OCN 10.2 MAINTENANCE OF CRITICAL SYSTEMS

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1. Purpose

The purpose of this procedure is to set forth the identity and procedures associated with the critical systems and equipment to ensure their reliability on R/V Oceanus

2. Reference

Safety Management Manual Procedure 10.2

3. General

The ISM Code calls for the identification of equipment and technical systems that are considered critical and that procedures are set in place to ensure these systems are adequately maintained and specific measures established aimed at promoting the reliability of such equipment or systems. These measures shall include the regular testing of stand-by arrangements and equipment or technical systems that are not in continuous use.

The critical equipment and systems are specifically set forth in this procedure. The reliability of this equipment and system is maintained through a combination of operation rotation, periodic testing, preventative maintenance, vibration monitoring and/or oil analysis depending on the equipment or system.

Systematic preventative maintenance is scheduled and performance records are maintained in NS5. Each piece of equipment designated as critical will have routine preventative maintenance scheduled in NS5. Periodic preventative maintenance is conducted through standard jobs that are scheduled through this maintenance software. Repairs and unscheduled work are recorded in Work Orders. The record of this maintenance is located in the NS5 software.

Oceanus is equipped with the Predict-DLI vibration monitoring system. Most of the major pieces of equipment on the vessel are included in the vibration monitoring system. In general, the monitoring is run once each quarter unless special circumstances develop that warrant increased frequency of monitoring. Some equipment is used infrequently and is tested annually. A list of the monitored equipment can be found in the Predict-DLI software.

Most pieces of equipment that have lube oil or hydraulic oil systems associated with them are subject to an oil analysis program. This oil analysis program subjects the oil in the system to periodic sampling which is sent out for analysis.

Critical Equipment or Systems
Main Engine - Clutch
Red Gears – CP Unit
Ship's Service System
Bow Thruster
Steering Gear
Emergency Generator/batteries
Fire Pump
Bilge/Ballast Pump
Air Compressors

4. Specific Details

A. Main Engine

Oceanus has one main engine, a 645-E5 EMD, for propulsion. It is geared through a Lufkin Red (1291) gear that drives a KaMeWa Model 72 CP Propeller.

1. Operation Procedures

   The main engine is normally started 2 hours prior to departure to ensure for an even warm-up period and to allow all systems to be checked prior to departure.

   The engine has an alarm panel to alert the engine room of any abnormal conditions. There is also a remote alarm indicator on the bridge to alert the mate on watch of all main engine alarms.

   The engine is salt-water cooled by an engine driven pump that has a duplex salt-water strainer. In case of emergency, cooling is provided by the general service cooling water system.

   Two permissives must be satisfied to engage the main propulsion shaft:
   a. The main engine must be at Idle RPM
   b. The propeller blades must be at zero pitch

2. Periodic Tests
   a. The main engine clutch and throttles control are tested prior to departure and signed off by the 2nd Mate.

3. Preventative Maintenance

   Main Engine, Main Clutch, Reduction Gears, CP Unit
   a. Standard jobs are maintained and scheduled in the NS5 software

4. Vibration Analysis
   a. Vibration analysis is contained in the Predict-DLI program

5. Oil analysis
   a. The Oceanus main engine, reduction gears and CP unit are included in the oil analysis program.

B. Ship Service Generators

Oceanus ship's service system consists of two Caterpillar 353 diesel generator sets, switchboard and distribution system. Depending on electrical loads, one diesel generator is capable of carrying the electrical load.

1. Operation procedures
   a. At least two generator sets are on line in restricted maneuvering situations.
   b. Generator sets are rotated to be on line to spread running hours and ensure dependability.

2. Preventative Maintenance
   a. Standard jobs are maintained and scheduled in the NS5 software

3. Vibration analysis
   a. Vibration analysis is contained in the Predict-DLI program

4. Oil Analysis
   a. The diesel engine/generators are included in the oil analysis program.

C. Emergency Electrical Power System

The emergency electrical power system consists of a John Deere 6068 diesel generator set (60KW), starting system, emergency switchboard and distribution system.

1. Operation procedures
   a. See OCN Procedure OCN 7.5.11

2. Periodic Tests
   a. Start and run once per week
   b. Load test performed once per month

3. Preventative Maintenance
   a. Standard jobs are maintained and scheduled in the NS5 software

4. Vibration Analysis (Annually)
   a. Vibration analysis is contained in the Predict-DLI program

5. Oil Analysis
   a. The diesel engine is included in the oil analysis program.

D. Bow Thruster System

Oceanus has an Elliott White Gill Model 32 VST which is powered by a PTO (power take off) generator. The PTO is geared off the main reduction gear and clutched in by the bridge via a Wichita clutch. The bow thruster is controlled by a motor/generator ADDvantage 32 digital regulator.

The #2 Ship Service Generator is configured to provide power through the rectifier cabinet to the Bow Thruster DC motor for emergency take home operations.

1. Operation procedures
   The bridge has use of the bow thruster underway to assist in maneuverability of the vessel.

2. Periodic Tests
   a. The bow thruster is tested prior to departure and arrival.

3. Preventative Maintenance
   a. Standard jobs are maintained and scheduled in the NS5 software

4. Vibration Analysis
   a. Vibration analysis is contained in the Predict-DLI program

5. Oil Analysis
   a. Oceanus bow thruster is not included in the oil analysis program.

E. Steering System

Oceanus has a Wagner Model L-2 Hydraulic full follow-up steering gear. The steering gear has two complete hydraulic packages for redundancy. The port steering pump is on the normal power bus and the starboard pump is on the emergency switchboard.

1. Operation procedures

a. Two pumps are used in restricted waters, one pump is used outside restricted waters. The pumps are rotated for dependability and even running hours.
b. Steering is checked prior to entering or departing a port.

2. Periodic Test
   a. Prior to departure
3. Preventative maintenance
   a. Standard jobs are maintained and scheduled in the NS5 software

4. Vibration Analysis
   a. Vibration analysis is contained in the Predict-DLI program

5. Oil analysis
   a. The hydraulic oil system is included in the oil analysis program

F. Fire Pump

Oceanus has one fire pump. This unit is powered from the emergency switchboard. Oceanus also carries an emergency diesel fire pump on board, located in the main lab.

1. Operation procedures
   a. The pumps are rotated for spreading running hours and dependability

2. Periodic Tests
   a. Fire pump is tested during fire and boat drills and pressure regulated by the engineer on watch to assure proper operations and pressures.

3. Preventative Maintenance
   a. Standard jobs are maintained and scheduled in the NS5 software

G. Bilge System

Oceanus has a bilge/ballast pump. The system also consists of bilge level sensors. Oceanus has seven (7) bilge compartments and valves arranged to pull suction from these sections. The pump has a duplex strainer and a fire pump that can also be lined up to pump these bilges in case of bilge pump failure.

Oceanus also has two dewatering pumps; a submersible pump with emergency power outlets located in the generator room at the top of the

engine room ladder and one in the main lab. The second is an emergency diesel fire/dewatering pump located in the main lab.

1. Operation Procedures
   a. The bilge/ballast pump is used regularly to dewater bilges and on the ballast system

2. Periodic Tests
   a. Annual operation tests of alarms

3. Preventative Maintenance
   a. Standard jobs are maintained and scheduled in the NS5 software

4. Vibration Analysis
   a. Vibration analysis is contained in the Predict-DLI program

5. Oil analysis
   a. The bilge system is not included in the oil analysis program

H. Fuel Oil Purification System.
The Oceanus has one fuel oil purifier. The purifier is not self-cleaning and is capable of supplying all of the vessel's fuel oil needs. It is cleaned manually based on hours (50 hrs) or more frequently as necessary.

1. Operation procedures
   a. The fuel oil purifier is used to transfer fuel from storage tanks for day use.

2. Periodic Tests
   a. Annual operation tests

3. Preventative Maintenance
   a. Standard jobs are maintained and scheduled in the NS5 software

4. Vibration Analysis
   a. Vibration analysis is contained in the Predict-DLI program

5. Oil Analysis
   a. The fuel oil purifiers are not included in the oil analysis program.