



**CLEVELAND  
MIXER**

EST. 1940

# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

*GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M*



**Created For:**

**Customer PO No.:**

**Agitator Serial No.:**



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Contents

Safety Considerations for Operation ..... 3

Mixer Receiving and Unpacking..... 5

Installation Site ..... 6

Customer Pre-Installation Check ..... 6

Reviewing the Assembly Drawing..... 7

Page 1 of a Typical Assembly Drawing:..... 7

Page 2 of a Typical Assembly Drawing:..... 8

Fasteners..... 9

Reducer Lubrication ..... 10

Gearbox Oil Breather/Vent Information..... 10

Oil Fill Quantity, MTD Reducer - Vertical Shaft Mount (V1 Orientation) \*\* ..... 11

Approved Lubrication Types: ..... 12

MTD Series Oil Drain/Fill Port Locations ..... 13

Note: The fill and drain port locations may vary slightly based on the case size. .... 13

Mixer Assembly..... 14

*System Force Diagram 1* ..... 15

Rigging/Installation Recommendations..... 15

Lifting the Drive Unit (Motor and Gearbox) ..... 16

The Proper use of Shaft Catchers if Included: ..... 19

Impeller Assembly..... 20

Standard Impeller Styles ..... 22

Shrink Disk Couplings ..... 23

Shaft Couplings ..... 24

Electric Motors..... 25

Motor Install – For Keyed Motor Output/Hollow Gearbox Input Interface ..... 26

Mixer Seals ..... 27

Packing Gland/Stuffing Box Operating Instructions ..... 27

Stuffing Box Lubrication Information: ..... 27

Troubleshooting..... 28

Long Term Storage ..... 30



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Safety Considerations for Operation

### General

This safety information applies in addition to the relevant product-specific operating instructions and for safety reasons must be taken into particular consideration in every case.

This safety information is intended to protect persons and objects from injury and hazards which can arise from improper use, incorrect operation, inadequate maintenance or other incorrect handling of electric drive units in industrial installations. Low-voltage machines have rotating parts and may have parts that are live, even when the machine is at rest, and surfaces that may become hot in operation. Warning signs and information signs on the machine are to be observed without exception. Details may be found in our detailed operating instructions. They are provided with the machine when it is supplied and can be requested separately as required by stating the mixer model.

### Personnel

All necessary work on electric drive units, in particular also planning work, transport, assembly, installation, commissioning, maintenance, repair, may only be performed by adequately qualified personnel who have the operating instructions provided and other product documentation available during any corresponding work and who are obliged to abide by the instructions contained therein. This work is to be monitored by a specialist supervisor. Qualified personnel are persons who are authorized due to training, experience, licensing, and instruction as well as their knowledge of relevant standards, rules, accident prevention regulations and operating conditions by the person responsible for the safety of the installation to perform the activities required in each case and who are able to recognize and avoid possible hazard.

Knowledge of first-aid measures and of the available lifesaving equipment is also required.

Non-qualified personnel shall be forbidden to work on gearbox/motor components.

### Intended use taking into account the relevant technical regulations

These machines are intended for commercial installations, unless otherwise expressly agreed. Use in a potentially explosive atmosphere is forbidden, if not expressly intended for this purpose (refer to additional information, TEXP information, etc.). If in a special case, such as use in a non-commercial installation, increased safety precautions are required (e.g. protection against access by children's fingers), these conditions are to be ensured when setting up the installation. The machines are designed for ambient temperatures between -20 degrees Celsius to +40 degrees Celsius as well as for installation heights up to 1000 meters above sea level. Data for mixers designed for differing ambient temperatures will be located on the mixer rating plate.

Any deviations found on the mixer rating plate must be taken into consideration.

The conditions at the place of work must correspond to all mixer rating plate data.

### Operating Instructions

For reasons of clarity, the operating instructions and safety information do not contain all information relating to all mixer types or configurations and cannot take into account every conceivable case of installation, operation or maintenance. The information is essentially limited to that which is required for qualified personal in normal working conditions. Any unclear points can be clarified by contacting Cleveland Mixer.

### Transportation and Storage

The eye bolts located on the motor are only to be used to lift the motor. The eye bolts should never be used to lift a motor while attached to a gearbox unit.

Damage sustained after delivery must be reported to the haulage company immediately. Commissioning may have to be suspended.

If components are to be stored, ensure a dry, dust free and low vibration environment. The life of the lubricants and seals is reduced with longer storage times.

There is a risk of fracture at very low temperatures (under approximately -20°C).



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Assembly

**Caution!** Depending on the reduction ratio, motor/gear assemblies develop substantially higher torques and forces than high-speed motors of similar power alone.

Mounts, substructure and torque restraint are to be rated for the high forces that are to be anticipated during operation and secured sufficiently against loosening.

**The mounting point for the mixer assembly should be rated for infinite rigidity to reduce the risk of excess vibration or component failure. To determine the static and dynamic loads of a specific mixer, please refer to the assembly drawing supplied with the mixer.**

Please refer to the *Handbook on Industrial Mixing* for questions regarding mixer mounting structures.

The output shafts as well as any rotating torque transmission elements mounting on/to it (couplings, retainers, etc.) are to be covered so that they cannot be touched.

## Connection of Electrical Power

All work shall only be carried out by qualified technical personnel on a stationary machine which has been protected against re-starting. Follow proper lock-out/tag-out procedures. This also applies to auxiliary circuits (e.g. stationary heating). Remove any transportation blocks, packing materials and tools before start-up.

## Commissioning

Before commissioning, protective films and wrappings are to be removed from all surfaces. Be sure the oil breather plug/valve dust cover has been removed to oil for proper ventilation of the gearbox. Be sure the impeller(s) is rotating in the designed direction, typically clockwise when looking down at the impeller. Observe the mixer/agitator system after first commissioning for at least one hour for any unusual heat, odor, or noises.

## Maintenance

In order to prevent breakdowns, danger and damage, the drive units must be examined at regular intervals depending on the operating conditions. The lubrication intervals for bearings and gear units specified in the respective operating instructions are to be observed. Worn or damaged parts are to be replaced using original spare parts or standard parts. In the event of heavy dust accumulation, clean exposed surfaces regularly to encourage cooling of the gear unit and motor. For all inspection and maintenance work, observe the information provided in the detailed operating instructions.

**Note: Use of a high pressure sprayer for cleaning of the gearbox and/or motor is not recommended**

## Operation

With certain layouts, relatively high temperatures can occur on the motor and gearbox case. These high temperatures are typically within the limits specified in the standard. If these drive units are located in a place where they are subject to intensive contact, measures must be taken by the installer or operator to provide protective shielding.

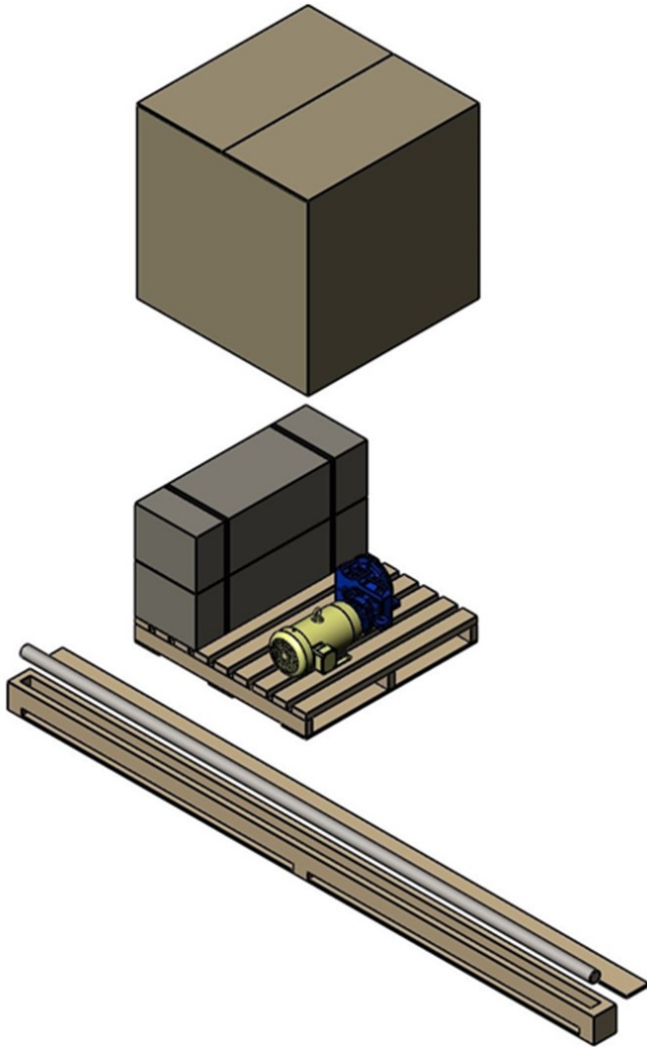


# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Mixer Receiving and Unpacking

Be sure to use care when uncrating, unpacking, lifting and handling your mixer. Certain parts such as impeller blades, hubs, couplings, steady bearings, seals, keys, hardware and other mixer accessories may be packed in boxes inside of crates or bolted down to skids. Do not discard any packing crates or materials until you've accounted for all the parts of your mixer assembly.



Make sure to check the packing slip for your shipment to make sure you've received the correct number of skids, crates and cartons. If any of the shipment was not delivered or delivered with visible damage, please contact the carrier to report the missing pieces or damage. Once you've contacted the carrier, please contact Cleveland Mixer so we can document the issue.

The weight of the mixer will be indicated on the mixer's assembly drawing and also in the shipping documents. It's important that the mixer be moved and installed by professionals. Any attempt to lift or move the mixer by an unqualified party can result in serious injury and catastrophic damage to the mixer.

The drive end of the mixer may be top-heavy. Never lift or rotate a gear reducer without the proper bracing. Doing so may result in instability of the reducer causing injury and/or damage to equipment.

Never lift the drive end of the mixer by the motor. Make sure when lifting shafting to keep the ends level so not to bend the shafting. After uncrating the mixer and parts, stage them on a level surface preferably indoors or in a clean dry location.

Some mixer parts such as shaft pullers are supplied to perform future maintenance. Cleveland Mixer suggests labeling these parts and putting them into storage.

The impeller shaft should remain evenly supported and horizontal when not installed on the mixer to prevent bending or damaging the surface of the impeller shaft. Cleveland Mixer recommends that you retain the impeller shaft shipping boxes for storage and maintenance purposes.

Cleveland Mixer suggests checking your unpacked mixer assembly parts against your packing slip and assembly drawing to make sure everything is accounted for before assembling your mixer



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Installation Site

Mixer drives must be properly installed if they are to produce the rated torque. Improper installation may lead to oil leaks, reduced life, or mechanical failure. Cleveland Mixer agitators are intended to be installed under the following conditions:

- Unimpeded air flow to and around the mixer.
- Accessibility to oil drain, motor, seal and breather plugs.
- Tank or mixer support must be able to support the weight of the mixer and the motion of the fluid.
- Unless special measures are taken, the immediate vicinity around the mixer drive should not be exposed to any aggressive or corrosive substances or gases.
- Tank nozzles should be rigid and strong enough to hold the weight of the mixer plus the forces of operation if the mixer is to be mounted directly to the tank.
- All bolt connection surfaces must be clean and free from contamination and corrosion. Tank/Flange/Beam mounting hardware and flange gaskets, if applicable, will be supplied by the customer
- The mixer mount stand must stand on and be bolted down to a solid level surface such as a concrete pad.
- Access to designed input voltage or air pressure to run motor.
- Access to seal flush plumbing when required.

The responsibility for the design and construction of the support foundation and tank is with the end user. The foundation must be adequate to withstand normal operating loads and possible overloads while maintaining alignment to attached agitator system components.

The mixer must be mounted in the designed orientation in order to stay properly lubricated. Consult Cleveland Mixer before making any changes to the mixer or mounting position.

## Customer Pre-Installation Check

1. Mixers are unpacked and all parts are accounted for.
2. The installation site meets requirements listed above
3. A professional is onsite with the correct equipment to safely and securely lift the mixer and it's components into position
4. A professional electrician is onsite to wire the motor/drive
5. The customer has all the necessary tools to install the mixer including a properly calibrated torque wrench.
6. The customer has read through the O&M manual for the mixer, the manual for the motor and manuals for mechanical seal or speed drive if applicable.
7. The tank is empty, clean and the customer has access to work inside to install impellers.
8. The steady bearing tripod has been laser aligned with the mixer shaft and welded in its designated location if applicable.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Reviewing the Assembly Drawing

The image below is an example of the assembly drawing sent with each mixer serial number. Refer to the table below each image for a brief description of the items noted.

### Page 1 of a Typical Assembly Drawing:

ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY.
1	266BA4616038FPNT	REDUCER, 2.375" HOLLOW BORE, CODE-4/, 46.16:1 RATIO, STANDARD FLANGE, CODE-3-/, 182TC NEMA INPUT, RINGFEEDER COVER W/HOLES	XX	1
	BALVECP3661T	MOTOR, 3HP, 1750RPM, 3/60/230/460, 182TC, TEFC, DRIP COVER	XX	1
3	BRGCD612180SFC	GCD6 BARREL	CARBON STEEL	1
4	FGMD61221X8CZC	12" FLANGE W/CLADDING & CORE, AL	CARBON STEEL/AISI 316 SS	1
5	SHCX8X1461XXS	MTD 6" LG. UPPER SHAFT	AISI 304 SS	1
6	CP3505007801SB	COUPLING	AISI 304 SS	1
7	KY55X700XXS	5/8" X 5/8" X 7" KEY	AISI 304 SS	1
8	TCAP5X8300S	TAPERED COUPLING, 2.5" SHAFT	AISI 304 SS	1
9	KY55X300XXS	5/8" X 5/8" X 3.00" KEY	AISI 304 SS	1
10	CP3005004063S4	CAP PLATE	AISI 304 SS	1
11	SHTX822602XXZ	UPPER SHAFT 2.5" X 226.0" LG. W/ TAPER & WELDED CPLG.	AISI 316 SS	1
12	SHCX822652122Z	2.50" DIA. X 336.5" LG. LOWER SHAFT W/WELDED CPLG.	AISI 316 SS	1
13	KY55X400138ZG	5/8" X 5/8" X 4.0" KEY W/GIB	AISI 316 SS	3
14	HBX3C2500250LZ	XTF-3R C-2500 HUB FOR 2.5" BORE	AISI 316 SS	3
15	BBA3X48X38X96ZX	AXF-3 BLADE X 48"	AISI 316 SS	3
16	BBA3X48X25X96ZX	AXF-3 BLADE X 48"	AISI 316 SS	6
17	MSAES-CSM-250-37283	2.5" MECHANICAL SEAL, CARBON VS. SILICONE CARBIDE FACES, W/KALREZ ORINGS, W/PIPE PLUGS	AISI 316 SS	1
18	TPX241500Z	TRIPOD FOR 2 1/4"-3" SHAFT	AISI 316 SS	1
19	SBB250TPXG	BUSHING FOR 2.5" SHAFT	GLASS FILLED TEFLON	1
20	BH24TPXZ	BUSHING HOUSING 2 1/4"-3" SHAFT	AISI 316 SS	1
21	MD6G36501550S	GUARD, MD6	AISI 304 SS	2
22	SHAFTCATCHER2500	SHAFT CATCHER 2.5" SHAFT	CARBON STEEL	1

Item No.	Description
1	Mixer model, Drawing/Serial Number and Revision - Have this information available when calling for assistance.
2	The Mixer Bill of Materials or BOM – Use this list as you unpack your mixer to confirm you have all components, hardware, etc. and that each item matches the description in item 2 above.
3	Reducer Mounting Detail – The mixer mounting bolt circle diameter or BCD as well as a description of the mounting bolts
4	General mixer information – Tank size, impeller shaft diameter/length, impeller diameter, rotation direction and rotation speed are contained here.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Page 2 of a Typical Assembly Drawing:

**MIXER DESIGN NOTES:**

- 1) IMPELLER SHAFT BENDING MOMENT: 10,932 IN. LBS.
- 2) MIXER REACTION TORQUE: 12,755 IN. LBS.
- 3) VISCOSITY: 100 CPS.
- 4) SPECIFIC GRAVITY: 1.26
- 5) MINIMUM REQUIRED TANK OPENING FOR IMPELLER ASSEMBLY OR BOLT ON HUB IS: 12.5" DIA.
- 6) TOTAL MIXER WEIGHT: 1327 LBS.
- 7) GEAR REDUCER WEIGHT: 439 LBS.
- 8) IMPELLER FINISH: 63RA.
- 9) WORKING DIMENSIONS IN DRAWING FROM MIXER MOUNTING BASE TO LOWEST IMPELLER. TOTAL SHAFT LENGTH IN BOM. ALSO INCLUDES PORTION THAT'S INSIDE THE BORE OF THE GEAR REDUCER.
- 10) CUSTOMER TO VERIFY TANK DIMENSIONS.
- 11) CUSTOMER TO LASER ALIGN TRIPOD +/- .06 CONCENTRIC WITH MIXER QUILL.
- 12) ITEM 21 IS FOR MAINTENANCE, HOLDS SHAFT IN PLACE FOR GEARBOX REMOVAL, AND IS SHIPPED SEPARATELY.

**GENERAL NOTES:**

- A) THIS APPROVAL DRAWING IS THE CONTROLLING DOCUMENT OF THE MIXER DIMENSIONS AND CONFIGURATIONS. ANY CHANGES TO THE MIXER DESIGN AFTER NOTICE TO PROCEED TO MANUFACTURING MAY HAVE COST AND DELIVERY IMPACTS ON ORDER.
- B) SEE ACCOMPANYING MOTOR DATA PACKET FOR FULL DESCRIPTION OF ELECTRIC MOTOR.
- C) MATERIAL CERTIFICATIONS WILL BE PROVIDED FOR MIXER WETTED ENDS WITH SHIPMENT.
- D) MOUNTING HARDWARE ON WETTED ENDS IS AISI 316 SS FOR STAINLESS STEEL COMPONENTS, AND GRADE 5 STEEL FOR CARBON STEEL COMPONENTS. GRADE 5 STEEL HARDWARE IS USED FOR NON WETTED ENDS, AND WILL BE SUPPLIED BY CLEVELAND MIXER.
- E) MOUNTING HARDWARE FOR TANK/MIXER CONNECTION IS TO BE PROVIDED BY CUSTOMER.
- F) IMPELLER SHAFT CRITICAL SPEED BASED ON A MIXER MOUNTING STRUCTURE STIFFNESS OF 1,000,000 IN. LBS. REFER TO ITEM 9 OF "THE HANDBOOK OF INDUSTRIAL MIXING" FOR MIXER MOUNTING STRUCTURE STIFFNESS.
- G) CHECK OIL LEVEL IN GEAR REDUCER BEFORE START UP.
- H) DO NOT OPERATE MIXER IF IMPELLERS ARE SEMI SUBMERGED.
- I) REFER TO O AND M MANUAL FOR INSTALLATION AND OPERATION GUIDELINES.

**DETAIL C SCALE 1 : 16**

**DETAIL B SCALE 1 : 16**

**DETAIL D SCALE 1 : 16**

**DETAIL F SCALE 1 : 16**

**Item 1**

**Item 2**

**Item 3**

**Item 4 – Important Call-In Details**

CUSTOMER TO WELD TRIPOD TO TANK BOTTOM. DIAMETER AT BASE OF TRIPOD IS 17".

BUSHING HOUSING SLIDES OFF BOTTOM OF SHAFT FOR EASY REPLACEMENT OF THE BUSHING. SHAFT PROTRUDES ABOUT 1.5" OUT THE BOTTOM OF THE BUSHING HOUSING.

1 REQUIRED

SCALE: 1:60 WEIGHT: SHEET 2 OF 2

UNLESS OTHERWISE SPECIFIED:  
 DIMENSIONS ARE IN INCHES  
 TOLERANCES:  
 FRACTIONAL ± 1/16"  
 DECIMAL ± .005"  
 ANGULAR ± .0015"  
 ONE PLACE DECIMAL ± .005"  
 TWO PLACE DECIMAL ± .010"  
 THREE PLACE DECIMAL ± .0025"  
 INTERPRET GEOMETRIC TOLERANCING PER:  
 MATERIAL:  
 COMMENTS:  
 REMOVE BURRS  
 ALL SHARP EDGES

PROPRIETARY AND CONFIDENTIAL  
 THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF CLEVELAND MIXER. ANY REPRODUCTION IN PART, OR AS A WHOLE, WITHOUT THE WRITTEN PERMISSION OF CLEVELAND MIXER IS PROHIBITED.

APPROVED	DATE	BY	APP. NO.
DESIGNED	DATE	BY	APP. NO.
CHECKED	DATE	BY	APP. NO.
ENG APPR.	DATE	BY	APP. NO.
MFG APPR.	DATE	BY	APP. NO.
G.A.	DATE	BY	APP. NO.

Item No.	Description
1	Mixer Design Notes – Bending moment, reaction torque, fluid properties as well as other mixer specific properties are included in this section.
2	General Notes – General installation/operation notes that are not necessarily mixer specific are included here.
3	Typically an isometric view of the customer's mixer is located here
4	Mixer model, Drawing/Serial Number and Revision - Have this information available when calling for assistance.





# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Fasteners

- Tighten all fasteners to the values shown unless specifically instructed to do otherwise.
- Lubricate all fasteners at assembly with fastener specific oil or anti-seize material
- If fasteners cannot be coated, use dry torque spec provided on chart. Loose hardware can cause catastrophic damage. It is very important to check all fasteners at scheduled maintenance intervals. Cleveland Mixer recommends that all fasteners be checked at least four times per year at a minimum.
- If your process is corrosive or sanitary check the wetted hardware to make sure it is the correct grade before assembly.
- Always use washers and lock washers if they were provided.

USA Standard	GRADE 5		GRADE 8		316 STAINLESS STEEL	
	FT LB DRY	FT LB LUBED	FT LB DRY	FT LB LUBED	FT LB DRY	FT LB LUBED
1/4-20	8	6.3	12	9	6	5
5/16-18	17	13	24	18	11	10
3/8-16	30	23	45	35	20	17
7/16-14	50	35	70	50	33	28
1/2-13	75	55	110	80	45	38
9/16-12	110	80	150	110	59	50
5/8-11	150	110	210	160	96	82
3/4-10	260	200	380	280	131	111
7/8-9	430	320	600	450	202	172
1-8	640	480	910	680	299	254

- Calculated tightening torques are based on conventional 60°F, clean and dry or lubricated (as indicated above) thread. Standard fasteners will be supplied with a split lock washer.
- Cleveland Mixer recommends SAE grade 5 or SAE grade 8 hardware



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Reducer Lubrication

Routine oil analysis, sound lubrication practices and good tracking of oil performance trends will help extend the life and maximize the performance of the agitator and agitator components.

### Extreme Operating Conditions

Additional precautions could be necessary in environments that are extremely wet or environments with poor air quality from dust or other contaminants. Please notify Cleveland Mixer before operating a GCD agitator in any of these conditions.

Environments with extreme seasonal temperature swings might require oil changes, using different oil grades based on the seasonal temperature or a protective covering built over the mixer drive to protect the mixer from over exposure. Please consult the factory if your mixer will be operating in an environment with extreme temperature variation.

### Lubricant Changes

MTD gearboxes are shipped from the factory with a pre-determined oil fill level in accordance to the specific reducer size and mounting position.

Cleveland Mixer MTD reducers are well sealed and designed to operate with little maintenance as long as they are operated within the gear reducer load limits. In normal operating conditions and with a lubricant temperature of approximately 80 Degrees Celsius, the oil should be replaced after approximately 15,000 operating hours when using CLP 220, or after 25000 operating hours when using PGLP 220/PGLP 460. The lubrication interval must be reduced at higher temperatures (halve it for each 10K increase in the lubricant temperature).

The lubricant must be changed after 2 years at the latest even if the operating hours are less than 15,000.

The medium and larger gear units have filling plugs and drain plugs. In the standard designs, these make it possible to change the lubricant without disassembly. With smaller gear units, the interior is accessed by unscrewing the connecting bolts. Alignment pins and centrings secure the precise assembly.

### Oil Change Procedure:

1. Drain the oil from the reducer (see fill/drain port diagrams)
2. Take a look to make sure the oil looks clean and clear. If the original oil is foamy and dark in color or has flakes of metal in it (a flashlight can be used to assist in examining the oil for metal flakes), please contact Cleveland Mixer for assistance.
3. Refill the reducer with the specified amount of appropriate oil.

## Gearbox Oil Breather/Vent Information

During the installation and commissioning process, once the mixer is in place and securely fastened to the mixer support structure, the gearbox pressure relief valve cover can be removed (see the image of the pressure relief valve below).

Breather on the MTD series mixers are Heinrichs breathers – a ball and spring loaded blow off valve. If the pressure exceeds the spring constant/weight of the ball it lifts the head just until the pressure is no longer enough to lift the head. Then the spring and ball pull the head back down to the closed position.

The head on the breather has a lip and O-ring to seal it off when closed. If pressure builds up behind it, it lifts slightly as a result and releases the pressure from the gearbox as needed until it is able to close again.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

There is not an open or closed position on the pressure valve as it is more of a relief valve.

There will not be much noticeable movement, if any at all, just enough to let air out. Again, it only releases when pressure build up in the gearbox exceeds the breather rating (sized to protect against the pressure blowing out the output seals, the breather will give first).

Pressure build ups are typically due to large temperature swings (air/oil expansion) or instantaneous overloads. You can manual pull the head of the breather to see but it hardly moves. When release, it will pull shut instantly.

A general picture of a comparable breather:



## Oil Fill Quantity, MTD Reducer - Vertical Shaft Mount (V1 Orientation) \*\*

MIXER MODEL	UNIT OF MEASURE	FILL QUANTITY
MTD-1	LITERS	1.45
MTD-2	LITERS	2.20
MTD-3	LITERS	3.20
MTD-4	LITERS	4.90
MTD-5	LITERS	6.70
MTD-6	LITERS	12.30
MTD-7	LITERS	24.20
MTD-8	LITERS	32.20
MTD-9	LITERS	62.00

\*\*Lubricant quantities and lubricant types should be compared with the rating plate located on the gear box.

### Lubrication Notes:

1. Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
2. When making a lubrication change, check with the lubrication supplier to ensure compatibility and to obtain recommended cleaning or flushing procedures.
3. Do not mix different oils with different additive packages or different base oil formulation types.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Approved Lubrication Types:

	Lubricant Type			
	Mineral Oil	Synthetic Oil		USDA H1 Oil
	ISO VG 220	ISO VG 68	ISO VG 220	ISO VG 220
<b>Disposal No.</b>	ASN 13 02 05	ASN 13 02 06	ASN 13 02 06	ASN 13 02 06*
	<b>Standard oil for mixer series:</b>	<b>Low Temperature Oil for mixer series:</b>	<b>High Temperature Oil for mixer series:</b>	<b>Foodstuffs industry oil for mixer series:</b>
	MTD-1 Through MTD-9	MTD-1 Through MTD-9	MTD-1 Through MTD-9	MTD-1 Through MTD-9
<b>Lubricant Manufacturer</b>				
AGIP	BLASIA 220			
ARAL	DEGOL BMB220 DEGOL BG220		DEGOL GS220	
BECEM RHUS	STAROIL SMO220			
BP	ENERGOL GR-XP220		ENERSYN SG-XP 220	
CASTROL	ALPHA SP 220 ALPHA BMB 220 OPTIGEAR BM 220 TRIBOL 1100/220	Alphasyn T68	ALPHASYN PG220 TRIBOL 800/220 ALPHASYN GS 220	CASTROL OPTILEB GT 220 CASTROL TRIBOL FOODFROOF 1800/220
CHEVRON	GEARTEX EP-A SAE 85W-90 Meropa 220		Synlube WS 220	Chevron Lubricating Oils FM 220 (USA)
FUCHS	RENOLIN CLP 220 RENOLIN CLPF 220 SUPER	RENOLIN UNISYN CLP 68	RENOLIN PG 220	
KLUBER	KLUBEROIL GEM 1-220 N		KLUBERSYNTH GH6-220	KLUBEROIL 4UH1-220N KLUBERSYNTH UH1 6-220
MOBIL	MOBILGEAR 600 XP 220 MOBILUBE HD PLUS 80W-90	MOBIL SHC 626	GLYGOYLE 220 GLYGOYLE 30	
OEST	Gearol C-LP 220			
SHELL	OMALA S2 G220 FALCON CLP 220		OMALA S4 WE 220	CASSIDA FLUID GL 220
TOTAL	CARTER EP 220			NEVASTANE SL220
WINTERSHALL	SRS ERSOLAN 220			

## Bearing Lubrication

The lubrication period for bearings on reducers with a NEMA input adapter, or motor frame size of 284TC and larger, will be 2000 operating hours or 6 months, whichever is soonest.

With lubrication intervals of up to half a year, the grease filling in the bearing can be supplemented at intervals of 1000 operating hours by periodically adding fresh grease. The complete grease filling must, however, be replaced after three grease top-ups at the latest. The grease top-up is approximately 30g. However, three times this quantity will be required (approximately 90g) when replacing the grease. When this is done, the surplus used grease should also be removed from the grease chamber. The typical food grade grease recommended is *Motor bearing grease Klüber UH1 14-151*.



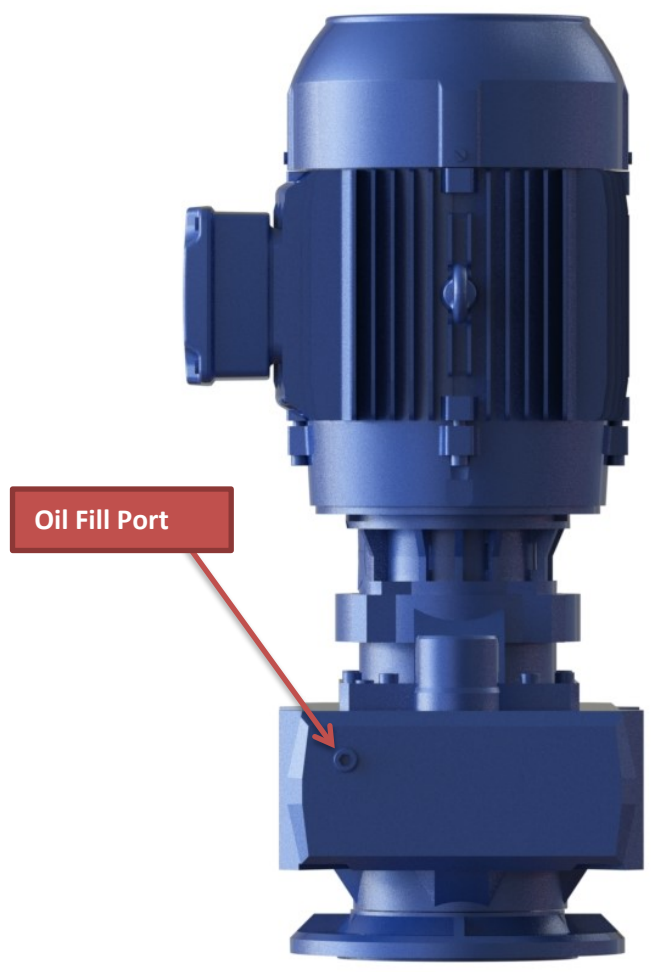
# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## MTD Series Oil Drain/Fill Port Locations

**Note:** The fill and drain port locations may vary slightly based on the case size.

Side View of the Gearbox:

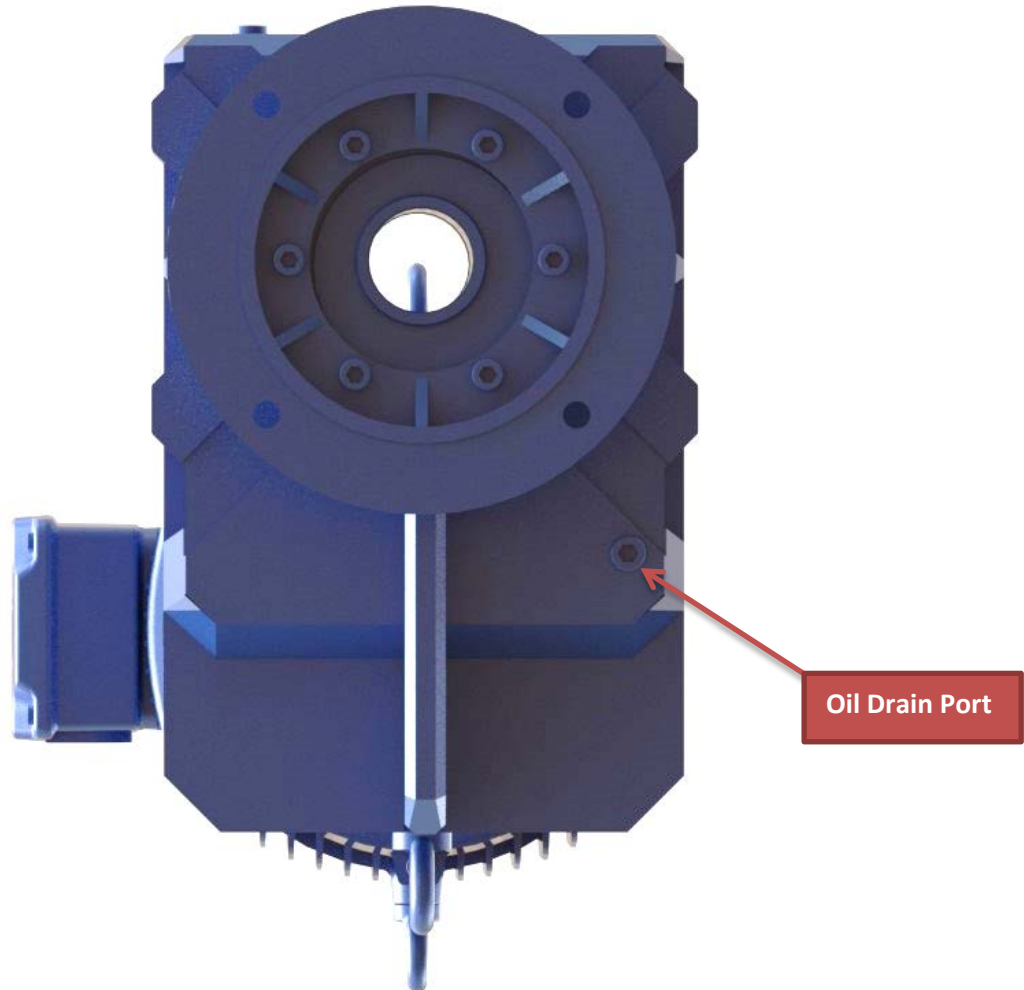




# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

Bottom view of the gearbox, looking up:



## Mixer Assembly

Before mounting the mixer, the customer will need to check the following:

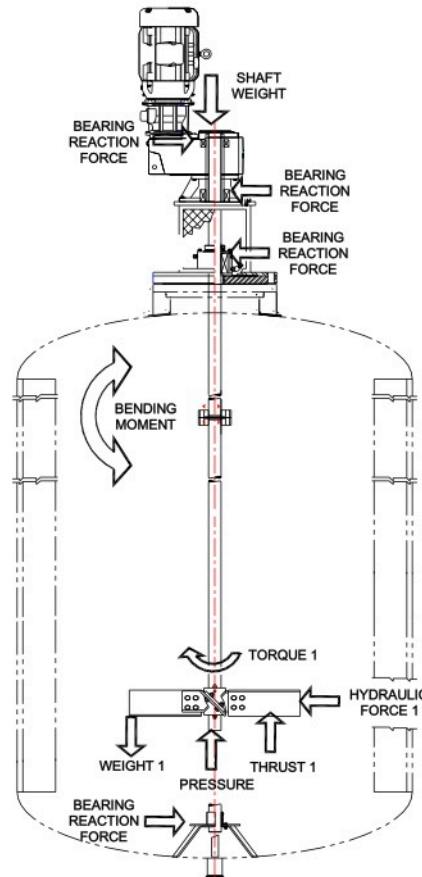
1. The mixer support structure, tank walls and tank nozzle are strong enough to support the weight of the mixer and the forces produced by the agitator. See the 'System Force Diagram 1' below for a basic example of forces acting on the overall agitation system and tank.
2. The tank bolt circle diameter matches the mixer bolt circle diameter
3. Tank mounting flanges will be selected for the specific application if applicable. The flange sizes will be standard ANSI dimensions. Tank flange gaskets will not be provided by Cleveland Mixer unless noted.
4. If your mixer seal requires a seal flush (most double mechanical seals will require a flush) you have the necessary fluid or gas piped to the seal.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## System Force Diagram 1



Note: Mixers should always be lifted and installed by a qualified professional. It is necessary to install mixers so that the components are in the correct locations, properly aligned/leveled and all hardware is torqued down to correct specifications once the mixer is in place. Confirm all components are present and their final location is known prior to raising the parts up off the ground. After the mixer is installed and the tank is filled with liquid, it can be very difficult to make changes or correct assembly errors. Confirm all tools needed for installation are present. The hardware will be US standard except for the reducer hardware, which will be metric.

## Rigging/Installation Recommendations

Although Cleveland Mixer products are extremely robust in design, when lifting any component of the mixer system, care should be taken to avoid dropping the mixer components and/or colliding with any obstacles during the rigging/lifting/installation process.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

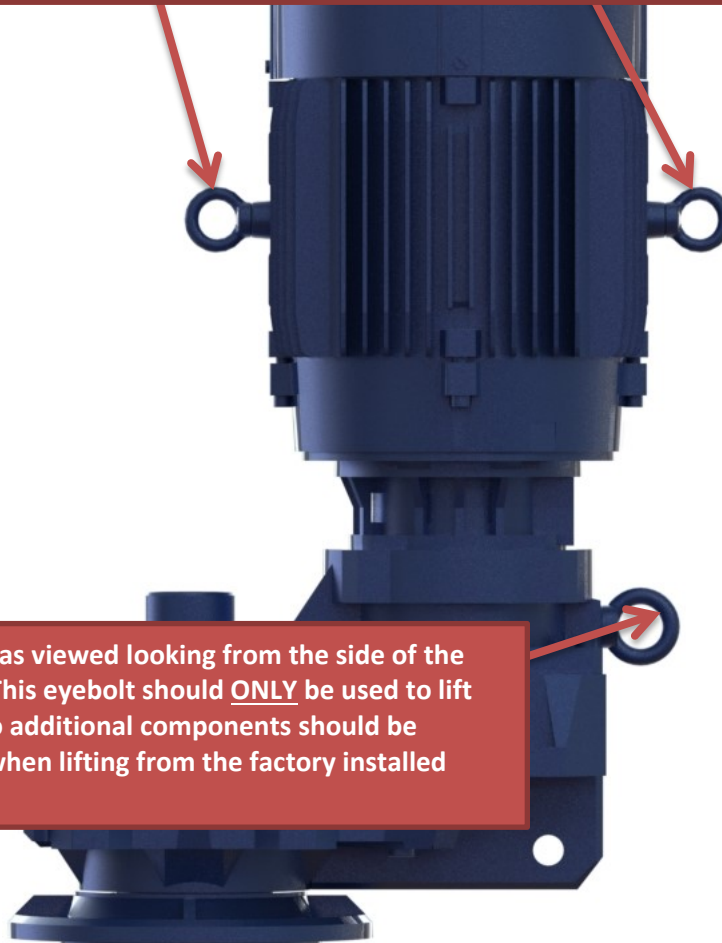
GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Lifting the Drive Unit (Motor and Gearbox)

Each gearbox is equipped with an eye bolt for proper lifting of the motor and gearbox as one unit. Prior to lifting, confirm that the eye bolt is firmly tightened.

The eyebolt on the gearbox should only be used to lift the motor and gearbox. The eyebolt is NOT intended to lift the entire mixer assembly (with impeller, impeller shaft, etc. assembled and attached to the gearbox)! The eyebolt on the motor is ONLY used for lifting the motor. Do NOT use the motor eyebolt for lifting the motor when connected to the gearbox or any other mixer component. (See Explanation Graphics Below)

These are the motor eyebolts as viewed looking from the side at the gearbox/motor assembly (position may vary based on motor selection). These eyebolts should ONLY be used to lift the motor. No additional components should be attached to this component when lifting from the factory installed eyebolt.



This is the gearbox eyebolt as viewed looking from the side of the gearbox/motor assembly. This eyebolt should ONLY be used to lift the motor and gearbox. No additional components should be attached to this assembly when lifting from the factory installed eyebolt.



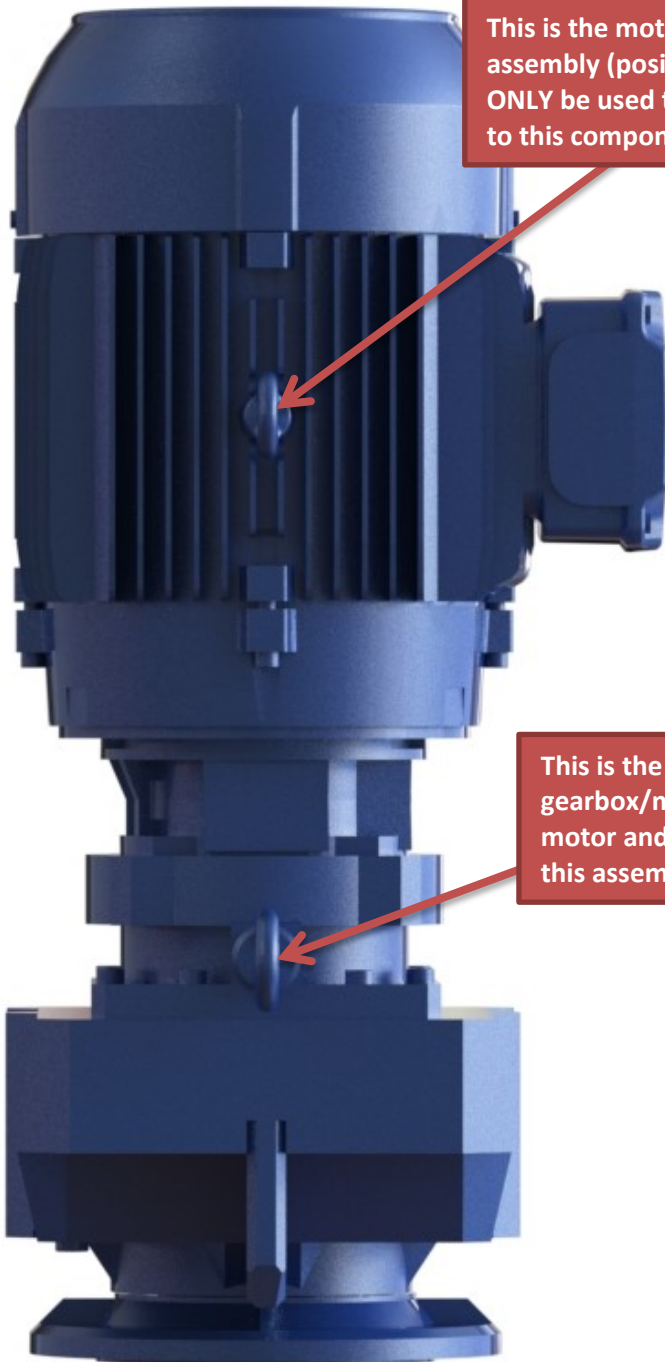


**CLEVELAND  
MIXER**

EST. 1940

# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M



This is the motor eyebolt as viewed looking from the side of the gearbox/motor assembly (position may vary based on motor selection). Motor eyebolts should **ONLY** be used to lift the motor. No additional components should be attached to this component when lifting from the factory installed eyebolt(s).

This is the gearbox eyebolt as viewed looking from the side of the gearbox/motor assembly. This eyebolt should **ONLY** be used to lift the motor and gearbox. No additional components should be attached to this assembly when lifting from the factory installed eyebolt.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Lifting the Impeller Shaft

When lifting the impeller shaft, avoid lifting from one end. Instead, review the diagrams below and position a pair of lifting straps approximately as shown. Doing so will avoid damage (bending, scoring, etc.) to the impeller shaft which could lead to excess runout, causing damage to the overall mixer system.



Lift the impeller shaft from both ends as shown below:



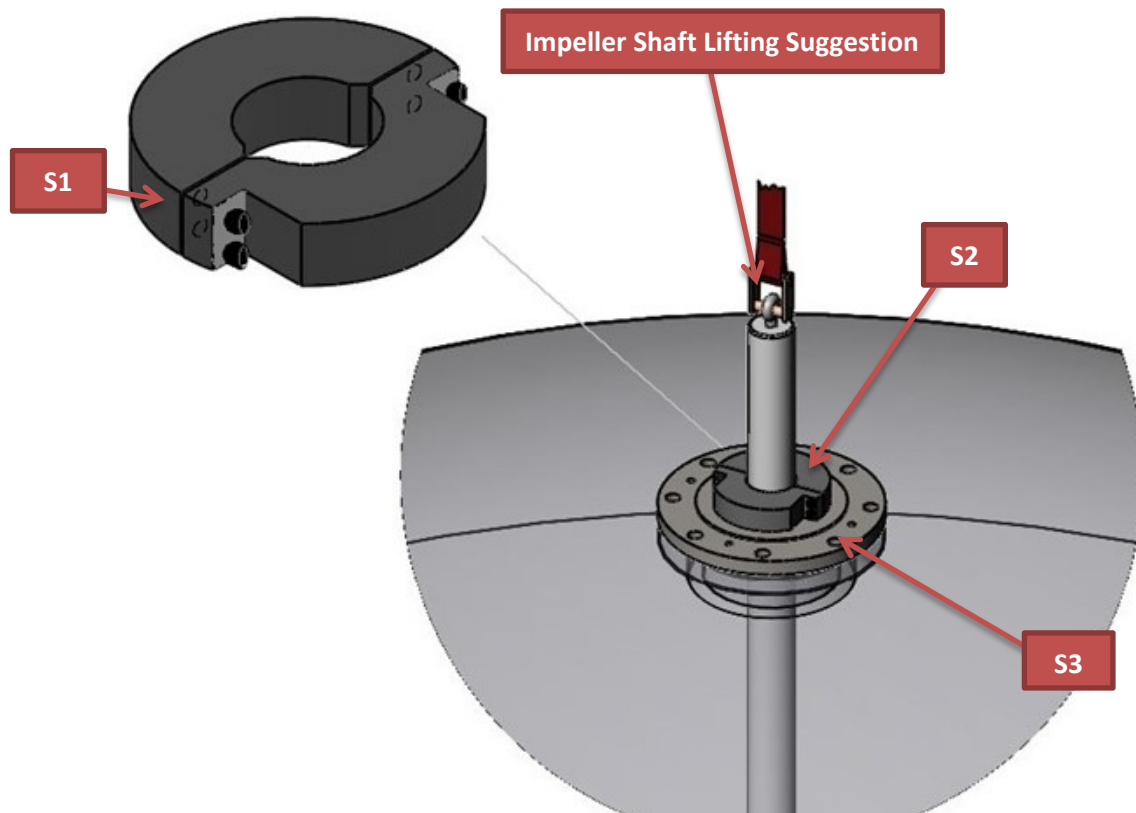


# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## The Proper use of Shaft Catchers if Included:

1. Shaft catchers are supplied with most mixers that have impeller shafts 2 inches in diameter or greater (Item S1)
2. Use bracing or a shaft catcher to secure the upper shaft section on the tank nozzle. (Item S2)
3. The tank flange bolts will go thru most pedestals so you can lay the flange in place but don't bolt it down until your pedestal is in place. (Item S3)
4. Brace the shaft with the seal components in place but don't lock the seal components down until the drive end of the mixer is level, in the final location and properly torqued to specifications.





# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Impeller Assembly

1. Assemble the impellers using the same procedure described above to tighten the connection hardware.
2. Check the center bore of the hub to make sure it's clean from dings, dents, scratches and dirt. The bore tolerance might be as close as +/- .005", you don't want to force the hub on the shaft. Forcing the hub onto the impeller shaft can cause it to score both interacting surfaces and seize onto the shaft making adjustment or removal difficult/impossible.
3. Check the hub for the marking "TOP".
4. Make sure that side of the hub slides up towards the mixer drive. The hub should slide up the shaft easily with minimal assistance beyond supporting the weight of the hub.
5. Starting with the top hub (if you have multiple impellers) slide the hub up over the key slot.
6. Insert the key into the key slot with the gib end down (See figure A below).

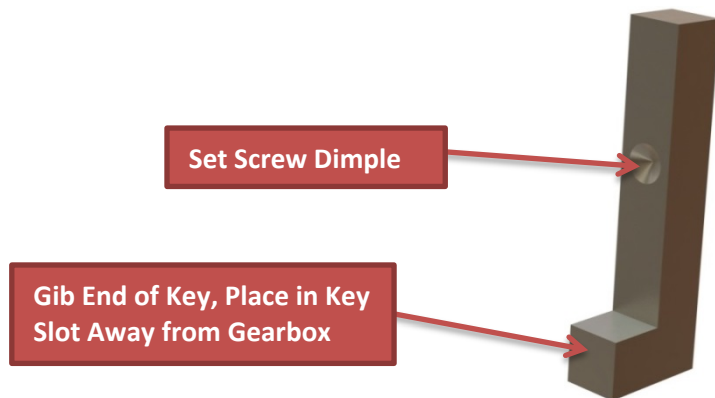


Figure A

7. Add a few drops of thread locking compound and torque the set screw into the key. The set screw should line up with a dimple in the center of the key. Confirm alignment with a flashlight through the threaded hole in the hub if needed.
8. Fasten the blades to the bottom of the hub (Hub ear should be on top of the mixer blade when looking down, see figure B and C below). Blades with stabilizer fins should have the fin side down. Double check this assembly before operating the mixer. Operating the mixer with the blades or hubs on backwards or upside down can cause damage to the mixer, tank, supports, and etcetera.
9. If you have any questions during assembly of the impellers, please contact Cleveland Mixer.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

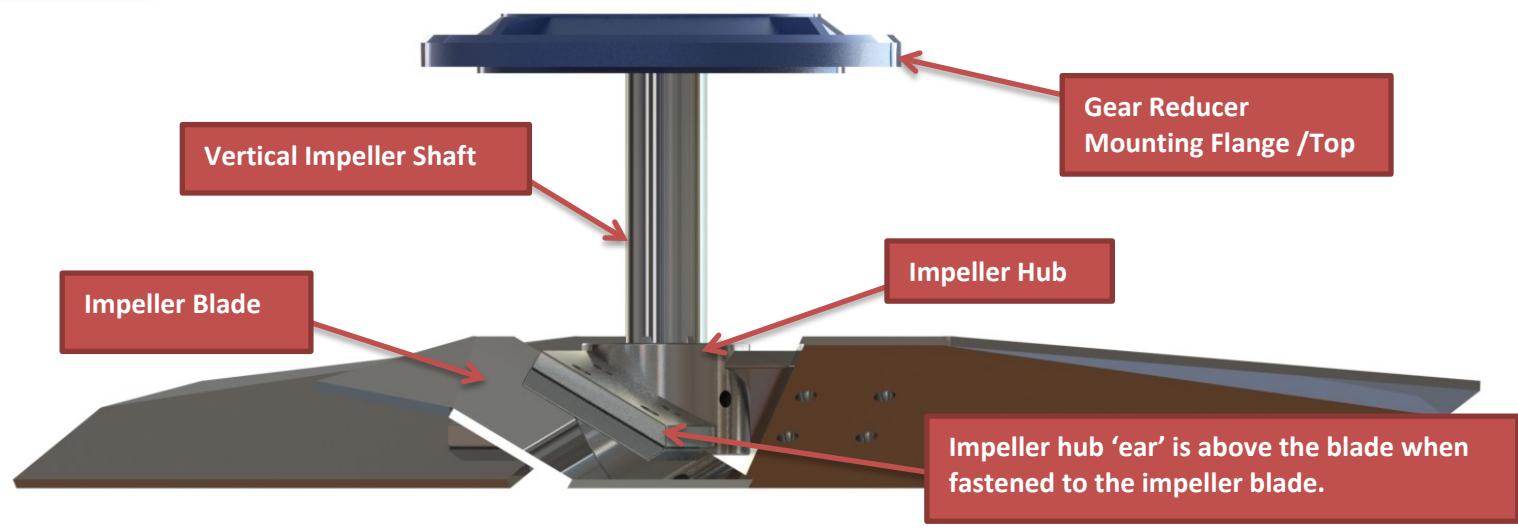


Figure B

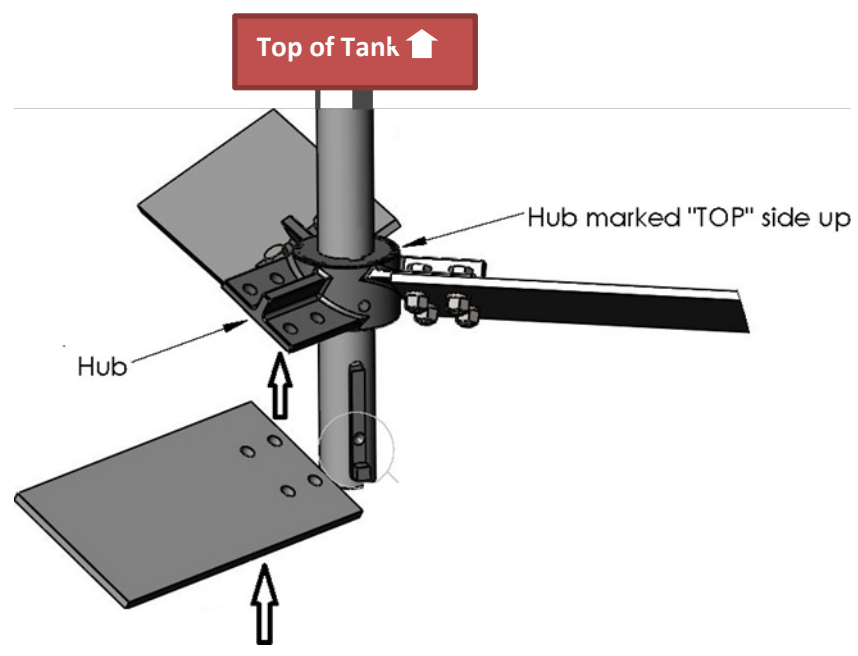


Figure C



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

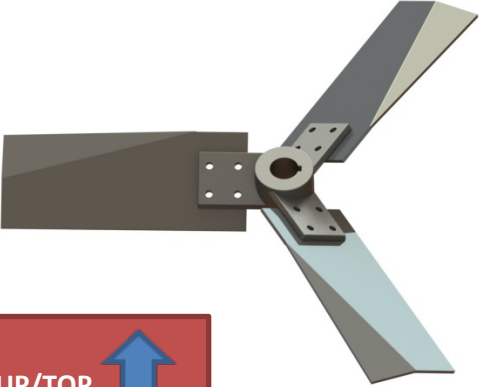





GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Standard Impeller Styles

Cleveland Mixer offers several different options for mixing impellers. The design of the impeller is typically based on the process specifications. Different types of mixing and different levels of agitation require different flow patterns and those flow patterns are created by the specific style of the impeller blades (blade width, overall diameter, blade shape, rpm and etcetera). The size and speed of the impeller along with the pitch of the blades will dictate the amount of power needed to turn them. The mixing power is a combination of the motor and gearbox ratings.

Most mixers are designed for one specific process requirement. Cleveland Mixer does not recommend altering the process or the design of the mixer without first consulting the factory. Increasing the viscosity of the process media or increasing the output RPM's are common causes for impeller damage and overload failure.

The most common impeller designs provided by Cleveland Mixer are as follows:

XTF-3R (3 blade hydrofoil)	AXF-3HE (3 blade, axial flow turbine)	RAD-4 (4 blade, radial flow turbine)
 	 	 



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Shrink Disk Couplings

Cleveland Mixer uses Shrink Disk Couplings to secure shaft assemblies that are too heavy for a cap plate assembly. Please use the Shrink Disk Coupling manual supplement in conjunction with this Cleveland Mixer O+M manual for instructions on how to install and properly secure your Shrink Disk coupling. Contact Cleveland Mixer with any questions that may arise in regards to proper installation of the Shrink Disk assembly.



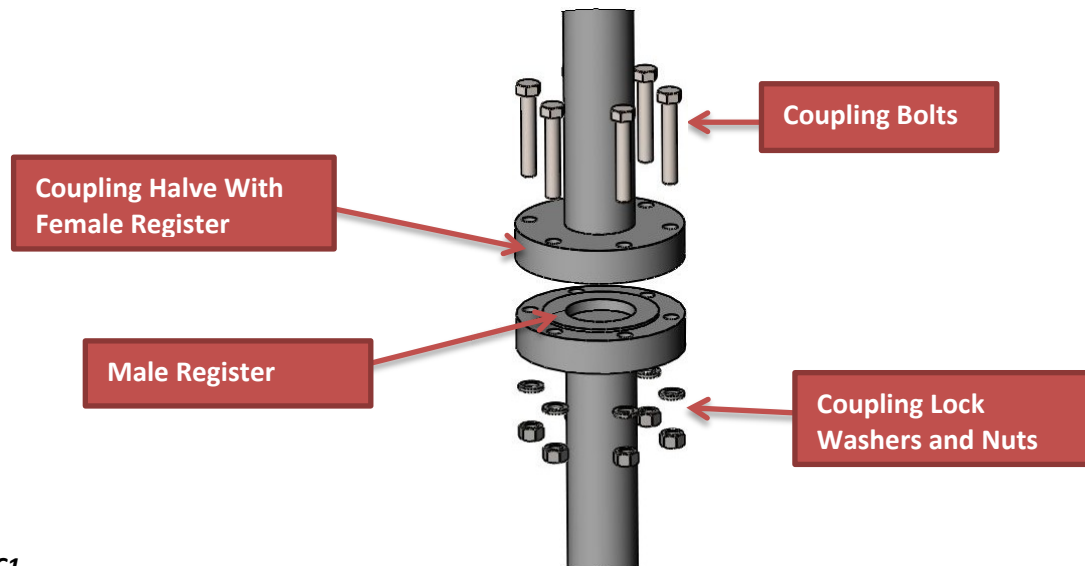


# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Shaft Couplings

1. Each shaft coupling connection will have a male and female register (See Figure SC1). Check these registers for dirt, dings and dents that might have accrued during shipment or staging of these components. For proper alignment, it's important these registers have a clean connection.
2. Once the registers are mated, insert the pre-lubricated connection bolts. Each set of hardware will include a bolt, split spring lock washer and a nut. Check the assembly drawing for the wetted end materials of construction to make sure correct hardware is used. The hardware will be either 316L stainless steel or zinc. Stainless steel hardware should be used in sanitary or corrosive applications.
3. Add a few drops of thread locker and hand tighten the nuts to the lock washers. Use the torque chart from this manual to find the torque value for the size of the bolt. Torque each of the fasteners down to the same torque value to ensure proper alignment of the coupling halves.



**Figure SC1**

Mixers supplied with a mechanical seal (MTDM - "M" for mechanical seal or MTD-2M for double mechanical seal) will typically have a removable coupling assembly inside the mixer pedestal. The removable coupling design allows for the mechanical seal to be removed from the shaft without taking the entire gearbox/motor assembly off of the tank. This design feature can be used if the mechanical seal requires maintenance or replacement.

The removable coupling mates with the tapered end of the mixer shaft. A key, cap plate and cap plate bolt(s) will secure the removable coupling in place.





# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

*GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M*

## Electric Motors

Electric motors are selected for each mixer's specific power requirements. Each gear reducer has a maximum input horse power (HP) and speed (RPM) rating. Increasing the input horse power or speed above the design limits of the gear reducer can result in damage to the reducer and/or other mixer components.

Electric motors should be connected by a licensed and insured electrician. The input voltage and amperage requirements of the motor can be found on the motor's nameplate or in the manufacturer's instructions provided with the motor.

Mixer motors are single speed, typically 1800RPM or 1200RPM, the output RPM from the reducer is determined by the gear reducer reduction ratio. Most mixers are designed to mix clockwise, pumping down or away from the mixer. The gear reducer output rotation will be opposite the motor's input rotation. The motor will need to run counter clockwise in order for the mixer shaft to run clockwise.

**Always check the rotation of your mixer shaft against the as-built drawing to make sure your mixer shaft is rotating correctly.**

If you're running your mixer with a variable frequency drive, consult with a qualified electrician or Cleveland Mixer to confirm that the motor and VFD are compatible.

**NOTE: Please consult Cleveland Mixer before operating the mixer at a different speed than the mixer was designed to run.**

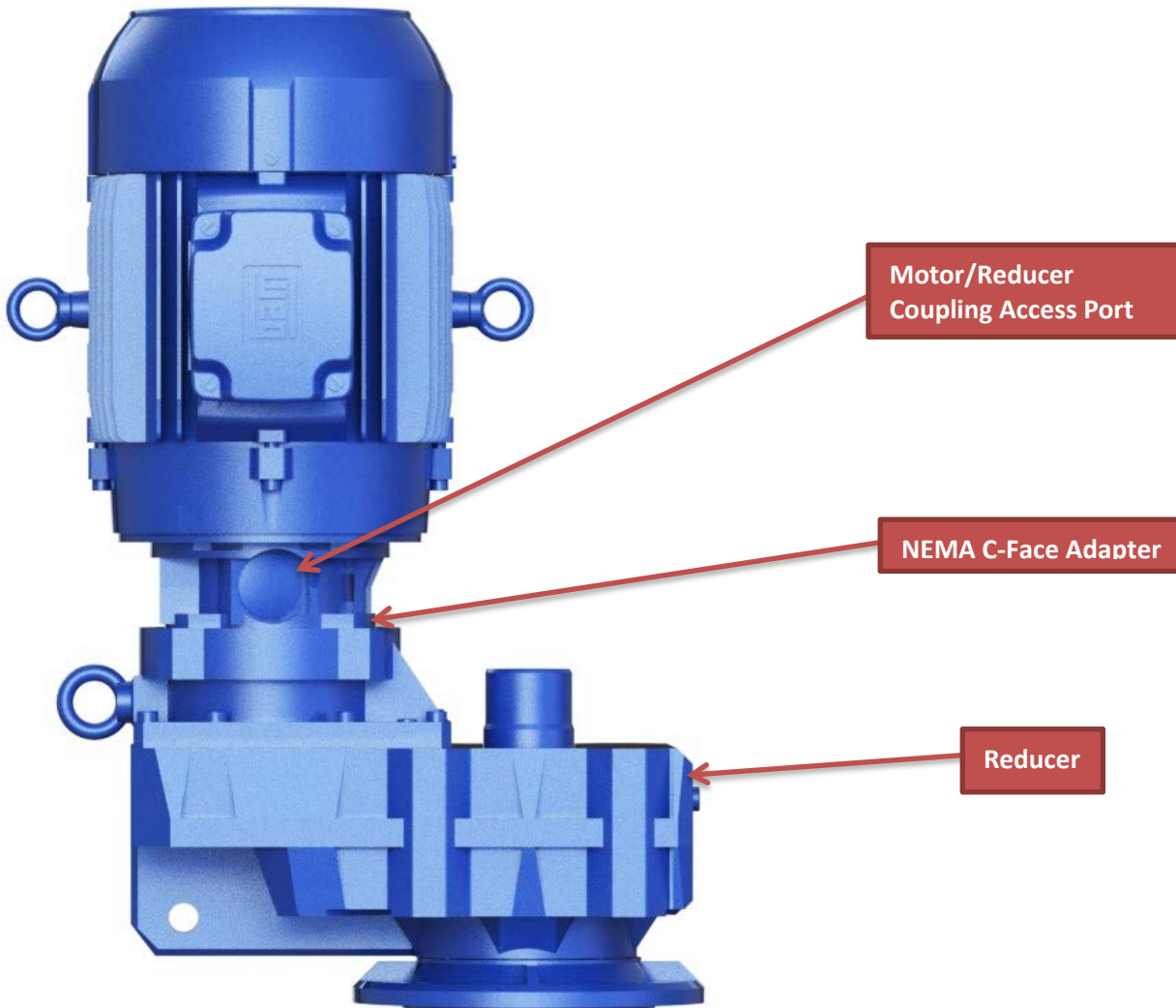


**CLEVELAND  
MIXER**

EST. 1940

# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M



## Motor Install – For Keyed Motor Output/Hollow Gearbox Input Interface

1. Typically, Cleveland Mixer ships the motor and gearbox assembled.
2. If assembly/reassembly becomes necessary, begin by removing the motor shaft access port cover.
3. Line up the motor shaft key with the reducer input key slot. Mate the motor with the reducer until the C-faces are fully connected.
4. Use an Allen wrench to release or tighten the set screw through the motor shaft access port, the set screw is located inside the reducer's motor input. You will need to rotate the motor shaft to align the set screw with the access port. If a flexible motor/gearbox coupling is used, please see the flexible coupling supplement.
5. Tighten the motor mount bolts to motor manufacturer's recommended torque specifications.
6. Please contact Cleveland Mixer with any questions.



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## Mixer Seals

Mechanical seals will come with their own set of manufacturers' installation and operating instructions. Refer to your assembly drawing (the mixer serial number should match the drawing number) if you don't know what kind of seal was supplied with your mixer.

## Packing Gland/Stuffing Box Operating Instructions

Cleveland Mixer stuffing box seals are supplied as either "high pressure" with 7 packing rings (the thickness of the packing is dictated by the shaft diameter) or "low pressure" with one or two packing rings, dependent on shaft diameter. High pressure stuffing box seals are typically supplied with mixers that are mounted on the side of the tank or on top of a sealed tank with pressure over 30 PSI, but less than 100 PSI. Low pressure stuffing box seals are typically supplied with mixers that are top mounted on sealed tanks with pressures of less than 30 PSI.

The operating instructions below are general operating instructions and might not apply to custom designed equipment. Refer to the as-built drawing for specific details about the specific mixer and seal in question.

1. Packing should always be installed as individual rings and not spiraled around the shaft.
2. Lubricate each ring generously with grease (food grade grease can be used with food grade packing in sanitary applications).
3. High pressure stuffing boxes have four packing rings, a lantern ring and then three packing rings on top. Once the gland is packed in that order, slide the split follower down to sit on top of the packing and snug the four nuts just so the split follower is touching the packing. The low pressure stuffing box is the same procedure but with the follower and one packing ring.
4. Pump the gland full of grease using the grease fitting on the side of the gland. Pump grease into the gland until it is seen pushing out the top. Once the gland is completely filled with grease, tighten the split follower nuts evenly until the gland is sealing properly. The seal is not created by tension from tightening the split follower; the seal is created by the grease in the packing against the mixer shaft. Over tightening the split follower and pushing it down on the packing can damage the mixer shaft.
5. As the mixer runs and the gland wears in, you'll most likely need to add additional grease and possibly tighten down on the split follower nuts slowly and evenly in about 1/2 turn increments.
6. The gland will need to be greased periodically to keep the seal. This can vary based on the contents of the tank, operation intervals, operating conditions, the shaft RPM and/or amount of pressure on the seal. For example, if your mixer is running 24/7, you might need to grease the packing as often as twice per week.
7. Remember to replace the pedestal guards and secure the guards back onto the pedestal once the packing gland is set up. You can add extensions to the grease fittings through the guards for ease of access during lubrication intervals.
8. Cleveland Mixer recommends stocking a spare seal and/or seal parts in case the mixer seal leaks.

## Stuffing Box Lubrication Information:

Once the mixer installation is complete, the split follower, located above the packing gland, needs to be tightened down until it makes a connection with the top packing ring.

**\*\*NOTE: DO NOT OVERTIGHTEN! The seal will not be created with tension on the nuts, the seal is created by injecting lubricant, creating a barrier between the packing and mixer shaft.**



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

## TROUBLESHOOTING

MIXER COMPONENT	PROBLEM	POSSIBLE CAUSES	REMEDY
REDUCER	Running Hot	Overloaded	Do not exceed the design capacity of the mixer. You can check your mixer's assembly drawing to view load limits. Settled solids, increased speed, increased volume/viscosity can cause overload
		Lubrication Issue	Check this manual for recommended lubricants and measured fill levels. Drain the oil, flush the case and refill with the proper oil and quantity
		Ventilation Issue	Be sure the breather dust cover was removed
	The reducer's breather plug should be located above the oil fill line and should be open and clean from debris.		
	Running Noisy	Broken Internal Parts	Try to isolate the source of the sound (reducer, motor, etc.) Check mount bolts are tight and not rattling, drain reducer oil, check for metal fragments
	Leaking Oil	Shaft Seal Defective	Replace oil seals/send reducer for service. Excess pressure, check breather valve Contact Cleveland Mixer
	Output shaft does not rotate w/ motor switched on	Interruption of movement chain	Contact Cleveland Mixer
MOTOR	Running Hot	Overloaded	Do not exceed the design capacity of the mixer. You can check your mixer's assembly drawing to view load limits. Settled solids, increased speed, increased volume/viscosity can cause overload
	Tripping Breaker	Not Wired Correctly	The motor should be wired by a qualified electrician
	Running Noisy	Bad Bearing	Rebuild or Replace Motor



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M

**CLEVELAND  
MIXER**  
EST. 1940

SEAL	Fluid is Gushing from a Packing Gland	Worn Packing	Replace the packing. Keeping the packing properly lubricated during operation will help extend the life of the packing.
	Fluid is Gushing from a Mechanical Seal	Damaged Seal Faces	Rebuild/Replace seal. Applications with solid particles or abrasives in the fluid should have a flush system or barrier fluid to prevent damage to seal faces
	Dripping	HPSB/Mechanical Seal	It's normal for HPSB's to drip / dripping mechanical seals mean damaged seal faces
SHAFT	Vibrating/Shaking	Loose bolts / bad bearing	Check coupling/mounting bolts, repair damaged bearings
		Impeller not assembled correctly	Make sure the impeller is installed correctly before filling your tank
		Impeller operating at/under liquid level	Impeller blades sucking in air or splashing will cause vibration. Raise liquid level
	Scoring	Damaged Seal	Scoring on the mixer shaft in the area where the shaft passes through the seal/flange is typically due to excessive run-out from a damaged tank seal
IMPELLER	Vibrating/Shaking	Loose Bolts	Torque the blade mounting hardware to appropriate value. Make sure to use the lock washers provided and thread locking compound when possible
		Missing Blade	
		On Backwards	Follow the impeller installation instructions in this manual
		Liquid Level	The operating liquid level should never be less than 2x the diameter of the impeller



# INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR CLEVELAND MIXER SERIES AGITATORS

*GEAR DRIVEN, TOP MOUNTED AGITATOR MODELS: MTD, MTDS, MTDM, MTD2M*

## Long Term Storage

- Store the mixer indoors in a clean dry area.
- Leave the breather plug dust cover in place when in storage.
- Once every 2-3 months, rotate the output shaft 10-20 revolutions to prevent the gears and bearings from drying out and seizing up.
- Keep the mixer shaft and impeller blades flat/straight to keep them from bending or warping.
- Space permitting, it is recommended that the drive units be turned 180 degrees after approximately one year and annually thereafter so that the lubricant in the gear units covers the bearings and gearwheels which have previously been positioned on top.
- If the storage period exceeds 2 to 3 years or the temperatures were unfavorable throughout a shorter period, drain the oil and refill the reducer with fresh oil before putting the mixer back into operation.
- The motor will come supplied with its own set of operating and maintenance instructions. Please follow those instructions for long term motor storage.
- If your mixer requires a mechanical seal, drive unit or any other components supplied with a separate manufacturers operation and maintenance manual, please follow those instructions for long term storage of those components.