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GENERAL MAINTENANCE

The following Technical Procedures apply to all vessels owned or managed by the Company.

1. MACHINERY ALARMS AND FAIL-SAFE DEVICES

Alarms and Safety devices shall at all times be in proper working order and are to be checked and tested frequently.

This protective equipment is provided, in most cases as original equipment by the machinery builders, to safeguard not only the engines and boilers to which it is fitted, but also the operators of the machinery.

The Chief Engineer shall ensure that the following instructions are observed:

1.1. A complete inventory of all alarms and safety devices installed in the plant is readily available in the engine room for reference purposes. This inventory should form the basis for a checklist against which the operation of the safety devices may be tested in accordance with the requirements of the Planned Maintenance programme or the dictates of sound Engineering Practices.

1.2. That watch keeping Officers are fully conversant with the purpose of each device, and the action required to be taken in the event of activation of this protective equipment.

1.3. That Engineering Officers under their command are fully aware of the correct method of blowing gauge glasses and that they are properly instructed when gauge glasses should be blown. Gauge glasses are to be blown at least once per day by alternately shutting off the steam and water cocks and blowing through with the drains open.

1.4. Special attention needs to be paid to water gauges on boilers being brought back into service after having been shut down as it is on such occasions particularly that problems may be experienced through the pipes or cocks being choked, or through the gauge having been isolated for maintenance.

1.5. Water gauges must be blown as soon as steam is raised on boilers being lit up.

1.6. Low water alarms and trips are also to be tested on a daily basis by simulating the low water condition by draining the float chambers. It is important that such tests be arranged so as to prove the integrity not only of the electrical circuits, but also of the interconnected mechanical and/or pneumatic elements as the case may be.

1.7. The same rationale is to apply to the emergency shutdown devices on diesel engines and other machinery, where for example, a low oil pressure condition must be applied to the pressure switch (not the pressure setting merely adjusted downwards which would prove only the electric circuitry). Such low-pressure condition may be simulated by isolating the sensor from the pressure source by means of a suitable cock and venting the entrapped oil.

1.8. Should the machinery not be equipped to enable such tests to be reliably and conveniently conducted, you are to make the necessary provision right away.

1.9. All watch keeping Officers are to be thoroughly familiar with the requirements of the necessary tests and the procedures themselves.

1.10. Testing of alarms and safety devices to be recorded in the Engine Room Logbook and signed by the testing Officer and countersigned by the Chief Engineer.

1.11. Pressure and temperature transmitters (switches) serving boiler and machinery self-protection shut down systems shall be re-calibrated annually. Set points are to be as per Machinery Makers Instructions.

2. TESTING OF PUMPING SYSTEMS

The Planned Maintenance programme caters for the testing of all pumping and valve systems.

The Chief Engineer shall ensure attention is drawn to the need for thoroughness in carrying out these tests and examinations.

2.1. Non-return bilge valve bonnets must be lifted to ascertain that the valve's non-return action is unimpeded by debris and that it seats effectively. The identification of these valves is also important. Ensure that the label on the valve corresponds to the duty of the line it serves. There have been occasions when cargo has been water damaged as a result of malfunctioning non-return hold bilge valves, and when many man hours of effort have been wasted in attempting to pump a compartment via an incorrectly identified valve.

2.2. Testing of the deck-wash / fire main system is to undertaken monthly. The integrity of each main, section and emergency-isolating valve must be tested by pressurizing one side of the valve whilst having the piping downstream of the valve open to drain. Special attention must be paid to valves downstream of inductor as an obstruction there, will result in the compartment served by the inductor being back-flooded by the educator driving-water.

2.3. Fire hydrant valves must be maintained in top-class condition and never permitted to drip. When not in use they must be properly shut.

2.4. Expensive water damage has been caused by valves being carelessly left open, or passing, when the line has been pressurized to provide water elsewhere in the ship.

2.5. In view of the significance of maintenance work / inspections performed on any pumping system it is prudent practice to record details of such work in the Engine Room Logbook.

3. ROUTINE MONTHLY SERVICING TASKS

The Chief Engineer shall ensure that all the routine monthly maintenance is timeously executed. The following list shall serve as an aid to the Chief Engineer, who may revise the list to ensure that the individual requirements of the vessel are fully met.

MONTHLY ROUTINE:

3.1. Safety Equipment Checks

a. Test CO2 alarms.

b. Test operation of Engine Room vent flaps.

c. Test emergency/remote stops.

d. Test quick-closing trip valves.

e. Run and service lifeboat engine(s). Service batteries.

f. Run and service emergency fire pump. Service batteries.

g. Run and service emergency alternator. Service batteries.

h. Check operation of steering gear on emergency manual mode.

i. Check operation of emergency lighting. Service Batteries.

j. Test general alarm.

k. Check integrity of scavenge and fixed CO2 smothering systems.

l. Check all drip-trays and save all for cleanliness.

m. Check all bilge strums and scuppers for cleanliness.

n. Check integrity of Oxy-Acetylene equipment.

o. Ensure all fire hoses and extinguishers in position and ready for use.

p. Check portable electric emergency equipment.

3.2. Mechanical Checks

a. Clean all lube oil filters: Main and Auxiliary machinery and any other systems, check oil levels.

b. Clean all hydraulic systems filters and check oil levels.

c. Clean all fuel oil filters: Main and Auxiliary machinery and boilers.

d. Clean all sea strainers on all S.W. systems.

e. Clean all air filters: Main and Auxiliary machinery, compressed air system and ventilation fans.

f. Inspect Main and Auxiliary engine's crankcase as per separate and accompanying note. Check explosion doors.

g. Reset tappets Main and Auxiliary engines.

h. Inspect air compressors crankcase and change oil.

i. Test domestic refrigeration plant for leaks and test shutdown devices and defrost evaporators.

j. Test air-conditioning plant for leaks and test shutdown devices.

k. Run emergency air compressor and check time taken to pump up air receiver.

l. Inspect M.E. sump tank cofferdam. Check for leaks and loose flanges.

m. Take set indicator cards on main engine and check fuel rack settings. Compare with trial data.

n. Compare all operating details of Main and Auxiliary engines with original trial data.

o. Check all oil levels of individual components forming part of the Main, Auxiliary or other machinery.

p. Clean and service all separators.

q. Chemically test cooling water, Main and Auxiliary engines. Adjust treatment dosage as necessary.

r. Water wash air and gas side Turbochargers and check oil levels.

s. Oil/Grease all pumps, fans and motors.

t. Deck machinery grease and oil levels, fan belts.

u. Grease steering gear.

v. Ship's side isolating valves to be operated and spindles lubricated.

w. Bilge inspection and clean.

x. Switch over and bring into service all duplicated equipment.

y. Examine and check holding down bolts on main propulsion plant and auxiliary diesel alternators.

3.3. Electrical Checks

a. Check navigation lights.

b. Check operations of overload, preference and reverse power trips.

c. Check operation of all motors for unusual vibration/bearing noise.

d. General lamping-up deck, holds, accommodation and engine room.

e. Check operation and safety of all portable electrical equipment, including cluster lights.

f. Check operation of Engine Room electric telegraph.

g. Check air-whistle on manual and automatic telegraph.

h. Visual inspection of switchboard and sub-distribution boards. Note connections, fuse holders, insulation. Check for evidence of arcing or other overheating caused by poor connection or insulation.

3.4. General Checks

a. Check sacrificial anodes in pipes, chests, and water boxes.

b. Examine Main engine cams and cam-followers for wear.

c. Clean Main engine scavenge spaces.

d. Clean/soot blow auxiliary boilers.

e. Service boiler burner units.

f. Drain stern tube water.

g. Bleed and replenish all deck hydraulic remote-control equipment.

h. Test operation of remote, local and bridge control of main engine(s).

4. CLASSIFICATION SOCIETY SURVEYS

Chief Engineers are responsible for ensuring that the Certificate of Survey is received on board within a reasonable period of time after a machinery survey has been conducted.

5. MACHINERY CALIBRATIONS - APPLICATION OF DATA

5.1. Chief Engineers shall ensure that component items of machinery which are subject to normal wear and tear, have, at the time of being returned to service, sufficient life remaining to reliably see the part reach its next scheduled inspection or overhaul date.

All measurements called for in the MACHINERY CALIBRATIONS FILE must always be carefully evaluated with this instruction in mind.

Example: Piston Ring-Groove Measurements.

Makers limit the clearance between piston ring and groove to 0.70mm. At inspection, clearance found to be 0.60mm. Previous inspection, 10 000 hours earlier, clearance recorded at 0.15mm.

Rate of wear = 0.45mm in 10 000 hours or 0.45mm/10 000 hours.

Next scheduled piston inspection (or overhaul, or survey) is in 10 000 hours' time.

Even assuming the rate of wear to be linear (which it definitely is not, it accelerates with time) the clearance by then would be at least 0.60 + 0.45 = 1.05mm, which is far in excess of the Makers' limit.

Action:

Piston is not to be returned to service until it has been reconditioned in such a manner that a further 10 000 hours (minimum) service may be had from the part. In this case restoration would probably involve machining the ring grooves to accept oversize piston rings so that clearances are brought to within 'as new' tolerances quoted by the manufacturer.

In instances where restoration or re-working is not possible, the component must either be immediately renewed, or the next inspection/overhaul/survey date formally advanced to conveniently cater for renewal of the part well before the time that the makers limits are expected to be reached.

All such actions are to be clearly noted on the appropriate page in the MACHINERY CALIBRATION FILE.

NOTE: This is an example and is not to be used as Makers' actual limits.

5.2. In addition to the Policy which requires that sizes and measurements are always to be recorded in the ship's MACHINERY CALIBRATIONS FILE, whenever the machinery for which it caters is inspected or worked upon, the Chief Engineer shall provide the Technical Superintendent with photocopies of new entries made in this file.

5.3. A duplicate copy of this instruction is to be securely filed in the front of your ship's MACHINERY CALIBRATIONS FILE.

6. MACHINERY MAKERS' OVERHAUL RECOMMENDATIONS

Chief Engineers are to check their planned maintenance master lists and Makers Instructions to ensure that Makers maintenance/service intervals for Main Engine, generators, pumps purifiers, etc. have not been exceeded.

Chief Engineers may recommend changes to makers' overhaul frequencies; however, changes must be authorised by the Technical Superintendent before implementation.

6.1. MC/MC-C Engines Condition Based Overhaul (CBO) Implementation

With reference to MAN Service Letter SL07-483/HRR Condition-based Piston Overhaul August 2007 for MC/MC-C/ME/ME-C type engines and subsequent circulars SL2009-509 - MAN STX New Guideline for Overhaul Intervals / SL2017-643SRJ - MAN Updated Overhaul Intervals.

After extensive service experience, longer overhaul intervals can be obtained with a condition-based overhaul strategy (CBO). The “Guiding Overhaul Interval” for pistons, previously set to 12-16,000 hours, appears to have been set rather too conservatively. Normally, the need for piston overhaul does not arise until much later, and extensions of up to 32,000 hours are possible. To obtain the highest number possible of safe running hours before an overhaul, a CBO, Condition Based Overhaul, strategy has been introduced as described in SL07-483/HRR.

During the routine prescribed service intervals, as per MAN guidance, negligible wear has been observed on vessels running with the MC/MC-C engines with high top land pistons. The Company has therefore decided to implement Condition-based Piston Overhaul after consultation with MAN, this will require more frequent inspections of the pistons and associated contact surfaces to be undertaken. In order to accurately record these inspections, Chief Engineer’s are to follow the below guidelines for inspection and document them on the MAN inspection sheets. The Initial extension to Mespas[1] has been set to 24000hrs. As vessels reach the new interval, we will once again review the vessel result to see if a further extension can be implemented.

NB: - Vessels are to ensure that they have as a minimum of one complete set of spares on board to be able to overhaul one unit. The decision whether or not to overhaul the units will be based on the results from the CBO.

6.2. Condition Based Overhaul (CBO) strategy

The most important factor in a CBO strategy is the evaluation of the actual condition. This is done by means of regular scavenge port inspections and recording the wear and hot corrosion values. According to MAN, all the decisive factors for piston overhaul can be checked via inspections through the scavenge air ports.

The most important factors for piston overhauls are:

1. Piston ring wear.
2. Maximum amount of hot corrosion of piston top allowed on the centre part, where it is normally the highest.
3. Sticking, broken or collapsed piston rings, leaking pistons.
4. Macro-seizures on piston ring running surfaces.

Inspection and recording of the actual cylinder condition including wear, should be performed regularly in order to become familiar with the wear development in the cylinder liner. Initially, these inspection intervals shall be quite short; 350 hours, vessels schedule permitting. As the wear trend history builds up intervals will be extended on Mespas[2].

[1] W 03 / 2024
[2] W 03 / 2024

6.3. New Form 6.6.6.2 MAN CBO Cylinder Condition Report Record Sheet

The new report form that has been introduced is an excel document named 6.6.6.2 MAN CBO Cylinder Condition Report Record Sheet. Within this Excel document are Four Sheets that will need to be completed.

1. Cylinder Condition Report. Please input original.
2. Condition Monitoring Report.
3. Condition monitoring Charts.
4. Inspection through Scavenge Ports.

The forms have been locked down and are specifically built by MAN with various tabs that need to be selected. Please do not attempt to modify the forms. Information can be gathered from old overhaul records, if the unit has not been overhauled, input the original data from manufacturer.

The following measurements should be and recorded on the form.

1. Top piston ring wear, defined by measuring the remaining depth of the CL grooves. The wear on the top piston rings can be determined by measuring the remaining depth of the CL grooves by means of a Vernier gauge. The degree of wear can also be estimated visually simply by checking the size of the remaining rounding on the upper and lower edges of the running surfaces.
2. Ring groove clearances, measured by means of feeler gauge.
3. Estimated piston burning on large bore engines, measured by means of a template via the scavenge ports.
4. Refer to **SL07-483/HRR** and the document **Procedure for inspecting Inspection Cylinder Condition** with pictorial guidance that has been placed in Sharepoint, Main Engine Service Letters Folder under the title Procedure Inspection Cylinder Condition. This will give a clear and concise guidance on what to look for.

The running surfaces of the piston rings are the best indicators of the cylinder condition in general. If the ring surfaces appear to be in good condition and free from scratches, micro or macro seizures, the liner will also be in good condition.

However, if the liner appears damaged by active seizures or if the wave-cut pattern has disappeared on the lower cylinder part visible through the ports, the rings will also be affected and most likely the unit has to be overhauled.

References:

SL07-483/HRR Condition-based Piston Overhaul August 2007
SL2009-509 - MAN STX New Guideline for Overhaul Intervals
SL2017-643SRJ - MAN Updated Overhaul Intervals