



WARNING
DO NOT OPERATE WITHOUT
READING MANUAL

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INSTRUCTION MANUAL MECHANICAL VACUUM BOOSTERS

INSTALLATION | OPERATION
MAINTENANCE



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Exploring Heights
Setting Benchmarks
To Become World Class

In Pursuit of Excellence
 **EVEREST**
 PRESSURE & VACUUM SYSTEMS

Roots Blowers | Mechanical Vacuum Boosters | Dry Screw Vacuum Pumps
 Acoustic Hoods | Industrial Vacuum Systems

SAFETY
FIRST
THE SAFE WAY IS
THE BEST WAY

SAFETY PRECAUTIONS

SAFETY
FIRST
DON'T TAKE
CHANCES

For equipment covered specifically or indirectly in this instruction book, it is important that all personnel observe safety precautions to minimize the chances of injury. Among many considerations, the following should particularly be noted:

- Mechanical Vacuum Booster (MVB) casing and associated piping or accessories may become hot enough to cause skin burns on contact.
- Internal and External rotating parts of MVB and driving equipment can produce serious physical injuries. Do not reach into any opening in the MVB while it is operating, or while subject to accidental starting. Cover external moving parts with adequate guards.
- Disconnect power before doing any maintenance work and avoid bypassing or rendering inoperative any safety or protective devices.
- Use proper care and good procedures in handling, lifting, installing, operating, and maintaining the equipment.
- Other potential hazards to safety may also be associated with operation of this equipment. All personnel working in or passing through the area should be warned by signs and trained to exercise adequate general safety precautions.
- When adding to or drawing oil from or otherwise servicing a MVB, which has been pumping toxic, inflammable, explosive or other hazardous substances, observe appropriate precautions to avoid serious personal injury.
- Conduct the leak test for MVB before using.
- MVB cannot discharge directly to atmosphere, they require backup pump for operation.
- Refer to material data sheets/material safety data sheets when you assess the potential hazards associated with your process materials, for example, auto-ignition.



CAUTION

Don't touch hot surfaces. The upper limit of operating MVB is 120 °C.
Don't touch the MVB while it is in operation and MVB should be cool while not in operation.



WARNING

Don't operate the MVB without guards in place



SAFETY FIRST
THE SAFE WAY IS THE BEST WAY

SAFETY PRECAUTIONS

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WARNING
Keep body & clothing away. During operation keep the body and clothing away from inlet & outlet of MVB



WARNING
MVB must be handled using appropriate device such as fork truck/lift. Refer table for weight of MVB. Take care that the MVB does not overturn while handling.



Cautions are given where failure to observe the instructions could result in damage to the equipment.

The following IEC warning labels appear on the Booster pump:

MANDATORY	MANDATORY ACTION	WARNING
Read operation & maintenance manual	Hearing protection required	Don't operate switch. Switch to be operated by authorized personnel only.



Electric Shock



Lifting Point



Earthing

WARNING

Check the quantity & colour of oil.
Refill / replace with same grade of oil.
Replace complete oil every 6 months.



Hot Surface



Risk of Being Pulled



Oil Fill



Direction of Rotation

INTRODUCTION

GENERAL DESCRIPTION

Congratulations on purchase of your **Mechanical Vacuum Booster (MVB)** from **Everest Blower Systems Pvt. Ltd.** You may please examine the MVB for any shipping damage, and if any shipping damage is found report it immediately to the carrier. If the MVB is to be installed at a later date than purchased, please make sure that it is stored in a clean, dry location and rotated periodically. If the pump is being stored outdoors, please ensure it is protected from weather and corrosion.

INTENDED USE

EVEREST MVB's are built to exacting standards and properly installed and maintained shall provide many years of reliable service. We request you to take time to read and follow every step of these instructions when installing and maintaining your MVB. We have tried to make these instructions as simple as possible. We realize getting any new piece of equipment up and running in as little time as possible is imperative to production.

The booster pump should be used as per system compatibility & operating recommendation report. If you use the pump to an application for which it is not recommended you may invalidate warranties. For any doubt contact EVEREST.



WARNING

Serious injury can result from operating this machine without first reading the service manual and taking adequate safety precautions.



Important note: Record the MVB model and serial numbers in the operating data form on the inside of the back cover of this manual. You will save time and expense by including this reference identification on any replacement part orders, or if you require service or application assistance.

This instruction manual describes instructions and precautions to be observed in the handling and maintenance of Everest Mechanical Vacuum Booster. It is strongly recommended that those who operate or maintain the MVB read this manual carefully prior to MVB operation, to ensure longevity of MVB's operational life.

TECHNICAL DATA SHEET

Table 1: Technical data for various models of Mechanical Vacuum Boosters.


Parameters	Units	EVB01	EVB05	EVB15	EVB30	EVB50	EVB60	EVB70	
Displacement @ 50Hz	$m^3 h^{-1}/ft^3 min^{-1}$ /LPM	260/153 /4333	400/235 /6667	800/471 /13333	1670/983 /27833	2930/1725 /48833	3900/2295 /65000	5250/3090 /87500	
Effective Pumping speed with backing pump	$m^3 h^{-1}/ft^3 min^{-1}$ /LPM	208/122 /3467	320/188 /5333	640/377 /10667	1336/786 /22267	2344/1380 /39067	3120/1836 /52000	4200/2472 /70000	
Maximum Differential Pressure (cut in)	mbar	90	120	90	70	50	65	45	
Inlet/Outlet Connection		ISO80	ISO80	ISO100	ISO160	ISO160	ISO250	ISO320	
Recommended line size	mm	50	65	80	100	125	150	200	
Rotational speed	rpm	0-1500							
Recommended backing pump capacity	$m^3 h^{-1}/ft^3 min^{-1}$ /LPM	65/38/ 1083	100/59/ 1667	200/118 /3333	400/235/ 6667	730/430/ 12167	975/574/ 16250	1300/765/ 21667	
Electrical supply voltage, 3-ph		380 -415V							
Motor power	kW/HP	1.1/1.5	2.2/3.0	3.7/5.0	5.5/7.5	7.5/10	11/15	11/15	
Operating temperature range	(°C/F)	5 to 100/40 to 212							
Maximum operating humidity	RH	95%							
Cooling method		Air Cooled							
Recommended oil		SHELL OMALA S2 G150							
Oil capacity	GEAR COVER (liters)	1	1	1.5	2.4	4	4	4	
	PULLEY COVER (liters)	0.5	0.5	1	1.5	2.5	2.5	2.5	
Weight	kg/ lbs.	116/256	116/256	170/375	316/697	425/937	500/1102	585/1290	
Sealing		LIP SEAL DESIGN - NBR(D)/FKM(O)/PTFE(O)							
Material of construction									
Casing		CI FG 260							
Rotors		CI FG 260 + EN19 (SHAFT)				S.G.IRON Gr. 450/10			
Side plates		CI FG 260							
Timing gears		20MnCr5							
(D) - DEFAULT, (O) OPTIONAL									

DATA PLATE & GENERAL INSTRUCTION

Shows volumetric displacement of MVB.

Identifies the specific model of MVB

Each MVB has its unique SR. NO. Punched on plate.

MECHANICAL VACUUM BOOSTER					
MODEL	PUMPING CAPACITY	m ³ /hr	RPM		
MOTOR POWER	kw	REQUIRED BACKUP VACUUM	TORR		
SR. NO.	ID. NO.	OIL USED			
SUCTION BORE	N.B.	DISCHARGE BORE	N.B.	MOTOR PHASE	
DATE OF MANUFACTURING		WEIGHT		KG	
 MANUFACTURED & SERVICED BY: EVEREST BLOWER SYSTEMS PVT. LTD. <small>Plot No 6, Sector 16, HSIDDC, Bahadurgarh 124507, Haryana, India E: service.ebs@everestblowers.com Tt: +91 11 45457777</small>					

Shows rpm at particular pumping capacity.

Minimum fore Pump Vacuum required

Oil used

MVB weight.

GENERAL INSTRUCTIONS

- a) Make sure proper oil levels are maintained at the gear end and in the drive end.
- b) Check oil level after every 40 hours of operation. Loss of oil should be replenished and reported.
- c) First oil change should be done within the first 100 operating hours and thereafter every 1000 hours or more often, if oil gets dirty.
- d) Check coupling alignment every fortnight. Misalignment will cause premature machine failure and cause overheating.
- e) Check regularly for any knocking or abnormal sound. High frequency sound indicates bearing trouble. Knocking sound indicates rotor timing upset. Contact "EVEREST" service team for necessary adjustments.
- f) Check to prevent any back pressure on MVB. Discharge piping should be of adequate sizing and free from any obstacle.
- g) EVEREST MVB's are meant for indoor installation & should be protected from direct sunlight and rain, if installed outdoor.

BASIC OPERATING PRINCIPLE OF “MVB”

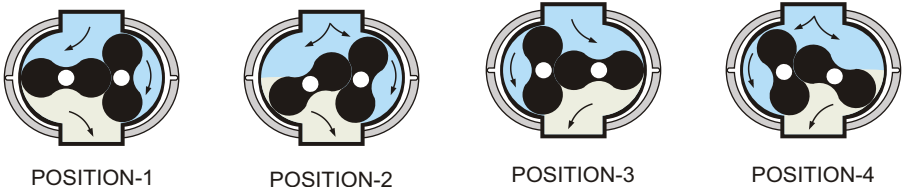


Fig. 1: Illustration of basic operation principal of MVB.

Everest Twin Lobe Rotary Mechanical Vacuum Boosters (MVB) are Positive displacement units, whose pumping capacity is determined by size, operating speed and pressure conditions. It employs two twin lobe impellers mounted on parallel shafts, rotating in opposite direction within a casing closed at the ends by side plates. As the impellers rotate, vapor is drawn into one side of the casing and forced out of the opposite side against the existing pressures. The differential pressure developed, therefore, depends upon the resistance of the connected system. The MVB, being positive displacement type, does not develop pressure within the casing but the discharge pressure depends upon the system resistance. Effective sealing of the MVB inlet area from the discharge area is accomplished by use of very small operational clearances, eliminating the need of any internal lubrication of the lobes. A pair of accurately machined alloy steel, hardened and ground timing gears maintain clearances between the impellers, during rotation. The vapor, thus delivered, is **100% OIL FREE**.

The pumping capacity of a MVB, operating at constant speed remains relatively independent of inlet and discharge pressure variations. These MVB's are constant volume machines, which deliver a fixed discharge. It is, therefore, essential to ensure that minimum pipeline restrictions, at the inlet and discharge, are imposed.

Adequate size piping and large radius bends ensure minimum line losses resulting in higher efficiency and low power consumption. Sudden change in pipeline cross section should also be avoided.

To change capacity, it is necessary either to change speed (energy saving) with the help of inverter drive or VFD. No attempt should ever be made to control the capacity of MVB by means of throttle valves in the intake or discharge piping. This suddenly increases the power load on the motor and may seriously damage the MVB.

CONSTRUCTION

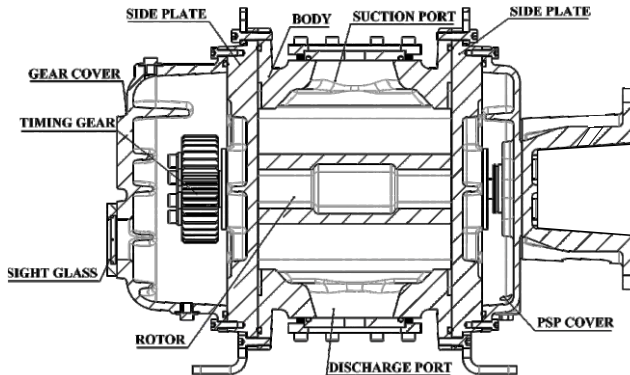


Fig. 2: CAD generated sectional view of MVB.

- a. Rotors: Two figure eight shaped rotors, precisely CNC machined, perfectly synchronized and with their shafts being supported at the drive end and driven end on bearings. The rotors are housed in the cylindrical body, the face ends of which are covered by the head-plates which house the bearings. The rotor shafts having different lengths, the longer one being the driver shaft and the shorter the driven shaft all positioned within the cylinder body and plates so that when they rotate, the contours of the rotors are always in close proximity of each other as their tips to the cylinder bore.
- b. Body: The cylinder body, having a machined oval section through the bore, has two flanged ports breaking into it, one from the topside and one from the bottom. The top port is the suction port and the bottom one the discharge port.
- c. Timing gears: Hardened and ground spur timing gears are used for rotor timing. The gear cover is fixed to the side plate and the whole of gear end assembly is splash lubricated.
- d. Bearing and shaft seals: The bearing housing and the seal housing are integral part of the side plates. All rotating parts within the drive end and driven end are adequately lubricated and dynamically balanced. Each side plate incorporates one lip seal to prevent the passage of lubricating oil from the bearing housing into the cylinder bore.
- e. There should be enough space around the pump allow for safe maintenance work and periodic inspections.

INSTALLATION

SAFETY:



WARNING



Follow the safety instruction given below and take appropriate precautions. If not followed, can cause injury to workers and damage to equipment.

- a. MVB should be installed under supervision of a trained technician.
- b. Process system must be vent and purged before starting any installation work.
- c. Don't connect the electrical connections until mechanical installation is satisfactorily completed.
- d. Do not use damaged parts and o-rings, get them replaced.
- e. Booster piping and connections may become hot while handling compressible gases which may cause burn hazard.

UNPACKING & INSPECTION:



WARNING



Use suitable lifting equipment to move the pump. Refer table 1 for the pump weight.

- a. Unpack the MVB and check for the following:
 - i) Items should be as per packing list & report if any damage is found.
 - ii) If the MVB is not to be used for some weeks, it should be stored by covering with suitable packing material and kept at a dry place.

HANDLING OF MVB

- a. MVB should be lifted and moved as shown in figure 3. Use two lifting hooks that are provided on MVB.
- b. MVB should always be transported in horizontal position.
- c. Dropping, rolling or tipping unit, or applying shock loads can cause damage and personnel injury. Ensure that the unit is properly supported and secure during lifting and handling.
- d. Ensure that MVB is mounted on a horizontal plane and vibration free surface.
- e. Make sure that the lifting bolts are in faultless condition (replace a damaged eyebolt with a new one).
- f. If it is to be installed outdoors, please ensure the motor, painting, peripheral equipment, and parts ,etc. are suitable for the outdoors operations.

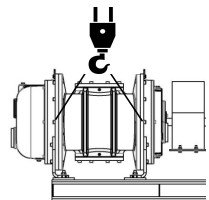


Fig. 3: The right way of lifting the MVB.

LUBRICATION OIL

- MVB shall be shipped with oil filled. Check the level of oil in gear chamber and pulley side chamber.
- Recommended oil is SHELL OMALA S2 G 150.
- For oil filling quantity, please refer technical specification table.
- MVB is equipped with one sight glass at each oil chamber.
- Oil should be filled to the upper mark of sight glass.
- Oil change will be after every 1000 hours of running.

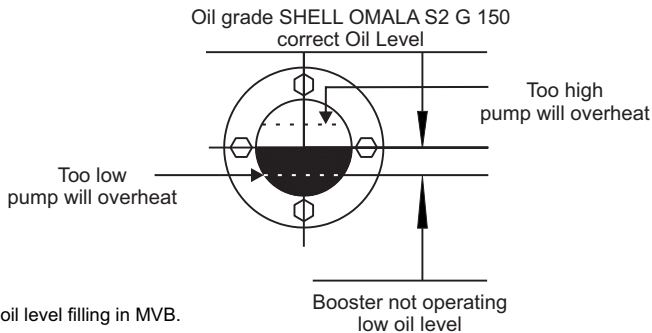


Fig. 4: Correct oil level filling in MVB.

ELECTRICAL CONNECTIONS & ROTATION:

- Electrical power connection should be installed by a qualified electrical engineer.
- Check for wiring connections on motor terminal box and electrical control panel. 3Ø, 415 V, 50Hz is the standard supply from EVEREST.
- It is recommended to use VFD (Inverter drive) for soft starting of MVB.

CHECK THE DIRECTION OF ROTATION



WARNING

Blank the inlet of MVB or connect to system before checking the direction of rotation to avoid the danger of objects being trapped in the rotors.



- Rotation of MVB shall be clockwise (indicated by an arrow) when seen from motor end.
- To check the direction of rotation watch the motor cooling fan rotation direction, switch on the pump for one or two seconds and switch off again.

- c. If the cooling fan rotates anticlockwise when viewed from the pump's motor end, the direction of rotation is incorrect. If the direction of rotation is incorrect:
- i) Isolated the pump's motor from the electrical supply.
 - ii) Reverse the electrical supply phase-wires in the pump-motor terminal-box.
 - iii) Recheck to ensure that the direction of rotation is now correct.
 - iv) When the direction of rotation is correct refit the cover to the pump motor terminal box.

PUMP INLET AND OUTLET



WARNING

Take all necessary precautions while pumping toxic, flammable or explosive gases. If not taken, can cause injury to workers.



MVB pump should be used with a suitable backing pump. When you connect the pump to the process system:

- a) Pump inlet outlet connection are made of standard ISO flanges as described in specification table.
- b) MVB pump have discharge at the underside of the pump.
- c) For optimum pumping speed ensure that the pumping line has size as per the specification.
- d) Use flexible connection in pipeline from the vacuum system to the pump to reduce vibration and stress in pipeline of system.

MOUNTING

- a. Everest MVB's should always be operated in a horizontal and level position. MVB's should never be installed in an upright (vertical) or angled position. Suction is always from top of MVB and discharge is from bottom.
- b. Always use VFD (Variable Frequency Drive) for MVB's smooth & trouble free operation. It diminishes the chances of timing out of MVB.
- c. Inlet and outlet connections should not be smaller than those mentioned in specification table for each model.
- d. Before installing a MVB for pumping a hazardous gases pumping, please consult EVEREST.
- e. Adequate size of backup pump is required for running the MVB. Lower the proportionality pressure, lower is the power consumption & higher is the vacuum achieved.
- f. The discharge path should be free from any restriction. This may lead to MVB damage and lower efficiency.

BACKING PUMP

The performance for any given size mechanical vacuum booster varies by changing the backing pump capacity, which alters the staging ratio (That is the ratio between the theoretical booster displacement and the actual backing pump speed).

The most common backing pumps are Dry Screw Vacuum Pumps, oil sealed rotary pumps, liquid ring pumps steam ejectors and liquid ejectors. Some performance curves for MVB are shown with Dry Screw Vacuum Pumps & MVB combinations.



OPERATION

GENERAL



WARNING

Don't operate the MVB without guards in place.



Before starting the MVB for the first time under power, recheck the installation thoroughly to reduce the likelihood of troubles. Use the following check list as a guide, but also consider any other special conditions in your installation.

- a) No bolts, rags or dirt has been left in MVB.
- b) Inlet piping should be free of debris/welding particles.
- c) If installation is not recent, check booster leveling, coupling alignment, and tightness of all mounting bolts.
- d) Volume of oil in the oil reservoir chambers.
- e) Leakage in setup should be under permissible limit.
- f) Driving motor is connected through suitable electrical overload devices. Earthing also needs to be ensured.
- g) With electrical power off and locked out to prevent accidental starting, rotate MVB shaft by hand to make sure MVB is rotating freely. Unevenness or tight spots is an indication of a problem that should be corrected before progressing to the next step.
- h) Check motor rotation by momentarily pushing the start button and check flow direction of the MVB. Reverse the motor connections if flow is in the wrong direction.

Initial startup will be done under "no load" conditions. Select the adequate size of backup pump which generates the required cut-in pressure along with the pumping capacity. Please refer specification sheet for cut-in pressure and required backup pump capacity. Then start the backup and wait until the required cut in pressure is achieved. Start the MVB, check for any unusual noise, vibration or other abnormal activity. In VFD, check that the MVB is coast free to stop.

Assuming all tests are satisfactory, the MVB is now ready for continuous full load operation. During the first several days, make periodic checks to determine that all conditions remain acceptable and steady. These checks may be particularly important if the MVB is part of a process system where conditions may vary. Also, recheck leveling, coupling alignment or belt tension, and mounting bolts for tightness every fortnight.

STARTING THE MVB PUMP

All the running and restricted parameters are shown in technical data sheets of MVB. Follow the data sheet for trouble free operation of MVB. The operating temperature of MVB depends upon the sealing arrangement. It generally varies between 25°C to 120°C.

- Close all valve to atmospheric pressure, ensure all opening to be closed.
- Switch on the backing pump and open backing valve if fitted.
- Switch on the Mechanical Vacuum Booster Pump, open inlet isolation valve slowly.
- Allow pump to run normally to achieve normal operating temperature.

SHUTDOWN

- Close pump inlet isolation valve (if fitted).
- Shut down the MVB by turning off the motor.
- Flush the booster if required or recommended.

MAINTENANCE & INSPECTION

GENERAL

It is recommended a maintenance plan and schedule to be adopted as per instruction given. Regular inspection of your MVB and its installation, along with complete checks on operating conditions will pay dividends in added life and usefulness. Also, service the drive as per manufacturer's instructions and lubricate the coupling or check belt drive tension. By use of thermometers and gauges, make sure that MVB operating temperature and pressure remain within allowed limits. The Booster and parts may contain hazardous media. Assure that pump and parts are evacuated of hazardous media prior to servicing.



CAUTION

The electrical service must be isolated and de-energized prior to maintenance. Apply appropriate procedures to assure electrical supply is de-energized during maintenance.



Assure piping and product is isolated prior to maintenance of booster. Apply appropriate procedures to assure piping and product is isolated and that inadvertent opening of valves cannot occur during maintenance.



CAUTION

During routine maintenance, inspect and assure that guards are in place and secure.



PERIODIC INSPECTION SCHEDULE:

A sound maintenance schedule will add years of trouble free services to your MVB. A newly installed MVB should be checked frequently during the first month of operation, especially lubrication. Follow the below minimum maintenance schedule as shown.

Table 2: General checklist for effective inspection of MVB.

Frequency	Maintenance Check
Daily	<ul style="list-style-type: none"> ✓ Check and maintain oil level, and add oil, if necessary. ✓ Check the electrical current load on the motor (Amps), temperature of MVB, inlet/outlet pressures. ✓ Check whether MVB rotates smoothly and in correct direction (Clockwise from motor side). ✓ Check MVB for any excessive noise and vibrations. ✓ Check for any sign of external oil leakage.
Weekly	<ul style="list-style-type: none"> ✓ Check electrical connection for loose connections of motor. ✓ Flushing and cleaning of lobes.
Monthly	<ul style="list-style-type: none"> ✓ Check the oil colour: if the oil colour is too dark, replace the oil. ✓ Check MVB coupling for any wear and misalignment.



MECHANICAL VACUUM BOOSTER MAINTENANCE AND INSPECTION SCHEDULE

Table 3: General inspection & maintenance schedule for MVB

Item	Check Point	Daily	Monthly	Quarterly	Half Yearly	Yearly
Motor Amperage	Any Change? Amperage as specified?	×				
Rotation	Is the rotation smooth and direction correct?	×				
Suction & Discharge Pressure	Is the pressure as specified?	×				
Noise & Vibration	Any abnormal sound or vibration?	×				
Temperatures	Any excessive oil or water temperature?	×				
Oil Level Gauge	Is oil at proper level?	×				
Oil Leaks	Any signs of oil leaks?	×				
Coupling Alignment	Coupling Alignment and Bolt tightness.		×			
Lubricant Color	Check color; if dark, replace lubricant		×			
Oil Level	If oil level drops drastically, check seals.		×			
Oil change				×		
Suction & Discharge Piping	Is there any accumulated scale or dirt?			×		
Process and Utility piping and supports	Check all flanges, pipes and connections and tighten it				×	
MVB casing internal and Rotor surfaces	Any signs of rust and flaw found?					×
Oil Seal, Bearing, O-Ring	Inspect for damage & replace as needed.					×
Timing Gears	Inspect for damage					×

COUPLING ALIGNMENT

Align coupling by using Dial Gauge. The concentricity should be as follows:

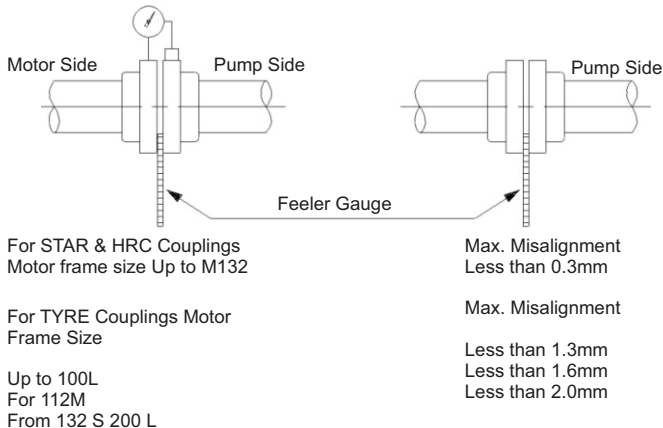


Fig 5: The right way of aligning the coupling and the shaft.

STUCK MVB CLEANING:

1. Isolate the MVB from the piping connection. Blind the MVB discharge.
2. Pour product miscible solvent slowly into suction port. Wait for few minutes until the MVB is full of solvent.
3. Repeat previous steps until MVB cannot get more solvent. Leave the MVB at least one hour until the precipitate can act enough with solvent.
4. Insert chain wrench into running device hub, rotate pump to clockwise.
5. If you cannot rotate it, repeat the steps 2-4 (Leave pump with more solvent).
6. If you can rotate it, keep going to next step.
7. Put suitable container under the MVB exhaust then remove the blind flange.
8. Rotate MVB three or four times completely by chain wrench. It is possible that MVB can't rotate.
9. If necessary, repeat steps 5 and 6.
10. Separate blind flange in pump suction line. Reconnect pump suction line to process system or open the suction valve.
11. Reconnect pump discharge line to discharge port.
12. If necessary, turn on power of pump motor.

DISMANTLING & ASSEMBLY

GENERAL:

The operating temperature in the MVB will increase by the compression work done on the process product. However, if the temperature increase locally and/or the external paint becomes scorched, it indicates a faulty MVB. The localized hot spots are typically due to rubbing of rotors with casing, or foreign material ingestion, such as process material built-up, metal chips or solid particulate. In this case, shut down the MVB immediately for inspection. In certain cases, the rotors and the casing may have been corroded. This corrosion induces to increase the clearance between the rotor and casing. This will increase the reversal flow of gas from the MVB discharge to the suction (increased slip), and the pumping capacity will decrease. In this case, shut down MVB and inspect the clearance to determine the required corrective actions. Request for appropriate technical support to your MVB from EVEREST.

- a) Unusual bearing temperature, vibration or noise can be detected by routine inspection. Thus, daily routine inspection of the MVB is highly recommended.
- b) Abnormal interference between rotors or between rotors and casing can be detected by using the stethoscope.

DISMANTLING PROCEDURE

- a) Disconnect all process pipeline and electrical connections. Remove motor, coupling, and key.
- b) Open oil fill/drain plugs (44) from GSP cover (8) & PSP cover (19).
- c) Remove the PSP Cover (19) by using jacking bolts. Oil seal (23) will come along with PSP cover.
- d) Remove the GSP Cover (8). Make sure that GSP cover (8) doesn't fall on Gears (10). It may damage the Gear profile.
- e) Remove the Gears (10) from both the shafts by opening the bolts. Make sure that gear hub (9) should not come along with gears.
- f) Open the bearing clamp (PSP side) (6), then remove the PSP plate (2), lip seals (23) & bearings will come out along with plate. Now, the rotors can be seen from motor side of MVB.
- g) Remove the gear hub (9) using jacking bolts, then remove key. Then remove the bearing clamp of GSP side (7).
- h) Pull the rotors (4, 5) out of Body (1).
- i) Remove the GSP plate (3), Lip seals (22) will be removed along with plate.

DISMANTLING & ASSEMBLY

All disassembled parts are to be cleaned by solvent and parts which have abrasion or damage should be changed with factory approved parts which are indicated by EVEREST. After every disassembly, MVB should be assembled with new bearings, seals, gasket and o-rings.

ASSEMBLY PROCEDURE

- a) Clean all the parts with diesel/suitable cleaner before reassembly. They should be free from corrosion, process and foreign materials. Assembly should be done vertically.
- b) Place the lip seals (22) in GSP plate (3) using special seals mounting tool.
- c) Bolt the GSP plate (3) on body (1).
- d) Mount the rotors (4,5) in body (vertical orientation) by keeping the GSP plate (3) downwards. Make sure that lips of lip seals (22) should not get damaged while mounting. Fit bearings (21) in GSP plate (3).
- e) Mount the gear hub (9) on shaft.
- f) Mount the PSP plate (2) (lip seals pre-installed) on other side of body (1). Bolt it and make sure that lips of lip seals (23) are not damaged while mounting.
- g) Fit bearings (20) in PSP plate and mount the gears (10) on GSP side shaft side.
- h) Do timing of rotors by maintaining the clearance between the rotors (4, 5), rotors (4, 5) & Body (1) & in-between rotors (4, 5) and side plates (2, 3). Tighten the timing gears (10). Check timing by rotating the rotors, they should rotate freely without touching each other.
- i) Mount the gear cover (8). Bolt it.
- j) Mount the PSP cover (19). Bolt it. Then fit the lip seal (23) of seal adaptor housing.
- k) Install key and coupling. Reassembly completes.



EXPLODED VIEW & PART LIST

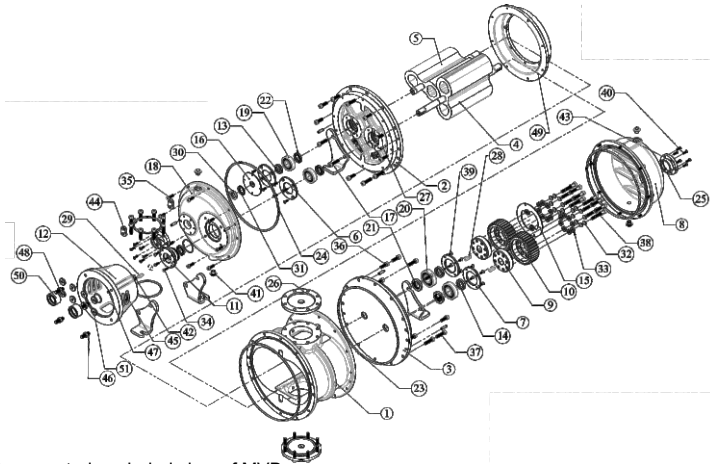


Fig.6: CAD generated exploded view of MVB.

S. NO.	DESCRIPTION	QTY.	S. NO.	DESCRIPTION	QTY.
1	BODY	1	27	PARALLEL DOWEL	6
2	PSP	1	28	PARALLEL KEY (HUB SIDE)	2
3	GSP	1	29	PARALLEL KEY (MOTOR BKT SIDE)	1
4	DRIVE SHAFT ASSY.	1	30	BRG. LOCK NUT	1
5	DRIVEN SHAFT ASSY.	1	31	LOCKING WASHER	1
6	BRG. CLAMP (Drive Shaft)	2	32	SPRING WASHER	16
7	BRG. CLAMP (Driven Shaft)	2	33	SPECIAL PLAIN WASHER	18
8	GEAR COVER	1	34	HSHC SCREW (Oil Seal Housing)	4
9	TIMING HUB	2	35	HSHC SCREW (Plates to Covers)	16
10	TIMING GEAR	2	36	HSHC SCREW (Body to Plates)	14
11	OIL SEAL HOUSING	1	37	HSHC SCREW (Body- Flang, Leg,Hook)	26
12	MOTOR BRACKET	1	38	HSHC SCREW (Gear to HUB)	16
13	SPLASHER SPACER	1	39	CSK SCREW (Brq. Clamp to Plate)	16
14	GEAR BRG. SPACER	2	40	CSK SCREW (Sight Glass Assy.)	12
15	OIL SPLASHER DISC (Gear Side)	1	41	DRAIN PLUG WITH O-RING 3/8"	4
16	OIL SPLASHER DISC (Pulley Side)	1	42	DRAIN PLUG WITH O-RING 1/4"	2
17	LEG	2L+2R	43	SIGHT GLASS ASSY./OIL LEVEL INDICATOR	2
18	PSP COVER	1	44	BOOSTER LIFTING HOOK	2
19	BEARING (PSP)	2	45	STUD (Motor Bracket)	4
20	BEARING (GSP)	2	46	STUD (PSP Cover to Bracket)	4
21	LIP SEAL (Gear End)	2	47	HEX NUT	4
22	LIP SEAL (Pulley End & Seal Housing)	3	48	HEX NUT	4
23	O-RING (Plates to Body)	2	49	GEAR COVER MOUNTING RING FOE EVB 05	1
24	O-RING (Plates to Covers)	2	50	AXIAL BUSH EVB 30	2
25	O-RING (Oil Seal Housing & Sight Glass Assembly)	3		AXIAL BUSH FOR EVB 50	4
26	VACUUM FLANGE WITH O RING	2	51	BRG. CLAMPS (Washer) EVB 50	8

FAULT FINDING AND TROUBLESHOOTING

Table 4: Troubleshooting of common problems that may occur in MVB.

FAULT	PROBABLE CAUSE	REMEDY
MVB overheating	<ul style="list-style-type: none"> Leakages in MVB or process side blockage in MVB discharge Higher inlet temperature Higher proportionality pressure across the MVB. 	<ul style="list-style-type: none"> Plug leakages in process or MVB Free discharge Install pre cooler Check backup pump vacuum
MVB motor drawing Over current	<ul style="list-style-type: none"> Check for all the probable Causes as shown in mvb Overheating. Motor faulty 	<ul style="list-style-type: none"> Check for all the remedies shown in MVB overheating Contact motor supplier
Over heating of bearing and gears	<ul style="list-style-type: none"> Inadequate lubrication Over filling of oil in chambers Other MVB overheating causes As mentioned above. 	<ul style="list-style-type: none"> Properly lubricate the booster Maintain recommended oil levels Remedies suggested in above column.
Vibration	<ul style="list-style-type: none"> Coupling misalignment Motor or MVB not properly grouted Vibration from Interconnecting piping 	<ul style="list-style-type: none"> Align the coupling Do proper grouting of machine Use dampners/bellows to bsorb inline vibrations
MVB jamming	<ul style="list-style-type: none"> Disturbed internal clearances Process material deposition Foreign material deposition or welding burrs/chips enter in MVB Excessive overheating of MVB 	<ul style="list-style-type: none"> Set timing Do flushing after each batch Ensure proper flushing of lines before mounting the MVB Take care of overheating cause
Heavy knocking sound while running	<ul style="list-style-type: none"> Timing out of MVB gears Hammering sound due to air Worn bearings/gears 	<ul style="list-style-type: none"> Adjust MVB gears timing Change bearings/gears
Oil leakage from booster	<ul style="list-style-type: none"> Incompatible seals Shaft under size Higher vibration 	<ul style="list-style-type: none"> Check chemical compatibility of seals with process media Change shaft or install speedi sleeve if possible Reduce vibrations

DISPOSAL NOTE

If you have any doubts about the disposal requirements for specific substances or components, contact your supplier or Everest for advice. Dispose of the Mechanical Vacuum Booster, cleaning solution, deposits removed from the pump, used pump oil and any components safely in accordance with all local and national safety and environmental requirements.

Take particular care with the following:

- Fluoro elastomers which may have decomposed due high temperatures.
- Oil & rubber which have been contaminated with dangerous process substances.

WARRANTY

Subjected to the terms and conditions here in after and set forth in general terms of sale, Everest Blower Systems Pvt. Ltd. warrants products and its manufactured parts, when shipped, and its work (including installation and start-up) when performed, will be of good quality and will be free from defects in material and workmanship. This warranty applies only to seller's equipment, under use and service in accordance with seller's written instructions recommendations and ratings for installation, operating, maintenance and service of products, for a period as stated in the table below. Because of varying conditions of installation and operation, all guarantees of performance are subject to plus or minus 5% variation. (Non standard materials are subject to a plus or minus 10% variation).

Table 5: Troubleshooting of common problems that may occur in MVB.

Product Type	Warranty Duration
New	15 months after date of shipment or 12 months after initial start up date, whichever occurs first
Repair	6 months after date of shipment or remaining warranty period, whichever is greater
Remanufactured	9 months after date of shipment or 6 months after initial start up date, whichever occurs first

This warranty extends only to buyer and/or original end user, and in no event shall the seller be liable for property damage sustained by a person designated by the law of any jurisdiction as a third party beneficiary of this warranty or any other warranty held to survive seller's disclaimer.

All accessories furnished by seller but manufactured by others bear only at the manufacturer's standard warranty.

All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event within one (1) year from date of shipment of the applicable item and all claims for defective work must be made in writing immediately upon discovery and in any event within one (1) year from date of completion thereof by seller. Unless done with prior written consent of seller, any repairs, alterations or disassembly of seller's equipment shall void warranty. Installation and transportation costs are not included and defective items must be held for seller's inspection and returned to seller's ex-works point upon request.

There are no warranties, expressed, implied or statutory which extend beyond the description on the face hereof, including without limitation, the implied warranties of merchantability and fitness of purpose.

After buyer's submission of a claim as provided above and its approval, seller shall at its option either repair or replace its product, part, or work at the original ex-works point of shipment, or refund an equitable portion of the purchase price. The products and parts sold here under are not

warranted for operation with erosive or corrosive material or those which may lead to build up of material within the product supplied, or those which are incompatible with the materials of construction. The buyer shall have no claim what so ever and no product or part shall be deemed to be defective neither by reason of failure to resist erosive or corrosive action nor for problems resulting from build-up of material within the unit nor for problems due to incompatibility with the materials of construction.

Any improper use, operation beyond capacity, substitution of parts not approved by seller, or any alteration or repair by others in such manner as in seller's judgment affects the product materially and adversely shall void this warranty.

No employee or representative of seller than an officer of the company is authorized to change this warranty in any way or grant any other warranty. Any such change by an officer of the company must be in writing.

The foregoing is seller's only obligation and buyer's only remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under the general terms of sale in the sections on contract performance, inspection and acceptance and the patents clause hereof, the foregoing is buyer's only remedy here under by way of breach of contract, tort or otherwise, without regard to whether any defect was discovered or latent at the time of delivery of the product or work. In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within one year after the cause of action has occurred.

OPERATING DATA

It is to the user advantage to have the requested data filled in below and make available in the event of a problem develops in the MVB. This information is also helpful when ordering spare parts.

Model No.: _____ Coupling Size: _____
 Serial No.: _____ Type of Lubrication: _____
 Start-up Date: _____ MVB RPM: _____
 Operating Vacuum: _____ Motor KW: _____
 Any other special accessories supplied or in use: _____

Dearest Everest Customer,

Thank you for your purchase of Everest Products. To help us improve the products and services we provide you, please complete and return this questionnaire by fax / mail.

Fax : +91-11- 28114944, 28114955, 28117469, 28116307

Email: service@everestvacuum.com

EVEREST WANTS TO KNOW WHAT YOU THINK

1. How did you first become aware of Everest's Products?

(a) Advertisement <input type="checkbox"/>	(b) Colleague's Recommendation <input type="checkbox"/>	(c) Internet <input type="checkbox"/>
(d) Trade Show <input type="checkbox"/>	(e) Others _____	

2. What Industry are you in? _____

3. What convinced you to purchase Everest Products?

(a) Prior Experience using Everest Products
(b) Product quality
(c) Technical Support
(d) Knowledgeable sales people
(e) Service support
(f) Product Reliability

4. Please Indicate what Everest products do you use.

5.

(a) Did you find it easy to place your order with us	Yes <input type="checkbox"/>	No <input type="checkbox"/>
(b) Did you receive your order on time?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
(c) Is the shipment complete and free from damage?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
(d) Are you satisfied with the workmanship?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
(e) Is the documentation complete	Yes <input type="checkbox"/>	No <input type="checkbox"/>
(f) Is it performing to your expectations?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

6. With respect to the above items, would you please indicate by its corresponding question number, in which areas can Everest most improve?

5 (a) <input type="checkbox"/>	5 (b) <input type="checkbox"/>	5 (c) <input type="checkbox"/>	5 (d) <input type="checkbox"/>	5 (e) <input type="checkbox"/>	5 (f) <input type="checkbox"/>	5 (g) <input type="checkbox"/>
--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------------



7. In order for us to maintain accurate records and minimize duplication of this questionnaire, we would appreciate if you will complete the following:

QUESTIONNAIRE, WE WOULD APPRECIATE IF YOU WILL COMPLETE THE FOLLOWING:

Name : _____

Company : _____

Designation : _____

Address : _____

City : _____

State : _____

Country : _____

Postal Code : _____

Phone : _____

Fax : _____

Email : _____

Website : _____

8. Comments : _____

Thank you for your time and input.

For internal use only:

Received By:	Received on (Date):
Opportunity for improvement/complaint	
Signature (Service Head):	Signature (Unit Head):
Signature (COO):	Signature (Director):

Thank you for purchasing your equipments from Everest. In our pursuit of complete customer satisfaction we would appreciate your comments on the usefulness and readability of this manual. Please fax or mail this sheet to Everest Blower Systems Pvt. Ltd., Plot No. 6, Sector 16, HSIIDC, Bahadurgarh - 124507, Haryana, India. Mail: service@everestblowers.com. If we can be of any assistance to you, feel free to contact us at +91-11-45457777 , +91 9992333011, 8199936400, (Monday to Saturday, 9:00 AM to 5:30 PM Indian standard time). Our weekly off day is sunday. Thanking you once again,

Manager
 Technical Publications.

Everest MVB Model No. _____ Everest Order No. _____

Revision Date of Manual _____

Please rate the following items :

- | | | | |
|---|-------------------------------|-------------------------------|-------------------------------|
| Compared to similar manuals, this manual is | Good <input type="checkbox"/> | Fair <input type="checkbox"/> | Poor <input type="checkbox"/> |
| Ease of reading is | Good <input type="checkbox"/> | Fair <input type="checkbox"/> | Poor <input type="checkbox"/> |
| Level of information is | Good <input type="checkbox"/> | Fair <input type="checkbox"/> | Poor <input type="checkbox"/> |
| Photographs and/or illustrations are | Good <input type="checkbox"/> | Fair <input type="checkbox"/> | Poor <input type="checkbox"/> |
| The amount of information was..... | Good <input type="checkbox"/> | Fair <input type="checkbox"/> | Poor <input type="checkbox"/> |

Comments:

Please Fax to +91 11 28114944, 28114955, 28117469
Your cooperation is greatly appreciated.

Thank You for your time and inputs.

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