



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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AEOD/E001

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MEMORANDUM FOR: Carl Michelson, Director
Office for Analysis and Evaluation of
Operational Data

FROM: Harold L. Ornstein
Office for Analysis and Evaluation of
Operational Data

SUBJECT: CRYSTAL RIVER NUCLEAR POWER PLANT DECAY HEAT CLOSED
CYCLE COOLING WATER PUMPS/DCP-1A AND DCP-1B

I have pulled together the following information:

The NRC requires surveillance testing of these pumps every 30 days. Pump DCP-1A tested satisfactorily on 2/6/80. Above and beyond the inservice inspection program required by NRC, Florida Power Corporation has an outside consultant (C&S Maintenance Consultants) conduct a plant-wide overall vibration maintenance program.

On 2/13/80, one week after DCP-1A passed the NRC required surveillance test, C&S found the pump motor vibration to have a 1.4 mil displacement (1.0 mil alert is required, 1.5 mil action is required). A C&S report, dated 2/15/80, noted the increased displacement and indicated that it was not at a point of concern, and advised FPC that the pump should be watched for increases in vibration and/or temperature.

On 2/26/80, at 8:00AM, C&S retested the motor and found it to be out of spec (4.7mil) and in need of immediate repairs. The vibration was attributed to the motor bearing closest to the coupling. A work request was written up noting the fact that this is a tech spec priority item (72-hour action status). The fact that DCP-1A was inoperable was not relayed to the control room personnel until after the incident, partially due to system inertia and the plant evacuation. (A meeting between the shift supervisor and the maintenance planners/coordinators to go over the pump repair did not take place until after reactor trip. The question of communication between operations and maintenance personnel regarding declaring vital equipment out of service needs to be addressed - is this a problem at many other plants vs. just Crystal River vs. just an isolated event at Crystal River?)

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The motor bearing closest to the coupling was changed on the morning of 2/27/80; however, excessive vibration was still recorded (displacement of 1.1 mil). Because of this vibration, the motor bearing on the opposite side of the motor was then changed. Changing the second bearing brought the displacement down to 0.68 mil which was within the alert range, but still outside the normal operating range of about 0.5 mil. Subsequently, FPC broke down the coupling, found that one end of the coupling was unlubricated, and that it "had bad teeth which were somewhat corroded"; most probably due to improper lubrication. The coupling was then replaced and the pump/motor were realigned. C&S ran vibration tests on the pump/motor on 3/28/80 and readings were within normal ranges (displacement was 0.3 mil).

The redundant decay heat closed cycle cooling system pump, DCP-1B, was examined, and the pump and motor were found to be out of alignment. There was grease in the coupling; however, the grease showed signs of degradation (loss of "slickness"). It was concluded that the degradation arose from misalignment which caused the heating of the grease and excessive wear.

The coupling does not have any grease cup or simple provisions for lubrication. In order to grease the coupling, it must be disassembled. FPC (G. Claar - shop supervisor) informed me that FPC was of the impression that the DCP couplings were not permanently lubricated. FPC had found that the plant equipment lubrication list (which was put together with the assistance of Gulf Atomic) had omitted the couplings on DCP-1A and 1B. As a result, FPC was planning to check the couplings during the next refueling outage for lubrication. I&E (Ashenden) was informed that, as a result of their recent experience with DCP-1A and 1B, FPC is now planning to implement a plant-wide program for alignment and coupling lubrication.

The lubrication problem on the decay heat closed cycle cooling system pumps, the unexpected failure, and the resultant delay in going to cold shutdown highlight the vulnerability of nuclear power plants to inadequate lubrication. The NRC does not appear to have adequate visibility of lubrication and maintenance on vital pumps and other critical equipment. Inadequate lubrication and alignment checks and the "impending common mode failures" of the decay heat closed cycle cooling water pumps, DCP-1A and 1B, at the time of the 2/26/80 Crystal River incident, are viewed as potential accident precursors which should be addressed immediately.

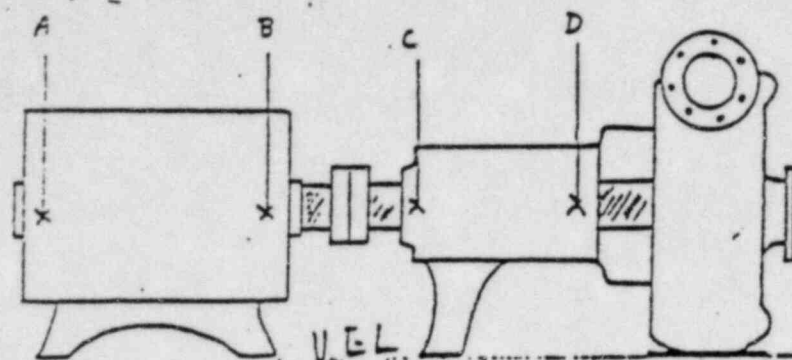
H. L. Ornstein

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Office for Analysis and Evaluation
of Operational Data

Enclosures:

1. C&S 'Maintenance Consultants'
Data Sheet
2. Florida Power Work Request

MACHINE SKETCH



MAINTENANCE CONSULTANT

plant _____

machine _____

P.M. PROGRAM

	date	1-13	12-12	1-2-80	2-13	2-26	2-27	2-27	2-28	2-28				
	open	CDN	AWZ	WEL	DWB	DWB	DWB	DWB	DWB	DWB				
A	H	.10	.07	.04	.14	.48	.14	.04	.04	.04				
	V	.07	.11	.05	.08	.18	.09	.02	.05	.05				
	A	.10	.06	.06	.09	.15	.04	.02	.04	.05				
B	H	.09	.06	.03	.16	.60	.14	.05	.05	.05				
	V	.09	.07	.06	.09	.16	.09	.04	.05	.06				
	A	.09	.06	.08	.07	.17	.05	.03	.04	.05				
C	H	.10	.11	.08	.13	.17	after	after	.11	.11				
	V	.05	.08	.09	.08	.10	1st	2nd	.06	.05				
	A	.05	.06	.05	.07	.10	change	change	.07	.08				
D	H	.07	.13	.06	.07	.12	on	on	.08	.10				
	V	.07	.06	.06	.07	.10	motor	motor	.09	.10				
	A	.07	.07	.06	.06	.10			.07	.06				

	date	1-13	12-12	1-2-80	2-13	2-26	09:28am	16:44am	07:29am	08:30am				
	open	AWZ	DWB	WEL	DWB	DWB	DWB	DWB	DWB	DWB				
A	H	.50	.20	.20	1.0	3.7	.98	.46	.21	.16				
	V	.51	.18	.19	.30	1.2	.20	.29	.16	.15				
	A	.25	.20	.21	.38	.88	.14	.30	.19	.17				
B	H	.60	.27	.23	1.4	4.7	1.1	.68	.30	.30				
	V	.25	.25	.30	.36	1.0	.29	.45	.26	.26				
	A	.19	.16	.27	.36	.78	.55	.29	.19	.20				
C	H	.3	.36	.30	.46	1.0			.34	.30				
	V	.27	.27	.12	.19	.52			.16	.14				
	A	.17	.17	.20	.20	.32			.18	.19				
	H	.3	.36	.30	.46	1.0			.34	.30				
	V	.27	.27	.12	.19	.52			.16	.14				
	A	.17	.17	.20	.20	.32			.18	.19				

COMMENTS

PART I:		IDENTIFICATION AND DESCRIPTION OF CONDITION	
SYSTEM: DECAY HEAT C.C. Co		NG WATER	DISCREPA: YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
ITEM/TAG NO: ELEC MOTOR / DCP-1A		NCOR NO:	
DESCRIBE CONDITION, CAUSE AND METHOD OF DETECTION:			
OUT OF SPEC VIBRATION			
BEARINGS POSSIBLY BAD			
+S VIBRANALIS READINGS: .6 IN/SEC (.1 NORMAL) VELOCITY			
4.7 MILS (.5 NORMAL) DISPLACEMENT			
A.I. ...			
G.E. 100 HP. 4160V 480V		DRIVE END BRG No. 6318 OPP END BRG. No. 6314	
RELATED DOCUMENTS: MAR NO.		PROC'D. NO.	WR NO.
ORIGINATOR:		DATE: 2/26/80	RESPONSIBLE SUPVR:
H. G. FORTH, JR.		TIME: 1100	R. A. Brown
DATE: 2.26.80			
PART II		EVALUATION OF WORK REQUIRED	
NUCLEAR SAFETY RELATED:		PRIORITY CODE:	
YES <input checked="" type="checkbox"/> QC REQ'D		<input checked="" type="checkbox"/> 1 TECH. SPEC. OR SECURITY ITEM <input type="checkbox"/> 2 SCHEDULE <input type="checkbox"/> 3 OUTAGE	
NO <input type="checkbox"/>			
QUALITY ITEM:		PROCEDURE REQUIRED:	
YES <input checked="" type="checkbox"/> QC REQ'D		YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	
NO <input type="checkbox"/>		POST. MAINT. TEST:	
		YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	
LIST		LIST	
SP-344		02-75	
SP 340		79-56	
		CHARGE ACCOUNT NO.:	
		530.00	
WORK INSTRUCTIONS:		REPAIR REQUIRED	
MANHOUR ASSESSMENT: NO. OF MEN: 2		NO. OF HOURS: 7	
EVALUATED BY: J. K. Kline		DATE: 2-26-80	
WORK REQUEST TO SUPERVISOR:		J. K. Kline	
PART III		WORK PERFORMED DESCRIPTION:	
DESCRIBE WORK AS PERFORMED:		SHIFT SUPERVISOR DATE:	
REMOVED INBOARD ENDBELL AND BEARING RTH 3 HRS. Removed outboard Endbell and replaced bearing 2 men 1.5 hr. 3 men hrs. AB determine take to Rotshop disassemble reassemble return pump for rotation Sat 2 men 6 hrs 12 men hrs. AB		J. K. Kline 2-26-80	
Before item and load to remove coupling from motor 2 men 2 hrs 4 hrs			
MANHOUR ACCOUNTING: NO. OF MEN: 2		NO. OF HOURS: 11	
TOTAL MANHOURS: 22			
COMPLETED BY: J. K. Kline		DATE: 28 Feb 80	
RESPONSIBLE SUPVR:		DATE:	
PART IV		CORRECTIVE ACTION	
CORRECTIVE ACTION:		DESCRIBE INVESTIGATION / ACTION TAKEN:	
YES <input type="checkbox"/> NO <input type="checkbox"/>			
INITIALS/DATE			
WORK REVIEW COMPLETION: DATE:		WORK VERIFIED BY: DATE:	
PLAN. COORD.)		(CC INSP.)	
RESPONSIBLE SUPT.: DATE:		COMPLIANCE ENG.: DATE:	
PLANT MANAGER: DATE:			

N: 09516