दूरभाष: २३०६/ Tele: 2306

सम्मिश्र जांच दल/ Composite Trials Team
द्वारा नौसेना कार्यालय/ c/o Navy Office
मुख्यालय/ Headquarter
अन्डमान एवं निकोबार कमान/
Andaman & Nicobar Command
पोर्ट ब्लेयर ७४४१०२/ Port Blair 744 102

CTT/300/04/04/TECH

10 अक्टूबर २३/ Oct 23

प्रधान सेनापति/ The Commander-in-Chief
{कृते कमान तकनीकी अधिकारी (समुद्री)/ for CTO(M)}
मुख्यालय/ Headquarters
अन्डमान एवं निकोबार कमान/ Andaman and Nicobar Command
द्वारा नौसेना कार्यालय/ c/o Navy Office
पोर्ट ब्लेयर ७४४ १०२/ Port Blair 744 102

POST REFIT TRIALS OF AFT DA – INS KARMUK (NR-23)

1. Refer to following: -

(a) INS Karmuk letter 309/4 dated 27 Sep 23.

(b) This unit letter of even number dated 04 Oct 23.

2. **Background**. Post Refit Trials including SDCs, Performance, Vibration, attenuation checks and electrical trials were undertaken on 29, 30 Sep, 03 & 06 Oct 23. DA was loaded up to 100% (350 kW) on load bank and sustained for duration of two hours. Detailed report w.r.t Engineering and Electrical trials are placed at **Enclosure I** and **Enclosure II** respectively.

3. **Performance Parameters**. The salient parameters are as follows: -

Ser	Parameter	Range	Remarks
(a)	Lub Oil Pressure	3.4 – 4.3 bar	Sat
(b)	Lub Oil Temperature	80 – 101 °C	
(c)	Fresh Water Temperature	74 – 87 °C	
(d)	Exhaust Temperature	558 / 545 °C	

4. **Vibration Analysis**. Vibration trials were undertaken at 60% and 100% of rated load and found Sat.

5. **Observations**. Salient observations/defects observed during the trails are as follows: -

(a) RPM of DA observed to be 1545 ERPM in control panel as against 1500 ERPM. On verification with Stroboscope & Leonova Diamond, the RPM recorded is 1505.

(b) **Halon FF for AFT DA compartment Non-Ops**.

(c) Following leakages observed:-

(i) Coolant leakage from drain line of sight glass.

(ii) Sea water leakage from s/w inlet durite.

(d) Control back up supply available for 15 min only..

(e) Air starting hose found twisted and deteriorated.

(f) F/W cooler outlet temp thermometer & Alternator Cooler leakage indication not fitted.

(g) DA Foundation base bolts and S/W pump foundation rusted.

(h) Both greasing cups of s/w pump not fitted.

(j) Attenuation across four mounts at 60 % and 100 % found **Unsat**.

(k) Torque tightening of SV mounts not offered.

(l) 03 Kw meter and synchroscope missing in Aft SWBD.

6. **Recommendations**. Following recommended: -

(a) Liquidation of defects/ observations mentioned at para 5 ibid.

(b) Attenuation of mounts to be re-checked after 100 Hours of exploitation and a report forwarded to this unit.

(c) Buffer Clearance value of mounts to be set as per OEM recommendations and torque tightness values to be offered.

(d) DA cleared for exploitation up to 100% of rated load for independent operation.

10/10

एस सी विलियम/ S C William)
कमांडर/ Commander
प्रभारी अधिकारी/ Officer-in-Charge

Encl: - As Above

Copy to: -

नौसेना खण्ड सेनापति/ The Naval Component Commander
{कृते वरिष्ठ कर्मचारी अधिकारी (यांत्रिकी)/ for SSO(Tech)}
मुख्यालय नौसेना खण्ड/ Headquarters Naval Component
द्वारा नौसेना कार्यालय/ c/o Navy Office
पोर्ट ब्लेयर ७४४१०२/ Port Blair 744 102

कोमोडोर अधीक्षक/ The Commodore Superintendent
{कृते उप महाप्रबंधक (मरम्मत)/ for DGM (Refit)}
नौसेना पोत मरम्मत यार्ड/ Naval Ship Repair Yard
द्वारा नौसेना कार्यालय/ c/o Navy Office
पोर्ट ब्लेयर ७४४ १०२/ Port Blair 744 102

कमान अधिकारी/ The Commanding Officer
भा. नौ. पो. कार्मुक/ INS Karmuk
द्वारा नौसेना कार्यालय/ c/o Navy Office
पोर्ट ब्लेयर ७४४ १०२/ Port Blair 744 102

Enclosure I to CTT (PBR) letter
CTT/300/04/04/TECH dated 10 Oct 23

FULL LOAD TRIALS OF AFT DA (350KW) – INS KARMUK (NR-23)

1. Trial Inspectors : (a) Paras Kumar, CH MECH
   (b) Sahul Narayan (TI)

2. Date and Time : 06 Oct 23 (1000-1400 hrs)

3. Equipment used for trials : (a) SPM T-30
   (b) Lenova Diamond
   (c) Temperature Gun
   (d) Stroboscope

4. Details of trials are as follows: -

   (a) **DA PARAMETER SHEET**

PARAMETER READINGS - LOCAL CONTROL PANEL								
SER	**DESCRIPTION**	**UNIT**	**IDLE**	**25%**	**50%**	**60%**	**75%**	**100%**
(i)	RPM	RPM	1100	1545	1530	1530	1530	1548
(ii)	L O. PRESSURE	KG/CM²	4.3	4.0	3.9	3.8	3.7	3.4
(iii)	S.W. PRESSURE	KG/CM²	1.0	1.1	1.1	1.1	1.1	1.1
(iv)	L.O. TEMP	°C	75	86	88	92	94	101
(v)	F.W. TEMP (LB/RB)	°C	70/69	70/72	74/75	78/80	80/82	85/87
(vi)	EXHT. TEMP (LB/RB)	°C	168 / 150	245 / 275	360 / 330	460 / 460	465 / 460	550 / 540
(vii)	LOAD	KW	-	87	177	213	264	354
(viii)	VOLT	V	-	418	418	418	418	418
(ix)	CURRENT	AMPS	-	121	243	293	363	485

PARAMETERS BY NON CONTACT TEMPERATURE GUN								
(x)	F.W. COOLER IN TEMP	°C	77	78	78	80	72	78
(xi)	F.W. COOLER OUT TEMP	°C	74	75	76	77	64	68
(xii)	SW IN TEMP TO F.W. COOLER	°C	30	30	30	30	30	31
(xiii)	SW OUT TEMP FW COOLER	°C	32	34	35	37	36	37
(xiv)	LO COOLER IN TEMP	°C	78	80	82	84	89	95
(xv)	LO COOLER OUT TEMP	°C	75	76	78	80	83	87
(xvi)	F.W.INLET TO LO COLLER TEMP	°C	75	75	76	77	65	69
(xvii)	F.W. OUTLET TO LO COLLER TEMP	°C	76	79	79	80	69	72

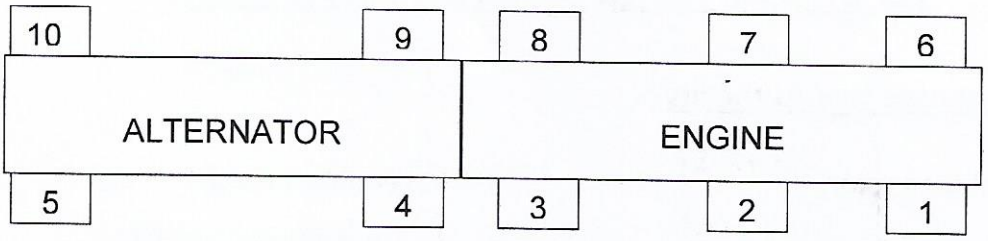
(b) **SAFETY DEVICES CHECK**

SER	DESCRIPTION	UNIT	DESIGNED LIMIT	ACTUAL ALARM	REMARKS
(i)	LOW L.O. PRESSURE ALARM	KG/CM^2	1.2	1.2	SAT
(ii)	LOW L.O. PRESSURE TRIP	KG/CM^2	0.7-1.0	0.9	
(iii)	HIGH F.W. TEMP.ALARM	°C	90±2	91	
(iv)	HIGH F.W. TEMP. TRIP	°C	95±2	94	
(v)	OVERSPEED TRIP	RPM	1650	1650	
(vi)	HIGH EXHAUST TEMP	°C	575	575	

(c) **VIBRATION TRIALS**.

SER	MEASURING POINTS	AT 60% LOAD			AT 100% LOAD			REMARKS (LIMIT 16 MM/SEC)
		H	V	A	H	V	A	
(i)	ENGINE FREE END	6.3	6.9	4.2	6.3	7.3	4.9	SAT
(ii)	ENGINE DRIVE END	4.1	5.7	3.5	5.3	10.1	8.8	
(iii)	ALTERNATOR DRIVE END	6.2	7.3	4.7	10.6	7.0	5.7	
(iv)	ALTERNATOR FREE END	6.9	6.1	6.3	7.1	5.6	10.1	

(d) **ATTENUATION CHECKS**. DA attenuation checks were carried out at 60 % & 100 % of rated load sustained by the DA.



Position	Vibration readings of SV mounts at 60 % Load									
	1	2	3	4	5	6	7	8	9	10
Top	4.7	6.6	6.6	7.4	6.1	8.1	3.3	6.8	2.0	2.4
Bottom	2.8	1.0	0.7	0.5	0.9	3.3	2.1	0.7	0.5	1.0
Attenuation % (Above 70%)	**40**	84	89	93	85	**59**	**36**	89	75	**58**
Remarks	**Unsat**	Sat				**Unsat**		Sat		**Unsat**

Position	Vibration readings of SV mounts at 100 % Load									
	1	2	3	4	5	6	7	8	9	10
Top	7.8	7.0	4.6	8.3	7.6	11.6	4.5	10.3	4.3	1.9
Bottom	5.1	1.8	1.1	0.6	0.6	5.8	2.6	0.6	0.6	1.5
Attenuation % (Above 70%)	**56**	74	75	72	92	**50**	**42**	94	86	**21**
Remarks	**Unsat**	Sat				**Unsat**		Sat		**Unsat**

(e) **SPM Reading**.

Ser	Description	0% LOAD dbm/dbc	60%LOAD dbm/dbc	100%LOAD dbm/dbc	Remarks
(i)	Alternator Drive End	8/-3(Green)	14/-8(Green)	8/-4(Green)	SAT
(ii)	Alternator Free End	4/-7(Green)	4/-9(Green)	16/-9(Green)	

Enclosure II to CTT letter
CTT/300/04/04 dated 10 Oct 23

ELECTRICAL TRIALS OF AFT DA – INS KARMUK

1. **Trials Presented by / Authority**.

(a)	Trial Inspector	:	VB Naidu, LEM(P) Tarun Kumar, LEM(P)
(b)	Presented by	:	SS / NSRY(PBR)
(c)	Trials date	:	06 Oct 23
(d)	Reference	:	ANCO (Tech) Art 0810 (f)
(e)	File Reference	:	CTT/300/04/04

2. **Test Equipment Used**.

(a) Power Quality Analyzer Fluke 435
(b) Light Meter
(c) Tong Tester
(d) Switchboard Panel Mounted meters
(e) SPM T-30

3. **Protective Devices**.

(a)	Over Voltage Trip	:	Sat (456V)
(b)	Reverse Power Relay	:	Sat
(c)	Under Voltage Relay	:	Sat (353V)

4. **Paralleling Trials**.

(a)	Unattended Paralleling	:	Not offered
(b)	Attended Paralleling	:	Not offered

5. **Observations**.

(a)	Governor droop	:	Sat **(0.89%)**
(b)	Governor checks	:	Sat
(c)	AVR Checks	:	Sat
(d)	M load trials	:	Sat

6. **Parameters of the Generating Set.**

(a) **Engine.**

(i)	Engine	:	Cummins
(ii)	Type	:	VTA 1710MG
(iii)	Maker's Name/Serial No	:	25208749
(iv)	Speed (R.P.M)	:	1500

(b) **Alternator.**

(i)	Maker's Name	:	Kirloskar
(ii)	Maker's Type /Serial No	:	8930775-09
(iii)	Full Load Output	:	350 KW
(iv)	Volts	:	415 V
(v)	Amps	:	600 Amps (At Unity PF)
(vi)	Speed (RPM)	:	1500

(c) **Governor.**

(i)	Maker's Name	:	Woodward
(ii)	Maker's Type/Serial No	:	19234930
(iii)	Type	:	Electronic Digital Governor

(d) **Automatic Voltage Regulator.**

(i)	Maker's Name	:	Not provided by SS.
(ii)	Type /Serial No	:	Not provided by SS.

(e) **Generator Supply Breaker.**

(i)	Maker's Name	:	L&T
(ii)	Capacity	:	800 Amps
(iii)	Maker's Type / Serial No	:	CT423280

7. **Parameters Recorded.**

(a) **Insulation Resistance.**

(i)	Cold	-	03 MΩ
(ii)	Hot	-	04 MΩ

(b) **Temperature Rise**.

(i) Ambient temperature at Start : 32^0C

(ii) Ambient temperature after two hours of running at Full load : 36^0C

(iii) Cooler (water cooled) : Effective

(c) **SPM Readings**.

Load	DE	Colour	NDE	Colour	Remarks
0 %	dbm/dbc = 8/-7	Green	dbm/dbc = 4/-7	Green	Sat
100 %	dbm/dbc = 8/-4	Green	dbm/dbc = 16/-9	Green	Sat

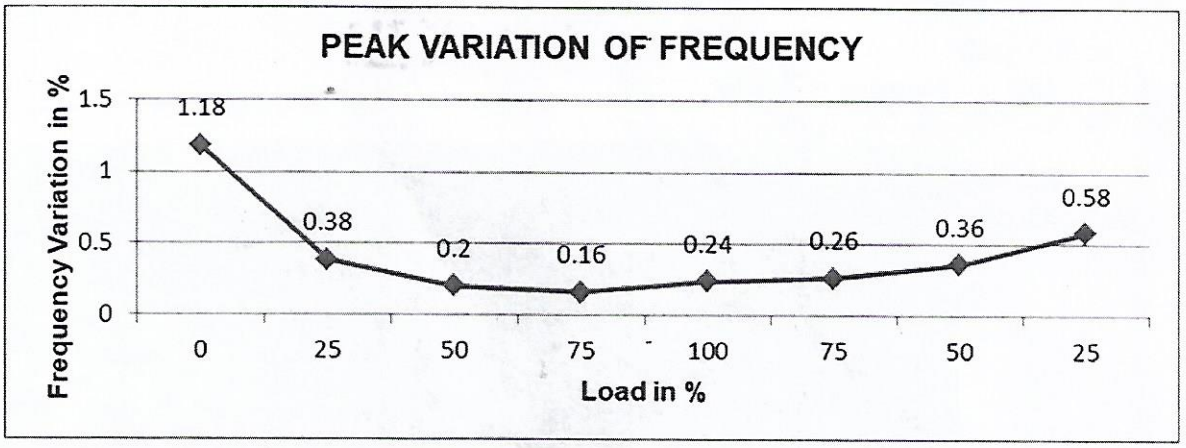
8. **Speed Control Tests**.

(a) **Steady State Tests**. (Set frequency at 50 Hz at 50 % Load)

Load%	Initial Speed (Hz)	Final Speed (Hz)	Governor droop(at 100 % load)	Permitted limits
50	-	Set frequency at 50 Hz	$\frac{(NI-N2)x100}{N}$	Between 0.875% to 1% (for electronic governor)
0-25	50.30	50.09	NA	
25-50	50.09	49.95		
50-75	49.95	49.88		
75-100	49.88	49.85		
100-0	**49.85**	**50.30**	**0.89%**	

(b) **Transient Tests**.

Load %		Initial Speed (Hz)	Momentary Speed (Hz)	Final Speed (Hz)	% Peak = Initial-Momentary / Nominal		Time of recovery (in sec)	
Initial	To				Observed	Permitted	Observed	Permitted
0	25	50.32	49.73	50.09	1.18	1.5 (L)	2	2
25	50	50.09	49.90	49.95	0.38		2	
50	75	49.95	49.85	49.88	0.20		2	
75	100	49.88	49.80	49.85	0.16		2	
100	75	49.85	49.97	49.91	0.24		2	
75	50	49.91	50.04	50.00	0.26		2	
50	25	50.00	50.18	50.12	0.36		2	
25	0	50.12	50.41	50.35	0.58		2	



For Machine Charged With Turbo Charged Engine.

Load %		Initial Speed (Hz)	Momentary Speed (Hz)	Final Speed (Hz)	% Peak = Initial - Final / Nominal		Remarks
Initial	To				Observed	Permitted	
0	70	50.36	49.09	49.92	2.54	5 %	Sat
100	0	49.85	50.80	50.32	1.90	5 %	Sat

(c) **Governor Range**. (This is undertaken by varying the frequency using the frequency control knob / lever provided for the alternator on switchboards).

Load %	Achieved frequency	Permitted	Remarks
0	50.30	49.50 – 50.50	Sat
100	49.85		Sat

(d) **Rate affected by Governor Motor**.

Load %	Rate Hz/s		Permitted	Remarks
	Up	Down		
0	0.05	0.06	Between 0.05 to 0.07 Hz per sec for Electronic Governors	Sat
100	0.06	0.07		Sat

9. **Voltage Control Tests**.

(a) **Steady State Tests**. (Set Voltage to Nominal value at 50 % load 415 V)

Load%	KW	Voltage(V)		Amps	PF
		Observed	Permitted		
0	0	415.47	± 4.15	0	-
25	87	415.56		148	0.8
50	174	415.27		305	0.8
75	264	415.68		463	0.8
100	350	415.44		624	0.8

(b) **Transient Tests**.

Load %		Initial Voltage	Momentary Voltage	Final Voltage	% Peak Initial-Momentary Nominal		Time of recovery (in sec)	
Initial	To				Observed	Permitted	Observed	Permitted
100	75	415.51	428.92	415.26	3.23	7.5	1	1
75	50	415.26	427.10	415.58	2.85		1	
50	25	415.58	428.56	415.80	3.12		1	
25	0	415.80	424.78	415.90	2.16		1	
0+M		415.90	373.08	415.79	10.31	15	1	
25+M		415.84	378.22	415.72	9.06		1	
50+M		415.56	381.32	415.48	8.25		1	
75+M		415.77	381.58	415.55	8.23		1	
85+M		415.44	381.36	415.37	8.21		1	

(c) **Voltage balance**.

Load %	Line Voltage			Difference (Between Max and Min of three values)	Permitted limits (1% of Avg of three line voltage)
	R-Y	Y-B	B-R		
0	416.5	417.4	415.4	2.0 V	4.17 V
100	414.5	416.2	416.8	2.3 V	

(d) **Voltage Range**. (This test is undertaken by varying the voltage trimmer (Hand / Auto as applicable) from lowest limit to highest limit.)

	Load %	At lowest limit of trimmer	At highest limit of trimmer	Remarks
AVR trimmer	0	-		SAT
	100			
Hand regulator	0	395	435	
	100	395	435	

Note. Permissible Limit ± 5% of rated voltage (Volts)