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

१९ अक्टूबर २३/ Oct 23

प्रधान सेनापति/ The Commander-in-Chief
{कृते कमान तकनीकी अधिकारी (समुद्री विद्युत)/ for CTO(ML)}
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

END OF REFIT TRIALS OF CENTRE DA – INS KARMUK (NR-23)

1. Refer to following: -

   (a) INS Karmuk letter 309/4 dated 16 Oct 23.

   (b) INS Karmuk Fax NR-23 dated 17 Oct 23.

2. **Background**. End of Refit Trials including SDCs, Performance, Vibration, attenuation checks, torque tightening of mounts and electrical trials were undertaken on 17 & 18 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	5.5 – 4.6 bar	Sat
(b)	Lub Oil Temperature	35 – 93 °C	
(c)	Fresh Water Temperature	52 – 84 °C	
(d)	Exhaust Temperature	510 / 565 °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) **Safety Hazards**

      (i) **Halon FF & FIT for the compartment Non-ops**.

      (ii) Bilge plates not fitted.

(iii) Plastic conduits used for control wiring system.

(iv) Poor compartment lighting. Luminosity value in vicinity of alternator measured to zero as against 300 lux.

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

(c) Control back up supply available for 15 min.

(d) Air starting hose deteriorated.

(e) 03/06 alternator aligning bolts not fitted.

(f) One supply blower non-ops.

(g) Attenuation across three mounts at 60 % and 100 % found **UNSAT**.

(h) Buffer Clearance value of mounts not verified.

(j) Exhaust drain line not fitted.

(k) Bilge Hygiene – **UNSAT**

(l) DA actuator connection not secured with lugs.

(m) Breather line not connected.

(n) Mismatch in analog & digital exhaust right bank gauge reading.

(p) Three Kw meters and synchroscope missing in Aft SWBD.

(q) **Paralleling trials not offered**.

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) DA Paralleling trials to be offered as & when the system is ready.

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

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

Encl: - As Above

Copy to: -

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

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

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 19 Oct 23

END OF REFIT TRIALS OF CENTRE DA (350KW) – INS KARMUK (NR-23)

1. Trial Inspectors : (a) Jitendra, ERA – III
   (b) Ambesh, LME
2. Date and Time : 17 & 18 Oct 23 (1000-1700 h)
3. Equipment used for trials : (a) SPM T-30
   (b) Leonova Diamond
   (c) Temperature Gun
   (d) Stroboscope
   (e) Light meter
4. Details of trials are as follows: -

(a) **SAFETY DEVICES CHECK**.

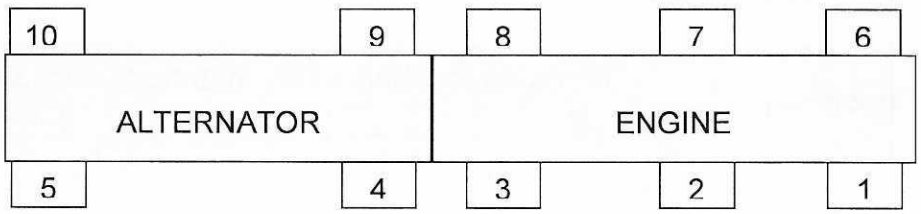
SER	DESCRIPTION	UNIT	DESIGNED LIMIT	ACTUAL ALARM	REMARKS
(i)	LOW L.O. PRESSURE ALARM	KG/CM²	**2.2**	2.2	SAT
(ii)	LOW L.O. PRESSURE TRIP	KG/CM²	**2.0**	2.0	
(iii)	HIGH F.W. TEMP.ALARM (LB/RB)	°C	90±2	91/90	
(iv)	HIGH F.W. TEMP. TRIP (LB/RB)	°C	95±2	95/95	
(v)	OVERSPEED TRIP	RPM	1650	1650	
(vi)	HIGH EXHAUST TEMP ALARM (LB/RB)	°C	575	574/576	

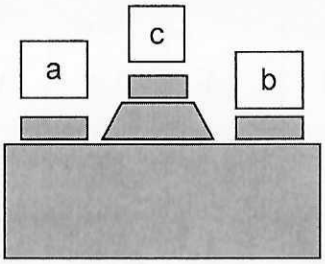
(b) **DA PARAMETER SHEET**

PARAMETER READINGS - LOCAL CONTROL PANEL								
SER	DESCRIPTION	UNIT	IDLE	25%	50%	60%	75%	100%
(i)	RPM	RPM	1100	1500	1500	1500	1500	1500
(ii)	L O. PRESSURE	KG/CM²	5.5	5.2	5.0	5.0	4.9	4.6

PARAMETER READINGS - LOCAL CONTROL PANEL								
SER	**DESCRIPTION**	**UNIT**	**IDLE**	**25%**	**50%**	**60%**	**75%**	**100%**
(iii)	S.W. PRESSURE	KG/CM²	0.8	1.4	1.4	1.4	1.4	1.3
(iv)	L.O. TEMP	°C	35	80	84	88	88	92
(v)	F.W. TEMP (LB/RB)	°C	52/53	77/78	78/82	80/80	80/80	83/84
(vi)	EXHT. TEMP (LB/RB)	°C	40/80	250/280	340/380	380/430	420/490	510/565
(vii)	LOAD	KW	-	87	177	213	264	350
(viii)	VOLT	V	-	415	415	414	415	415
(ix)	CURRENT	AMPS	-	123	248	294	371	484
PARAMETERS BY NON CONTACT TEMPERATURE GUN								
(x)	F.W. COOLER IN TEMP	°C	68	70	72	72	73	75
(xi)	F.W. COOLER OUT TEMP	°C	41	53	58	60	63	65
(xii)	SW IN TEMP TO F.W. COOLER	°C	30	30	31	31	31	33
(xiii)	SW OUT TEMP FW COOLER	°C	31	33	34	34	36	39
(xiv)	LO COOLER IN TEMP	°C	76	80	81	85	86	88
(xv)	LO COOLER OUT TEMP	°C	73	77	79	79	79	80
(xvi)	F.W.INLET TO LO COLLER TEMP	°C	68	68	68	69	70	71
(xvii)	F.W. OUTLET TO LO COLLER TEMP	°C	59	60	60	61	62	64

(c) **MOUNTS TORQUE TIGHTNESS CHECKS**.





Torque Values

Bottom (a) = 240 NM
Bottom (b) = 240 NM
Top (c) = 320 NM

DA SV Mounts Torque Values				
Ser	**Top (c)**	**Bottom (a)**	**Bottom (b)**	**Remarks**
1.	320 NM	240 NM	240 NM	SAT
2.	320 NM	240 NM	240 NM	
3.	320 NM	240 NM	240 NM	
4.	320 NM	240 NM	240 NM	
5.	320 NM	240 NM	240 NM	
6.	320 NM	240 NM	240 NM	
7.	320 NM	240 NM	240 NM	
8.	320 NM	240 NM	240 NM	
9.	320 NM	240 NM	240 NM	
10.	320 NM	240 NM	240 NM	

(d) **VIBRATION TRIALS**.

SER	MEASURING POINTS	AT 60% LOAD			AT 100% LOAD			REMARKS (LIMIT 16 MM/SEC)
		V	A	H	V	A	H	
(i)	ENGINE FREE END	9.5	3.6	12.1	10.3	6.4	12.0	SAT
(ii)	ENGINE DRIVE END	7.2	5.3	11.1	9.4	6.9	13.7	
(iii)	ALTERNATOR DRIVE END	3.5	5.3	7.1	4.4	9.4	6.1	
(iv)	ALTERNATOR FREE END	2.5	8.6	8.2	6.5	8.4	10.5	

(e) **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	10.2	4.2	3.7	5.0	5.6	7.5	4.9	5.0	10.8	9.9
Bottom	1.4	1.2	2.0	1.0	2.3	3.0	1.5	1.4	1.5	1.1
Attenuation % (Above 70%)	84	71	**45**	80	**58**	**60**	70	72	86	88
Remarks	Sat		**Unsat**	Sat	**Unsat**		Sat			

Position	Vibration readings of SV mounts at 100 % Load									
	1	2	3	4	5	6	7	8	9	10
Top	15.3	7.4	5.8	5.2	7.0	6.2	4.2	4.8	11.6	8.3
Bottom	1.3	2.1	3.0	1.0	2.5	1.8	1.0	1.0	2.3	1.0
Attenuation % (Above 70%)	91	71	**48**	80	**64**	**68**	76	82	80	87
Remarks	Sat		**Unsat**	Sat	**Unsat**		Sat			

(f) **SPM Reading**.

Ser	Description	0% LOAD dbm/dbc	60%LOAD dbm/dbc	100%LOAD dbm/dbc	Remarks
(i)	Alternator Drive End	19/10(Green)	20/10(Green)	20/8(Green)	SAT
(ii)	Alternator Free End	4/-9(Green)	10/-9(Green)	5/-9(Green)	

Enclosure II to CTT letter
CTT/300/04/04 dated 19 Oct 23

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

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

(a)	Trial Inspector	:	Nishant Yadav, LEM(P)
			Tarun Kumar, LEM(P)
(b)	Presented by	:	SS / NSRY(PBR)
(c)	Trials date	:	18 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 **(0.99%)**
(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	:	Kirloskar Cummins
(iv)	Speed (R.P.M)	:	1500

(b) **Alternator**.

(i)	Maker's Name	:	Kirloskar
(ii)	Maker's Type /Serial No	:	**Not Provided**
(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	:	**Not Provided**
(iii)	Type	:	Electronic Digital Governor

(d) **Automatic Voltage Regulator**.

(i)	Maker's Name	:	**Not provided**
(ii)	Type /Serial No	:	**Not provided**

(e) **Generator Supply Breaker**.

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

7. **Parameters Recorded**.

(a) **Insulation Resistance**.

(i) Cold - 04 MΩ

(ii) Hot - 06 MΩ

(b) **Temperature Rise**.

(i) Ambient temperature at Start : 35°C

(ii) Ambient temperature after two hours of running at Full load : 38°C

(iii) Cooler (water cooled) : Effective

(c) **SPM Readings**.

Load	DE	Colour	NDE	Colour	Remarks
0 %	dbm/dbc = 19/10	Green	dbm/dbc = 4/-9	Green	Sat
100 %	dbm/dbc = 20/8	Green	dbm/dbc = 5/-9	Green	Sat

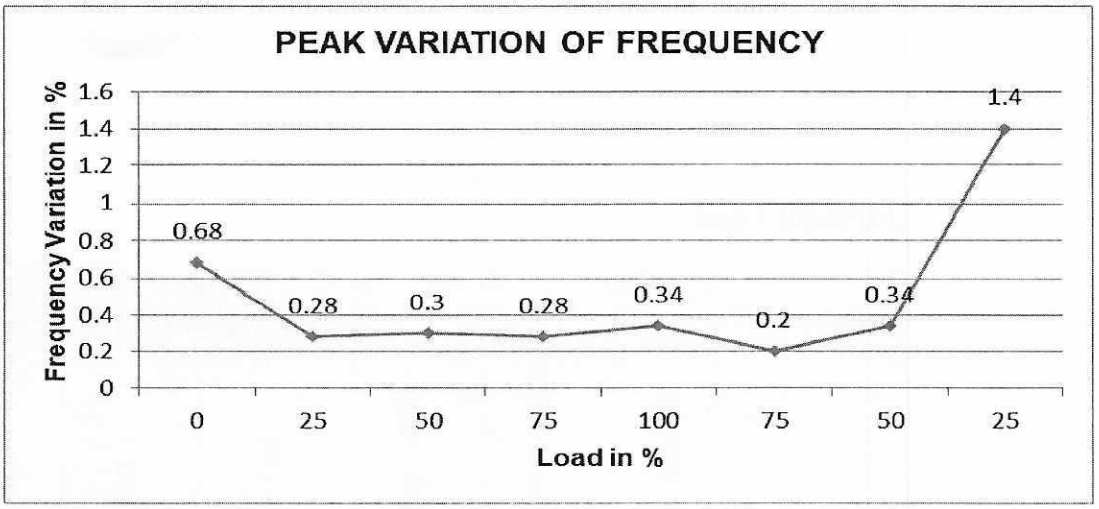
8. **Speed Control Tests**.

(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	50.26	50.11	NA	
25-50	50.11	50.00		
50-75	50.00	49.87		
75-100	49.87	49.76		
100-0	**49.76**	**50.26**	**0.99%**	

(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	50.29	49.95	50.09	0.68	1.5 (L)	2	2
25	50	50.09	49.95	50.00	0.28		2	
50	75	50.00	49.85	49.87	0.30		2	
75	100	49.87	49.73	49.76	0.28		2	
100	75	49.76	49.93	49.90	0.34		2	
75	50	49.90	50.00	49.99	0.20		2	
50	25	49.99	50.16	50.11	0.34		2	
25	0	50.11	50.81	50.31	1.4		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	50.31	48.72	49.92	3.18	5 %	Sat
100	0	49.77	52.20	50.25	4.86	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	50.29	49.50 – 50.50	Sat
100	49.76		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	415.89	± 4.15	0	-
25	87	415.86		154	0.8
50	176	415.00		309	0.8
75	261	415.39		462	0.8
100	350	413.90		618	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	413.90	425.20	415.01	2.72	7.5	1	1
75	50	415.01	424.64	415.13	2.32		1	
50	25	415.13	425.28	415.39	2.44		1	
25	0	415.39	422.84	415.49	1.79		1	
0+M		415.51	381.56	415.48	8.18	15	1	
25+M		415.30	383.70	415.45	7.61		1	
50+M		415.12	388.56	415.15	6.40		1	
75+M		415.70	394.14	415.07	5.19		1	
85+M		414.95	406.24	414.59	2.09		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	415.82	415.84	415.92	0.1 V	4.17 V
100	416.66	417.32	416.72	0.66 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)