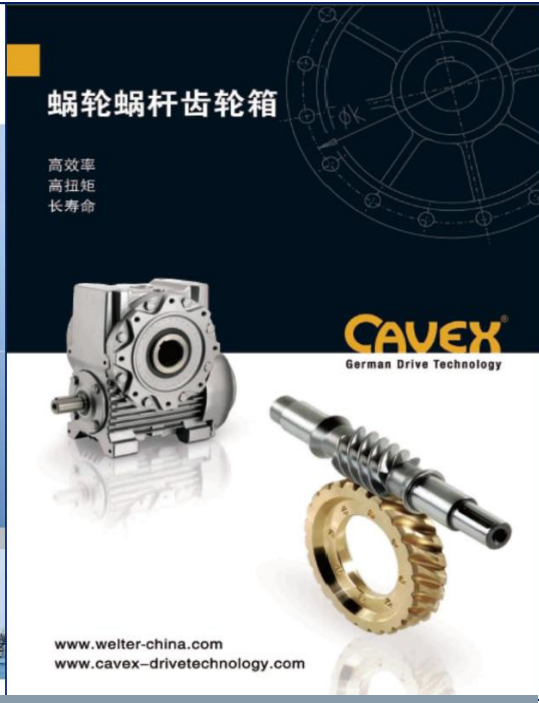


Workshop Inspection Report-KMPS Gearbox

Customer:	Taiwan Cement Corp. (Guigang)
Contact:	Ding jinshan 153 8076 1762
Project:	Complete System Maintenance
Date:	Mar. 27th. 2023
Engineer:	Wang renjie/Hu shuanglong
Order No.:	WS23105S30207
Gearbox:	Model:KMPS 546; S/N: 4305240-0060-1

Contents

1. Introduction of the Arrival Situation

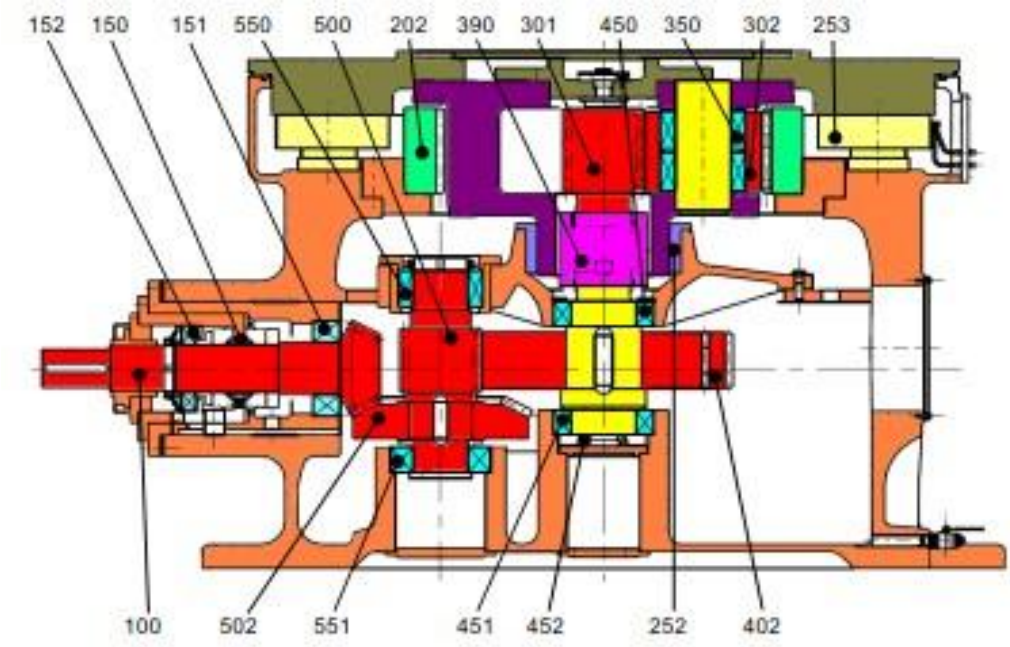
On March 27, 2023, a faulty gearbox was received (Model - KMPS 546; Serial Number 4305240-0060-1). The external appearance and preliminary inspection details of the gearbox are shown in Fig.

The visual inspection includes various components such as end covers, couplings/joints, keys, breather caps, adjustment pads, sight hole covers, temperature probes, auxiliary transmissions, overrunning clutches, motors, pulleys, tensioning sleeves, oil pipes and joints, valves, cooling coil joints, and the housing (the housing should be wiped clean, and visible cracks, especially around lifting holes, mounting holes, and the various joint surfaces or mounting surfaces, should be checked). Defects in the housing and components need to be detailed in Part 4.

- Input does not include couplings.
- The lower housing is lacking an oil sight glass.
- The upper housing lacks the return part of the oil supply pipeline.
- The input shaft is equipped with a key strip

Fig. 1

2. Gearbox Structure



位置号	名称
100	伞齿轴
150	轴承 150
151	轴承 151
152	轴承 152
202	内齿圈
252	推力 轴承
253	推力 轴承
301	太阳轮
302	行星齿轮
350	轴承 350
390	齿套
402	斜齿轮
450	轴承 450
451	轴承 451
452	轴承 452
500	斜齿轴
502	伞齿轮
550	轴承 550
551	轴承 551

Fig. 2 : Gearbox Structure Diagram and Components

3. Gearbox Information

Model	KMPS546	**Serial Number**	4305240-0060-1
Power (KW)	4000	**Lubricant Type**	MIN
Input Speed (RPM)	990	**Viscosity**	VG320
Speed Ratio	41.8	**Oil Change Time**	
Manufacturing Date		**Cooling Water Inlet Temperature** (°C)	
Motor Manufacturer		**Cooling Water Inlet Temperature** (°C)	
Motor Production Date		**Oil Station Outlet Pressure** (Bar)	
Rated Power of Motor (KW)		**Vibration** (mm/s)	
Real-time Power of Motor (KW)		**Cooling Water Inlet Temperature** (°C)	
Operating Environment Temperature (°C)		**Cooling Water Outlet Temperature** (°C)	

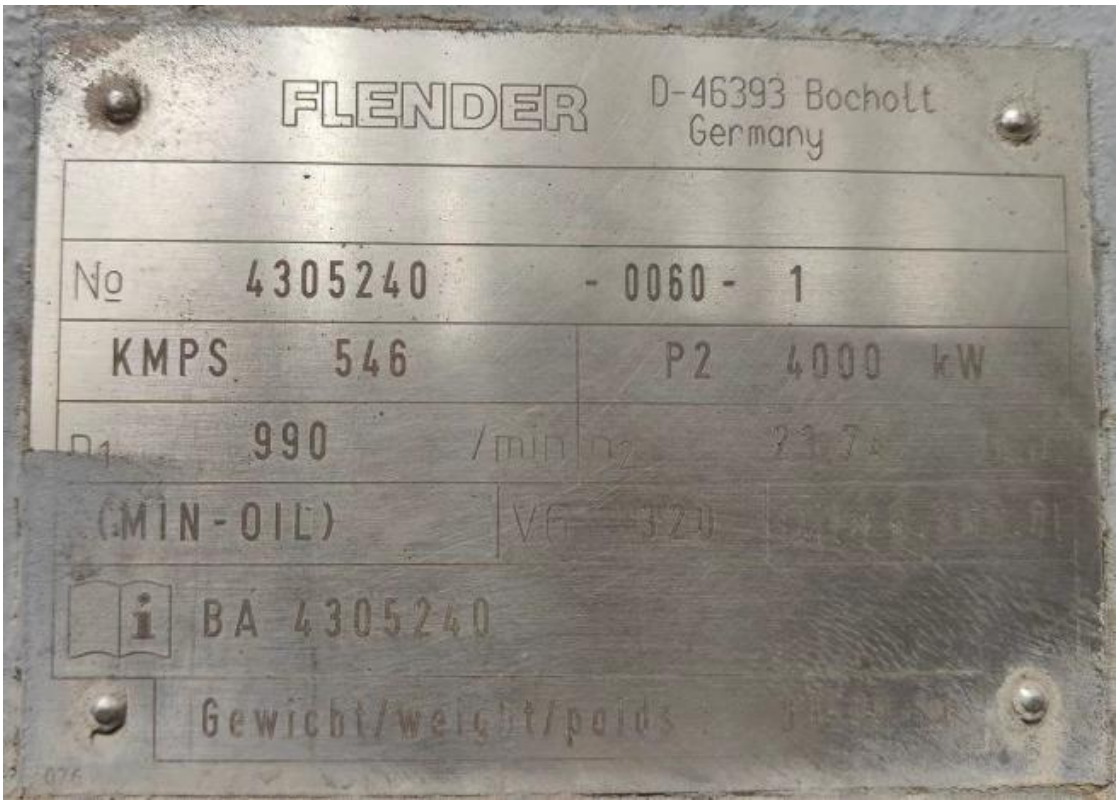


Fig. 3 Nameplate

4. General Equipment Status

- **Gears/Gear Shafts:**
  - The gear shafts show normal wear on the tooth surfaces. One tooth on the 500 shaft has been previously ground, and there are traces of grinding on five tooth surfaces. The tooth surfaces display black spots, likely caused by emulsification of the lubricating oil. Some tooth surfaces exhibit slight rusting.
- **Bearings:**
  - The bearings show signs of rusting, with some corrosion on the raceway and rollers. Upon disassembly, foreign particles are visually observed, resulting in radial scratches and wear on the bearing. The thrust pad exhibits deep radial scratches, indicating severe wear. The radial thrust metal pad shows wear and scratches.
- **Attachments and Others:**
  - The one-way valve is blocked, one spring is deformed, the interval ring (122) is worn, the oil sight glass is missing, O-rings are aged, and there is wear and size degradation on the bearing adjustment ring and adjustment pad, which do not meet assembly standards.

4.1. Gears/Gear Shafts

100-Bevel gear shafts

Fault Type:

Normal Wear

PT (Penetrant Testing) indicates no cracks.

Suboptimal meshing position, but tooth clearance is normal.

Surface rust, black spots on the tooth surfaces.

Continue usage.

502-Bevel gear


Fault Type:

- Normal Wear
- PT Testing shows no cracks.
- Surface rust, black spots on the tooth surfaces.
- Continue usage.

500- Tooth Shaft

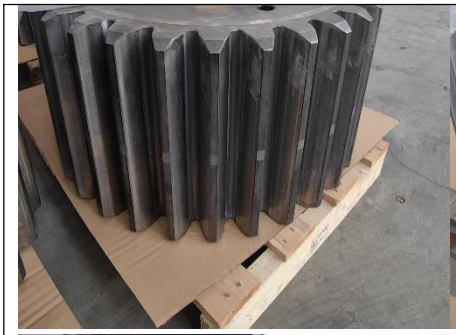


Fault Type:

- Evidence of prior grinding on one tooth.
- Evidence of prior grinding on five tooth surfaces.
- PT Testing shows no cracks.
- Surface rust, black spots on the tooth surfaces.
- Continue usage.

402-Gear  	**Fault Type:** • Slight wear on tooth surfaces. • Surface rust, black spots on the tooth surfaces. • PT Testing shows no cracks. • Continue usage.
400-Shaft 	**Fault Type:** • Slight impact wear at the keyway. • Surface rust. • PT Testing shows no cracks. • Continue usage.
390- Gear Sleeve  	**Fault Type:** • Slight impact wear at the keyway. • Surface rust, black spots on the tooth surfaces. • PT Testing shows no cracks. • Continue usage.

301- Sun Gear  	**Fault Type:** • Slight wear on tooth surfaces. • Surface rust, black spots on the tooth surfaces. • PT Testing shows no cracks. • Continue usage.
302- Planetary Gear     	**Fault Type:** • Multiple tooth surfaces show signs of repair. • Surface rust, black spots on the tooth surfaces. • PT Testing shows no cracks. • Due to incomplete disassembly of the planetary gear bearing (position 350), it is not possible to determine if the inner bore of the planetary gear is worn. Pending confirmation from the buyer, the assessment of whether the inner bore of the planetary gear is repaired will be done later.

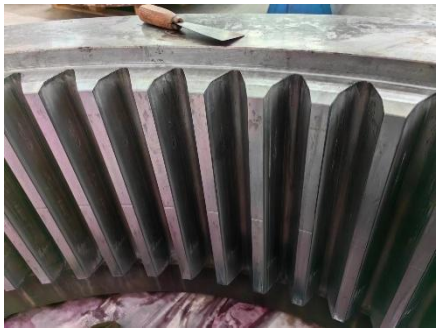


300-Shaft




Fault Type:

- Surface rust.
- Axial pull marks.
- After manual grinding, continue usage.
- Grinding process for axial pull marks: Grinding high points with an angle grinder.

200- Planetary Carrier 	**Fault Type:** • Surface rust. • After rust removal, continue usage.
202- Ring Gear    	• **Fault Type:** • Six teeth have impact damage. • PT Testing shows no cracks. • Surface rust, black spots on the tooth surfaces. • After manual grinding, continue usage. • Repair process: Grinding high points using an angle grinder.

290- Output Flange

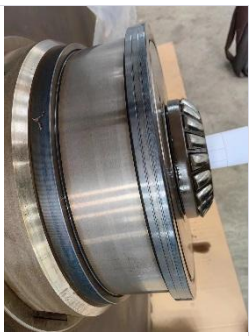
Fault Type:

- Surface rust on the output flange mirror, with scratches.
- After manual grinding, continue usage.
- Grinding process: Polishing rusted areas to brightness using 600-1000# sandpaper.

4.2. Bearings

150- Bearing 	**Fault Type:** • Rust corrosion. • Replacement required.
151- Bearing 	**Fault Type:** • Rust corrosion. • Replacement required.
152- Bearing  	**Fault Type:** • Rust corrosion. • Foreign object entry. • Replacement required.
252- Bearing  	**Fault Type:** • Foreign object entry, radial scratches. • After manual grinding, continue usage. • Repair process: Grinding high

	points using oilstone or sandpaper.
253 Thrust Pad  	**Fault Type:** • Foreign object entry, deep scratches on the surface. • Surface layer of Babbitt alloy peeling. • Surface scratches have signs of repair. • Repair required. • Repair process: Pouring Babbitt alloy, grinding, and fitting.
350- Bearing   	**Fault Type:** • Rust corrosion. • Peeling. • Foreign object entry. • Replacement required.

450- Bearing  	**Fault Type:** • Rust corrosion. • Replacement required.
451- Bearing  	**Fault Type:** • Rust corrosion. • Foreign object entry. • Replacement required.
452- Bearing 	**Fault Type:** • Foreign object entry. • Replacement required.
550- Bearing 	**Fault Type:** • Rust corrosion. • Replacement required.

551- Bearing 	**Fault Type:** • Rust corrosion. • Foreign object entry. • Replacement required.

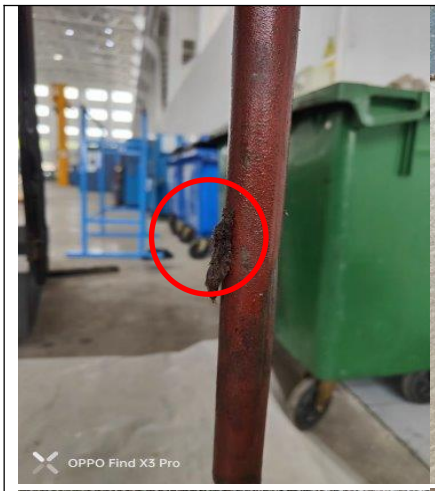
4.2.1. Accessories and Others

118- Adjustment Ring 	**Fault Type:** • Adjustment usage. • Replacement required.
122- Thrust Plate 	**Fault Type:** • Wear on the spacer ring. • Repair required.
123- O-ring 	**Fault Type:** • Aging of the O-ring. • Replacement required.

124- O-ring 	**Fault Type:** • Aging of the O-ring. • Replacement required.
127- Spring 	**Fault Type:** • Deformation of one spring. • Replacement required.
128- Adjustment Pad 	**Fault Type:** • Adjustment usage. • Replacement required.
132- O-ring 	**Fault Type:** • Aging of the O-ring. • Replacement required.

284- O-ring 	**Fault Type:** • Aging of the O-ring. • Replacement required.
286- O-ring 	**Fault Type:** • Aging of the O-ring. • Replacement required.
289-O O-ring 	**Fault Type:** • Aging of the O-ring. • Replacement required.
288- Bolt 	**Fault Type:** • Bolt sliding. • Replacement required.

528- Adjustment Pad 	**Fault Type:** • Adjustment usage. • Replacement required.
Check Valve 	**Fault Type:** • Check valve blockage. • Replacement required.
Oil Window 	**Fault Type:** • Missing oil window. • Replacement required.
Thrust Pad Spray Lubrication:	**Fault Type:** • Multiple blockages in the oil pipe. • Debris identified as cotton or transparent tape. • After cleaning, continue usage.


OPPO Find X3 Pro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5. Summary

The internal cavity of the reducer contains water-contaminated lubricating oil, surface rust on internal parts, black spots on tooth surfaces, and bearing rust due to oil emulsification. Foreign debris such as cotton and transparent tape is found in the oil supply pipeline, causing blockage of the check valve. The longevity of the grinder's waterproof usage results in the entry of a large amount of water during the rainy season, possibly reaching the reducer's internal cavity. Frequent starts and stops of the reducer, especially when the temperature is low, can lead to moisture intake, causing internal component rust, such as bearing corrosion and gear corrosion. It is recommended to check if there is a large amount of water in the grinder during long-term shutdowns due to insufficient capacity. To prevent rust on components during reducer downtime, rotate the oil station temporarily every 10-20 minutes every few days.

6. Repair Material List

No.	Item	Location Number	Qty	Repair Form	Remark
1	Bearing	150	2	Replace	
2	Bearing	151	1	Replace	
3	Bearing	152	1	Replace	
4	Thrust Bearing	253	12	Repair	Technical Proposal
5	Bearing	350	8	Replace	
6	Bearing	450	1	Replace	
7	Bearing	451	1	Replace	
8	Bearing	452	1	Replace	
9	Bearing	550	1	Replace	
10	Bearing	551	1	Replace	
11	Adjustment Ring	118	1	Replace	Technical Drawing
12	Thrust Plate	122	1	Replace	Technical Proposal
13	O-ring φ5	123	3m	Replace	
14	O-ring φ5	124	2m	Replace	
15	Spring	127	1	Replace	
16	Adjustment Shim	128	1	Replace	Technical Drawing
17	O-ring	132	1m	Replace	
18	O-ring	284	1m	Replace	
19	O-ring	286	2m	Replace	

20	O-ring	289	4m	Replace	
21	Hexagonal Bolt	288	10	Replace	
22	Adjustment Shim	528	1	Replace	Technical Drawing
23	Check Valve		12	Replace	
24	Oil Window 255		1	Replace the missing part	
25	Planetary Gear		4	Whether the inner hole needs repair, to be confirmed	

7. Suggestion

1. Regularly check the engagement and tooth flank clearance of the bevel gears.
2. Replace lubricating oil on time as per the reducer operating manual.
3. Implement vibration status monitoring every six months.
4. Avoid overloaded operation and frequent impact loads.

END

Engineer：Wang renjie/Hu shuanglong

Date：27th Mar 2023