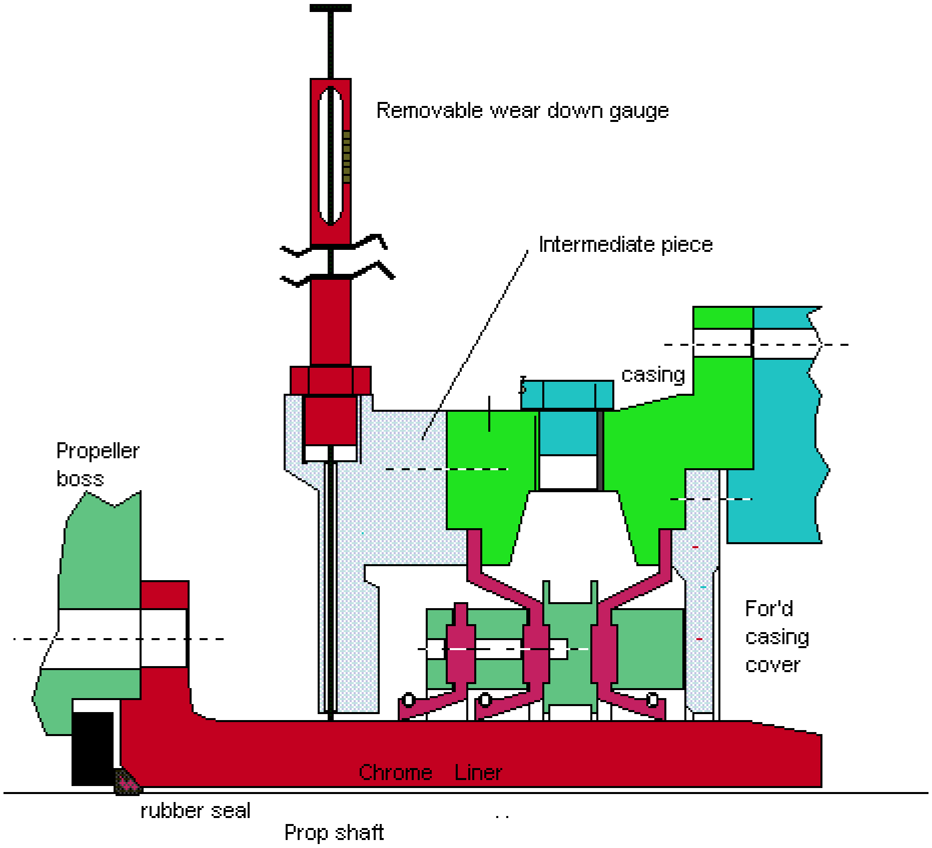
Simplex shaft seal



A very common arrangement for oil lubricated stern tube bearings. A simplex seal arrangement is fitted to both inner and outer ends.

The replaceable chrome liner prevents damage to the prop shaft which would be expensive to repair.

Not show is a rope guard bolt to the hull which prevents material from being 'wound' into the gap and damaging the seal. Rope cutters may be fitted with a fixed blade attached to the hull and a moving blade to the propeller.

Oil pressure is fed to the area between the two opposite facing seals. This pressure is governed by the draught of the vessel and is often supplied via tanks situated at set heights. This pressure balances the sea water pressure on the seal and prevents sea water ingress; by opening the correct tank the pressure exerted by the oil is insufficient to cause oil to leakage out.

Stern tube seals with oil lubrication have tended to use rubber rings increasingly. Fluoric rubber (Viton) with additives has been shown to be more effective than nitrile butadiene rubber for seal rings

Fitting Shaft seals in service.

It is possible to replace lip seals without removal of the tail shaft by vulcanising split seals on the shaft.

The old seal is removed and the shaft and housing carefully cleaned

A precut seal is assembled into the vulcanising machine

The vulcanising machine is then set up off the shaft and the position of the seal checked.

The vulcanising agent is mixed and applied to the seal ends.

The vulcanising machine is then fitted to the shaft and connected to an electrical supply. A heater within the machine heats the seal to a predetermined temperature for a set time determined by ambient temperature, material type etc.

Split type stern tube (Ross-turnbull)

Main advantage of this system is that tail end shaft, stern tube bearing and tapped bolts can be inspected without dry docking. System allows stern tube to be drawn into the vessel for inspection

The bottom half bearing is supported on chocks which in turn rest on two fore and aft machined surfaces within stern tube boss; these chocks govern the height of shafting. A detachable arch is attached to the lower bearing and carries the outboard oil seal, the face of which comes into contact with a seal seat which is fastened to and rotates with tail shaft flange.

The top half of the bearing module makes a seal on the face of the arch and a seal along the horizontal joint on the bearing. The bearing is held in place vertically by 4 x 50 tonne pilgrim type jacks, these jacks also hold the two half bearings together. Lateral positioning is by 4 x 30tonne pilgrim type jacks, two each side.

A running track is arranged above the bearing for easy removal of top half. A rolled race skid is provided so that the bottom half can be transported.

Removal-The hydro mechanical seal is actuated making a seal on the ford face of the propeller and locked mechanically in position. The space is then drained of water.

Top half of bearing can then be removed by taking out the top vertical jacks and using the lifting jack to allow the top half to be brought inboard on the running track. These jacks are now fitted under the lower half bearing to raise bearing and shaft sufficient to allow the chocks to be removed.

The jacks are then lowered until the propeller rest on the propeller rest built into the stern frame. Further lowering allows the bearing to move away from the shaft until bearing is resting on roller skids. The lower half bearing complete with oil seal can then be removed into the vessel for examination.

Reversing the procedure enables the bearing to be replaced

Odd facts-Anti vibration locking gear fitted to jack nuts. As with a CPP it is usual to fit a flange mounted propeller eliminating taper and keyway with their associated problems. The tap bolts securing propeller to tail shaft flange can be removed one at a time, crack detected and returned to their working position.

Stresses in tail shafts

Due to the considerable weight of the propeller, the tail shaft is subject to a bending stress. There is however other stresses which are likely to be encountered. There is a torsional stress due to the propeller resistance and the engine turning moment, and a compressive stress due to the prop thrust. All these stresses coupled with the fact that the shaft may be in contact with highly corrosive sea water makes the likelihood of corrosion attack highly probable.

Examining a tail shaft and stern tube

- Before the periodic inspection the bearing wear down should be measured.
- After shaft removed given thorough examination.
- On water lubricated shafts the integrity of the fit of the bronze liner should be checked by tapping with a hammer along its length listening for hollow noise indicating a separation.
- Measure wear of shaft.
- Examine key way for cracks especially the nut thread area.
- Replace rubber rings