



## **Installation, Lubrication and Maintenance of Industrial Gear Units**

### **Introduction**

With proper care and maintenance, Shackleton industrial gearboxes will give long and trouble-free service.

Particular attention must be paid at the time of installation. Unsuitable foundations will distort gearcases and cause gear tooth misalignment. Similarly any misalignment of coupled machinery will cause damage to shafts and reduce bearing life.

It is important that the correct grade of lubricating oil is used as advised in the maintenance instructions.

### **Foundations**

Shackleton advise that concrete foundations are used which are large enough to give a rigid and stable support. A bedplate can be used to mount the gearbox but this must be level and fixed to the foundation.

When a gear unit is mounted on a steel structure, care must be taken to provide enough rigidity to prevent gearcase deflection, shaft misalignment and vibration.

We recommend that a selection of flat rectangular steel packing pieces are prepared to be placed between the gear unit and the foundation. These pads are to be placed underneath the high and low speed shafts and also on both sides of all foundation bolts.

### **Installation**

Remove all packing material and clean the underside of the gearcase and ensure that the mounting surfaces are flat by removing any burrs.

The gearcase is provided with specific lifting points for lifting the gearcase. These are provided in the bottom part of the gearcase and these must not be used for lifting additional weights such as bedplates. The upper lifting points are only to be used to lift the top of the gearcase for maintenance purposes.

Prepare the foundations by placing the packing pieces in the correct places and lift the gearcase onto the foundation studs. If the studs are existing or are loose in the foundation pockets then locate the gearbox to suit.

The gear unit is then to be accurately levelled using a precision engineer's level placed on the levelling pads machined on the gearcase. Shims are added to the packing pieces in a logical order until the gearcase is level in two directions. When the foundation bolts are completely fixed, the nuts are to be tightened and the level is rechecked. Any change in the level needs to be corrected before grouting in position. Gear units on bedplates need to be located by widely spaced dowels after lining up.

The levelling process depends also upon other site conditions. If the driven machine is already installed, the output shaft of the gear unit is first to be lined up to the driven machine and the motor is then to be lined up to the input shaft of the gear unit. Input and output couplings must then be accurately lined up with their mating halves, keeping angularity and eccentricity within the limits given by the coupling manufacturer.



## **Important**

Shackleton gear units are not normally designed to cater for external thrust loads from coupled machinery. Great care must be taken at installation to avoid the possibility of loads being transmitted to the gear unit. The correct choice of couplings can often protect the gear unit from external thrust loads. Refer to our technical department for advice on coupling selection.

## **Lubrication**

If the gears are lubricated by oil splash, our design ensures that oil is fed to all bearings during normal operation.

Only use an approved oil of the grade specified on the instruction plate and fill to the level marked on the level gauge. Please check with Shackleton the suitability of other high grade mineral oils before use.

When a forced lubrication system is used, the gear unit is normally supplied with pipework and fittings in position. Occasionally, the pipework is dismantled for transportation and is to be reassembled on site and all flanges and unions tightened up before the foundation bolts are finally tightened. Foundation bolts for the lubrication system are to be left loose in the foundation cores until the connecting pipes are fixed in position. It is important to check that the piping is according to the general arrangement drawing before starting the gear unit.

## **Oil Pump**

The oil pump delivers the lubricating oil from the oil sump to the spray nozzles and bearings in the gear case. The sump can be in the gearcase or a separate settling tank. Some gearboxes lubricate the bearings and gears by the action of the gears splashing oil within the gearbox.

## **Pressure Gauge**

The pressure gauge is to indicate that oil is being delivered at the correct pressure. Normally the pressure will read 1 Bar but if the pressure rises this indicates a blockage in the system. Oil strainer blockage could be the cause of pressure rises, which cleaning will bring back to normal pressures. A loss of oil pressure indicates a leakage. Gearboxes are often protected with a pressure switch, which stops the drive system at low pressure.

## **Oil Strainer**

The oil strainer or filter should be cleaned at regular intervals as directed in the maintenance manual. Damaged filter baskets should be replaced. Where a magnetic plug is part of the strainer this should also be cleaned. Excessive metal in the magnetic plug after the initial start up is an indicator of wear and should be investigated.

## **Relief Valves**

Pressure relief valves are fitted to safeguard the system against over pressure. They are adjustable and should be set using the pressure gauge to tune the oil pressure at commissioning.



## **Oil Cooler**

The heat generated by friction in the bearings and the gears is transferred to the oil. The oil temperature will rise above the ambient and heat is then transferred to the gearcase and the atmosphere. If the gearbox cannot dissipate the heat by natural cooling then a cooling fan is installed on the input shaft or a heat exchanger is used as an oil cooler. The gearbox design and testing will dictate which method of cooling is used.

## **Maintenance**

A complete change of oil is recommended after the first 2,500 hours of operation or 6 months and afterwards every 12 months. The gearcase should be occasionally washed out with paraffin to remove any degraded oil deposits.

The oil level should be checked at regular intervals, with the gears at rest. The oil level is set at testing of the gearbox and overfilling and underfilling is to be avoided.

The gears should be periodically inspected through the inspection cover.

## **Couplings**

There are generally three types of coupling in use.

### *Rigid Couplings*

Not normally recommended as extreme care is needed to align the shafts exactly. Bad alignment induces additional loads on the shafts, which adversely affect the gearbox life.

Where it is necessary to use rigid couplings to support one of the shafts, the gearbox must be designed to take account of these extra forces.

### *Pin Type Flexible Couplings*

This type is effective where small misalignments are unavoidable. The resilience of the rubber bushes enable the pin type coupling to absorb energy from shock loads. They are therefore suitable in applications where shock or vibration is present.

### *Gear Type Flexible Couplings*

This type allows for considerable angular or radial misalignment due to bearing wear, foundation settlement and temporary conditions found at start up or change of load.

Misalignment is accommodated by a special barrelled tooth form within the coupling. Gear couplings require lubrication.

## **Disclaimer**

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