounds, smell something out of the ordinary, Touch Vibration, Monitor Temperature of Bearings/Reducers
3. Housekeeping - Material build up, Access to maintenance points,
4. Clean equipment makes repairs easier and quicker
5. Safer work environment.
6. Earthing of plants to protect load cells

Routine Maintenance

Daily, weekly, monthly, semi-annually, and annually maintenance are as follows:

Daily Maintenance

- Inspect oil filter on air compressor, drain tank, manifolds, and water traps.
- Inspect and fill all oil tanks on plant and DG
- Inspect conveyor belts for alignments and excessive wear
- Check the formation of air pockets
- Check Scales
- Requirement of lubricants
- General condition of the equipment
- Drain Pneumatic systems — drain compressor tanks, manifolds and filters.
- Check oil level in all pneumatic oilers on plant, fill as needed.
- Inspect all air cylinders, gates and valves.
- Inspect tension on all C, V-drive belts.
- Lubricate all screw conveyor reducer adaptors.
- Retract inlet chute, lock out, and wash out interior of drum at the end of the day or during extended down-time.
- Clean out inlet and discharge chutes thoroughly.
- Check pneumatic lubricator bowls and fill if necessary.
- Check for unusual noise/vibration
- Drain receiver condensation manually

Weekly Maintenance

- Maintain all hoppers and doors in clean and efficient working order
- Check mixer blades, paddles or arms for wear and tighten and adjust as necessary
- Check dust seals on cement hoppers for wear
- Clean load cells on weighing equipment
- Check air lines for leaks
- Check pipe works for leaks and wear
- Check wiring and electrical apparatus for correct operation and overheating
- Check area under plant for spillage and trace the source of spillage
- Clean-up yard, checking whether all drains and traps are clear
- Maintain settlement pits, recyclers and wash down areas in efficient working order
- Check all storage bins and doors for efficient operation
- Check conveyors, boom scrapers and bucket elevators for free running and wear, and adjust as necessary
- Lubricate all bearings. Included are head and tail pulleys on all conveyors, snubbed roller on loading conveyor, head and tail bearings on cement feeder screws, wheel bearing supports on turn head, etc.
- Lubricate all aggregate gate pivot points.
- Blow clean or replace all air filters on aeration blowers.
- Inspect and tighten all bolts and bearing set screws.
- Inspect and/or adjust all belt wipers.
- Lubricate packing at the ends of the cement feeder screws with oil.
- Inspect all decals. For location information, please see Local Decal Location.
- Remove build up from plant structure, charging hoods and hoppers.
- Check oil level in the gear reducers.
- Clean and inspect thrust rollers. (Sealed unit – no lube necessary)
- Clean and grease mixer drive pillow block bearings places.
- Remove any concrete build-up inside of the drum, inlet, and discharge chutes while being careful not to cut, puncture or otherwise damage the urethane liners. Repair or replace any damaged liners immediately.

Monthly Maintenance

- Check hydraulic filters and replace as per manufacturer's instructions or if the condition of the filter warrants a change
- Change oil in air compressor
- Check calibration of equipments for weighing of aggregate, cement, water and admixture
- Inspect oil level in all gear reducers.
- Adjust/or Replace skirt boards and conveyor seals as needed.
- Adjust and tighten conveyor belts as needed.
- If using Petroleum based lubrication, change oil
- Blow clean or replace air inlet filter
- Inspect and clean compressor intercooler tubes
- Check operation of compressor and receiver relief valves
- Inspection and check tension of C, V-belts
- Clean motor
- Check and tighten all screws/bolts
- Inspect for air leaks
- Check pump-up-time of compressor and record
- If using Petroleum based lubrication, inspect valves.
- Check operation of low oil level switch.

Semi-Annual/Annual Maintenance

- Inspect auger flights
- Inspect/clean the plant structure
- Change oil in all conveyor gear reducers.
- Tighten or replace all V, C-belts as needed.
- Inspect scale accuracy as well as water meter accuracy.
- Inspect hanger bearings in feeder screws and replace as needed.
- Change oil (**ISO VG 100** for compressor)
- Lubricate inlet unloaded piston O-rings with 200 F lubricant
- Lubricate motor bearings

Preventive maintenance

Preventive Maintenance involves scheduling and performing repair tasks on equipment before it becomes necessary. Preventive Maintenance is required to prevent frequent breakdown of the plant. To attain this objective, the periodicity of the change of spares/minor/major assemblies must be observed.

Plants where a formalized inspection and maintenance schedule is in place tend to have fewer breakdowns. Preventive Maintenance should be undertaken regularly to identify the condition of bearings. belts, leaky air systems. and filter bags and the defective item may be repaired/replaced before breakdowns interrupt plant operations.

Plant Safety

Employees working around conveyors, aggregates and electrical panels are exposed to potential injury, which translates from exposure for the plant operator—to downtime as well as legal liability. Safety features that should be in every plant include emergency Puli-cord shutoffs and safety disconnects on conveyor and turn head motors, and confined entry access manholes in aggregate and cement bin compartments.

PRECAUTIONS DURING OPERATION AND MAINTANCE

Do's General

- Be familiar with all controls, gauges. instruments.
- Look around before starting the plant and equipment.
- Operate the equipment only from operator's seat/platform.
- Keep operator's platform clean and free from oil and grease.
- The operator must have maximum unrestricted view of the operating area.
- Inspect all cables of plant periodically.
- Ensure mixer motor is turned off before carrying out mixer cleaning or chipping.
- Provide additional emergency lightening in case of power failure.
- Check earthling frequently.
- Create awareness regarding safety among staff.
- Provide proper training to staff on safety.
- Provide first-aid boxes with adequate supplies.
- Use proper tools and tackles.
- Ensure proper and clean platform/pathways for the workers to pass
- through.
- Provide adequate illumination.
- There should be an emergency switch located at a short distance from the plant, which will stop all plant operations in the event of an emergency.
- Lubricate the equipment daily.
- Do keep fast moving parts in store.
- Do ensure that all safety devices are working while the plant is in
- operation.
- Use antifreeze mixture in the radiator as per the prescribed instructions while working in frosty conditions.
- Maintain Generator, Monitor Voltage and Frequency.
- Keep panel power off while carrying out any welding work in the plant.
- Keep all panels under shelter, water should not enter the panels.
- Remove all material from the plant before shutdown.
- Load cell frame should be free during operation and locked when plant is not working.
- Check the oil level in all gear boxes.
- Proper setting of thrust wheel of drum.
- Greasing of all bearings.
- Ensure belt centre run position.
- Greasing of bearing and oil checking in all gear boxes.

- **Mobile Concrete Plant**: Operators must have thorough understanding of the technical manual before operating the plant.
- Follow all preventive maintenance procedures.
- Wash out the auger within 20 minutes of the last use.

- Keep the entire body clear from all moving parts.
- Check that electrical supply is within correct voltage (415 ± 5.1v) and there is no signal phasing.
- All the connections should be right and tight.
- All phases should be correct, check every day.
- Plant should be properly earthed. Check earthen connections and resistance value every month.
- Clean mixer every day after completing work if there is gap in concrete mixing then clean the mixer as soon as last batch is done.
- Check the weighing system accuracy every week.
- Ensure that sand is always kept in its designed sector only and there is a working vibrator at that gate.
- Maintain a logbook for machine; this should include information for hours run, any problem & details of repair or maintenance.

Don’ts General

- Do not allow any foreign matter in the cement bin.
- Do not allow the waterlines and flow meters to freeze with water in them.
- Do not run the water pump dry.
- Never attempt to repair the machine while in operation (always turn the power source off).
- Never attempt to walk on top of the aggregate bin to cross from the cement bin to the water tank (use the ladder).
- Never climb inside the aggregate bin (use a small pole to dislodge any aggregate that has bridged).
- Never enter the cement bin while in operation (there are moving parts inside the bin).
- If any motor /gear box is not working properly do not just replace the same without analysing the reason & removing the basic fault. Do not repair the mixer when power is on.
- Do not allow unauthorized & untrained person to operate any part of the machine.
- Do not allow any rod or big stone or bolt into the mixer as it will damage the blades. Also avoid inappropriate feeding of aggregate, it can also cause damage.
- Do not allow screw conveyor to rotate in reverse direction in normal plant operation.
- Make sure that all the connection of mixer and all the machinery must be disconnected while repairing or during maintenance.
- The Mixer motor cannot start with full vessel. Do not stop the mixer until the vessel is totally emptied.

QUALITY CONTROL IN CONCRETE BATCHING & MIXING PLANT

The performance of concrete is determined by its microstructure. Its microstructure is determined by,

1. Composition.
2. Homogeneity of the material
3. Curing conditions.
4. Mixing method and
5. Efficiency of the mixer

Other factors that affect the quality of Concrete:

1. Quality of raw materials:

- Raw material should be consistent with
- Specific gravity.
- Fitness.
- Grain size.
- Strength etc.

i. Quality of raw material includes:

- Characteristics of material,
- Friction between mixer and mix.
- Angle of internal friction.
- Effective grain diameter,
- Particle size distribution.
- Particle form.
- Particle strength,
- Mix proportions e.g., Water/Cement ratio, shear strength

2. Operational Factors:

- Over Batching can be an extra expense over time, but even one excessive under batch can result in major cost through rejection of the concrete.
- Proper proportion of water in the mix. Proper water to cement ratio of the mix.
- Adequate mixing prevention of segregation and/or bleeding. Inadequate mixing will lead to poor finish and variation of texture.
- Effective moisture measurement will ensure consistent weighing of material, irrespective of the variation of moisture in the aggregates and the production of concrete with the final moisture content.
- Mixing cycle time, velocity of mixing tool, efforts, filling height applied by the mixer, batch size. etc.

3. Mix Design:

Quality of the concrete is dependent on the mix design. The design of the mix ensures the proportion of various ingredients, mixing time, temperature, moisture content, curing time, gradation of the aggregate etc. and thus quality and the strength depends on it.

11. Detailed Maintenance and Repair

MIXER DRUM

Cleanout

We recommend cleaning of Reversible drum mixers by rinsing with water or running a mix of water and rock to clean light build up. Done at the end of the day, this usually takes about 10 minutes. In mixers with metal liners, remove excessive build up with chipping hammers or needle scalars.

Maintenance

Plant operators should perform regular inspections of drum liners and mixing blades. Inspection may be done on daily basis or after a fixed amount of concrete. (checked once a month).

Check for worn or cracked liners on daily basis. Check for wear and tear on guiding, mixing and discharge blades on weekly basics. Operator should also inspect the bottom end of the blade weld to make sure the collar hasn't eroded. Operator should ensure appropriate greasing for mixer ring and pinion together. Regularly greasing the gears and pulleys of your mixer will prevent damage caused by friction. This will extend the lifespan of the mixer and also keep it performing at an optimum level.

The best way to keep the motor clean is by using an air compressor to blow out any cement or dust particles. By keeping your motor clean, you can ensure that it performs optimally, while also preventing the need for expensive repairs. Loose particles can wreck destruction on the motor, causing damage that is costly to repair.

COMPRESSOR

We, are using two stage reciprocating air compressors for pneumatic operations, of the **AH-15** concrete batching and mixing plant

There are some items that should be inspected on regular basis for the better performance of the compressor. Inspect check within operation hours or time span, which is earlier.

Inspection Chart & Maintenance Time

Contents	**Inspect**				
	Daily	**50hr.**	**200hr.**	**1200hr.**	**2400hr.**
		Weekly	Monthly	6 Months	Years
Check oil level	○				
Drain air receiver	○				
Check operating pressure of pressure switch		○			
Check safety valve Operation		○			
Abnormal vibration or Sound	○				
Looseness of bolts, nuts or Screws			○		
Belt tension and damage			○		
Air intake filter			○		Replace
Replace lubricating oil			○	○	

Maintenance time

Contents		50hr.	200hr.	1200hr.	2400hr.	Remarks
		weekly	Monthly	6Months	Yearly	
Overall	Carbon on delivery pipe, intercooler and joints check Valve				○	Remove carbon or replace with new parts (Do not damage seated section during dismantling)
	Carbon on valve set and cylinder head				○	
	Check valve			○		Check each part and replace it if there is any wear and damage on it. Apply heat resistant grease on O-ring.
	Piston ring				Replace	When oil consumption increase abnormally, replace complete piston ring set
	Piston and cylinder				○	If sliding of piston and cylinders are damaged or worn. Replace.
	Rotating & sliding section				○	Check bearing and pin of crankshaft for wear or abnormality. If abnormal, replace with new parts.
	Electrical parts				○	If contact point is worn or lamp burns out, replace.
	Pipe & fitting, rubber hose, resin tube				○	It hardened or cracked, replace.
Air receiver	Air receiver				○	Check shell and end plates for corrosion, leak or bulge, remove inspection blanking lid and clean.
	Pressure gauge				○	Check that pointer of pressure gauge points to 0 when pressure is 0.

Trouble Shooting

Trouble	Problem cause	Remedies
Compressor does not start.	Fuse or wiring is cut.	Replace.
	Thermal protector of starter activates.	Eliminate the cause to activate protector and reset protector. (Push green button)
	Defective starter.	Replace.
	Defective motor.	Repair.
	Voltage is low.	Contact electric company.
	Single-phase operation.	Check wiring.
	Defective pressure switch.	Repair.
Pressure does not rise or it takes time for pressure to Increase	Stop valve or drain valve is not tightened.	Tighten.
	Leak from tightened section and piping.	Repair leaking section.
	Leak from safety valve.	Repair or replace
	Defective valve.	Clean or replace.
	Wear on piston ring.	Replace.
	Defective pressure gauge.	Replace.
	Air intake filter is clogged.	Clean or replace filter.
	Leak from relief valve.	Repair or replace.
Abnormal vibration or sound.	Defective installation.	Check and install correctly.
	Wear in basic compressor.	Repair.
	Parts are loose.	Tighten screws.
Condensate does not come out from drain valve	Drainpipe is clogged.	Clean.
Air leakage from drain valve.	Defective drain valve.	Clean or replace.
Air leakage from relief valve continuously after stoppage.	Defective check valve.	Repair or replace.

PNEUMATIC CONTROL PANEL

The systematic maintenance of a pneumatic control panel is necessary to ensure its long service life and reliability of its devices and components. Lack of regular maintenance may result in loss of air and associated pressure drops, premature wear of moving parts, production shortfalls and increased downtime of pneumatic components.

Aggregate batcher discharge gates are operated by a **Pneumatic Cylinder**. The cylinder receives air from a double acting solenoid valve that operates from an electrical signal from the batch control.

General Maintenance Procedure

A good maintenance procedure can be summed up in these words: **'keep it tight, keep it clean,** keep it lubricated and inspect it frequently and thoroughly' to perform maintenance and not repair. More specifically the general procedure to maintain a pneumatic system comprises various activities like.

- Removal of dust, moisture.
- Checking of possible loose bolts and nuts in the system components.
- Preventing air leakage.
- Reducing frictional losses.
- Ensuring safety of personnel.

The first procedure in any organized maintenance program should be the inspection of equipment and systems to prevent a future occurrence of any serious trouble. An important cause of failure of pneumatic systems is the presence of dust, moisture or any other foreign particle in the compressed air which must be removed to ensure the proper functioning of the system. Another frequent cause of failure is loose bolts and connections in the system. Each connection should be periodically checked for tightness and the inspection should include checking of possible loose bolts and nuts on each components/sub-assembly of the system. Leakage is another important concern of all compressed air systems, especially the older once. Leaks are caused by damaged/ corroded pipe-works, faulty seals, faulty pipe joints, poor quality of fittings and tubes, incorrect installation of airline couplers, dynamic wear, cuts in tubing and open drain taps.

Air leakage is a major reason for pressure drops. Leakage can occur but may remain undetected. The efficient operation of compressed air system demands the detection and stoppage of the compressed air leakage. The following measures can be taken to prevent air leakage:

- Maintain good quality of air in the system, contaminants in the air system will cause increased leakage and equipment malfunction.
- Take special care during assembly of all fittings and tubing. Use special tube cutters and leakage-resistant equipment.
- Stop air consumption during non-operational times.
- Estimate the correct air pressure for the system, over-pressurization will result in more compressed air leakage and higher energy costs

System Malfunctions

1. **Malfunctions Due to Contaminants**

Pneumatic systems require the compressed air free of moisture and impurities, such as dust particles, pipe scales, etc., for reliable operation. Various conditioning devices-such as filters, dryers, lubricators etc are installed for the removal of unwanted and harmful contaminants. Lack of maintenance or servicing of these devices may result in the failure of the system operation.
Rust and scale particles are introduced within the system piping by moisture resulting from condensation. These free moving particles combined with oil and water sledge can scratch seals, abrade surfaces of precision parts of valves and cylinders, thus causing leaks. These particles can also block orifices, thus jamming valve spools. Further air passages may become restricted resulting in reduced airflow and increase pressure drop. Moisture can also wash away the lubricants from pneumatic valves, resulting in faulty operation, corrosive damage to surfaces and excessive wear. Moisture that is collected in pneumatic cylinders could cause cushions to become ineffective.

2. **Malfunctions Due to Improper Mounting**

A cylinder, mounted haphazardly, will cause an undue strain on the mounting plate, thus increasing the stress level on the mounting bolts. A piston rod, if not properly supported or aligned with the centre line of a cylinder, will exert severe strain on seals and glands and will reduce their working life connections and supports that are subjected to vibration should be examined for tightness and strain.

3. Malfunctions Due to Inadequate Air Supply

Many a time, pneumatic systems/machines are added without enlarging the capacity of existing compressed air supply. Owing to this, malfunctions may occur sporadically, and the fault-finding may become extremely difficult. For example, sudden pressure drops, caused by the actuation of additional nearby components, result in variations in piston force and piston speed for short durations

4. Malfunctions Due to Under-Lubrication/Over-Lubrication

Lubrication of the compressed air may be necessary to provide seal lubrication. It prevents sticking of moving parts and help in controlling wear. Absence of lubrication or under- lubrication will cause the valves and cylinders to jam and the deterioration of their components due to increased wear, thus tending to make the whole system unsafe. Over-lubrication may produce sluggish operation of valves, cylinders and pneumatic tools.

Maintenance Tips

The following maintenance tips constitute general guidelines for maintaining the components of pneumatics systems. The exact maintenance procedure should be determined only after consultation with experts and taking into account the site conditions.

1. Maintenance of Compressors

Compressors should be located in clean accessible areas for inspection and maintenance. Avoid locations where the air may have high humidity and where winds whip up dust, grit and litter. It should also be possible to dissipate heat quickly from the compressor area. Compressors have their own maintenance requirements. Their maintenance must be carried out in accordance with the manufacturer’s instructions. However, the following general maintenance aspects relating to compressors may be kept in mind. The essential routine maintenance activities are cleaning, visual inspection, running checks and servicing of filters, lubricators and cooling facilities.

2. Maintenance of Air Receiver

Condensate drain from air receiver should be automatic wherever possible, but they still need to be inspected regularly to make sure that the complete unit is working properly. Safety devices on air receivers, like pressure relief valve, must be maintained in satisfactory functional order.

3. Maintenance of Air-Mains

Proper maintenance of air mains is very important. Regular inspection of air mains for leaks should be taken up, preferably after the close of the work when there is no interfering background noise. Build up the pressure to the operating level after closing all consumer lines. Determine the pressure drop at the air-receiver over a period of time. This gives an indication of the air leakage in the system, locate and repair leaks in the air-mains

Maintenance of Air Service Unit (FRL)

The air service unit consists of **filter, regulator, and lubricator**. If filters and lubricators are not taken care of and not cleaned when dirty, the money spent on their installation goes waste. A properly maintained filter system can eliminate about 75% of the potential cause of power system failure. In addition, the life of the system components is increased considerably. The following regular maintenance of FRL is of utmost importance.

3.1 Filter

The condensate level must be checked regularly. The condensate must not exceed the maximum level marked; otherwise, the condensate could be drawn into the system again. The drain screw must be opened to drain the accumulated condensate. Another maintenance activity is the cleaning of the filter cartridge is it is clogged.

3.2 Regulator

Usually, this unit requires no regular maintenance, especially during the initial years of its service life.

3.3 Lubricator

The lubricating oil is used up in the process of lubricating the compressed air. Check the oil level and top-up, if necessary,

3.3.4 Polycarbonate bowls

Polycarbonate bowls, used for filters and lubricators must be treated with some care. The following measures need to be taken on polycarbonate bowls.

1. Maintenance of Pneumatic Cylinders

There are number of precautions that must be taken when installing and servicing pneumatic cylinders that will greatly increase their performance and operating efficiency. As a rule, it is not necessary to open the cylinder always for inspecting its internal condition.

2. Causes of Cylinder Failure

An important reason for cylinder failure is the presence of dirt which might lodge in between the piston and the barrel and may score the barrel and seals. It may make the piston seal defective by occurrence of excessive leakage through the resulting gap between the piston and the barrel. Among other causes of the failure of pneumatic cylinder are worn-out or damaged seals, scratches, score marks, pitting etc on the cylinder barrel, piston rod and/or piston rod bearing. Incorrect installation of cylinders can result in irregular stresses being exerted on them. It can damage cylinder or distort them. To keep the wear to the minimum, air service equipment should be fitted immediately upstream of cylinders, as close to them as possible. This will ensure that no grit particles, moisture, that are injurious to cylinder can reach it. When used with good quality air and not subjected to any abnormal operating stresses, cylinder will have a normal working life in excess of five million cycles. The following regular maintenance activities may be carried on pneumatic cylinders.

- Check the cylinder bearings and mountings at regular intervals.
- Improper mounting of the cylinder is the most common cause of damage to wiper ring, cup packing and bushing. Replace these parts if damaged.
- Piston rod should be examined for score marks
- Check the support of the piston rod.
- Check the rod bearings in the cylinder for wear and replace if necessary
- Use proper lubricants in sufficient quantity.
- Use clean piping to connect cylinder to the final control element (valve).

3. Maintenance of Pneumatic Valves

Pneumatic valves, in general, will have a working life of 10 million cycles if operated under normal working conditions. If a valve requires servicing before 5 million cycles, then check most
Carefully the installation, environment conditions and operating conditions as these might be the cause of its shortened working life. The main cause of valve failure is the leaking of 'O' rings which results from the entry of abrasive particles into the valve and consequent wearing of the Seal. For this reason, it is essential to have filtered and lubricated air supply to ensure that no dirt particles get into the valve. Use noncorrosive piping, such as polyurethane piping.

Other probable causes of valves failure are blocked bleed holes and jammed springs. To detect this failure, connect the valve to the air supply and operate it. The return movement of the valve must be snappy, and any sluggishness is indicative of the blocked bleed holes or jammed springs. This can be set right simply by cleaning the bleed holes, taking care that the very small holes are not enlarged at all. Valves can also be damaged, in particular their operating mechanism, by incorrect installation and operation. Excess force on the operating mechanism, for example, could cause this mechanism to become disturbed. The coil in a solenoid valve, if damaged, it must be replaced with new one.

Faults in Pneumatic System

- Misalignment or mechanical jam
- Power supply failure
- Insufficient or low voltage
- Twisted tubing
- Burned solenoid coils
- Bend piston rod/barrel
- Flow restrictions
- Lack of lubrication
- Insufficient compressed air delivery

General Safety Measures

Adequate safety measures must be taken to avoid the risk of personal injury and equipment damage from your application or system. Minor problems can become major issues when they are not addressed. Following are some general safety measures that must be taken in pneumatic systems to avoid accidents.

- Keep your workplace clean before and after work.
- Use personal protective devices for all hazardous jobs.
- Follow the standard procedure while operating a machine.
- Know your job thoroughly
- Inspect regularly for damaged tubing, fittings and leaks
- Repair or replace components that show signs of wear or damage.
- Clean the spillage of grease, oil etc. immediately
- Never direct compressed air towards yourself or anyone else.

BEARINGS

The way a bearing is maintained and handled has a huge impact on its performance. Proper maintenance and handling lead to longer bearing life, minimized downtime, and greater productivity, which ultimately leads to cost savings and lower cost of ownership for your business.

Checklist & Maintenance

Here is a simple 8-point checklist for ensuring your bearing is always handled in the correct way and thus, optimizing performance.

Handle Bearings with Care

Bearings are precision components. As such, they should be handled and stored in a proper manner to avoid the entry of contaminants. Bearings should be stored horizontally in a clean and dry environment with their packaging intact. Care should be taken to avoid exposing bearings to airborne contaminants, as just a tiny speck of dirt in a raceway can cause premature bearing failure. Do not hammer, pound or apply direct force on a bearing or its outer ring. This can cause the rolling elements to be damaged and misaligned. Bearings should also not be installed if they have been dropped or mishandled, as little cracks and scratches can result in poor performance, and subsequently, premature bearing failure.

1. **Inspect the Bearing Housing and Shaft**

Before mounting a bearing, inspect the housing and shaft for physical condition or damage. Use a soft cloth to wipe the surfaces clean, and ensure any nicks and burrs are removed.

2. **Apply the Correct Mounting Method**

When mounting bearings, the correct method to use depends on the type of bearing and type of fit. Bearings with cylindrical bores are normally mounted through press fit method (mounting by pressing the bearing on the shafts) or shrink fit (heating the bearing to expand its diameter). Bearings with tapered bores can be mounted directly on tapered or cylindrical shafts with the help of tapered sleeves. Take note that pressure should only be applied with a press fit. Applying pressure without a press fit to the ring will damage the raceways.

3. Prevent Direct Heating or Overheating

The maximum permitted temperature of bearings depends on the heat treatment of the material. Temperatures above the heat limit can permanently deform or soften the bearing steel, thus reducing load carrying capacity and leading to eventual failure. Never heat a bearing using an open flame. Bearings should ideally be heated with induction heaters.

4. Use Proper Tools

Always use the appropriate equipment whenever handling bearings or during the mounting and dismounting process. Some of the specialized tools available for mounting and dismounting are bearing pullers, bearing fitting tool kits, oil injector kits, hydraulic nuts or induction heaters. These tools are customized to ensure a smooth mounting and dismounting process and minimize risk of bearing damage. Avoid using general purpose tools for handling bearings. These are not specialized for bearings and may cause unwanted damage and incur unnecessary repair costs.

5. Prevent Corrosion

If bearings are exposed to the presence of water over time, rust and corrosion may occur. This will cause premature bearing fatigue and over time, affect your machine performance and productivity, increasing operating costs. When handling bearings, make sure you wear gloves, as perspiration on your hands, water, or other contaminants can cause corrosion. You may also use a water-resistant grease as your lubricant, which will then act as a protective barrier in damp environments. For extremely corrosive environments, you might want to consider using bearings with different materials, such as ceramic bearings.

6. Proper Lubrication is Essential

Proper lubrication is extremely important if you want your bearings to have a prolonged life. Lubricants can be either oil or grease, and the right lubricant depends on a series of factors such as environmental conditions, temperature, speed and load. Follow your bearing manufacturer's recommendations for the most suitable grade and type of lubricant. Failure to use the right lubricant can result in machine failure or voiding of warranty. Do check lubrication levels frequently and be sure to change lubricants at least yearly.

7. Observe And Check for Danger Signs

The final step is to make sure you observe and be alert to any signs of abnormal or poor bearing performance. Examples include excessive noise, increased temperature or abnormal vibration. If your bearings display any of these signs, they should be monitored more closely, and if needed, removed before any further damage occurs to your equipment or machinery. Vibration analysis can help you to track and detect any bearing danger signs early. Vibration analysis is part of condition monitoring, which can include technologies such as thermographs, vibration analysis and oil analysis, tools which can help compare current bearing states with historical data and thus provide an accurate assessment of the remaining life of the bearing. Tools like vibration pens can also provide a quick, compact and easy option to check the Condition of your rotating equipment. This can provide you with an early warning about potential machine problems before a costly breakdown or failure.

VIBRATOR

Vibrator Mounting

With any vibrator installation, proper mounting is the key. A rigid mount ensures that vibration is transferred efficiently and prevents undue stress on the structure. A weak mount can result in damage to the structure and can allow the vibrator to detach from the structure if left unchecked.

These costly issues can be avoided by performing periodic mounting inspections, and using proper mounting procedures which are as follows

- Inspect and tighten mounting bolts.
- Inspect all welds – repair cracks and broken welds immediately. Remember that with Vibrators, it's best to use stitch welds rather than continuous welds.
- Use safety cables whenever possible to prevent a cracked weld from turning into a serious Safety issue should the vibrator become detached.

Maintenance Precautions

Electric Vibrators can be extremely low maintenance when properly installed. A few periodic checks can keep them in tip-top shape.

- It is extremely important with electric vibrators to make sure that your mount is in good condition. An insufficient mount can cause electric vibrators to draw too many amps, and if proper overload protection is not in place, the vibrator can burn up.
- Inspect all electrical connections and replace any damaged connectors.
- Inspect all wiring, and repair or replace any exposed wires.
- Listen to the vibrator while running. If you hear anything out of the ordinary, such as loud knocking, or grinding, turn the vibrator off, following all lock out/tag out procedures, and perform a visual inspection of the vibrator and mount.

LOAD CELL

Load cells are used to weight the consumable material like sand, cement, fly ash, water, Ad-mix, concrete. There are two types of load cells, provided for weighing: - **Single point platform load cell & S – Beam load cell.**

Important points to remember

- Never earthen the load cell.
- Never use welding operation while load cell wires are connected.
- The connection to the load cells should be tight and right.
- Check the load cells on regular basis that there is any crack in the particular
- The weighing system should be free from any platform it should not be rested anywhere for accurate weighing.
- Load cell wire should not be grounded.

Individual load cells are provided for the weighing of **Aggregate, sand, cement, fly ash, water, admix**.

Maintenance

Routine maintenance of the **S-type load cell & single point platform load** cell should include cleaning the electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction. Make sure liquids are not allowed to migrate into devices that are not hermetically sealed. Such devices should only be wiped with a damp cloth, and never be submerged or have liquids poured on them. Never use a pressure washer on the load cells.

Trouble shooting

Proper performance of a load cell requires careful attention to both electrical and mechanical aspects of the measurement system. A basic understanding of the electrical and mechanical installation requirements is recommended.

1. Mechanical Trouble Shooting

A mechanical checklist includes:

- Check for proper installation of fixturing.
- Check integrity of the fixturing.

2. Electrical Trouble Shooting

An electrical checklist should start with:

- Check cables for proper wiring and make sure connections are secure and proper.
- Inspect for loose or dirty electrical connections.
- Check for improper shield grounds.
- Check for proper grounding of the structure that the load cell is mounted on.
- Check the signal conditioning electronics for proper setup.
- Check the insulation resistance of shielded conductors for short circuits.
- Check isolation resistance, load cell flexure to conductors.
- Check load cell bridge resistances.
- Check bridge balance.

CEMENT SCREW CONVEYOR

Start up and Installation.

Remove the protective packing from the drive unit. If the screw is in several sections, remove Flight restriction bracket and lay the screw conveyor in the correct sequence. Make sure that Screw flight is free to rotate and check that there are no loose bodies present within the casting.

1. Important

Never start the screw if cover has been removed from inspection door. If the ratio motor unit protective housing has been removed. Check that all the bearing has been greased and check the oil level. If the direction of rotation is wrong, reconnect inverting the polarity of the motor. Never put your hands into a running screw feeder and never open the inspection hatches before having disconnected the feeder from main supply.

2. Attention

At the bottom of the drive head with incorporated END bearing assembly, the outflow of viscous and sticky substance may be noticed this is no lubricant leakage from a faulty reducer or bearing assembly, but the surplus of a special liquid used for the impregnation of the shaft sealing rings of the stuffing box.

Oil change

The unit is supplied with first oil filling and is equipped with oil level, outlet and breather plug. First oil replacement must be done after 500 operating hours, then every 2500hrs. The temperature should be maintained between 0° to 35°C.

Lubrication

Outlet end bearing Supplied with a long-life grease filling bearing does not require and further lubrication.

- Inlet end bearing – Greasing approx., after every 200 working hours.
- Substitute lubricant approx. after every 7500hrs.
- Hanger bearing it should be greased after every 10 working hrs. approx.

Cleaning
At the end of each of each working day run the screw conveyor until empty. This operation will prolong the life of screw, especially in the presence of material that tends to flood feed.

Maintenance
- Check top ventilation hood after every four weeks and keep clean.
- Check pressure relief valve by hand.
- Filter should be cleaned.
- Check seals between hopper and screw conveyor.
- Once in a year remove bearing flange, after loosening the tie bars.

Trouble shooting

Minor problems can be solved without consulting to a specialist

Problem	**Possible reason**	**solution**
Motor does not start	No correct wiring. Motor failure or failure in Wiring supply.	Check fuse.
Motor starts but then stops.	Incorrect rotation. Screw obstruction. Output rate too high. Motor burnt out. Defective bearing	Reverse poles Change hanger bearing. Check ammeter reading and output rate.
Motor starts but screw does not convey.	Incorrect rotation Bad outflow of material from silo due to material from silo due to faulty fluidization. Gear pinion or drive shaft sheared.	Improve outflow of material Reverse poles.
Motor does start but no product is being discharged.	Product does not enter the screw because it is not suitably aerated. Screw is rotating in the wrong direction.	Improve aeration in silo. Invert polarity on the motor.

GEAR BOX

Maintenance and replacement work must be done by expert maintenance technicians trained in the observance of applicable laws on health and safety at work and the special ambient problems attendant on the installation.
Before doing any work on the unit, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning (due to suspended loads or similar external factors).
Furthermore, all additional environmental safety precautions must be taken (e.g., elimination of residual gas or dust, etc.).

- Before doing any maintenance work, activate all safety equipment and, if necessary, inform persons working in the vicinity. In particular, mark off the area around the unit and prevent access to any equipment which, if activated, might be the cause of unexpected health and safety hazards.
- Replace worn components with original spare parts only.
- Use the lubricants (oil and grease) recommended by the Manufacturer.
- When working on the gear unit always replaces gaskets and seals with new original ones.
- If a bearing requires replacement, it is good practice to also replace the other bearing supporting the same shaft.
    - We recommend replacing the lubricating oil after all maintenance work.

The above instructions are aimed at ensuring efficient and safe operation of the gear unit.
The Manufacturer declines all liability for injury and damage to components due to the use of non-original spare parts and non-routine work which modifies the safety requirements without the express prior authorization of the Manufacturer.

Routine Maintenance

Frequency	Component	Type of work	Operation
1000 h	External seals and gaskets	Check oil level Check for leaks by eye	Maintain or replace components as required
3000 h	For gear units with torque arm: polymer bushings	Check for cracks/ageing	Replace if no longer fully effective
5000 h	Gear unit seals and gaskets	Inspect Carefully of Wear And Aging of external seals.	Replace if aged/worn

Trouble shooting

PROBLEM	CAUSE	SOLUTION
Bearing temperature too high	Oil level too low	Top up oil level
	Oil too old	Replace oil
	Defective bearings	Contact authorised workshop
Operating temperature too high	Oil level too high	Check oil level
	Oil too old	Replace oil
	Impurities in oil	Replace oil
Abnormal running noise	Gears damaged	Contact authorised workshop
	Bearing axial backlash too high	Contact authorised workshop
	Bearings defective or worn	Contact authorised workshop
	Service load too high	Correct service load to nominal values given in Sales Catalogue
	Impurities in oil	Replace oil
Abnormal noise at gear unit Mounting	Mounting bolts loose	Tighten down to specified torque
	Mounting bolts worn	Replace bolts
Oil leaks	Oil level too high	Check oil level
	Casing/coupling seals inadequate	Contact authorized workshop
	Gaskets worn	Contact authorized workshop
Gear unit does not run or runs with difficulty	Oil viscosity too high	Replace oil (see table of recommended lubricants)
	Oil level too high	Check oil level
	Service load too high	Redesign drive for actual service load
Output shaft does not turn with motor running	Gears damaged	Contact authorized workshop

BUTTERFLY VALVE

Basic operations

- By-pass valves keep it open while every opening / closing cycle of the Butterfly Valve.
- Once the Butterfly Valve is closed, the By-pass valve may be kept closed till next operation of the butterfly valve.
- In case the manually operated Butterfly Valve demands excessive force to operate, ensure that there is no mechanical obstruction in pipeline or in the operating mechanism.
- Do not use means like levers on hand wheel to exert addition force. These hand wheels are designed to be weak links to protect other expensive parts in operators.

Maintenance checklist

Sr.	Parameter to Check	Method of Checking	Weekly	During Overhaul
01	Leakage through DE / DNE ends, side flange gaskets	Visual	•	
02	Noise / Vibrations while Opening or closing the Valve	Feel	•	
03	Condition of resilient Disc Seal for cuts, deformation & Resilience	Visual & feeler gauge		•
04	Condition of Shaft Seals - for cuts, deformation & resilience	Visual		•
05	Condition of Shaft Bearings	Visual		•

Trouble Shooting

PROBLEM	CAUSES	REMEDIES
Leakage between valve and actuator	• Packing leak	• Clean packing bore and replace packing
Bottom turn-on leaks	• Packing or gasket leak	• Replace bottom shaft ring
Valve leaks when closed	• Disc not fully closed or past fully closed • Disc edge wear or damage • Rubber seat wear/damage	• Adjust actuator closed position stop • Clean and/or repair disc Edge • Adjust or replace valve seat
Chain wheel jams	• Poorly fitting chain	• Replace with correct Chain
Valve hard to operate	• Foreign material in valve • Corroded actuator parts • Loose actuator	• Remove obstructions • Clean and grease Actuator • Apply locative or Omni-fit locking compound and tighten bolts
Automatic valve does not Actuate	• No power source • Improper signal • Burned out or impaired component	• Check incoming power source and replace fuses or rest pressure • Check actuating signal Sequence • Check and repair or replace solenoids, motors and relay devices

CONTROL PANEL

Basic Start-Up and Checking Procedures.

Prior to applying power to the system, the Operator should make several final inspections of the hardware components and interconnections. These inspections will undoubtedly require extra time. However, this invested time will almost always reduce total start-up time, especially for large systems with many input/output devices. The following checklist pertains to prestart-up procedures:

- Visually inspect the system to ensure that all PLC hardware components are present. Verify correct model numbers for each component
- Inspect all CPU components and I/O modules to ensure that they are installed in the correct slot locations and placed securely in position.
- Check that the incoming power is correctly wired to the power supply (and transformer) and that the system power is properly routed and connected to each I/O rack.
- Verify that the I/O communication cables linking the processor to the individual I/O racks correspond to the I/O rack address assignment.
- Verify that all I/O wiring connections at the controller end are in place and securely terminated. Use the I/O address assignment document to verify that each wire is terminated at the correct point.
- Check that the output wiring connections are in place and properly terminated at the field device end.
- Ensure that the system memory has been cleared of previously stored control programs. If the control program is stored in EPROM, remove the chips temporarily.

1. Static Input Wiring Check

A **static input wiring check** should be performed with power applied to the controller and input devices. This check will verify that each input device is connected to the correct input terminal and that the input modules or points are functioning properly. Since this test is performed before other system tests, it will also verify that the processor and the programming device are in good working condition. Proper input wiring can be verified using the following procedures:

- Place the controller in a mode that will inhibit the PLC from any automatic operation. This mode will vary depending on the PLC model, but it is typically stop, disable, program, etc.
- Apply power to the system power supply and input devices. Verify that all system diagnostic indicators show proper operation. Typical indicators are AC OK, DC OK, processor OK, memory OK, and I/O communication OK.

- Verify that the emergency stop circuit will de-energize power to the I/O devices.
- Manually activate each input device. Monitor the corresponding LED status indicator on the input module or monitor the same address on the programming device, if used. If properly wired, the indicator will turn ON. If an indicator other than the expected one turns ON when the input device is activated, the input device may be wired to the wrong input terminal. If no indicator turns ON, then a fault may exist in either the input device, field wiring, or input module.
- Take precautions to avoid injury or damage when activating input devices that are connected in series with loads that are external to the PLC.

2. Static Output Wiring Check

A **static output wiring check** should be performed with power applied to the controller and the output devices. A safe practice is to first locally disconnect all output devices that involve mechanical motion. When performed, the static output wiring check will verify that each output device is connected to the correct terminal address and that the device and output module are functioning properly. The following procedures should be used to verify output wiring:

- Locally disconnect all output devices that will cause mechanical motion.
- Apply power to the controller and to the input/output devices. If an emergency stop can remove power to the outputs, verify that the circuit does remove power when activated.
- Perform the static check of the outputs one at a time. If the output is a motor or another device that has been locally disconnected, reapply power to that device only prior to checking. The output operation check can be performed using one of the following methods:
- Assuming that the controller has a forcing function, test each output, with the use of the programming device, by forcing the output ON and setting the corresponding terminal address (point) to initial. If properly wired, the corresponding LED indicator will turn ON and the device will energize. If an indicator other than the expected one turns ON when the terminal address is forced, then the output device may be wired to the wrong output terminal (Inadvertent machine operation does not occur because rotating and other motion-producing outputs are disconnected). If no indicator turns ON, then a fault may exist in either the output device, field wiring, or output module.

- Program a dummy rung, which can be used repeatedly for testing each output, by programming a single rung with a single normally open contact (e.g., a conveniently located push button) controlling the output. Place the CPU in either the RUN, single scan, or a similar mode, depending on the controller. With the controller in the RUN mode, press the push button to perform the test. With the controller in single scan mode, depress and maintain the push button while the controller executes the single scan. Observe the output device and LED indicator, as described in the first procedure.

3. Control Program Checkout

The **control program checkout** is simply a final review of the control program. This check can be performed at any time, but it should be done prior to loading the program into memory for the dynamic system checkout.

A complete documentation package that relates the control program to the actual field devices is required to perform the control program checkout. Documents, such as address assignments and wiring diagrams, should reflect any modifications that may have occurred during the static wiring checks. When performed, this final program review will verify that the final hardcopy of the program, which will be loaded into memory, is either free of error or at least agrees with the original design documents. The following is a checklist for the final control program checkout:

- Using the I/O wiring document printout, verify that every controlled output device has a programmed output rung of the same address.
- Inspect the hardcopy printout for errors that may have occurred while entering the program. Verify that all program contacts and internal outputs have valid address assignments.
- Verify that all timers, counter, and other pre-set values are correct.

4. Dynamic System Checkout

The **dynamic system checkout** is a procedure that verifies the logic of the control program to ensure correct operation of the outputs. This checkout assumes that all static checks have been performed, the wiring is correct, the hardware components are operational and functioning correctly, and the software has been thoroughly reviewed. During the dynamic checkout, it is safe to gradually bring the system under fully automatic control. Although small systems may be started all at once, a large system should be started in sections. Large systems generally use remote subsystems that control different sections of the machine or process. Bringing one subsystem at a time on-line allows the total system to start up with maximum safety and efficiency. Remote subsystems can be temporarily disabled either by locally removing their power or by disconnecting their communications link with the CPU. The following practices outline procedures for the dynamic system checkout:

- Load the control program into the PLC memory.
- Test the control logic using one of the following methods:
    - ❖ Switch the controller to the TEST mode, if available, which will allow the execution and debugging of the control program while the outputs are disabled. Check each rung by observing the status of the output LED indicators or by monitoring the corresponding output rung on the programming device.
    - ❖ If the controller must be in the RUN mode to update outputs during the tests, locally disconnect the outputs that are not being tested, to avoid damage or harm. If an MCR or similar instruction is available, use it to bypass execution of the outputs that are not being tested, so that disconnection of the output devices is not necessary.
- Check each rung for correct logic operation and modify the logic if necessary. A useful tool for debugging the control logic is the single scan. This procedure allows the user to observe each rung as every scan is executed.
- When the tests indicate that all of the logic properly controls the outputs, remove all of the temporary rungs that may have been used (MCRs, etc.). Place the controller in the RUN mode and test the total system operation. If all procedures are correct, the fully automatic control should operate smoothly.
- Immediately document all modifications to the control logic and revise the original documentation. Obtain a reproducible copy of the program as soon as possible.

The start-up recommendations and practices presented in this section are good procedures that will aid in the safe, orderly start-up of any programmable control system. However, some controllers may have specific start-up requirements, which are outlined in the manufacturer's product manual. The user should be aware of these specific requirements before starting up the controller.

System Maintenance

Programmable controllers are designed to be easy to maintain, to ensure trouble-free operation. Still, several maintenance aspects should be considered once the system is in place and operational. Certain maintenance measures, if performed periodically, will minimize the chance of system malfunction.

1. Preventive Maintenance

Preventive maintenance of programmable controller systems includes only a few basic procedures, which will greatly reduce the failure rate of system components. Preventive maintenance for the PLC system should be scheduled with the regular machine or equipment maintenance, so that the equipment and controller are down for a minimum amount of time. However, the schedule for PLC preventive maintenance depends on the controller's environment "**the harsher the environment, the more frequent the maintenance".**

The following are guidelines for preventive measures:

- Periodically clean or replace any filters that have been installed in enclosures at a frequency dependent on the amount of dust in the area. Do not wait until the scheduled machine maintenance to check the filter. This practice will ensure that clean air circulation is present inside the enclosure.
- Do not allow dirt and dust to accumulate on the PLC's components; the central processing unit and I/O system are not designed to be dust proof. If dust builds up on heat sinks and electronic circuitry, it can obstruct heat dissipation, causing circuit malfunction. Further-more, if conductive dust reaches the electronic boards, it can cause a short circuit, resulting in possible permanent damage to the circuit board.
- Periodically check the connections to the I/O modules to ensure that all plugs, sockets, terminal strips, and modules have good connections. Also, check that the module is securely installed. Perform this type of check more often when the PLC system is located in an area that experiences constant vibrations, which could loosen terminal connections.
- Ensure that heavy, noise generating equipment is not located too close to the PLC.
- Make sure that unnecessary items are kept away from the equipment inside the enclosure. Leaving items, such as drawings, installation manuals, or other materials, on top of the CPU rack or other rack enclosures can obstruct the airflow and create hot spots, which can cause system malfunction.
- If the PLC system enclosure is in an environment that exhibits vibration, install a vibration detector that can interface with the PLC as

a preventive measure. This way, the programmable controller can monitor high levels of vibration, which can lead to the loosening of connections

.

2. Spare Parts

It is a good idea to keep a stock of replacement parts on hand. This practice will minimize downtime resulting from component failure. In a failure situation, having the right spare in stock can mean a shutdown of only minutes, instead of hours or days. As a rule of thumb, the amount of a spare part stocked should be 10% of the number of that part used. If a part is used infrequently, then less than 10% of that particular part can be stocked.

Main CPU board components should have one spare each, regardless of how many CPUs are being used. Each power supply, whether main or auxiliary, should also have a backup. Certain applications may require a complete CPU rack as a standby spare. This extreme case exists when a downed system must be brought into operation immediately; leaving no time to determine which CPU board has failed.

3. Replacement of I/O Module

If a module must be replaced, the user should make sure that the replacement module being installed is the correct type. Some I/O systems allow modules to be replaced while power is still applied, but others may require that power be removed. If replacing a module solves the problem, but the failure re-occurs in a relatively short period, the user should check the inductive loads. The inductive loads may be generating voltage and current spikes, in which case, external suppression may be necessary. If the module's fuse blows again after it is replaced, the problem may be that the module's output current limit is being exceeded or that the output device is shorted.

2

WORKSHOP MANUAL

MODEL: AH-15

CAPACITY: 15 M³

AKONA ENGINEERING PVT LTD.

AN ISO 9001:2008 CERTIFY COMPANY

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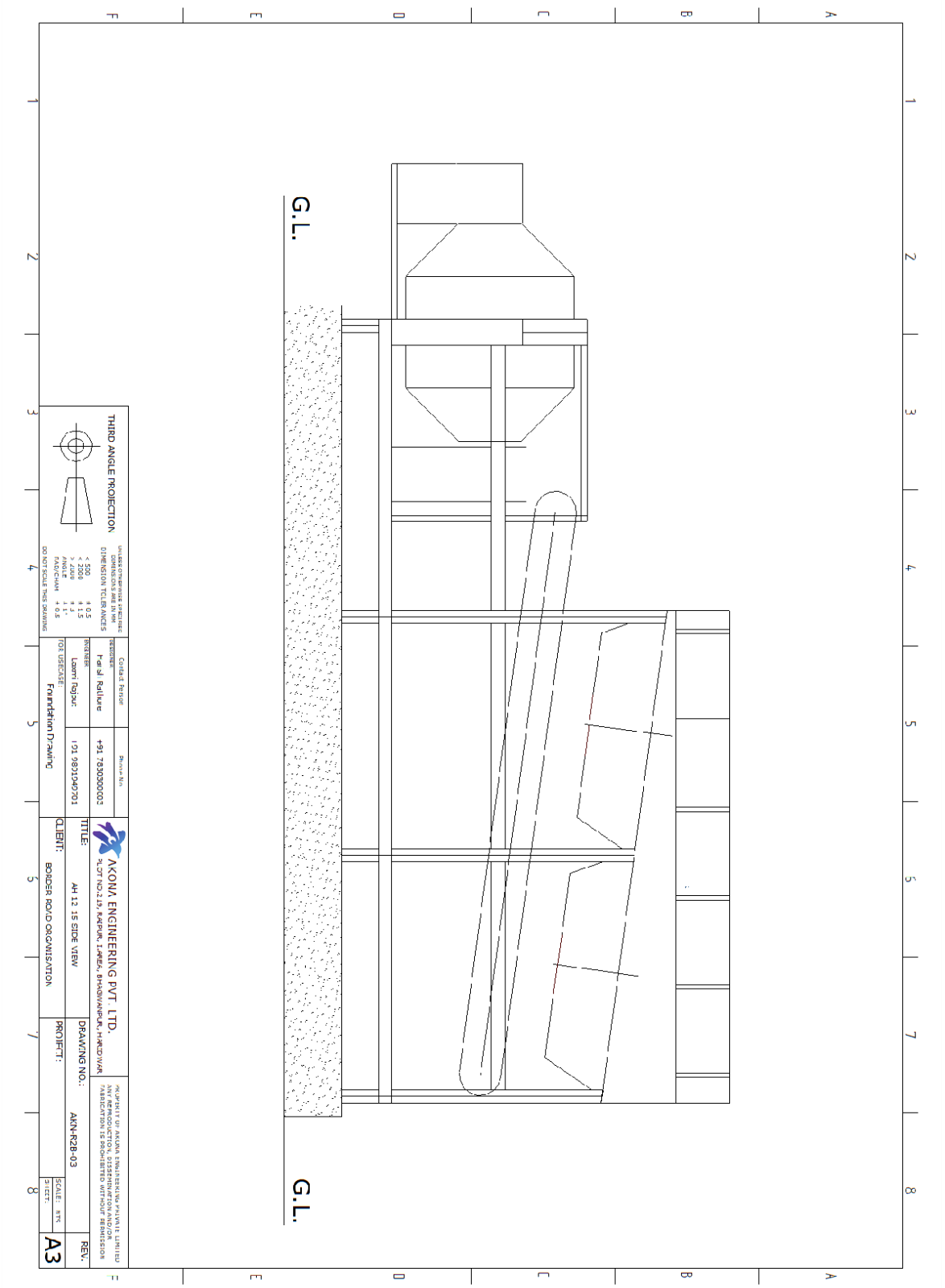
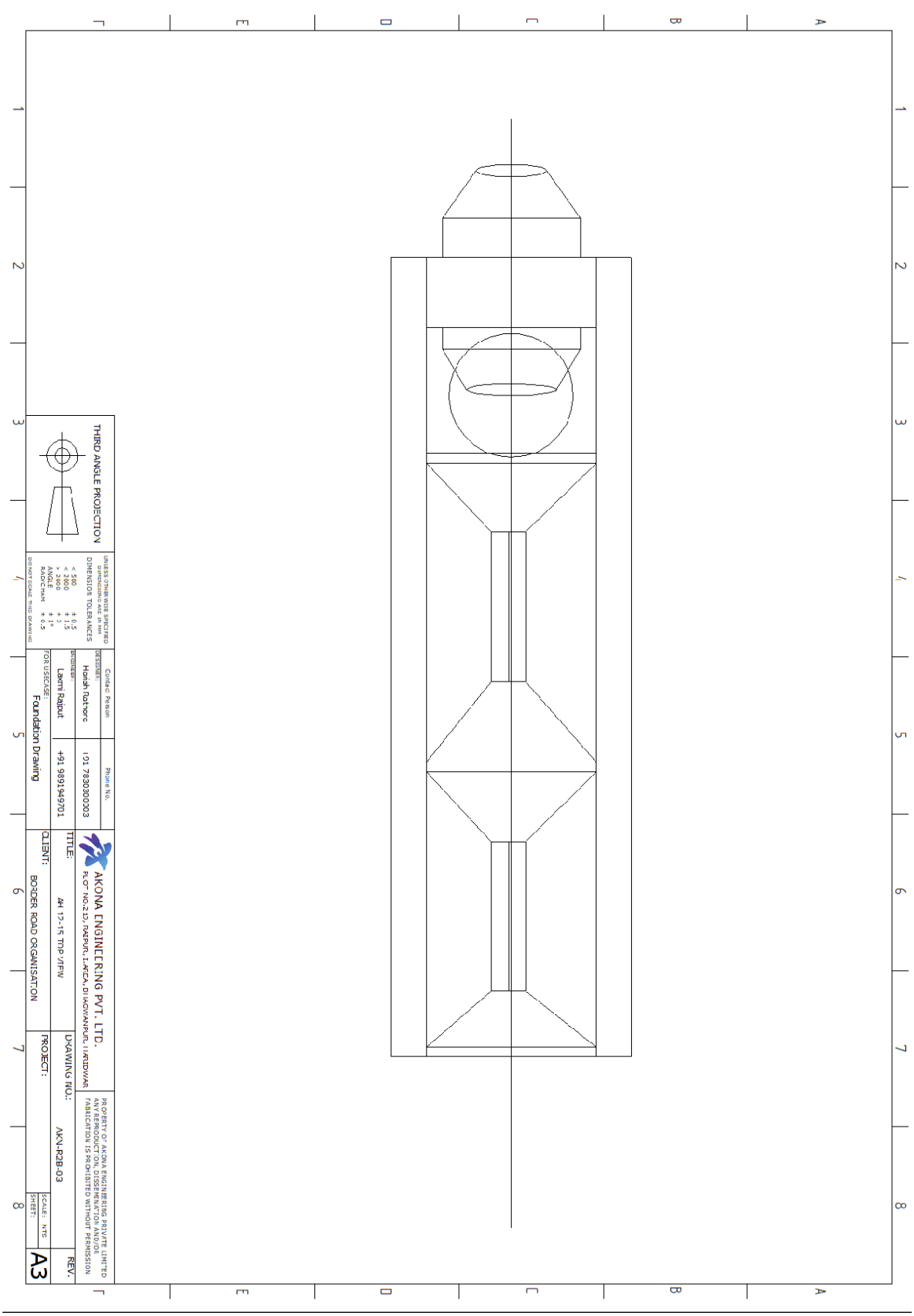
AH 15 COMPLETE SIDE VIEW



FOUR BIN FEEDER



3

ILLUSTRATED PARTS CATALOUGE

MODEL: AH-15

CAPACITY: 15 M^3

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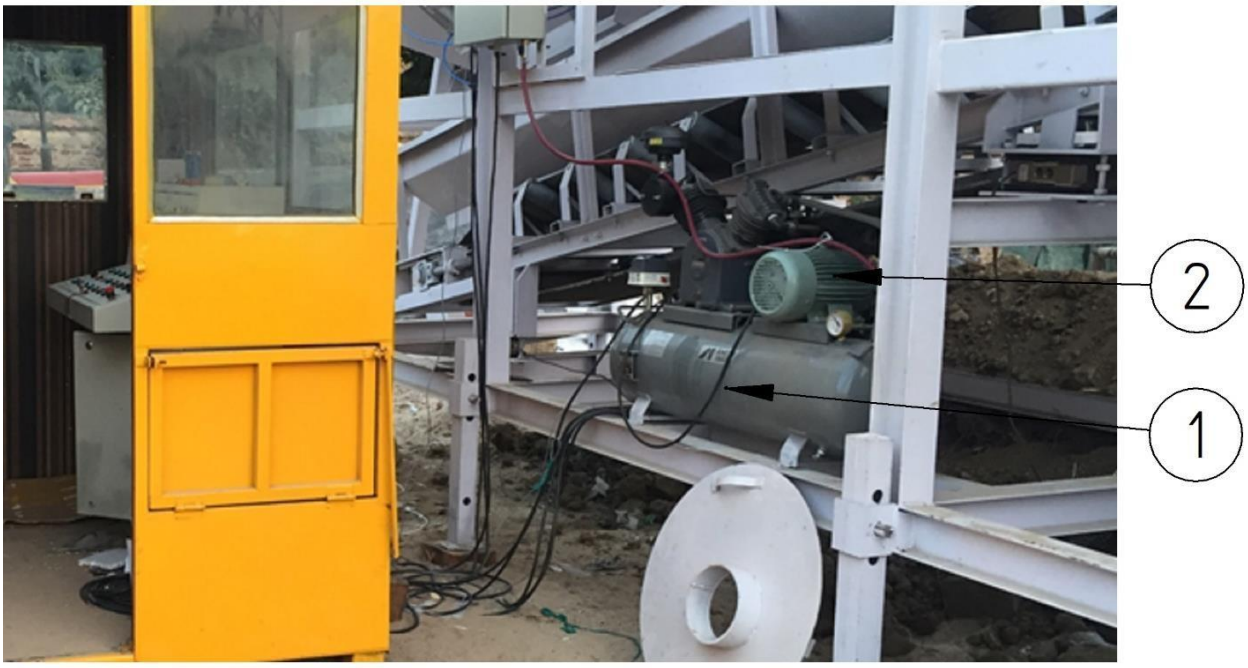
SPARE PARTS LIST AH-SERIES

Sections

0. ALL PLANT ITEMS (AIR COMPRESSOR, ELECTRIC WIRES, TOOLBOX ETC.)
1. BIN FEEDER ASSEMBLY
2. GATHERING CONVEYOR AND BATCHING ASSEMBLY
3. CEMENT, WATER, AD-MIXTURE SYSTEM ASSEMBLY
4. MIXING DRUM ASSEMBLY
5. BASE FRAME ASSEMBLY
6. CEMENT HOPPER AND SCREW CONVEYOR ASSEMBLY
7. CONTROL CABIN
8. WHEELS AND MECHANICAL JACK

0. ALL PLANT ITEMS

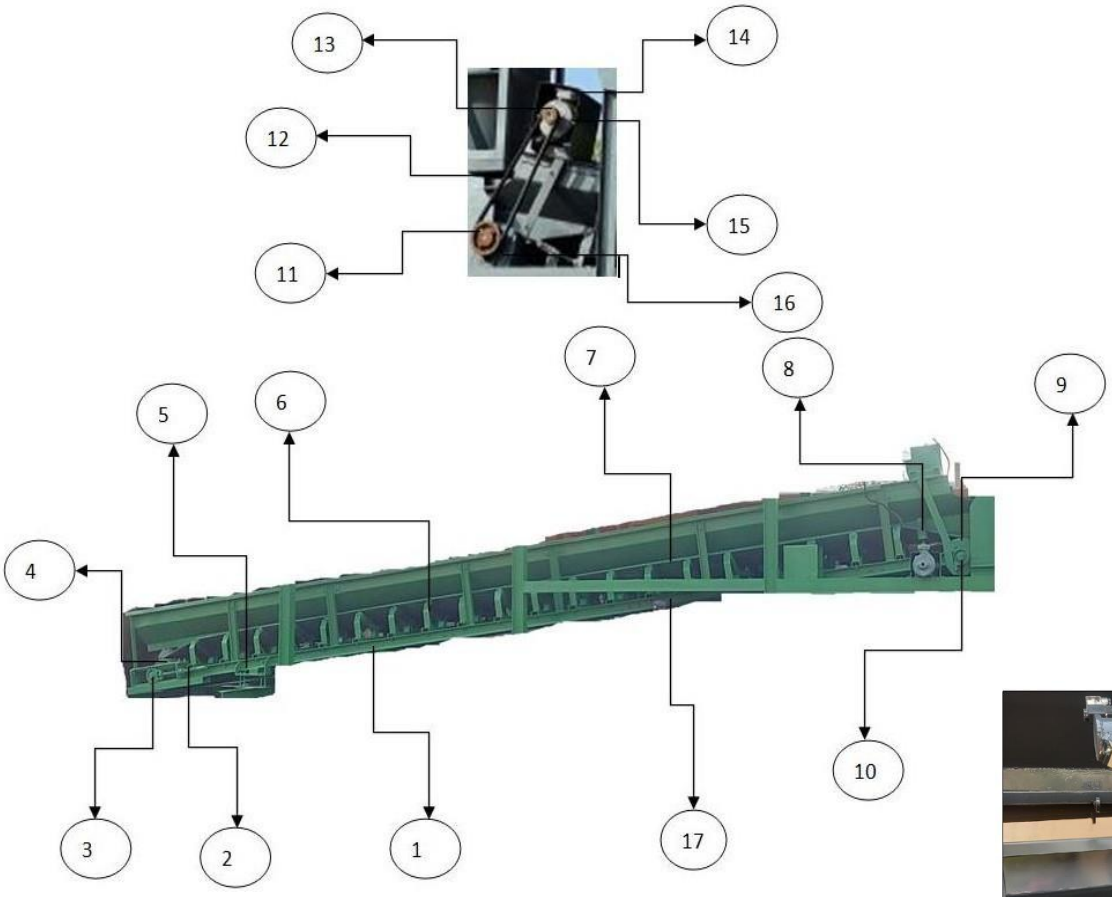


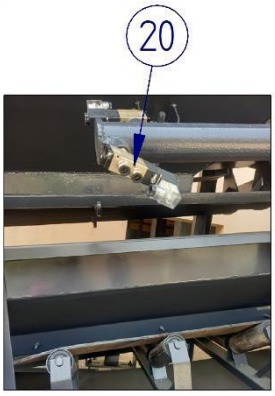
S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/00-01	AIR COMPRESSOR	1	
2	R2B-03/00-02	AIR COMPRESSOR MOTOR	1	
3	R2B-03/00-03	CABLE 3C 2.5	70 MTR	
4	R2B-03/00-04	CABLE 3C 1.5	40 MTR	
5	R2B-03/00-05	CABLE 8C 1.0	20 MTR	
6	R2B-03/00-06	CABLE TIE	1	
7	R2B-03/00-07	ERECTION NUT/BOLT	1 SET	
8	R2B-03/00-08	INSULATION TAPE	3	
9	R2B-03/00-09	LOAD CELL WIRE	50 MTR	
10	R2B-03/00-10	TEFLON TAPE	3	
11	R2B-03/00-11	TOOLBOX WITH TOOL KIT, PLIER, SCREW DRIVE GREASE GUN, PRESSUR OIL CAN	1 SET	

1. BIN FEEDER ASSEMBLY

S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/01-01	AIR DELIVERY PIPE	1	
2	R2B-03/01-02	BIN HOPPER	2+2	
3	R2B-03/01-03	BIN FEEDER GATE BEARING	8	
4	R2B-03/01-04	BIN WALL	1 SET	
5	R2B-03/01-05	DISCHARGE GATE	4	
6	R2B-03/01-06	DISCHARGE GATE STOPPER	4	
7	R2B-03/01-07	PNEUMATIC AIR CYLINDER	4	
8	R2B-03/01-08	PNEUMATIC PIPE 8/5	50 MTR	
9	R2B-03/01-09	SAND VIBRATOR WITH NUT BOLT	1 SET	
10	R2B-03/01-10	STRUCTURE FRAME FOR BIN	1 SET	
11	R2B-03/01-11	BRASS NIPPLE	6	NOT SHOWN
12	R2B-03/01-12	MALE CONNECTOR 1/4”	2	NOT SHOWN
13	R2B-03/01-13	MALE CONNECTOR 3/8”	8	NOT SHOWN

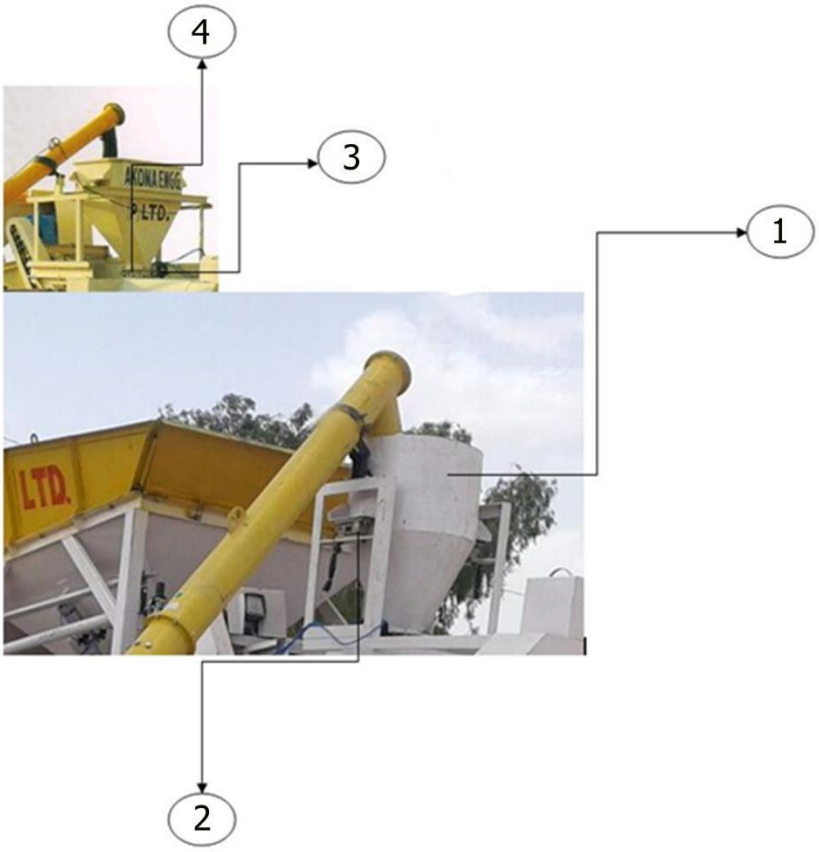
2. GATHERING CONVEYOR AND BATCHING ASSEMBLY

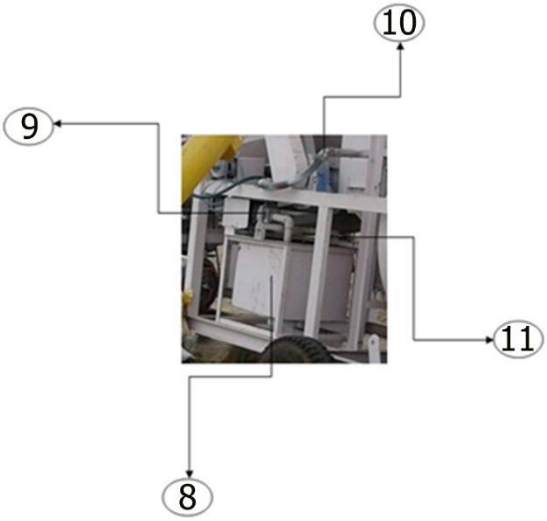


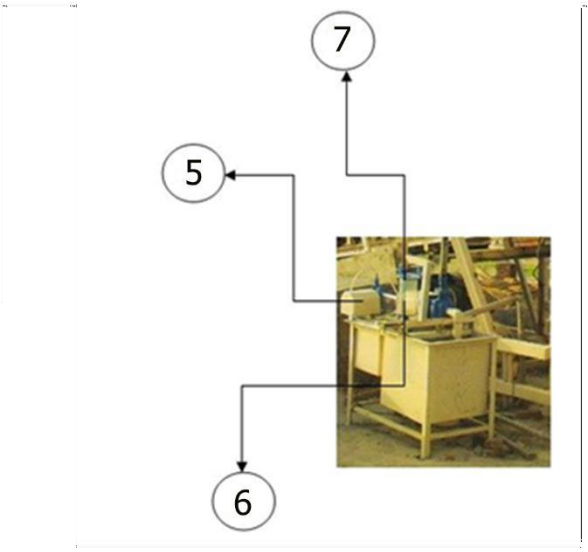


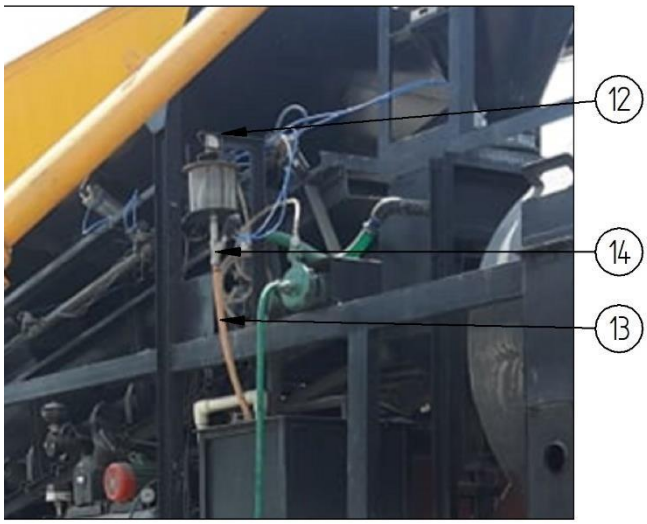
S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/02-01	MAIN FRAME CHANNEL	2	
2	R2B-03/02-02	ROLLER ADJUSTING SCREW	2	
3	R2B-03/02-03	BELT ADJUSTING BEARING	2	
4	R2B-03/02-04	DRIVEN ROLLER	1	
5	R2B-03/02-05	LOAD CELL WITH PLATE AND NUT-BOLTS	4	
6	R2B-03/02-06	M.S ROLLER STAND	10	
7	R2B-03/02-07	CONVEYOR BELT	1	
8	R2B-03/02-08	GUIDE ROLLER	2	
9	R2B-03/02-09	BELT CONVEYOR MAIN ROLLER	1	
10	R2B-03/02-10	MAIN ROLLER BEARING	2	
11	R2B-03/02-11	BELT CONVEYOR GEAR BOX PULLEY	1	
12	R2B-03/02-12	V BELT B/W MOTOR AND GEARBOX	2	
13	R2B-03/02-13	BELT CONVEYOR MOTOR PULLEY	1	
14	R2B-03/02-14	MOTOR COVER	1	
15	R2B-03/02-15	BELT CONVEYOR MOTOR	1	
16	R2B-03/02-16	BELT CONVEYOR GEAR BOX	1	
17	R2B-03/02-17	CONVEYOR BELT SUPPORTING ROLLER	1	
18	R2B-03/02-18	CHUTE VIBRATOR	1	
19	R2B-03/02-19	SMALL ROLLER	30	
20	R2B-03/02-20	SOLENOID VALVE	6	

3. CEMENT, WATER, AD-MIXTURE SYSTEM ASSEMBLY



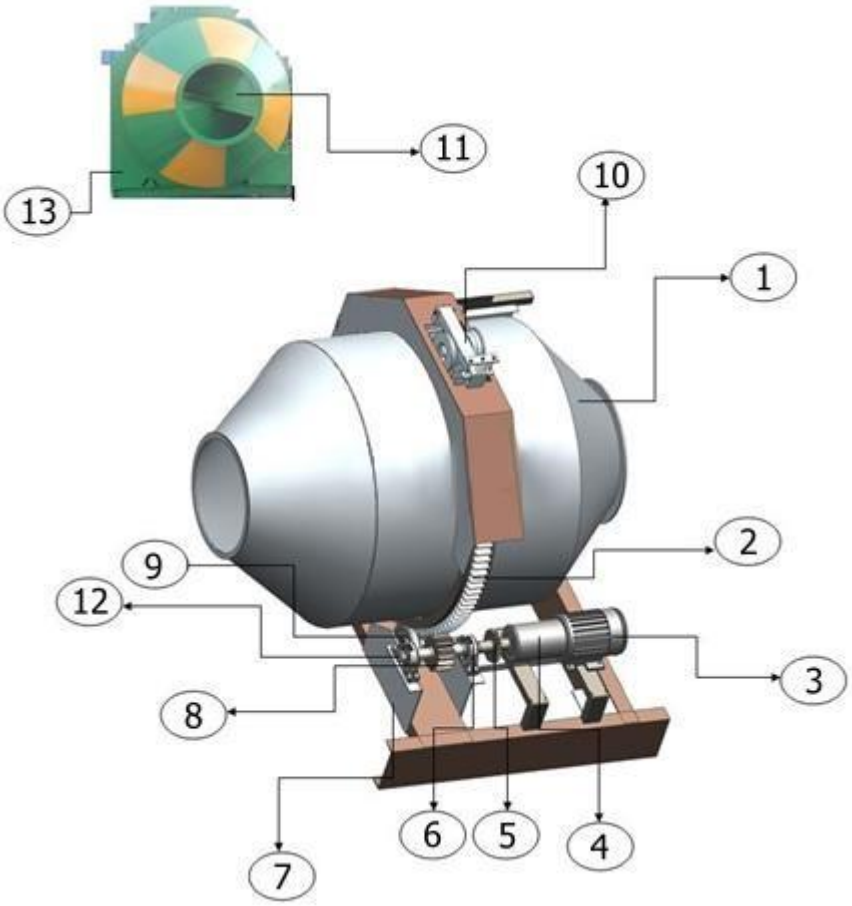






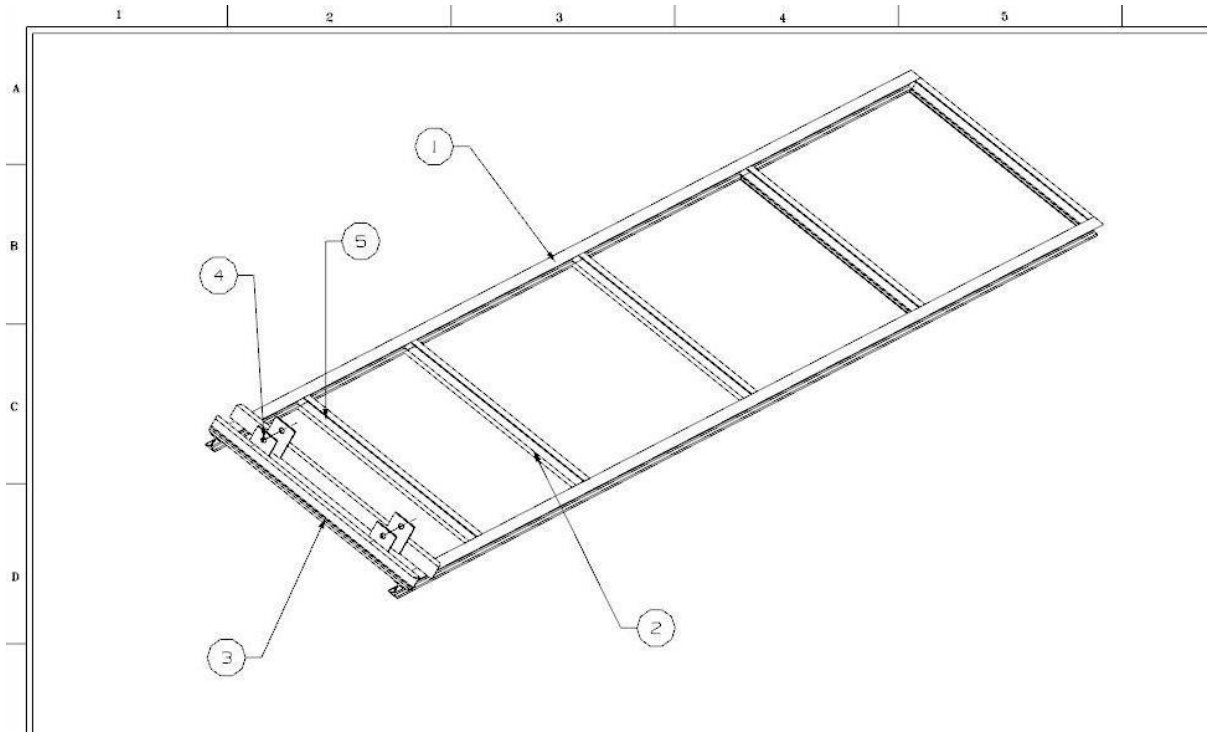
S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/03-01	CEMENT BUCKET	1	
2	R2B-03/03-02	CEMENT LOAD CELL WITH PLATE AND NUT-BOLTS	2	
3	R2B-03/03-03	CEMENT PNEUMATIC ACTUATOR	1	
4	R2B-03/03-04	CEMENT BUTTERFLY VALVE SINGLE FLANGE	1	
5	R2B-03/03-05	CHEMICAL PUMP	1	
6	R2B-03/03-06	CHEMICAL JAR	1	
7	R2B-03/03-07	CHEMICAL LOAD CELL (S TYPE)	1	
8	R2B-03/03-08	WATER TANK FOR WEIGHING	1	
9	R2B-03/03-09	WATER PUMP	1	
10	R2B-03/03-10	WATER LOAD CELL (S TYPE)	1	
11	R2B-03/03-11	WATER PIPE LINE	1 SET	
12	R2B-03/03-12	CHEMICAL JAR STAND	1	
13	R2B-03/03-13	CHEMICAL PIPE ½”	3	
14	R2B-03/03-14	CHEMICAL SOLENOID VALVE	1	
15	R2B-03/03-15	CEMENT WEIGHING BOX	1 SET	NOT SHOWN
16	R2B-03/03-16	CEMENT WEIGHING BOX COVER	1	NOT SHOWN
17	R2B-03/03-17	CHEMICAL HOSE PIPE CLAMP	6	NOT SHOWN
18	R2B-03/03-18	G I NIPPLE	1	NOT SHOWN
19	R2B-03/03-19	G I REDUCER	1	NOT SHOWN
20	R2B-03/03-20	G I TEE	1	NOT SHOWN
21	R2B-03/03-21	M.S HEX NIPPLE	1	NOT SHOWN
22	R2B-03/03-22	SECTION PIPE 1”	3 MTR	NOT SHOWN
23	R2B-03/03-23	WATER HOSE PIPE CLAMP	2	NOT SHOWN
24	R2B-03/03-24	WATER PVC FOOT VALVE	1	NOT SHOWN
25	R2B-03/03-25	WATER PVC HOSE NIPPLE	3	NOT SHOWN

4. MIXING DRUM ASSEMBLY



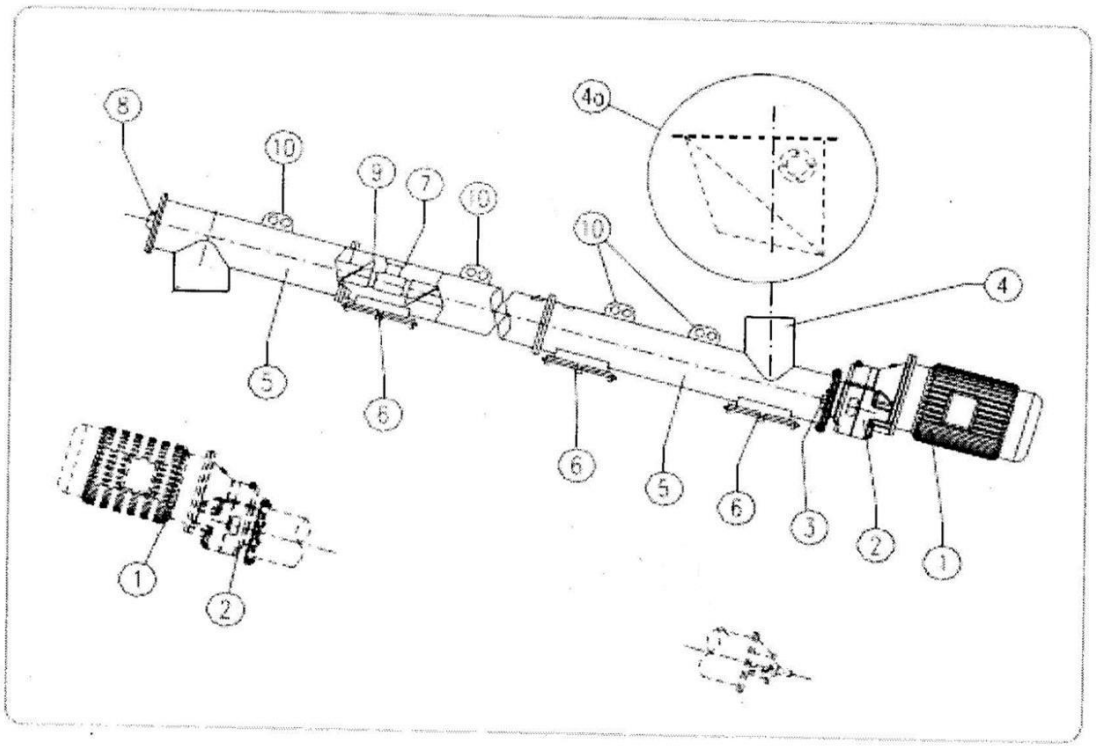
S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/04-01	MIXING DRUM	1	
2	R2B-03/04-02	MIXER RING	1	
3	R2B-03/04-03	MIXER MOTOR	1	
4	R2B-03/04-04	MIXER GEAR BOX	1	
5	R2B-03/04-05	CHAIN SPOCKET COUPLING	1	
6	R2B-03/04-06	Drum Pinion shaft bearing	1 SET	2 Pc.
7	R2B-03/04-07	PINION MOUNTING STAND	1	
8	R2B-03/04-08	PINION	1	
9	R2B-03/04-09	Drum guide roller bearing	6	
10	R2B-03/04-10	TOP ROLLER ASSEMBLY	1	
11	R2B-03/04-11	DISCHARGE BLADE	2	
12	R2B-03/04-12	PINOIN SHAFT	1	
13	R2B-03/04-13	DRUM GEAR COVER	1 SET	
14	R2B-03/04-14	MIXER DRUM RUBBER PACKING WITH RING	1 SET	Not Shown
15	R2B-03/04-15	MIXING BLADE-1	2	Not Shown
16	R2B-03/04-16	MIXING BLADE-2	2	Not Shown

5. BASE FRAME ASSEMBLY



S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/05-01	FRAME MAIN I-SEC.	2	
2	R2B-03/05-02	BIN NOUNTING I-SEC.	4	
3	R2B-03/05-03	DRUM MOUNTING CHANEL	2	
4	R2B-03/05-04	ROLLER MOUNTING PLATE	4	
5	R2B-03/05-05	DRUM CHHUTE MOUNTING	1	

6. CEMENT HOPPER AND SCREW CONVEYOR

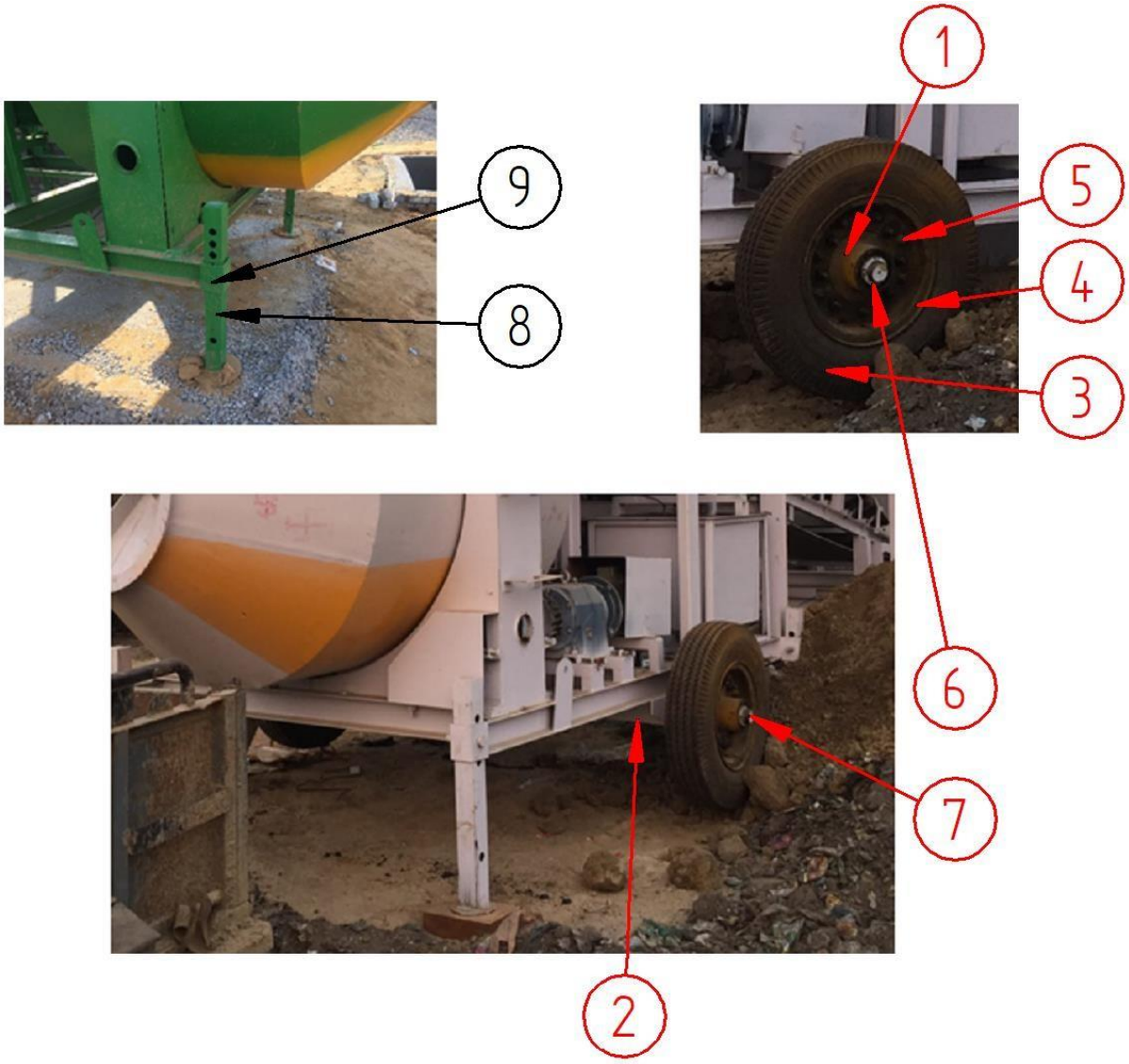


S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/06-1	CEMENT SCREW CONVEYOR MOTOR	1	
2	R2B-03/06-2	GEAR REDUCER	1	
3	R2B-03/06-3	GEAR REDUCER SHAFT SEALING	1	
4	R2B-03/06-4	INLET SPOUT	1	
5	R2B-03/06-5	TUBLER HOUSING	1	
6	R2B-03/06-6	INSPECTION HATCH	1	
7	R2B-03/06-7	OUTLET END BEARING	1	
8	R2B-03/06-8	INTERMEDIATE HANGER BEARING	1	
9	R2B-03/06-9	AUGER	1	
10	R2B-03/06-10	LIFTING EYE	4	
11	R2B-03/06-11	CEMENT HOPPER WITH JALI	1 SET	
12	R2B-03/06-12	CONVEYOR CLAMP WITH STAND	1	
13	R2B-03/06-13	CEMENT SCREW CONVEYOR COMPLETE ASSEMBLY	1	
14	R2B-03/06-14	CONVEYOR NUT/BOLT PACKING	16	

7. CONTROL CABIN

S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/07-01	DOOR LOCK	1	
2	R2B-03/07-02	ELECTRIC CONTROL PANEL	1	
3	R2B-03/07-03	ELECTRIC CONTROL PANEL INDICATOR	1	
4	R2B-03/07-04	OPERATOR CONTROL CABIN	1 SET	

8. WHEELS AND MECHANICAL JACK



S. No.	Spare Part ID	Description	QTY	Remarks
1	R2B-03/08-01	HUB	2	
2	R2B-03/08-02	AXLE SHAFT	1	
3	R2B-03/08-03	TRYE	2	
4	R2B-03/08-04	RIM	2	
5	R2B-03/08-05	NUT BOLT KIT	1 SET	
6	R2B-03/08-06	BEARING	4	
7	R2B-03/08-07	CHUCKNUT	2	
8	R2B-03/08-08	MECHANICAL LEG	2	
9	R2B-03/08-09	MECHANICAL JACK PIN	2	

4

ILLUSTRATED LIST OF SPECIAL MAINTENANCE TOOLS

MODEL: AH-15

CAPACITY: 15 M^3

AKONA ENGINEERING PVT LTD.

AN ISO 9001:2008 CERTIFY COMPANY
MFG. UNIT: -PLOT NO.: -200 RAIPUR INDRUSTRIAL AREA, ROORKEE, HARIDWAR (U.K)
HEAD OFFICE: - HYCON-HOUSE, A-455, HINDON VIHAR, DELHI MEERUT RAOD, GHAZIABAD-201001 (U.P)
MAIL: - info@akonaindia.com
WEBSITE: -www.akonaindia.com

Toll free No-1800-121-457-457

RECOMMENDED LUBRICATION

Hydraulic Oil: -No.-68
Gear Box Oil: -No.-320 &220

***NOTE = We Recommend Gear oil ISO 320 from summer & ISO 220 from winter ISO VG 100 for compressor**

Mobile: -20W40
Grease: - shell

5

LUBRICATION CHART OF COMPLETE PLANT

MODEL: AH-15

CAPACITY: 15 M^3

AKONA ENGINEERING PVT LTD.
AN ISO 9001:2008 CERTIFY COMPANY
MFG. UNIT: -PLOT NO.: -200 RAIPUR INDRUSTRIAL AREA, ROORKEE, HARIDWAR (U.K)
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MAIL: - info@akonaindia.com
WEBSITE: -www.akonaindia.com
TOLL FREE NO-1800-121-457-457

AKONA MAKE: CONCRETE BATCH MIX PLANT 12-15 M^3

LUBRICATION CHART

S. NO.	PARTICULAR	DAILY	WEEKLY	MONTHLY (200HRS.)	1000 HRS.
1	Gear Oil (Check)		•		
2	Gear oil (Change)				•
3	Engine Check	•			
4	Engine Oil (Change)			•	•
5	Hydraulic Oil (check)			•	
6	Hydraulic Oil (Change)				AT SERVICE

Please use only recommended oil and lubricants as mentioned in section [4]

AKONA MAKE: CONCRETE BATCH MIX PLANT 12-15 M^3
PERIODIC MAINTENANCE CHART

S. NO.	MAINTENANCE POINT	DAILY	50 HRS.	200 HRS.	500 HRS.	1000 HRS.
1	Fasteners checking	●				
2	Electrical connection for all motors			●		
3	Earthing					●
4	Load cell calibration check					●
5	Belt alignment			●		
6	V-belt replacement					●
7	Vibrating spring change					●
8	Mixing blade					●
9	Auxiliary Belt setting			●		
13	Electrical supply check 3-phasex415Vx50 Hz	●				
14	Bearing greasing			●		

RECOMMENDED LUBRICATION

Hydraulic Oil: -No.-68
Gear Box Oil: -No.-320 &220

***NOTE = We Recommend Gear oil ISO 320 from summer & ISO 220 from winter ISO VG 100 for compressor**

Mobile: -20W40
Grease: - shell

AKONA CEMENT BATCHING AND MIXING PLANT 20 M^3
INSTRUCTIONS SHEET

1. Check visually complete plant before starting for any unwanted external object.
2. Check Electric supply 3 phase x415 V x50 Hz properly.
3. Check all electrical connections periodically.
4. The DG Set should run idle for 2 minutes before starting production and stop after 3 minutes of idle running.
5. Check fuel before starting DG Set.
6. Always clean the discharge chute before stopping the plant.
7. Apply ample of grease at all greasing points before start.
8. Check calibration of mixing system periodically. Do not operate the plant if calibration is not proper.
9. Do not insert bar/ rod/ hand during the operation of plant.
10. Check gear oil visually in all gear boxes.
11. Replace both belts together.
12. Do not allow outside persons inside the control room.
13. Operate the plant by trained operator only. Do not operate the plant if operator is not there.
14. Keep plant on level surface. Do not operate plant in overload conditions.