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SVL Singapore Services

- Condition Monitoring
- Ship Pre-purchase Inspection
- Vibration Analysis
- Predictive Maintenance Survey
- Ultrasound Survey
- Energy Technical Audit
- Thermal Imaging Survey
- Marine Technical Consultancy

M.T.Sample

IMO No 9302994

Vessel Pre-docking Condition Monitoring Report

December 2016

Survey place

Suez to Malta

Date 02nd to 07th December 2016

Prepared for

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M.T.Sample –PREDOCKING CONDITION MONITORING REPORT

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Executive Summary

Condition Monitoring Survey

The survey was carried out by J. Rajagopalan, Class I UK certified marine engineer, NRIC: S2699185D, additionally qualified, trained experienced in Vibration, Air borne ultra sound and infrared thermal Imaging applications. This inspection was done on a loaded voyage between Port Suez & Malta from 02 Dec to 06 Dec 2016. The purpose of the survey was to carry out machinery condition assessment using Thermal Imaging, Vibration and Ultrasound to arrive at the Machinery which require to be attended during the forthcoming dry-docking.

General Information

Vessel M.T.Sample (IMO: -----, MMSI: -----) is a **crude oil tanker** built in 2007 and currently sailing under the flag of **Liberia**. M.T.Sample has 274m length overall and beam of 48m. Her gross tonnage is 79235 tons. Her Deadweight is 150296 tons. She is on worldwide trade. Machinery spaces, pump room and the overall ship is found well maintained. The Main switchboard is in good condition. Exhaust pipeline insulation of Auxiliary engines and Main engine need to be improved. There are many bearings to be renewed for motors.

Results of the Condition Monitoring survey

The techniques used to evaluate the Machinery systems are:

- Thermal imaging
- Vibration Monitoring
- Ultrasound

During the condition monitoring survey for running machinery in Engine room the following instruments used-

- FLUKE Ti 32 Infrared thermal imaging technique and Smart View 3.14 software
- UE Ultra probe 10000 with UE Spectralyzer 4.2
- Adash Vibrio M with DDS software

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Table below enumerates the carious defects identified using the above mentioned instruments.

Technique	Serious defects	Caution	Comments
Thermal Imaging	10	Nil	Majority of the Electrical and Mechanical systems imaged
Vibration monitoring	6	1	All the running machineries were checked
Ultrasound	30	5	Majority of the Electrical and Mechanical systems tested

Introduction

M.T.Sample is a crude oil tanker built at Tsu shipyard (Japan) in the year 2007. The vessel has one Main engine 6 RTA 72 with 22360 bhp at 94 rpm. There are three Auxiliary engines Yanmar 6N 21-SV driving Tayo generators of 800 kw each. The cargo handling system consists of three turbine driven M

The purpose of this survey was to carry out Health assessment of the machinery. While we recommend this service to be carried out once a year, it is also beneficial to carry out three months prior docking. In this case, this is a pre-docking survey. This service is focused to establish what exactly requires to be done during docking so that repairs and maintenance focused to where they are required.

Critical systems

Main engine: Only Thermal Imaging carried out on the Exhaust manifold and some weakness in insulation noted. Thermal Imaging, Ultrasound and vibration checks were carried out only for the Forward Auxiliary blower.

Generators: There are three Auxiliary engines driving three Generators. The engines are operated on Heavy fuel oil. Thermal imaging was done the Auxiliary engine and Alternators. Vibration measurements were taken for the complete engine with alternators. In addition, for No2 auxiliary engine, Ultrasound measurements were taken for the Main bearings as the engine was just overhauled.

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Cargo systems: Vibration, Ultrasound & Thermal imaging carried out for the Cargo turbines and pumps including all related Electrical panels. Cargo turbines were run at 700 rpm and with this restricted speed, investigative capabilities get limited.

Auxiliary Boilers: We carried out Thermal imaging on the FD fan, feed pumps and the panels. Vibration readings were taken for the motors and pumps. We carried out Ultrasound checks for the motor bearings and the panels. We found all in order with respect to Thermal imaging and vibrations. We have listed the noisy bearings for renewal in the Ultrasound report.

Pumps & Motors in Engine room:

Vibration levels of all pumps and associated motors in Engine room which could be operated were checked. Pumps and motors with excessive vibration and defective bearing tone with Ultrasound are listed in the defect list.

Recommendations:

All the items marked as “Immediate attention required” should be attended during the forthcoming docking.

All the items marked as “Warning” to be monitored and repaired in the near future.

Reference standards (copies attached in the appendix 4 of this report)

- DNV –GL vibration standards used for Vibration limits
- NETA 2005 standards for Thermal Imaging
- UE standards are normally used for ultrasound when we have baseline readings. In the absence of base line data, our reports are based on tonal quality and waveforms (FFT & Time wave)

DEFECT LIST

Vibration (Immediate attention required)

Please refer to Vibration report Appendix 1 for details

Machine ID	Report ID	Page no	Recommendation
AC cooling pump	Ndb1	8,9 and 10	Vibration high at 1 X. This mainly due to imbalance. Impeller with shaft assembly to be balanced

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No1 Auxiliary engine Sea water pump	Ndb3	Page 8	Vibration high at 1 X. This mainly due to imbalance. Impeller with shaft assembly to be balanced
No1 Main LO pump	Ndb3	Pages 9 & 10.	Vibration high at 1 X. This mainly due to imbalance. Impeller with shaft assembly to be balanced. Shaft trueness to check
No1 IG Fan	Ndb 7	Pages 7 & 8	Vibration high at 1 X. This mainly due to imbalance. Impeller with shaft assembly to be balanced. Shaft trueness to check

Thermal Imaging (Immediate attention required)

Please refer to Thermal Imaging report Appendix 2 for details

Machine ID	Report ID	Page no	Recommendation
No3 Auxiliary engine	Auxiliary engines	11,16 &17	Exhaust leak around Turbocharger gas outlet. Insulation to be renewed
No1 Auxiliary engine	Auxiliary engines	25,27 & 28	Exhaust leak around Turbocharger gas outlet. Insulation to be renewed
No 2 Auxiliary engine	Auxiliary engines	35,37 & 38	Exhaust leak around Turbocharger gas outlet. Insulation to be renewed
No2 Ballast pump control panel	Cargo ,IG system & Boiler panel	150	Delta T is 10 deg at the connection. Clean the terminals and contact. Check the current in all phases after rectifying the fault. Isolate power supply before working on power panels

Ultrasound results: Following bearings to be renewed (Immediate attention)

Please refer to Ultrasound report Appendix 3 for details

Machine ID	Report ID	Page no	Recommendation
No2 Main SW pump Motor	Auxiliaries	3	NDE Bearings to be renewed
Vacuum Condensate pump motor	Auxiliaries	6	NDE & DE Bearings to be renewed
No2 Crosshead LO pump motor	Auxiliaries	10	NDE & DE Bearings to be renewed
No2 Aux Blower Motor	Auxiliaries	11	NDE Bearing to be renewed

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Fire Pump motor	Auxiliaries	12	NDE & DE Bearings to be renewed
GS pump Motor	Auxiliaries	13	NDE & DE Bearings to be renewed
No1 Aux SW pump Motor	Auxiliaries	15	DE Bearing to be renewed
No1 Crosshead LO pump Motor	Auxiliaries	18	NDE & DE Bearings to be renewed
No1 FD fan motor	Auxiliaries	23	NDE & DE Bearings to be renewed
No2 FD fan motor	Auxiliaries	25	NDE & DE Bearings to be renewed
No2 Main Feed pump Motor & pump	Auxiliaries	27	DE Bearings to be renewed
No 1 condensate pump motor	Auxiliaries	28	NDE & DE Bearings to be renewed
No2 Condensate pump motor	Auxiliaries	29	NDE & DE Bearings to be renewed

Machine ID	Report ID	Page no	Recommendation
No1 COP Bottom Bearing	COT & COP's	7	Bearing to renew

Machine ID	Report ID	Page no	Recommendation
No2 AHU Motor drive	Pump room blower & air con system	6	DE bearing to renew
Air handling unit Pillow block bearing	Pump room blower & air con system	7	Pillow block bearing to renew
No1 Air Conditioning Compressor	Pump room blower & air con system	9	DE bearing to renew

Machine ID	Report ID	Page no	Recommendation
No1 Steering Motor NDE	Steering & Emergency Fire pump	3	Bearing to renew
Emergency Fire pump Motor NDE	Steering & Emergency Fire pump	6	Bearing to renew

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Electrical / Electronic problems

Machine ID	Report ID	Page no	Recommendation
No1 FO purifier Alpha Laval box connection	Main Air Compressor & Purifiers	5	Please refer to the paragraph below
Viscometer motor drive	Main Air Compressor & Purifiers	6	
No1 HO Purifier	Main Air Compressor & Purifiers	7	

Alfa Laval panel tracking due to loose connection. **Immediate attention**

Viscometer Motor noisy. Assembly to be renewed. **Caution**

No1 Purifier gear box assembly noisy: Gear case inspection to be carried out and the defect to be identified & rectified. **Caution**

Machine ID	Report ID	Page no	Recommendation
No3 Alternator AVR	AVR & Boiler Panel	2	Please refer to the paragraph below
No1 Alternator AVR	AVR & Boiler Panel	3	
No2 Alternator AVR	AVR & Boiler Panel	4	
Boiler panel LS Controller	AVR & Boiler Panel	5	
Boiler Main Controller	AVR & Boiler Panel	7	
AC-DC controller for maneuvering panel	AVR & Boiler Panel	8	

The tonal quality is very similar in all three AVR's. It is hard to suspect problems in all three AVR's and at the same we cannot rule out problems as well. We should expect the AVR's to run silent.

Our suggestion would be to get one spare AVR install and check the Sound quality. It is not usual to hear such tracking sound from the AVR's. **Caution**.

Boiler panel LS controller: Three clicks we hear from time Wave form which is indicative of Relay operation or Minor Tracking. **We recommend to renew this unit. Immediate attention**

Boiler Main Control display Unit: Uniformity of Time Wave form is an indication of Mechanical vibration from a coil or a Switching Power supply. This is not a serious issue of above. **Caution**

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There are two converter units under maneuvering console giving a coil Vibration tone. This does not appear serious. We recommend servicing these units or keep one spare. **Caution**

We recommend Ultrasound check of the above units once a year to make sure that Sound tone does not deteriorate

Conclusion

The condition monitoring survey has established that the ship is operating good order. The defects listed are mainly for docking repairs.

We appreciate the active co-operation and assistance from the ship staff and all other involved in organizing this inspection.

Appendix

1. Vibration Full report
2. Thermal Imaging Full report
3. Ultrasound full report
4. Reference standards