

Inserve

marine technical services

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Our biggest resource:

Surveying a large number of different vessels, normally two a week per surveyor, and seeing a wide variety of ship operations...

...including various planned maintenance systems (PMS)

We often find PMS are poor due to:

- Not taking into account the end user, ie ship's staff.
- Not ship specific.
- Not updated to reflect loss prevention, service letters and bulletins.

and are normally lacking:

- Adequate job descriptions.
- All maintenance tasks and measurements as per the maintenance manuals.
- Adequate reporting, with measurements and observations.

Ship' s staff:

- Worldwide shortage of experienced and skilled staff, particularly engineers.
- More need for enhanced job descriptions.
- Possibly written in two languages.
- Computer or paper based - advantages and disadvantage.

Ship Specific PMS:

- Must be written specifically for the machinery and equipment on board each ship. Often maintenance schedules and job descriptions are often too vague.
- The vessel's trading pattern and type of machinery etc. should dictate how the maintenance is carried out.

Updated for Loss Prevention:

- If loss prevention information is given to ship's it's normally in the form of company circulars, service letters or technical bulletins. These are normally received on board, filed and very often not used.
- Job descriptions, frequency of jobs and extra measurements and observations are not normally revised to reflect the loss prevention.

Our recommendations:

- Weekly and monthly TBM schedules
- A running hour form
- Job descriptions
- Report forms

Planned Maintenance System

Time based maintenance (TBM)

Schedule:	Monthly, bi monthly, three monthly
Revision date:	26 th March 2008

Item name	Job number	Responsibility	Date done	Name
Document check		captain		
Bridge equipment		C/O		
Deck greasing		C/O		
Life saving apparatus		2/O		
Fire hoses	002	2/O		
Lifeboats		2/O		
Stern tube		C/E		
ME alarm testing	003	2/E		
Oil mist detector		2/E		
CPP system		2/E		
Lube oil test	004	2/E		
Black out test		2/E		
Em. lighting and escapes		2/E		
Remote stops		2/E		
Quick closing valves		2/E		
Pump change over		2/E		
Steering gear		2/E		
Refrigeration system		2/E		
DG alarm testing		3/E		
Air compressors		3/E		
Boiler		3/E		
ER fire fighting equip.		3/E		
Exhaust check		3/E		
Sewage system		3/E		
ER greasing		3/E		
Oily water separator		3/E		
Fire detection system		E/O		
Emergency batteries		E/O		
Meggar testing		E/O		

Planned Maintenance System

Running hours

Revision date:	17 th March 2008
End of month:	

Total main engine running hours:						
Main engine running hours this month:						
Cylinder number	1	2	4	5	6	

Fuel injectors					
Fuel pumps					
Starting valves					
Cylinder heads					
Pistons					
Liners					
Con. rods					
Bottom end brgs.					
Main bearings					

Running hours:	Total	This month
Generator number one		
Generator number two		
Generator number three		
Purifier number one		
Purifier number two		
Air compressor number one		
Air compressor number two		
Fridge compressor number one		
Fridge compressor number two		

Job Descriptions:

Probably the most important part
of a PMS.

Job Descriptions should include:

- What work or test is required and when, ie the scope of work and frequency.
- How it is carried out. This may refer to a section or page in the machinery instruction manual. For instance, tightening torques are useful to include.
- It is sometimes useful to photocopy sections of the maintenance manual and or service letters and attach these to the job description or put them in a plastic wallet type folder. This system replaces the need for a working copy of the maintenance manual in entirety.

Job Descriptions should include:

- What company circulars or loss prevention information are available. A sister ship may have had a failure due to the job not being carried out correctly or a manufacturer's service letter may refer to a fault if the job is not correctly carried out.
- Any safety information, such as what personal protective equipment (PPE - gloves, hard hat etc) is needed to carry out the job, special tools to be used etc.
- Any useful photographs which may help a description, ie location of a sensor or a crack which must be inspected.

Job Descriptions should include:

- If the job is mandatory, i.e. SOLAS ,MARPOL or a class requirement, give the regulation, ie Lloyd's rule 6.2. This is useful if there is a disagreement between crew or with port state inspections on the frequency or details of testing some equipment, ie fire hoses. This may also give more impetus for the job to be done correctly.
- What reporting is needed, ie a report form is required, note made in the logbook or the superintendent is to be informed when the job is finished etc. It may be necessary to inform the chief engineer before carrying out the job.

Planned Maintenance System

Job description

Item name:	Fire hoses
Job number:	002
Revision date:	17 th March 2008

Description:

Every month a selection of fire hydrants, hoses and nozzles are inspected and or pressure tested.



This is a SOLAS requirement – covered in part C section 2.3.1, testing part E section 2.2.3.1

Inspection - make sure a hose, nozzle and wheel key is located at each hydrant. Inspect the rubber seal on each item, renew as necessary if the rubber is perished or hard. Open and close the hydrant and grease the spindle.

To be carried out in even months - inspect number 1,3,5,7 and 9 fire hydrants.
To be carried out in odd months – inspect number 2,4,6,8 and 10 fire hydrants.

A general arrangement is attached to this job description with the location of each hydrant.

Pressure testing – connect the nozzle and hose to the hydrant and pressurise the fire main to eight bar. Operate the nozzle checking for leaks at the seals.

Pressure test to eight bar one fire hose a month, ie number one in January etc.



Inform the duty officer and the engine room watchkeeper before starting the fire pump.



Complete a general report form **and write in the bridge logbook** which hydrants have been inspected and which hose and nozzle has been pressure tested.

Planned Maintenance System

Job description

Item name:	Bottom end bolts
Job number:	005
Revision date:	17 th March 2008

Description:

To be carried out at 20000 running hours, preferably at the same time as the generator full overhaul.

The bottom end bolts must be changed for new bolts every 20000 hours due to cyclic stresses weakening the bolts.



See company circular 021 dated 21st September 2002 and B&W service letter 183 dated October 2002. Instruction manual section 6.2 with regard to the correct tightening method. These documents are attached to this job description.

The old bolts are to be discarded.



A general report form is to be completed stating the bolts have been changed for new bolts. The chief engineer is to sign the report form and a copy emailed to the superintendent.



There is a special tool for tightening the bolts, see page 200 of the instruction manual.



Do not exceed 200Nm.



Reporting should include:

- What was done.
- What measurements were taken.
- What was not done and why.
- What needs to be done next time the job is carried out.

Planned Maintenance System

Specific report form

Job name:	Generator full overhaul
Job number:	006
Machinery:	
Date:	
Carried out by (name):	

Piston (min. dia. 119mm, max. groove 5.5mm)				
	1	2	3	4
Min. diameter				
Max. ring groove				
Piston crown condition				
Replaced Y/N				

Liner measurements (new dia. 220mm, maximum dia. 221mm)								
	1		2		3		4	
	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft
A								
B								
C								
D								
E								
Condition								
Renewed Y/N								

	1	2	3	4
	Connecting rod top end			
Condition of bearing				
Renewed Y/N				

Diameter of gudgeon pin (min. 74mm)				
Condition				
Renewed Y/N				

	Connecting rod bottom end (max. ovality 0.2mm)			
Dimensions A - B				
Dimensions C - D				
Ovality (A-B) – (C-D)				
Condition				
Con. Rod renewed Y/N				
Bearing renewed Y/N				

	Bottom end journal			
Diameter (min. 109mm)				
Condition				

	Main bearings and journals *				
	1	2	3	4	5
Journal diameter (min. 119mm)					
Condition of the journal					
Condition of bearing shells					
Inspected Y/N				Yes	
Bearing renewed Y/N					

* Number four journal is undersize, diameter 118mm. This must be inspected.

Overall remarks:

Common issues which would benefit from enhanced maintenance in the PMS:

- Four stroke medium speed main engine crankshaft bearings.
- Turbocharger overhauls and bearings.
- Piston crown thinning.
- Lube oil testing, ashore and onboard.
- Alarm and shutdown testing.
- Tank inspections.

One important issue we see:

- Maintenance records and sometimes running hours of machinery are not handed over to a new owner.

This should be part of the memorandum of agreement when a ship is delivered.

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- Take time to write good ship specific job descriptions and report forms.
- Superintendents to review the PMS with ship's staff during ship inspections – update job descriptions when company circulars are created or PSI deficiencies are given etc.