DAFTAR PUSTAKA

Doug Woodyard, 2009, *Marine Diesel Engine and Gas Turbine 9th edition*, Butterworth-Heinemann.

Endrodi, 2004, *Motor Diesel Penggerak Utama*, Semarang.

G. H. Clark, 1984, *Marine Diesel Lubrication*, Taiwan: Keelung.

Handari Nawawi, 2015, *Metode Penulisan Bidang Sosial*, Yogyakarta: Gajah Mada University Press.

Handoyo Jusak Johan, 2014, *Mesin Penggerak Utama Motor Diesel*, Deepublish, Yogyakarta.

Hariwijaya, Moh dan Triton P.B, 2007, *Teknik Penulisan Skripsi dan Tesis*, Yogyakarta: Oryza.

Instruction manual, 1989, *Mitsubishi 6 UEC 60 LS Diesel Engine*, Japan.

Karyanto, 2000, *Panduan Reparasi Mesin Diesel*, Jakarta: Pedoman Ilmu Jaya

Karl W. Stinson, 1981, *Diesel Engineering Handbook*, Ohio State University: By Diesel Publication, Inc.

P. Van Maanen, 1981, *Motor Diesel jilid 1*, Jakarta: Edmar.

Rayner Joel, 1998, *Basic Engineering Thermodynamics*, Sweden.

Sugiono, 2009, *Metode penelitian kuantitatif dan kualitatif dan R&D*, bandung: Alfabeta.

Suharsimi, Arikunto, 2002, *Prosedur Penelitian*, Jakarta: Rineka Cipta.

Sukoco, M.pd. dan Zainal Arifin, M.T, 2013, *Teknologi Motor Diesel*, Bandung: Alfabeta.

Tim Penyusun PIP Semarang, 2009, *Buku Pedoman Penulisan Skripsi*, Semarang, Politeknik Ilmu Pelayaran Semarang.

DAFTAR RIWAYAT HIDUP

Nama	:	Khamim Arrosyid
Tempat, Tanggal Lahir	:	Banjarnegara, 07 April 1996
Agama	:	Islam
Alamat	:	Bantarwaru RT 01/RW01, Madukara, Banjarnegara
No. telp	:	082138936201

Nama Orangtua

Ayah	:	Imam Maful
Ibu	:	Sri Wahyuni
Alamat	:	Bantarwaru RT 01/RW01, kec. Madukara, kab. Banjarnegara.
No.telp	:	082134826157

Riwayat Pendidikan

Tahun 2001 - 2006	:	SDN 1 BANTARWARU
Tahun 2007 - 2009	:	SMPN 1 MADUKARA
Tahun 2010 - 2012	:	SMK PANCA BHAKTI Banjarnegara
Tahun 2013 - Sekarang	:	POLITEKNIK ILMU PELAYARAN Semarang

Pengalaman Praktek laut

PT. Meratus Line Surabaya (MV. Meratus Medan 3)

MERATUS

Lampiran 1

CREWLIST MV. MERATUS MEDAN 3

GT / KW : 16731 TON / 10.591 KW

NO.	NAMA	JABATAN
1	Capt.Muchamad Rufi'i	Nakhoda
2	Mohammad Furkan	Mualim I
3	Eko Wayudi	Mualim II
4	Andri Kurniawan	Mualim III
5	Waspada Sitepu	KKM
6	Friandly Situmorag	Masinis II
7	Samuel	Masinis III
8	Nanda Hadi Anggoro	Masinis IV
9	Bernadinus Kostan	Serang
10	Denny Susiyanto	Juru Mudi
11	Suratno	Juru Mudi
12	Arif Rahman Hakim	Juru Mudi
13	Juwari	Juru Minyak
14	Chaerul Sobri	Juru Minyak
15	Rian	Juru Minyak
16	Nurwahid	Electrician
17	Abdul Syakur	Kelasi
18	Hasim Achmadi	Juru Masak
19	Mark Christian S.P.N.	Cadet Deck
20	Muhamad Yunus	Cadet Deck
21	Khamim Arrosyid	Cadet Mesin
22	Sofyan Nur Fuad	Cadet Mesin

MERATUS

Lampiran 1

CREWLIST MV. MERATUS MEDAN 3

GT / KW : 16731 TON / 10.591 KW

NO.	NAMA	JABATAN
1	Capt. Tjetjep	Nakhoda
2	Mohammad Furkan	Mualim I
3	Eko Wayudi	Mualim II
4	Rudy Wijayanto	Mualim III
5	Waspada Sitepu	KKM
6	Warlim Juanda	Masinis II
7	Samuel	Masinis III
8	Ainnur Rochim Maf'ul	Masinis IV
9	Bernadinus Kostan	Serang
10	Denny Susiyanto	Juru Mudi
11	Suratno	Juru Mudi
12	Arif Rahman Hakim	Juru Mudi
13	Juwari	Juru Minyak
14	Chaerul Sobri	Juru Minyak
15	Gagat Prasetyo	Juru Minyak
16	Nurwahid	Electrician
17	Abdul Syakur	Kelasi
18	Hasim Achmadi	Juru Masak
19	Mark Christian S.P.N.	Cadet Deck
20	Muhamad Yunus	Cadet Deck
21	Hariyandi	Cadet Mesin
22	Khamim Arrosyid	Cadet Mesin

SHIP'S PARTICULARS

Ship's Name	:	**MV. Meratus Medan 3**					
Previous Name	:	**Ex. MV Millenia Tower**					
Call Sign	:	**PMFX**					
Flag/ Port of Registry	:	**Indonesia/Surabaya**					
Owner	:	**PT Mandiri Abadi Santosa**					
Classification	:	**BKI**					
IMO Number	:	**8914269**					
MMSI Number	:	**525 025 068**					
Inmarsat-C Number # 1	:	**452 502 023**					
Inmersat-C Number # 2	:	**452 502 022 (LRIT)**					
Built	:	**1990**					
Builder	:	**SHIN KURUSHIMA DOCKYARD CO.LTD,EHIMA JAPAN**					
Kind of Ship	:	**Full Containers**					
L.O.A.	:	**184.50**	**m**				
L.B.P.	:	**174.8**	**m**				
Length from Bridge to Stern	:	**40.01**	**m**				
Breadth (Moulded)	:	**27.60**	**m**				
Depth (Moulded)	:	**14.0**	**m**				
Summer Draft	:	**9.50**	**m**				
Light Ship Draft	:	**2.801**	**m**				
Highest point from keel	:	**43.65**	**m**				
Gross Tonnage	:	**16731**	**Tons**				
Net Tonnage	:	**8251**	**Tons**				
Summer/ Tropical Deadweight	:	**22734**	**/**	**23518**	**MTons**		
Summer/ Tropical Displacement	:	**29510**	**/**	**30294**	**MTons**		
Light Ship Weight	:	**6776**	**MTons**				
Ton per cm immersion (TPI)	:	**39.30**	**Tons**				
Main Engine		**Mitsubishi**	**Model**	**6UEC6OLS / 10.590 KW**			
Propeller		**Single screw**		**KA1BC3 (Ni-A1-Br)**			
Service Speed		**19.1**	**Knot**				
Fuel Oil Consumption (At Sea)		**40.8**	**Tons/day**				
Crane/ Derrick		**N/A**	**Maker**				
Container Capacity		**1302**	**TEUs or**			**FEUs**	
Ballast Water Capacity		**5809.66**	**MTons**				
Fresh Water Capacity		**307.12**	**MTons**	**187 mm (Fresh Water Allowance)**			
Fuel Oil Capacity		**2066.28**	**m^3**	**IFO**			
Diesel Oil Capacity		**171.50**	**m^3**	**MGO**			
Container Stacking Load		**Double Bottom**		**=**	**20' = 100**	**Tons (for TEUs)**	
					40' = 150	**Tons (for FEUs)**	
		Upper Deck		**=**	**20' = 60**	**Tons (for TEUs)**	
					40' = 90	**Tons (for FEUs)**	
Reefer Plug (on deck/ in cargo Holds)		**79 (440 v)**	**Plugs**	**6 (220 v)**	**Plugs**		

MERATUS
SHIP MANAGEMENT

LAPORAN KINERJA MOTOR INDUK
Main Engine Performance Report

Vessel Name :	MV. MERATUS MEDAN 3	Engine Maker / Type :	MITSHUBISHI / 6UEC60LS
Date :	3-Feb-16	From :	Tg. Priok
Voyage :	16/03	to :	Makassar
Draft Forward :	5.8 m	After :	6.4 m
Draft Mean :	6.1 m		
Corresponding Displacement :	16650.0 MT		
Weather :	Cloudy		
State of Sea :	Smooth		
Wind Force and Direction :	E / 2		
Vessel Speed :	17.1 Knots		
Engine Speed :	16.4 Knots		
Slip Speed :	-4%		

Power Output :		KW	Engine Speed :	83	Rpm
	14400	HP	Bore : 600 mm	Stroke :	2200 mm
Engine Position :	CTR				
Governor Index (Position) :	77		Pitch Indicator (Position) :		
Fuel in Use :	MFO 380 cst		FO. Density :	0.9909	kg/m³, at 15 °C
FO. Sett. Tank Temperature :	83	°C			
FO. Purification Temperature :	98	°C	FO. Cons. :	27.5	KL/day
FO. Day Tank Temperature :	105	°C	Cylinder Oil Cons. :	215	ltrs/day
FO. Injection Temperature :	130	°C	System Oil Cons. :	70	ltrs/day
FO. Viscosity at Injection :		cSt			

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	Average
Max. Combustion Press. (kg/cm²) :	84	85	85	85	85	80				84
Compression Press. (kg/cm²) :	55	55	55	55	55	52				54.5
Fuel Pump Index :	45	43	45	43	42	46				44
Exhaust Gas Temp.(°C) :	370	360	370	365	370	370				367.5
Fresh Water Inlet Temp. (°C) :	65									
Fresh Water Outlet Temp.(°C) :	80	76	80	78	75	79				78
Piston Cooling Inlet Temp.(°C) :	41									
Piston Cooling Outlet Temp.(°C) :	46	47	47	47	47	48				47

FO. Press. Before Filter :		kg/cm²	Turbocharger Speed :	7200	Rpm
FO. Press. After Filter :	3.5	kg/cm²	Scavenge Air Pressure Before Cooler :		kg/cm²
			Scavenge Air Pressure Before Cooler :	0.6	kg/cm²
Lube Oil Piston Cooling Press. :	1.8	kg/cm²	Scavenge Exhaust Receiver Differential Pressure :		kg/cm²
Lube Oil Bearing Press. :	1.8	kg/cm²	Temperature of Scavenge Air Inlet Cooler :	58	°C
Lube Oil Camshaft Press. :	1.8	kg/cm²	Temperature of Scavenge Air Outlet Cooler :	48	°C
Lube Oil Turbocharger Press. :	1.6	kg/cm²	Temperature of Scave. Air at Scave. Manifold :	46	°C
			Temperature of Exhaust Gas Inlet Turbine :	460	°C
Frash Water Press. :	2.9	kg/cm²	Temperature of Exhaust Gas Outlet Turbine :	290	°C
Sea Water Press. :	1.8	kg/cm²	Differential Temp. between Inlet & Outlet Turbine :		°C
			Temperature of Sea Water Inlet Charge Air Cooler :	43	°C
Sea Water Temp. :	35	°C	Temp. of Sea Water Outlet Charge Air Cooler :	53	°C
Engine Room Temp. :	42	°C	Temperature of Fresh Water Inlet Turbocharger :		°C
			Temperature of Fresh Water Outlet Turbocharger :		°C
			Temperature of Lube Oil Inlet Turbocharger :	41	°C
			Temperature of Lube Oil Outlet Turbocharger :	54	°C

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	T/C
Cylinder Working Hours :	356.4	308.5	356.4	308.5	308.5	308.5				308.5
Date of Overhaul :	17/11/15	25/11/15	19/11/15	18/12/15	19/12/15	20/12/15				20/12/15

Remarks :

Date : 3-Feb-16

Waspada Sitepu
Chief Enginer

Date : 3-Feb-16

Capt. M. Rufi`i
Master

MERATUS
SHIP MANAGEMENT

LAPORAN KINERJA MOTOR INDUK
Main Engine Performance Report

Vessel Name :	MV. MERATUS MEDAN 3			Engine Maker / Type :	MITSHUBISHI / 6UEC60LS	Engine Position :	CTR
Date :	08 - 03 - 2016 / 16`00	From :	Tg. Priok	Power Output :	KW	Engine Speed :	83 Rpm
Voyage :	16/06	to :	Belawan		14400 HP	Bore : 600 mm	Stroke : 2200 mm
Draft Forward :	8.0 m	After :	8.0 m				
Draft Mean :	8.0 m			Governor Index (Position) :		Pitch Indicator (Position) :	
Corresponding Displacement :	20500.0 MT						
Weather :	Cloudy			Fuel in Use :	MFO 380 cst	FO. Density :	0.9909 kg/m³, at 15 °C
State of Sea :	Smooth			FO. Sett. Tank Temperature :	83 °C		
Wind Force and Direction :	W 2			FO. Purification Temperature :	98 °C	FO. Cons. :	27.5 KL/day
Vessel Speed :	15.0 Knots			FO. Day Tank Temperature :	105 °C	Cylinder Oil Cons. :	215 ltrs/day
Engine Speed :	16.4 Knots			FO. Injection Temperature :	128 °C	System Oil Cons. :	70 ltrs/day
Slip Speed :	9%			FO. Viscosity at Injection :	cSt		

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	Average
Max. Combustion Press. (kg/cm²) :	86	86	88	86	84	80				85
Compression Press. (kg/cm²) :	56	56	56	56	54	52				55
Fuel Pump Index :	46	44	46	44	43	47				45
Exhaust Gas Temp.(°C) :	375	360	360	370	360	380				367.5
Fresh Water Inlet Temp. (°C) :	60									
Fresh Water Outlet Temp.(°C) :	80	70	78	74	70	75				74.5
Piston Cooling Inlet Temp.(°C) :	41									
Piston Cooling Outlet Temp.(°C) :	46	45	47	45	45	45				45.5

FO. Press. Before Filter :		kg/cm²	Turbocharger Speed :	7600	Rpm
FO. Press. After Filter :	3.5	kg/cm²	Scavenge Air Pressure Before Cooler :		kg/cm²
			Scavenge Air Pressure After Cooler :	0.8	kg/cm²
Lube Oil Piston Cooling Press. :	1.8	kg/cm²	Scavenge Exhaust Receiver Differential Pressure :		kg/cm²
Lube Oil Bearing Press. :	1.8	kg/cm²	Temperature of Scavenge Air Inlet Cooler :	54	°C
Lube Oil Camshaft Press. :	1.8	kg/cm²	Temperature of Scavenge Air Outlet Cooler :	46	°C
Lube Oil Turbocharger Press. :	1.6	kg/cm²	Temperature of Scave. Air at Scave. Manifold :	46	°C
			Temperature of Exhaust Gas Inlet Turbine :	460	°C
Frash Water Press. :	2.9	kg/cm²	Temperature of Exhaust Gas Outlet Turbine :	285	°C
Sea Water Press. :	1.8	kg/cm²	Differential Temp. between Inlet & Outlet Turbine :		°C
			Temperature of Sea Water Inlet Charge Air Cooler :	36	°C
Sea Water Temp. :	36	°C	Temp. of Sea Water Outlet Charge Air Cooler :	42	°C
Engine Room Temp. :	40	°C	Temperature of Fresh Water Inlet Turbocharger :		°C
			Temperature of Fresh Water Outlet Turbocharger :		°C
			Temperature of Lube Oil Inlet Turbocharger :	41	°C
			Temperature of Lube Oil Outlet Turbocharger :	52	°C

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	T/C
Cylinder Working Hours :	672.4	624.5	672.4	624.5	624.5	624.5				624.5
Date of Overhaul :	17/11/15	25/11/15	19/11/15	18/12/15	19/12/15	20/12/15				20/12/15

Remarks :

Date : 8-Mar-16

Waspada Sitepu
Chief Enginer

Date : 8-Mar-16

Capt. M. Rufi`i
Master

MERATUS
SHIP MANAGEMENT

LAPORAN KINERJA MOTOR INDUK
Main Engine Performance Report

Vessel Name :	MV. MERATUS MEDAN 3			Engine Maker / Type :	MITSHUBISHI / 6UEC60LS	Engine Position :	CTR
Date :	12 - 04 - 2016 / 08`00	From :	Tg. Priok	Power Output :	KW	Engine Speed :	83 Rpm
Voyage :	16/09	to :	Makassar		14400 HP	Bore : 600 mm	Stroke : 2200 mm
Draft Forward :	5.6 m	After :	7.1 m				
Draft Mean :	6.4 m			Governor Index (Position) :		Pitch Indicator (Position) :	
Corresponding Displacement :	18337.7 MT						
Weather :	Blue Cloudy			Fuel in Use :	MFO 380 cst	FO. Density :	0.9909 kg/m³, at 15 °C
State of Sea :	Smooth			FO. Sett. Tank Temperature :	83 °C		
Wind Force and Direction :	SE 2			FO. Purification Temperature :	98 °C	FO. Cons. :	27.5 KL/day
Vessel Speed :	16.4 Knots			FO. Day Tank Temperature :	105 °C	Cylinder Oil Cons. :	215 ltrs/day
Engine Speed :	16.4 Knots			FO. Injection Temperature :	130 °C	System Oil Cons. :	70 ltrs/day
Slip Speed :	0%			FO. Viscosity at Injection :	cSt		

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	Average
Max. Combustion Press. (kg/cm²) :	82	82	84	82	82	80				82
Compression Press. (kg/cm²) :	52	52	54	52	52	50				52
Fuel Pump Index :	45	43	45	42	42	47				44
Exhaust Gas Temp.(°C) :	385	370	380	375	375	380				377.5
Fresh Water Inlet Temp. (°C) :	60									
Fresh Water Outlet Temp.(°C) :	80	70	75	73	70	73				73.5
Piston Cooling Inlet Temp.(°C) :	42									
Piston Cooling Outlet Temp.(°C) :	46	46	47	46	46	45				46

FO. Press. Before Filter :		kg/cm²	Turbocharger Speed :	7400	Rpm
FO. Press. After Filter :	3.5	kg/cm²	Scavenge Air Pressure Before Cooler :		kg/cm²
			Scavenge Air Pressure After Cooler :	0.7	kg/cm²
Lube Oil Piston Cooling Press. :	1.8	kg/cm²	Scavenge Exhaust Receiver Differential Pressure :		kg/cm²
Lube Oil Bearing Press. :	1.8	kg/cm²	Temperature of Scavenge Air Inlet Cooler :	52	°C
Lube Oil Camshaft Press. :	1.8	kg/cm²	Temperature of Scavenge Air Outlet Cooler :	45	°C
Lube Oil Turbocharger Press. :	1.6	kg/cm²	Temperature of Scave. Air at Scave. Manifold :	45	°C
			Temperature of Exhaust Gas Inlet Turbine :	465	°C
Frash Water Press. :	2.9	kg/cm²	Temperature of Exhaust Gas Outlet Turbine :	275	°C
Sea Water Press. :	2.1	kg/cm²	Differential Temp. between Inlet & Outlet Turbine :		°C
			Temperature of Sea Water Inlet Charge Air Cooler :	36	°C
Sea Water Temp. :	36	°C	Temp. of Sea Water Outlet Charge Air Cooler :	42	°C
Engine Room Temp. :	42	°C	Temperature of Fresh Water Inlet Turbocharger :		°C
			Temperature of Fresh Water Outlet Turbocharger :		°C
			Temperature of Lube Oil Inlet Turbocharger :	42	°C
			Temperature of Lube Oil Outlet Turbocharger :	52	°C

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	T/C
Cylinder Working Hours :	1020	972.1	1020	972.1	972.1	972.1				972.1
Date of Overhaul :	17/11/15	25/11/15	19/11/15	18/12/15	19/12/15	20/12/15				20/12/15

Remarks :

Date : 12-Apr-16

Waspada Sitepu
Chief Enginer

Date : 12-Apr-16

Capt. M. Rufi`i
Master

MERATUS
SHIP MANAGEMENT

LAPORAN KINERJA MOTOR INDUK
Main Engine Performance Report

Vessel Name :	MV. MERATUS MEDAN 3			Engine Maker / Type :	MITSHUBISHI / 6UEC60LS	Engine Position :	CTR
Date :	23 - 05 - 2016 / 04`00	From :	Tg. Priok	Power Output :	KW	Engine Speed :	83 Rpm
Voyage :	16/13	to :	Belawan		14400 HP	Bore : 600 mm	Stroke : 2200 mm
Draft Forward :	8.4 m	After :	9.1 m				
Draft Mean :	8.8 m			Governor Index (Position) :		Pitch Indicator (Position) :	
Corresponding Displacement :	27435.0 MT						
Weather :	Cloudy			Fuel in Use :	MFO 380 cst	FO. Density :	0.9909 kg/m³, at 15 °C
State of Sea :	Smooth			FO. Sett. Tank Temperature :	83 °C		
Wind Force and Direction :	N 2			FO. Purification Temperature :	98 °C	FO. Cons. :	27.5 KL/day
Vessel Speed :	15.6 Knots			FO. Day Tank Temperature :	105 °C	Cylinder Oil Cons. :	215 ltrs/day
Engine Speed :	16.4 Knots			FO. Injection Temperature :	130 °C	System Oil Cons. :	70 ltrs/day
Slip Speed :	5%			FO. Viscosity at Injection :	cSt		

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	Average
Max. Combustion Press. (kg/cm²) :	84	86	86	86	86	82				85
Compression Press. (kg/cm²) :	54	56	56	56	56	52				55
Fuel Pump Index :	48	46	48	47	46	50				47.5
Exhaust Gas Temp.(°C) :	390	370	375	375	375	395				380
Fresh Water Inlet Temp. (°C) :	63									
Fresh Water Outlet Temp.(°C) :	85	83	83	81	79	81				82
Piston Cooling Inlet Temp.(°C) :	43									
Piston Cooling Outlet Temp.(°C) :	49	49	49	49	49	49				49

FO. Press. Before Filter :		kg/cm²	Turbocharger Speed :	8000	Rpm
FO. Press. After Filter :	3.5	kg/cm²	Scavenge Air Pressure Before Cooler :		kg/cm²
			Scavenge Air Pressure After Cooler :	0.9	kg/cm²
Lube Oil Piston Cooling Press. :	1.8	kg/cm²	Scavenge Exhaust Receiver Differential Pressure :		kg/cm²
Lube Oil Bearing Press. :	1.8	kg/cm²	Temperature of Scavenge Air Inlet Cooler :	90	°C
Lube Oil Camshaft Press. :	1.8	kg/cm²	Temperature of Scavenge Air Outlet Cooler :	48	°C
Lube Oil Turbocharger Press. :	1.6	kg/cm²	Temperature of Scave. Air at Scave. Manifold :	48	°C
			Temperature of Exhaust Gas Inlet Turbine :	465	°C
Frash Water Press. :	2.8	kg/cm²	Temperature of Exhaust Gas Outlet Turbine :	270	°C
Sea Water Press. :	2.1	kg/cm²	Differential Temp. between Inlet & Outlet Turbine :		°C
			Temperature of Sea Water Inlet Charge Air Cooler :	34	°C
Sea Water Temp. :	36	°C	Temp. of Sea Water Outlet Charge Air Cooler :	42	°C
Engine Room Temp. :	42	°C	Temperature of Fresh Water Inlet Turbocharger :		°C
			Temperature of Fresh Water Outlet Turbocharger :		°C
			Temperature of Lube Oil Inlet Turbocharger :	42	°C
			Temperature of Lube Oil Outlet Turbocharger :	52	°C

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	T/C
Cylinder Working Hours :	1475.4	1427.5	1475.4	1427.5	1427.5	1427.5				1427.5
Date of Overhaul :	17/11/15	25/11/15	19/11/15	18/12/15	19/12/15	20/12/15				20/12/15

Remarks :

Date : 23-May-16

Waspada Sitepu
Chief Enginer

Date : 23-May-16

Capt. Tjetjep
Master

MERATUS
SHIP MANAGEMENT

LAPORAN KINERJA MOTOR INDUK
Main Engine Performance Report

Vessel Name :	MV. MERATUS MEDAN 3			Engine Maker / Type :	MITSHUBISHI / 6UEC60LS	Engine Position :	CTR
Date :	23 - 05 - 2016 / 04`00	From :	Tg. Priok	Power Output :	KW	Engine Speed :	83 Rpm
Voyage :	16/13	to :	Belawan		14400 HP	Bore : 600 mm	Stroke : 2200 mm
Draft Forward :	8.4 m	After :	9.1 m				
Draft Mean :	8.8 m			Governor Index (Position) :		Pitch Indicator (Position) :	
Corresponding Displacement :	27435.0 MT						
Weather :	Cloudy			Fuel in Use :	MFO 380 cst	FO. Density :	0.9909 kg/m³, at 15 °C
State of Sea :	Smooth			FO. Sett. Tank Temperature :	83 °C		
Wind Force and Direction :	N 2			FO. Purification Temperature :	98 °C	FO. Cons. :	27.5 KL/day
Vessel Speed :	15.6 Knots			FO. Day Tank Temperature :	105 °C	Cylinder Oil Cons. :	215 ltrs/day
Engine Speed :	16.4 Knots			FO. Injection Temperature :	130 °C	System Oil Cons. :	70 ltrs/day
Slip Speed :	5%			FO. Viscosity at Injection :	cSt		

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	Average
Max. Combustion Press. (kg/cm²) :	84	86	86	86	86	82				85
Compression Press. (kg/cm²) :	54	56	56	56	56	52				55
Fuel Pump Index :	48	46	48	47	46	50				47.5
Exhaust Gas Temp.(°C) :	390	370	375	375	375	395				380
Fresh Water Inlet Temp. (°C) :	63									
Fresh Water Outlet Temp.(°C) :	85	83	83	81	79	81				82
Piston Cooling Inlet Temp.(°C) :	43									
Piston Cooling Outlet Temp.(°C) :	49	49	49	49	49	49				49

FO. Press. Before Filter :		kg/cm²	Turbocharger Speed :	8000	Rpm
FO. Press. After Filter :	3.5	kg/cm²	Scavenge Air Pressure Before Cooler :		kg/cm²
			Scavenge Air Pressure After Cooler :	0.9	kg/cm²
Lube Oil Piston Cooling Press. :	1.8	kg/cm²	Scavenge Exhaust Receiver Differential Pressure :		kg/cm²
Lube Oil Bearing Press. :	1.8	kg/cm²	Temperature of Scavenge Air Inlet Cooler :	90	°C
Lube Oil Camshaft Press. :	1.8	kg/cm²	Temperature of Scavenge Air Outlet Cooler :	48	°C
Lube Oil Turbocharger Press. :	1.6	kg/cm²	Temperature of Scave. Air at Scave. Manifold :	48	°C
			Temperature of Exhaust Gas Inlet Turbine :	465	°C
Frash Water Press. :	2.8	kg/cm²	Temperature of Exhaust Gas Outlet Turbine :	270	°C
Sea Water Press. :	2.1	kg/cm²	Differential Temp. between Inlet & Outlet Turbine :		°C
			Temperature of Sea Water Inlet Charge Air Cooler :	34	°C
Sea Water Temp. :	36	°C	Temp. of Sea Water Outlet Charge Air Cooler :	42	°C
Engine Room Temp. :	42	°C	Temperature of Fresh Water Inlet Turbocharger :		°C
			Temperature of Fresh Water Outlet Turbocharger :		°C
			Temperature of Lube Oil Inlet Turbocharger :	42	°C
			Temperature of Lube Oil Outlet Turbocharger :	52	°C

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	T/C
Cylinder Working Hours :	1475.4	1427.5	1475.4	1427.5	1427.5	1427.5				1427.5
Date of Overhaul :	17/11/15	25/11/15	19/11/15	18/12/15	19/12/15	20/12/15				20/12/15

Remarks :

Date : 23-May-16

Waspada Sitepu
Chief Enginer

Date : 23-May-16

Capt. Tjetjep
Master

MERATUS
SHIP MANAGEMENT

LAPORAN KINERJA MOTOR INDUK
Main Engine Performance Report

Vessel Name :	MV. MERATUS MEDAN 3			Engine Maker / Type :	MITSHUBISHI / 6UEC60LS	Engine Position :	CTR
Date :	04 - 06 - 2016 / 16`00	From :	Tg. Priok	Power Output :	KW	Engine Speed :	83 Rpm
Voyage :	16/14	to :	Makassar		14400 HP	Bore : 600 mm	Stroke : 2200 mm
Draft Forward :	4.3 m	After :	6.8 m				
Draft Mean :	5.6 m			Governor Index (Position) :		Pitch Indicator (Position) :	
Corresponding Displacement :	15006.0 MT						
Weather :	Cloudy			Fuel in Use :	MFO 380 cst	FO. Density :	0.9909 kg/m³, at 15 °C
State of Sea :	Slight			FO. Sett. Tank Temperature :	83 °C		
Wind Force and Direction :	E 20			FO. Purification Temperature :	98 °C	FO. Cons. :	27.5 KL/day
Vessel Speed :	15.5 Knots			FO. Day Tank Temperature :	105 °C	Cylinder Oil Cons. :	215 ltrs/day
Engine Speed :	16.4 Knots			FO. Injection Temperature :	128 °C	System Oil Cons. :	70 ltrs/day
Slip Speed :	5%			FO. Viscosity at Injection :	cSt		

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	Average
Max. Combustion Press. (kg/cm²) :	84	84	84	82	84	80				83
Compression Press. (kg/cm²) :	54	54	54	52	54	50				53
Fuel Pump Index :	47	46	46	45	45	47				46
Exhaust Gas Temp.(°C) :	380	375	375	370	370	380				375
Fresh Water Inlet Temp. (°C) :	63									
Fresh Water Outlet Temp.(°C) :	84	80	82	81	79	80				81
Piston Cooling Inlet Temp.(°C) :	43									
Piston Cooling Outlet Temp.(°C) :	49	50	50	49	49	50				49.5

FO. Press. Before Filter :		kg/cm²	Turbocharger Speed :	8000	Rpm
FO. Press. After Filter :	3.5	kg/cm²	Scavenge Air Pressure Before Cooler :		kg/cm²
			Scavenge Air Pressure After Cooler :	0.9	kg/cm²
Lube Oil Piston Cooling Press. :	1.8	kg/cm²	Scavenge Exhaust Receiver Differential Pressure :		kg/cm²
Lube Oil Bearing Press. :	1.8	kg/cm²	Temperature of Scavenge Air Inlet Cooler :	90	°C
Lube Oil Camshaft Press. :	1.8	kg/cm²	Temperature of Scavenge Air Outlet Cooler :	48	°C
Lube Oil Turbocharger Press. :	1.6	kg/cm²	Temperature of Scave. Air at Scave. Manifold :	48	°C
			Temperature of Exhaust Gas Inlet Turbine :	465	°C
Frash Water Press. :	2.8	kg/cm²	Temperature of Exhaust Gas Outlet Turbine :	290	°C
Sea Water Press. :	2.1	kg/cm²	Differential Temp. between Inlet & Outlet Turbine :		°C
			Temperature of Sea Water Inlet Charge Air Cooler :	36	°C
Sea Water Temp. :	32	°C	Temp. of Sea Water Outlet Charge Air Cooler :	42	°C
Engine Room Temp. :	44	°C	Temperature of Fresh Water Inlet Turbocharger :		°C
			Temperature of Fresh Water Outlet Turbocharger :		°C
			Temperature of Lube Oil Inlet Turbocharger :	42	°C
			Temperature of Lube Oil Outlet Turbocharger :	52	°C

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	T/C
Cylinder Working Hours :	1590.4	1542.5	1590.4	1542.5	1542.5	1542.5				1542.5
Date of Overhaul :	17/11/15	25/11/15	19/11/15	18/12/15	19/12/15	20/12/15				20/12/15

Remarks :

Date : 4-Jun-16

Waspada Sitepu
Chief Enginer

Date : 4-Jun-16

Capt. Tjetjep
Master

MERATUS
SHIP MANAGEMENT

LAPORAN KINERJA MOTOR INDUK
Main Engine Performance Report

Vessel Name :	MV. MERATUS MEDAN 3			Engine Maker / Type :	MITSHUBISHI / 6UEC60LS	Engine Position :	CTR
Date :	15 - 06 - 2016 / 07`00	From :	Tg. Priok	Power Output :	KW	Engine Speed :	83 Rpm
Voyage :	16/15	to :	Belawan		14400 HP	Bore : 600 mm	Stroke : 2200 mm
Draft Forward :	8.1 m	After :	8.8 m				
Draft Mean :	8.4 m			Governor Index (Position) :		Pitch Indicator (Position) :	
Corresponding Displacement :	25478.0 MT						
Weather :	Cloudy			Fuel in Use :	MFO 380 cst	FO. Density :	0.9909 kg/m³, at 15 °C
State of Sea :	Smooth			FO. Sett. Tank Temperature :	83 °C		
Wind Force and Direction :	NE 2			FO. Purification Temperature :	98 °C	FO. Cons. :	27.5 KL/day
Vessel Speed :	15.7 Knots			FO. Day Tank Temperature :	105 °C	Cylinder Oil Cons. :	215 ltrs/day
Engine Speed :	16.4 Knots			FO. Injection Temperature :	128 °C	System Oil Cons. :	70 ltrs/day
Slip Speed :	4%			FO. Viscosity at Injection :	cSt		

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	Average
Max. Combustion Press. (kg/cm²) :	88	90	92	90	88	86				89
Compression Press. (kg/cm²) :	60	60	62	60	60	58				60
Fuel Pump Index :	47	45	47	45	45	47				46
Exhaust Gas Temp.(°C) :	375	370	370	375	370	375				372.5
Fresh Water Inlet Temp. (°C) :	56									
Fresh Water Outlet Temp.(°C) :	80	80	80	78	78	78				79
Piston Cooling Inlet Temp.(°C) :	43									
Piston Cooling Outlet Temp.(°C) :	49	50	50	49	49	50				49.5

FO. Press. Before Filter :		kg/cm²	Turbocharger Speed :	8200	Rpm
FO. Press. After Filter :	3.5	kg/cm²	Scavenge Air Pressure Before Cooler :		kg/cm²
			Scavenge Air Pressure After Cooler :	1	kg/cm²
Lube Oil Piston Cooling Press. :	1.8	kg/cm²	Scavenge Exhaust Receiver Differential Pressure :		kg/cm²
Lube Oil Bearing Press. :	1.8	kg/cm²	Temperature of Scavenge Air Inlet Cooler :	88	°C
Lube Oil Camshaft Press. :	1.8	kg/cm²	Temperature of Scavenge Air Outlet Cooler :	44	°C
Lube Oil Turbocharger Press. :	1.6	kg/cm²	Temperature of Scave. Air at Scave. Manifold :	44	°C
			Temperature of Exhaust Gas Inlet Turbine :	455	°C
Frash Water Press. :	2.7	kg/cm²	Temperature of Exhaust Gas Outlet Turbine :	285	°C
Sea Water Press. :	2.1	kg/cm²	Differential Temp. between Inlet & Outlet Turbine :		°C
			Temperature of Sea Water Inlet Charge Air Cooler :	37	°C
Sea Water Temp. :	34	°C	Temp. of Sea Water Outlet Charge Air Cooler :	47	°C
Engine Room Temp. :	38	°C	Temperature of Fresh Water Inlet Turbocharger :		°C
			Temperature of Fresh Water Outlet Turbocharger :		°C
			Temperature of Lube Oil Inlet Turbocharger :	45	°C
			Temperature of Lube Oil Outlet Turbocharger :	54	°C

Number of Cylinder :	I	II	III	IV	V	VI	VII	VIII	IX	T/C
Cylinder Working Hours :	1687.3	1639.4	1687.3	1639.4	1639.4	1639.4				1639.4
Date of Overhaul :	17/11/15	25/11/15	19/11/15	18/12/15	19/12/15	20/12/15				20/12/15

Remarks :

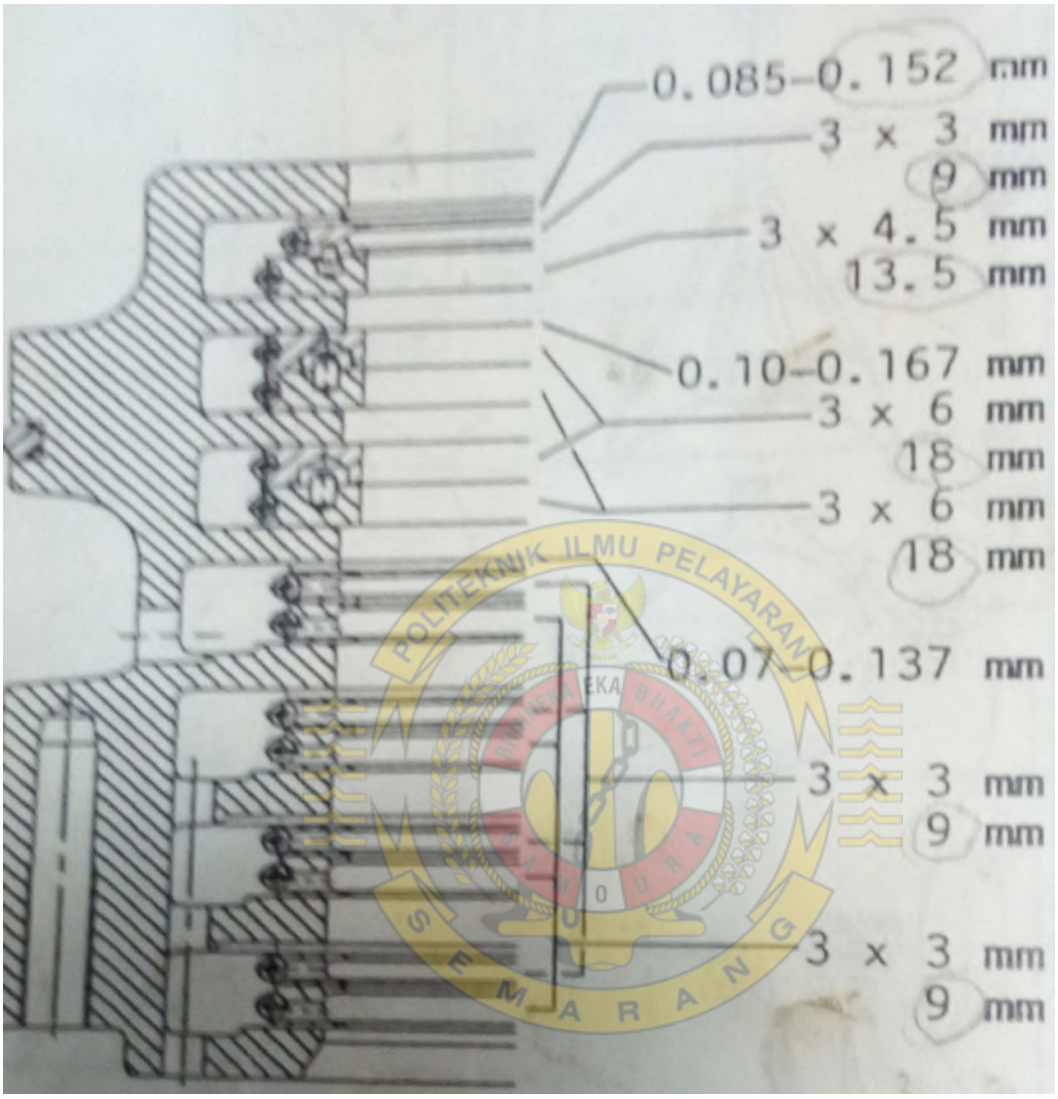
Date : 15-Jun-16

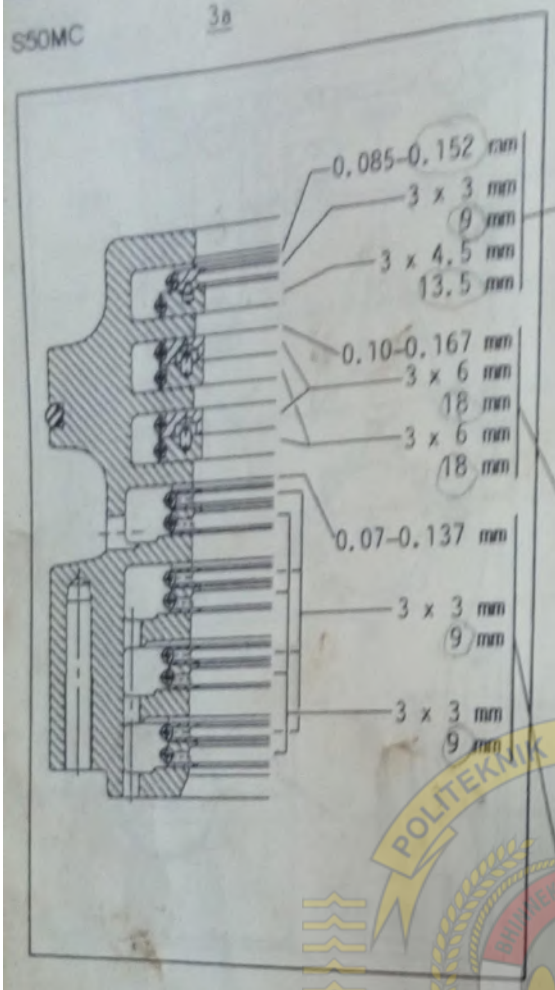
Waspada Sitepu
Chief Enginer

Date : 15-Jun-16

Capt. Tjetjep
Master

Lampiran 4


0.085–0.152 mm
3 x 3 mm
9 mm
3 x 4.5 mm
13.5 mm
0.10–0.167 mm
3 x 6 mm
18 mm
3 x 6 mm
18 mm
0.07–0.137 mm
3 x 3 mm
9 mm
3 x 3 mm
9 mm



The ring-end clearances stated apply rings.

Uppermost scraper ring / seal ring

Clearance between scraper ring and g

Clearance at ring ends (scraper ring)
Total clearance (scraper ring)

Clearance at ring ends (seal ring)
Total clearance (seal ring)

Seal rings

Clearance between seal ring sectio groove.

Clearance at ring ends (protecting ring)
Total clearance (protecting ring)

Clearance at ring ends (seal ring)
Total clearance (seal ring)

Scraper rings

Clearance between scraper ring and gr

Clearance at ring ends
Total clearance

As a general guide, it is recommend depending on the overhauling intervals own experience - to replace seal rings scraper rings when the above clearan values have changed by more than 50%.

Lampiran 5

TRANSKIP WAWANCARA

A. Daftar responden

1. Responden 1: Friandly Situmorang
2. Responden 2: Waspada Sitepu
3. Responden 3: Warlim Juanda

B. Hasil wawancara

Wawancara kepada *crew* kapal MV. Meratus Medan 3 penulis lakukan pada saat melaksanakan praktek laut pada bulan Agustus 2015 sampai dengan bulan Agustus 2016. Berikut adalah daftar wawancara beserta respondennya:

1. Responden 1

Nama : Friandly Situmorang

Jabatan : 1st Engineer

Tanggal wawancara : 09 Oktober 2015

Cadet : "Selamat siang bass, saya ingin bertanya soal *surging*/suara berisik pada *turbocharger* yang baru saja terjadi, menurut bass friandly apakah hal-hal yang dapat menyebabkan terjadinya surging?"

Engineer : "Selamat siang det, jadi penyebab yang memungkinkan terjadinya *surging* itu banyak sekali, dari *turbocharger* itu sendiri, dari perawatan intercooler yang buruk, pembakaran yang tidak sempurna di *main engine*, bisa juga temperatur udara bilasnya terlalu tinggi."

Cadet : "Selama pengalaman bass menjadi masinis, yang pernah bass jumpai sebagai masalah penyebab terjadinya *surging turbocharger* itu kenapa bass?"

Engineer : "Saya pernah menangani kapal yang mengalami *surging*, dulu sewaktu saya menjadi masinis 2 dan *surging* tersebut disebabkan karena *turbocharger* itu

sendiri jam kerjanya tinggi ditambah *intercooler* pada sisi udara sudah terlalu kotor."

Cadet : "Kemudian bagaimana tindakan penanganannya?"

Engineer : "Sebelumnya kami hanya terfokus pada pembersihan *intercooler* sisi air laut saja, sampai kami buka *cover intercooler* sisi udara dan ditemukan bnyak kotoran yang menyumbat dan kami membersikannya mengunakan *carbon remover* untuk membersihkan kotoran tersebut."

Cadet : "Kemudian menurut analisa bass, untuk kasus *surging* yan terjadi dikapal kita ini kenapa?"

Engineer : "Dilihat dari analisa yang sudah dilakukan, *surging* ini terjadi karena tekanan udara bilas yang dihasilkan terlalu rendah, sehingga pembakaran di *main engine* tidak sempurna dan pembilasan sisa pembakaran juga tidak maksimal, nah akhirnya hal tersebut berdampak pada kondisi *turbocharger* itu sendiri."

Cadet : "Kemudian bagaimana cara untuk menanganinya?"

Engineer : "Untuk sementara ini kita harus mengoperasikn *main engine* dalam putaran rendah dahulu dengan menurunkan rpm untuk mengurangi getaran, dan terpaksa *auxilary blower* dioperasikan secara manual untuk menambah tekanan udara bilas karena masalah utamanya belum ditemukan dan jika akan dilakukan pembongkaran pada *turbocharger* juga belum mendapat persetujuan dari pihak *management* di kantor."

Cadet : "Terimakasih bass atas penjelasannya semoga penyebab *surging* dapat segera diatasi dan kapal dapat kembali beroperasi dengan normal."

2. Responden 2

Nama : Waspada Sitepu

Jabatan : Chief Engineer

Tanggal wawancara : 10 Oktober 2015

Cadet : "Selamat siang bass mohon ijin bertanya, menurut analisa bass penyebabnya terjadinya *surging* yang terjadi di kapal kita ini apa bass?"

Engineer : "Kalau melihat dari kondisi tekanan dan temperatur pada jurnal *main engine* dan *log book, surging* ini terjadi karena tekanan *scaving air* yang terlalu rendah yang menyebabkan pembakaran tidak sempurna dan pembilasan yang terjadi tidak maksimal."

Cadet : "Kemudian apa yang menyebabkan tekanan *scaving air* itu rendah bass?"

Engineer : "Bisa saja *intercooler*-nya kotor, *scaving* kemasukan minyak lumas, bisa juga karena *air flapper* tidak berfungsi dengan baik. Kita juga belum melihat kondisi *air filter* didalam *main engine* disisi luar *scaving air trunk*."

Cadet : "Siap bass, terimaksih atas informasinya, selamat siang."

(Wawancara berlanjut pada tangal 13 Oktober 2015)

Cadet : "Mohon ijin bass, saat kemarin banyak minyak lumas di *scaving air trunk* yang seharusnya tidak ada disitu, bagaimana menurut pandangan bass jika dikaitkan dengan dampak terhadap tekanan *scaving air* yang terlalu rendah?"

Engineer : "*Scaving air trunk* seharusnya kering dan bersih, karena itu akan mempengaruhi terjadinya pembakaran yang terjadi pada *main engine*. Jika terdapat minyak di *scaving air trunk* pasti minyak tersebut juga ikut terbakar di *main engine*, dan yang lebih parah minyak ini juga akan mempengaruhi temperatur udara bilas yang akan masuk kedalam *main engine* yang menyebabkan pembakaran menjadi tidak sempurna serta pembilasan yang terjadi tidak akan maksimal."

Cadet : “Kemudian menurut analisa yang sudah dilakukan, darimana minyak itu muncul?”

Engineer : “Minyak tersebut berasal dari celah *piston rod stuffing box ring* dengan *piston rod* yang sudah terlalu besar.”

Cadet : “Berarti apakah perlu kita lakukan pergantian *piston rod stuffing box ring* bass?”

Engineer : “Itu sangat perlu, namun kita belum tahu *piston rod stuffing box ring* nomor berapa yang perlu dilakukan penggantian, karena *main engine* kita tepat melakukan *drain* hanya ada satu. Tidak seperti jenis *main engine* lain yang tiap-tiap silinder mempunyai ceratan *scaving* sendiri-sendiri.”

Cadet : “Jika hal tersebut dikaitkan dengan penyebab terjadinya *surging turbocharger* bagaimana menurut penilaian bass?”

Engineer : “Itu sangat mungkin, karena penyebab terjadinya *surging* pada *turbocharger* juga disebabkan karena pembakaran yang tidak sempurna pada *main engine*, apalagi saat minyak yang tergenang tersebut dalam jumlah yang banyak, hal tersebut akan memperburuk kondisi pembakaran *main engine* pada dan gas sisa pembakaran lebih banyak mengandung karbon dan akan merusak komponen dari *needle valve* sampai dengan *bearing turbocharger,* dan seperti yang pernah saya jelaskan, genangan tersebut juga akan mempengaruhi tekanan dan temperatur udara bilas *main engine*.”

Cadet : “Kemudian bagaimana langkah yan perlu dilakukan supaya pembakaran dapat tercapai secara maksimal?”

Engineer : “Sementara ini yang bisa dilakukan supaya genangan tersebut tidak ikut terbakar yaitu dengan melakukan *drain* secara rutin pada *drain valve* supaya tidak ada genangan di *scaving air trunk.”*

Cadet : “Siap bass, terimakasih atas informasinya.”

3. Responden 3

Nama : Warlim Juanda

Jabatan : 1st Engineer

Tanggal wawancara : 28 Oktober 2015

Cadet : "Assalamu'alaikum bass, mohon ijin bass. Bagaimana menurut bass mengenai terjadinya *surging turbocharger* yang terjadi di kapal kita?"

Engineer : "Wa'alaikumsalam, *surging turbocharger* yang terjadi di kapal kita terjadi karena pembakaran yang tidak sempurna karena pembakaran yang terjadi tidak berlangsung secara sempurna, dan juga terdapat genangan minyak lumas di *scaving air trunk* yang mengganggu *scaving air*, kemudian dalam jangka panjang akan merusak komponen-komponen sampai dengan *turbocharger*-nya dan terjadilah *surging."*

Cadet : "Kemudian bagaimana cara mengatasinya?"

Engineer : "Yang paling utama yaitu dengan mengatasi sumber masalahnya, pertama kita mengecek kondisi *piston rod stuffing box ring* pada tiap-tiap batang *piston* kemudian melakukan pergantian pasa *piston rod stuffing box ring* yang sudah tidak layak untuk digunakan."

Cadet : "Apakah bass sebelumnya prnah melakukan penggantian *piston rod stuffing box ring*?"

Engineer : "Pernah. Sebelum saya di kapal ini saya juga melakukan penggantian *piston rod stuffing box ring*, jadi prosedur penggantiannya dapat dilakukan dari *crankcase*/bawah dan juga bisa dilakukan lewat atas dengan melepas *piston* terlebih dahulu. Untuk prosedur penggantiannya kamu bisa membaca di *manual book*."

Cadet : "Siap bass, nanti saya baca, terimakasih atas waktunya. Assalamu'alaikum."

Engineer : "Wa'alaikumsalam.