Repairs on Controllable Pitch Propeller

The repairs described below are to aid maintenance planning and not a forum for denigrating machinery, companies or personnel

History

The vessel was on passage with 60% loading on the CPP driven though the gearbox. A loud noise was heard and smoke issued from the gearbox vent. The drive engine was stopped

Investigation

Damage was noted to the non-controllable PTO shaft. The centre bearing had failed due to unknown cause. The cage had disintegrated and allowing the rollers to move axially. Several rollers had turned through 90' and and begun to slide. Overheating led to a contained explosion of the oil mist.

One off roller exited the damaged bearing and entered the main gear mesh. The roller had fell into the trough of the controllable pinion and then pressed into the metal. The Bull wheel teeth was then damaged by contact with this roller. The damage to the bull wheel teeth caused a deformation and spreading at the root. The reduced backlash then led to interference damage on the teeth of the pinion. Removing the non controllable pinion shaft indicated a badly worn bearing housing.

This was the most liekly source of failures. Oil galleries, flexible couplings were inspected. Recent Lube Oil analysis had not indicated any fault

Repair

The non-controllable PTO shaft was removed and a new shaft supplied. The damage to the bearing keep was such that there was excessive clearance to the bearing.Line boring was not an option with the facilities available at the shipyard. The time to bring in suitable outside contractors would have incurred excessive off hire costs.

With manufacturer agreement the shaft was machined to move the bearing location to the good portion of the keep. As the shaft is non-controllable it requires no clutch. Therefore the loading on the centre bearing is reduced and a smaller width bearing used which utilises half the keep landing area.

A spacer was fitted in place of the old bearing to allow reuse of the original circlip groove.

The bull wheel and pinions where had ground using angle grinders and fine sandpaper pads. Blue was used to ensure that there was no contact in the damaged area and sufficent backlash existed.

The entire bull wheel and pinion teeth mesh was magnafluxed. Two samll cracks were detected where the roller had been pressed in. These were ground out completely.

The system was flushed with hydraulic oil to clean and then refilled. The system wsa run at 15% load for one week and then steadily increased to 35% over the next month. Maganaflux was repeated and any asperities indicated by local spalling ground out.

After 6 months condition of class was removed and the gearbox operated normally

Concluding

No vibration monitoring was being carried out on board. It is likely that the extra vibration caused by the damage and increased clearance of the bearing keep could have been picked up at the early stages. This would have allowed proper repair timed to reduce off hire.