I.O.M. SUPPLEMENT NO. 6

CHEMINEER GEAR DRIVE
UNIT SIZES 3 & 6
TRIPLE REDUCTION ONLY

INDEX

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This manual supplement contains lubrication and maintenance information specific to the Units Sizes 3 & 6 Triple Reduction Gear Drive. Refer to the Agitator Installation, Operation and Maintenance Manual for complete agitator instructions.

1.0 LUBRICATION (See Figure 9)

THE GEAR CASE HAS BEEN DRAINED OF OIL FOR SHIPPING.

1.1 Fill the gear case with a good quality, straight mineral petroleum base gear oil. See Agitator Manual for a list of satisfactory oils. These lists are presented as a guide only; equivalent oils by other manufacturers may be used. Always use new oil. Always be sure that the lubricant being put into the gear case is free of dirt, metal particles, dilution and other contaminants. If there is any doubt about contaminants in the oil, insert a strainer in the filling funnel.

1.2 In cases where the gear teeth have been abused by overloading, use of improper lubricant, shock loading, elevated temperature, etc., the use of an E.P. oil can prolong the life of the drive. Choose an E.P. oil with equivalent viscosity to the straight gear oil recommendations.

1.3 Remove Fill Plug [281] and Shipping Plug [280]. Pour one (1) quart (1 liter) of oil through fill port [281]. Add required oil quantity through Breather [280] port. Fill to bottom of level plug [285]. *DO NOT OVERFILL*.

APPROXIMATE OIL CAPACITY

Case 3 - 3.75 gal. U.S. (14 Liters)
Case 6 - 13.25 gal. U.S. (50 Liters)

Install Breather [280] and fill plug [281].

1.4 Drain and refill gear case after first week of operation and every 2500 hours of operation (approximately 6 months), thereafter. If surrounding air is extremely contaminated or moisture laden, more frequent oil changes are advisable. Major lubricant suppliers can test oil and recommend oil change intervals based upon the condition of the oil. This is the most economical approach to establishing oil change intervals.

1.5 The Low-Speed Shaft Bearings [241] and [255] are grease lubricated. The bearings are packed with grease prior to shipment from the factory. However, they will require additional grease every three (3) to four (4) months. Use high quality Lithium-base grease of No. 2 consistency. See the Agitator Manual for a list of satisfactory greases. Those listed should be regarded as typical rather than specific recommendations.

1.6 Re-grease Bearing [241] by removing vented relief Plug [289] and pumping grease into Grease Fitting [288] until new grease appears at the relief hole. Grease capacity is:

1.7 Re-grease Bearing [255] by pumping grease into Grease Fitting [288]. Add approximately twice the grease as required at Bearing [241]. Grease capacity is:

1.8 Rotating the low-speed shaft slowly while adding grease will evenly distribute the new grease within the bearing.

2.0 MAINTENANCE (See Figure 9)

2.1 The Chemineer HT Drive is a precision spiral bevel/helical gear unit. The care of the gear unit is an important operational function which should be given every reasonable attention to assure long, efficient service life.

2.2 During initial operation, the unit should be checked often for abnormal temperature, oil leaks, noise, vibration, etc. in the event of any start-up difficulties, the unit should be shut down immediately. Review the Trouble-Shooting Section of the Agitator Manual. If no solution is obvious, contact your local Chemineer Representative, or the Home Office for assistance.

2.3 Other than periodic lubrication, no routine operational gear drive maintenance is required. In order to assure the longest life of your drive, annual shut-downs which can correspond with plant shutdowns should be planned. Gear tooth wear pattern, shaft/bearing end play, bolting and condition of all seals should be checked. Worn parts should be replaced and any areas of general concern should be brought to the attention of your local Chemineer Representative.

2.4 Chemineer has complete facilities and parts available to overhaul your HT Drive. A reducer exchange program is also available. Contact your local Chemineer Representative or the Home Office.

2.5 In the event that repair is done in the field, the following assembly and disassembly instructions should be observed.

3.0 DISASSEMBLY (See Figure 9)

3.1 Clean external surfaces and drain oil by removing Drain Plugs [284 or 287].

3.2 Remove Input Housing assembly [335, and 336 thru 347].

3.3 Remove Change Gear Cover [276] and Gasket [277].

3.4 Remove Change Pinion Locknut [217] and washer [216].

3.5 Remove Change Pinion [215]. All change pinions are spline-mounted.

3.6 Remove Change Gear bolt, Lockwasher and Washer [218, 219, 220.

3.7 Remove Change Gear [221]. All change gears are taper hub mounted and will require a gear puller for removal.

3.8 Remove spiral bevel pinion cartridge assembly [224 thru 228, 230, 236]. Keep shim set [236] intact for reference at assembly.

3.9 Press Cross-Over Shaft Assembly [349, 348, 208, 210 and 212] out of Bearing Cone [213] through input end of housing.

3.10 Remove Bearing Cups [210 and 213].

3.11 Remove Bearing Cap [240], including Bearing Cup [241] and Shim Set [243].

3.12 Install eyebolt and lift Output Shaft Assembly [248], [247] and [253], including Bearing Cones [241] and [255], out of housing.

3.13 Remove Lower Bearing Cap [257] and Shim Set [259]. Keep Shim Set [259] intact for reference at assembly.

3.14 Remove Bearing Cup [255].

The gear unit is now disassembled into major sub-assemblies; i.e., input housing, cross-over shaft, spiral bevel pinion cartridge, output shaft and bearing caps.

4.0 DISASSEMBLY OF SUB-ASSEMBLIES

4.1 Cross-Over Shaft

4.1.1 Remove gear bolt, lockwasher, flat washer [349] and press off gear [348].

4.1.2 Loosen setscrew(s) in locknut [208] two turns. Disengage keyed lockwasher [209] (case 6 only). Remove Locknut [208] with Lockwasher.

NOTE (case 6 only): The locknut is retained with a setscrew. Remove setscrew and drill out the tapped hole. Drill just deep enough to spot the shaft with the drill point. This will allow for removal of the locknut without damaging shaft threads.

4.13 Press off Bearing Cone [210].

4.2 Spiral Bevel Pinion Cartridge

4.2.1 Remove setscrew from locknut [226]. Disengage keyed lockwasher [225]. Remove locknut [224].

NOTE: The locknut is retained with a setscrew. Remove setscrew and drill out the tapped hole. Drill just deep enough to spot the shaft with the drill point. This will allow removal of the locknut without damaging shaft threads.

4.2.2 Press Pinion Shaft [230], including Bearing Cup [228] out of Bearing [226].

4.2.3 Press Bearing Cone [228] off pinion shaft.

4.2.4 Pull Bearing Cups [226 and 228] out of cartridge (see 4.4.1).

4.3 Output Shaft

4.3.1 Remove gear mounting bolts, press Gear [248] off shaft.

4.3.2 Press grease Retainer [253] (case 6 only) and/or Bearing Cone [241] off shaft.

4.3.3 Remove V-ring [258] (case 3 only) and press Bearing Cone [255] off Shaft.

4.4 Bearing Caps

4.4.1 Pull Bearing Cup [241] out of Bearing Cup.

NOTE: Cups mounted in caps are press-fit and can be difficult to remove with commercial bearing puller. Removal can be facilitated by arc welding a 1/8" weld bead completely around the cup in the center of the roller race. Upon cooling, the cup will shrink, making removal easy. Be sure to protect adjacent surfaces from weld spatter.

4.5 Input Housing.

4.5.1 Remove Pinion Locknut [347] and Spacer [346]. Remove Pinion [345]. The pinon is spline-mounted.

4.5.2 Remove High Speed Bearing Cap [337] including V-ring [338], Gasket [339] and cap cover [336].

4.5.3 Press high Speed Shaft assembly out of Bearing cone [344] through the input end of housing.

4.5.4 Loosen setscrews in locknut [341] two turns. Remove Locknut [341].

4.5.5 Press off Bearing Cone [342].

4.5.6 Pull Bearing Cups [342 and 344] out of housing (see 4.4.1).

The gear unit is fully disassembled. Clean all parts and inspect for wear.

5.0 ASSEMBLY of SUB-ASSEMBIES

5.1 NOTE: At anytime when the gear unit is fully disassembled, it is recommended that all bearing, bearing lockwashers, locknuts, lip seals and gaskets be replaced with new parts. When replacing gears and bearings it's not recommended that a new part be installed with an old part; i.e., replace bearing cup and cone; replace gears in pairs. Spiral bevel gears must always be replaced in matched sets.

5.2 Grease retainer [253] (case 6 only) and all bearing cones are mounted with interference fits.

5.3 The recommended assembly procedure requires the heating of the above mentioned parts. ***Do not apply direct flame. Heat bearings in oven or oil bath. Do not allow parts to touch bottom or sides of oven or oil bath.***

5.4 Lip Seals; clean cap bore, coat O.D. of lip seal with Permatex #2 or equivalent. Install seal with the spring facing bearing.

5.5 Bearings; heat bearing cones and press onto shafts. Hold bearing cones against shaft shoulder while bearing cools. Bearings must be seated against shaft shoulder. Check with feeler gage.

Press bearing cups into housings cold. Cup must be firmly seated against shoulder. Check with feeler gage.

5.6 Spiral Bevel Pinion Cartridge

5.6.1 Press Bearing Cups [226 and 228] into Housing [227].

5.6.2 Heat and press Bearing Cone [228] onto Pinion Shaft [230].

5.6.3 Allow bearing to cool.

5.6.4 Insert pinion shaft into cartridge housing. Heat bearing Cone [226] and press onto pinion shaft until cartridge housing shows slight restraint to turning by hand.

5.6.5 While Bearing Cone [226] is cooling, place the cartridge assembly in a large bench vise, clamping on the cartridge flange.

5.6.6 Install Locknut [224] and keyed lockwasher [225]. Locknut is furnished with a setscrew for locking locknut to the shaft after making final adjustments.

5.6.7 Spray Bearings [226 and 228] and Locknut [224] with light machine oil, tighten locknut against bearing cone face.

5.6.8 Install bolt [218] and tighten securely. Apply torque wrench and measure turning torque while rotating the shaft at approximately 3 RPM.

5.6.9 Increase turning torque by tightening Locknut [224]. To decrease torque, loosen locknut and drive the pinion shaft axially (using a rawhide mallet). Turn shaft one complete revolution between adjustments. Adjust torque to: (cold)

Case 3 - 5.5 to 6.5 inch-pounds
Case 6 - 8 to 9 inch-pounds

5.6.10 Tighten locknut setscrew. Engage keyed lockwasher.

5.7 Low-Speed Shaft

5.7.1 Heat Bearing Cone [255] and press onto Output Shaft [247].

5.7.2 Install Gear [248] on output shaft. Tighten bolts to:

Case 3 - 30 foot-pounds dry, 17 foot-pounds lubricated
Case 6 - 90 foot-pounds dry, 50 foot-pounds lubricated

5.7.3 Heat Grease Retainer [253] and press onto output shaft (Case 6 only).

5.7.4 Heat Bearing Cone [241] and press onto output shaft.

5.7.5 Install O-ring0 [254] and V-ring [258] (Case 3 only). The V-ring lip is to face away from the bearing.

5.8 Input Housing

5.8.1 Heat Bearing Cone [344] and press on High Speed Input Shaft [343].

5.8.2 Install Pinion [345], Spacer [346]and Locknut [347]. Torque Locknut to 35 foot-pounds. Allow Bearing to cool.

5.8.3 Press Bearing Cups [342 and 344] into Input Housing [335].

5.8.4 Insert High Speed Input shaft into input housing. Heat bearing cone [342] and press onto input shaft until shaft shows slight restraint to turning by hand.

5.8.5 While bearing cone is cooling, install Locknut [341].

NOTE: Locknut is furnished with setscrews for locking locknut to the shaft after making final adjustments.

Spray locknut and bearings with light machine oil. Tighten locknut against bearing cone face.

5.8.6 Apply torque wrench to Locknut [347] and measure turning torque while rotating the input shaft at approximately 3 RPM.

5.8.7 Increase turning torque by tightening Locknut [341]. To decrease torque, loosen locknut and drive the input shaft axially (using a rawhide mallet). Turn shaft one complete revolution between adjustments. Adjust torque to: (cold) 3.0 inch-pounds.

5.8.8 Tighten locknut setscrews.

5.8.9 Remove the protective covering from a new gasket [339] and align with the notch in the bearing cap [337]. Apply adhesive side to the reducer side of input shaft bearing cap [337].

5.8.10 Remove the protective covering from a new gasket [339] and align with the four holes in input cap cover [336] and apply to the cover.

5.8.11 Place the High Speed Input Shaft bearing cap/gasket against the input housing. Orient the notch at the 12:00 o'clock top of housing position.

5.8.12 Slide V-ring [338] onto the input shaft just past the end of the keyway. The V-ring lip is to face away from the bearing.

5.8.13 Place the cap cover/gasket over the end of the input shaft with gasket side facing the input shaft bearing cap.

5.8.14 Using the cap cover, push the V-ring down the shaft. Assemble the cap cover and the bearing cap to the input housing with bolts and lockwashers [340].

6.0 FINAL ASSEMBLY

6.1 Spiral Bevel Pinion Cartridge/output Shaft.

6.1.1 Install fully assembled spiral bevel pinion cartridge [223] and Shim set [236] into Housing [262]. Install bolts and lockwashers [237 and 238].

Measure original Shim set [236] and duplicate thickness.

Red = .002" TH., Blue = .005" TH.

6.1.2 Rotate spiral bevel pinion shaft [237] until the tooth marked "X" is on top center.

6.1.3 Install Lower Bearing Cap [257], including Bearing Cup [255], Lip Seal [258] (case 6 only) and Shim set [259]. Install bolts and lockwashers [260 and 261]

Measure original Shim set [259] and duplicate thickness.

Red = .002" TH., Blue = .005" TH.

6.1.4 Lower the output shaft assembly into the housing.

Make sure the spiral bevel gear teeth marked "X" straddles the pinion shaft tooth marked "X".

6.1.5 Install Upper Bearing Cap [240], including Bearing Cup [241]. Secure with two (2) bolts only finger tight.

6.1.6 Check backlash by placing a dial indicator against one of the Locknut [224] slots. Restrain the output shaft from turning and rotate the pinion shaft back and forth measuring the free movement.

This measurement should correspond to the blacklash value etched on the spiral bevel gear.

Add shims to set [259] to decrease backlash. Remove shims to increase.

6.1.7 Measure required shim set thickness under Bearing Cap [240] and add .003" to .004" for bearing end play.

6.1.8 Check output shaft end play. If adjustment is required, add or subtract from shim set [243] to obtain .003" to .004" end play.

6.1.9 Install Upper Bearing Cap Assembly [239] with ship set [243]. Install bolts and lockwasher [244 and 245].

6.2 Cross-Over Shaft

6.2.1 Install bearing cups [210 and 213], into housing [262].

6.2.2 Heat bearing cone [213] and press on cross-over shaft [212].

6.2.3 Install Change Pinion [215], Spacer [216] and Locknut [217]. Torque to:

Case 3 - 50 foot-pounds
Case 6 - 135 foot-pounds

NOTE: Counter bored side of change pinion [215] should be placed against bearing [213].

6.2.4 Insert cross-over shaft into housing form the change gear cover end. Heat bearing cone [210] and press onto shaft until shaft shows slight restraint to turning by hand.

6.2.5 While bearing cone is cooling, install locknut [208] and keyed lockwasher [209] (case 6 only).

NOTE: Locknut is furnished with setscrew(s) for locking locknut to the shaft after making final adjustments.

Spray locknut and bearings with light machine oil. Tighten locknut against bearing cone face.

6.2.6 Apply torque wrench to pinion locknut [217] and measure turning torque while rotating the cross-over shaft at a approximately 3 RPM.

6.2.7 Increase turning torque by tightening locknut [208]. To decrease torque, loosen locknut and drive the cross-over shaft axially (using a rawhide mallet). Turn shaft one complete revolution between adjustments. Adjust torque to: (cold)

Case 3 - 3.5 to 4.5 inch-pounds
Case 6 - 8 to 9 inch-pounds

6.2.8 Tighten locknut setscrew(s). Engage keyed lockwasher (case 6 only).

6.2.9. Slide gear [348] (taper bore) into place on cross-over shaft [212]. Install key, bolt, lockwasher, flatwasher [349]. Torque bolt to 20 foot-pounds dry, 11 foot-pounds lubricated.

6.3 Input Housing Assembly

6.3.1 Apply Permatex Silicone Form-A-Gasket or equal to input housing mounting surface.

6.3.2 Install dpwed pins bolts [350] and lockwashers [351 and 352]. Torque bolts to 50 foot-pounds dry, 28 foot-pounds lubricated.

6.4 Change Gear and Change Cover

6.4.1 Slide Change Gear [221] (taper bore) into place on Spiral Bevel Pinion Shaft [230].

6.4.2 Install key, bolt, lockwasher, and change gear washer [222, 218, 219,220] and torque bolt to:

Case 3 - 20 foot-pounds dry, 11 foot-pounds lubricated.
Case 6 - 160 foot-pounds dry, 88 foot-pounds lubricated.

6.4.3 Install gasket [277] and bolt change gear cover [276] firmly into place using bolts and lockwashers [278 and 279]

6.5 Prior to Placing Unit Into Service:

6.5.1 Add grease to Bearings [241 and 255] through grease fittings. ***See Lubrication.***

6.5.2 Fill the gear case with oil. ***See Lubrication.***

6.5.3 Rotate the high speed input shaft by hand until the output shaft makes at least one revolution. Check for any binding.

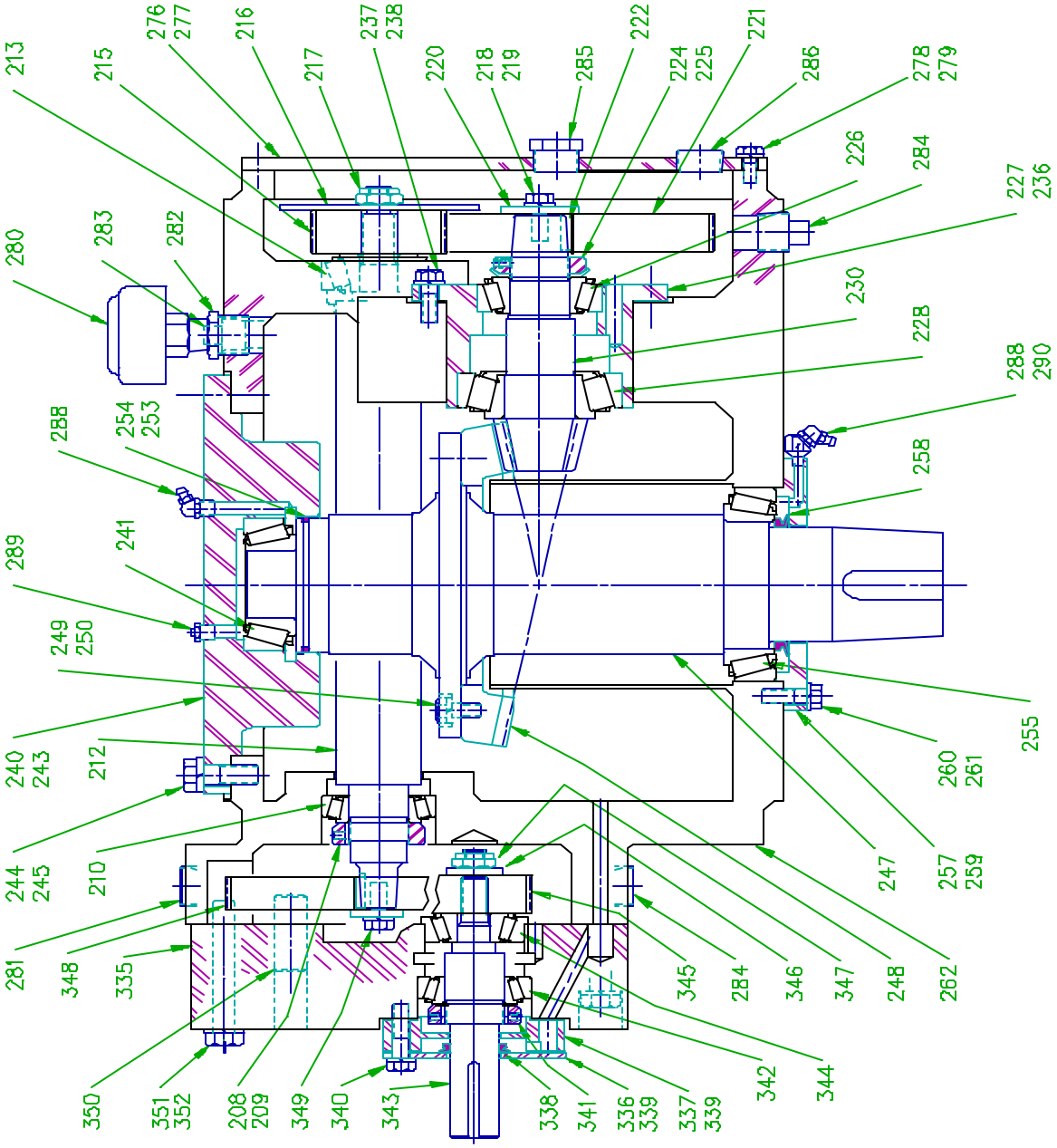

Figure 9: HT_M Drive (Sizes 3 and 6)

HT_M AGITATOR ITEM LIST
DRIVE (SIZES 3 and 6)

Item #	Description	Qty.
200	**gear drive assembly**	1
208-001	shoe locknut w/setscrews	1
208-002	locknut w/setscrew	1
209	keyed lockwasher (case size 6 only)	1
210-001	bearing	1
211	cross-over shaft assembly	1
212	cross-over shaft	1
213-001	bearing	1
215	change pinion	1
216	change pinion washer	1
217-001	pinion locknut	1
218	bolt	1
219	lockwasher	1
220	change gear washer	1
221	change gear	1
222	key	1
223	spiral bevel pinion cartridge assembly	1
224-001	locknut w/setscrew	1
225	keyed lockwasher	1
226	bearing	1
227	cartridge housing	1
228	bearing	1
230	spiral bevel pinion shaft	1
236	shim set	1
237	bolt	6
238	lockwasher	6

HT_M AGITATOR ITEM LIST
DRIVE (SIZES 3 and 6)

Item #	Description	Qty.
239	upper bearing cap assembly	1
240	upper bearing cap	1
241	bearing	1
243	shim set	1
244	bolt	1
245	lockwasher	1
246	output shaft assembly	1
247	output shaft	1
248-001	spiral bevel gear	1
249	bolt	1
250	lockwasher	1
253	grease retainer (case 6 only)	1
254	O-ring	1
255	bearing	1
257	lower bearing cap	1
258-001	V-ring (case 3 only)	1
258-002	V-ring (case 6 only)	1
259	shim set	1
260	bolt	
261	lockwasher	
262	housing	1
276	change gear cover	1
277	gasket	1
278	bolt	
279	lockwasher	
280-001	breather	1
281	pipe plug, NPT	1
282	hex bushing	1

HT_M AGITATOR ITEM LIST
DRIVE (SIZES 3 and 6)

Item #	Description	Qty.
283	pipe plug, NPT	1
284	magnetic drain plug, NPT	2
285	oil level sight glass	1
286	pipe plug, NPT	1
288	grease fitting	2
289	relief fitting	1
290	elbow fitting	1
335	**input housing**	**1**
336	cap cover	1
337	bearing cap	1
338	v-ring	1
339	gasket	2
340	bolt, lockwasher	4
341	shoe locknut w/setscrew	1
342	bearing	1
343	high speed input shaft	1
344	bearing	1
345	pinion	1
346	spacer	1
347	locknut	1
348	gear	1
349	key, bolt, lockwasher, flatwasher	1