FLUSHING OF MAIN GEARBOXES AND LUBRICATING OIL SYSTEMS

BY

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Introduction

The aim of this short article is to help ship's Marine Engineer Officers to avoid prolonged flushing routines for main gearboxes and lub. oil systems by warning of problems experienced by ships in Portsmouth Dockyard over the past two and a half years. Solutions to some of these problems and also suggestions that might well be helpful are provided.

No attempt has been made to be specific on any flushing procedure as laid down in the reference, and the suggestions apply generally. Everything in this article is intended to be complementary to and not replacing any official instructions and, of course, opinions expressed are those of the author.

The Problem

There have been several cases where the time for flushing gearboxes in ships coming out of refit has run into months, rather than weeks. The most significant cause in each case has been pockets of dirt out of the main oil stream (and therefore not subjected to adequate oil velocity) which have metered dirt into the system. This has resulted in the gauzes achieving a certain level of contamination and then failing to improve.

To achieve the cleanliness necessary in a reasonable time, the flushing must be planned in two phases:

(*a*) The Preparation.

(*b*) The Flush itself.

Preparation

All likely pockets of dirt should be sighted and cleaned where possible early in the refit. In DLGs the rectangular manifolds under the gear-driven lub. oil pumps have been known to be traps as have the main lub. oil pipes running down the sides of the gearboxes. Main lub. oil coolers have proved to be effective dirt traps in *Rothesay* and *Leander* Class frigates.

Ensure that arrangements for heating the oil are adequate. One standard 2-inch O.D. shore-steam hose is totally inadequate for both drain tanks in a DLG. Coils fitted to drain-tank lids are generally too small for effective heating of the oil and have too little surface area immersed in the oil unless the tanks are filled right up. Ships with fitted heating coils normally have fewer problems achieving temperature as the coils are adequate in size and are totally immersed.

Discuss with Dockyard Officers the flushing arrangements; and cover, in particular, the following points:

(*a*) Provision of gauzes with backing plates.

(*b*) Which procedure is to be used.

(*c*) The manpower to change the gauzes.

Before closing the gearboxes, hand spray the inside with lub. oil paying particular attention to all nooks and crannies.

Efficient flushing can only be achieved by providing a good oil velocity. To obtain this, a light flushing oil such as OM24 or OM33 must be used. OEP69 is

not at all suitable as its velocity through 100-mesh gauzes is low, particularly if the oil is not heated close to 160°F. Furthermore, OM24 is the recommended oil for the removal of lacquers (para. 10 of reference). Adequate notice must be given to PSTO(N) so that additional supplies of OM24 can be obtained if necessary. (This applies to procedures C, D, and E of reference.)

Regulations state that a gauze is to be fitted at the top of the oil filling line. It is recommended that a gauze is fitted also at the storage tank end of the filling line, especially if the system has been idle for some months.

Flushing

Flushing procedures are laid down in the reference. These do tend, however, to mislead in respect of the time required—the impression given is that, after twelve hours of flushing, the required cleanliness standard is approaching. This is very seldom the case.

The objective for the initial period of the flush must be to get the maximum oil velocity through each part of the system (i.e. para. (h) of procedures C and D in the reference). This can be achieved by flushing the main pipe system using a temporary return to the drain tank having first blanked all oil supplies to the gearbox. The temporary pipes and blanks are then removed, all orifice valves screwed down, and flushing continued opening up each orifice valve in turn. This routine, in conjunction with hammering of pipes, should shift most of the dirt. Blocking of gauzes will be detected by changes in oil pressure readings and some will undoubtedly choke quickly. When all branches of the system have been opened out, all gauzes should be changed. Any branches of the system which choke quickly should be individually flushed again.

The changing and inspection of all gauzes at four-hourly intervals on complicated gearboxes (e.g. DLGs) is time consuming and a waste of manpower. The routine normally worked is to change the same 25 per cent. of gauzes each time, these being the known dirty ones selected by previous experience and experience gained from the initial flush. In addition, a further four gauzes on each box are inspected in rotation so that complete coverage is finally achieved. A further saving in time and manpower can be made by accepting a small leakage from joints, by not overtightening them and by re-using the joints several times. It has also been found that the use of skilled manpower for making and breaking joints has advantages—stripped bolt threads due to pipes having to be sprung for the insertion of gauzes and backing plates can be very frustrating.

Arrangements must be made for frequent sullaging to maintain the bilge in a safe condition.

The CHA(RN) 6300 standard laid down (reference) is unlikely to be achieved, and, in fact, is seldom achieved with clean OEP69 as supplied. It is understood that this standard is being reviewed. The practical criterion is that no hard particles are collected on the gauzes. When possible, oil samples should be tested locally during the flush so that progress can be determined. If gauzes contain hard dirt and the particle count does not improve, then it is probable that there is still a pocket of dirt lying somewhere in the system. This will then have to be searched out and cleaned.

Problems Experienced

(*a*) A DLG after long refit found dirt lying in the square manifolds under the gear-driven lub. oil pumps and in the main supply pipes alongside the gearboxes. The lub. oil filling system was also dirty and rust scaled.

(*b*) The gauzes in two frigates showed no improvement after weeks of flushing. Dirt was trapped at the bottom of the lub. oil coolers which were

fitted downstream of the filters. In one of the ships, the coolers had been chemically cleaned.

(*c*) Lub. oil filters have been wrongly assembled allowing oil to bypass the elements. A gauze fitted downstream of the filters does provide extra insurance.

(*d*) A frigate ran up its turbo-driven lub. oil pump for trial near the end of the flushing routine. The filters were dirty and the bypass operated. An extra week of flushing was required.

(*e*) A lub. oil temperature of 70°C (160°F) has not been achieved due to lack of pressure and quality of steam. Larger size hoses or one hose for each drain tank were required.

(*f*) The flushing charge was not drained properly and the charge of OEP69 was contaminated with OM24. Proper care must be taken to run down all parts of the system including coolers. Slight OM24 contamination is acceptable.

(*g*) Delays in flushing have been caused by lack of OM24 supplies. PSTO(N) should be given time to obtain additional supplies. A top-up of the flushing charge will be required to make up for losses during gauze changing.

Acknowledgements

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Reference:

BR 3001. Art. 2009