UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

September 16, 1993

NRC INFORMATION NOTICE 93-74: HIGH TEMPERATURES REDUCE LIMITORQUE AC MOTOR OPERATOR TORQUE

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees that high ambient temperatures can reduce ac motor torque capability in Limitorque motor operators. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Background

In order to size a motor operator to a given valve, the expected operator torque capable of being developed under design-basis conditions is calculated. The operator torque output is directly related to the torque output of the operator motor. For dc motor operators, Limitorque has published derating factors that are applied to high ambient temperature applications. However, until recently, no derating information was available for Limitorque motor operators equipped with ac motors.

Description of Circumstances

In response to NRC questions, Limitorque Corporation established a test program to evaluate whether elevated ambient temperatures could significantly affect ac motor output torque. In October of 1992, Limitorque completed testing of five ac motors. This testing indicated that ac motor stall torque values decreased significantly with increasing ambient temperatures. The measured torque reductions ranged from 14 to 25 percent for ambient temperature increases from 24°C [75°F] to 169°C [336°F]. Limitorque contracted with its main motor supplier, Reliance Motor Co., to calculate the expected stall torque reduction for all Limitorque/Reliance ac motor designs.

On May 13, 1993, Limitorque issued a report about a potential 10 CFR Part 21 condition. The report contained a tabulation of motor types and expected torque reductions for ambient temperature increases from 25°C [77°F] to 180°C

[356°F]. This data is given in Attachment 1. Limitorque has since indicated that the torque reductions would be applicable only for motors in ambient conditions above 40°C [104°F] as the motors are designed to deliver full rated torque up to 40°C [104°F].

Limitorque has stated that the torque reduction is linear with respect to temperature. The Limitorque table also contains information on the expected reduction in locked rotor current at elevated temperatures. The reduced locked rotor current would provide a slightly higher motor terminal voltage. Although this would improve the calculated reduced voltage motor performance, it would not compensate for the torque reduction resulting from an elevated temperature. Limitorque further stated that motor temperature rise as a result of prior motor energization and motor run time (valve stroke time) must be accounted for.

Additional information concerning motor operator performance can be found in NRC Inspection Report 99900100/93-01 issued June 28, 1993.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: Jeffrey B. Jacobson, NRR
(301) 504-2977

Thomas G. Scarbrough, NRR
(301) 504-2794

Attachments:
1. Current/Torque Changes from 25 to 180 Centigrade
2. List of Recently Issued NRC Information Notices

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Orignal signed by
Al Chaffee for/

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* See Previous Concurrence

OFFICE:	*RSIB:DRIL	*SC:RSIB:DRIL	*C:RSIB:DRIL	*D:DRIL:NRR
NAME:	JBJacobson	DPNorkin	EVImbro	CERossi
DATE:	08/12/93	08/12/93	08/13/93	08/16/93

OFFICE:	*EMEB:DE	*OGCB:DORS	*Tech Ed	*C:OGCB:DORS	D:DORS:NRR
NAME:	TGScarbrough	RJKiessel	DGable	GHMarcus	BKGrimes
DATE:	08/23/93	09/01/93	09/01/93	09/08/93	09/16/93

Document Name: 93-74.IN

Current/Torque Changes from 25 to 180 Centigrade

Start/RPM	Frame	Curve #	% Current Loss	% Torq Loss
2'#/1800	56	M2735A	27.8%	20.7%
5'#/1800	48	M2734	29.0%	18.6%
5'#/1800	56	M1658	21.8%	21.9%
7.5'#/1800	56	M2925	22.4%	5.7%
10'#/1800	56	M1468	26.9%	27.7%
15'#/1800	56	M1476	23.7%	23.1%
25'#/1800	56	M1480	23.1%	23.2%
40'#/1800	56	M1488	21.1%	23.4%
60'#/1800	56	M5204	20.8%	20.9%
60'#/1800	180	SK-59454	19.6%	18.2%
80'#/1800	210	SK-59423	16.1%	15.8%
100'#/1800	210	SK-59419A	17.0%	13.1%
200'#/1800	256	SK-34177	13.5%	9.0%
250'#/1800	256	SK-34193	11.8%	6.9%
300'#/1800	326	SK-34183	11.7%	5.8%
2'#/3600	48	413018-03	28.3%	16.0%
5'#/3600	48	M199	27.7%	18.5%
5'#/3600	56	M1454	24.7%	26.8%
7.5'#/3600	56	M1457	27.6%	16.7%
10'#/3600	56	M1458	23.5%	30.8%
15'#/3600	56	M1460	19.2%	21.4%
25'#/3600	56	M1463	16.2%	24.1%
40'#/3600	56	M4635	27.9%	15.9%
40'#/3600	180	SK-59450	16.2%	11.8%
60'#/3600	210	SK-59446	18.2%	16.5%
80'#/3600	210	SK-59448	18.0%	18.3%
100'#/3600	256	SK-34176	14.1%	9.8%
150'#/3600	256	SK-34184	13.9%	10.0%
200'#/3600	326	SK-34188	10.5%	3.4%
250'#/3600	326	SK-34173	9.3%	3.4%
300'#/3600	326	SK-34171	10.8%	2.9%
400'#/3600	365	SK-34800-	8.8%	-1.8%

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-73	Criminal Prosecution of Nuclear Suppliers for Wrongdoing	09/15/93	All NRC licensees.
93-72	Observations from Recent Shutdown Risk and Outage Management Pilot Team Inspections	09/14/93	All holders of OLs or CPs for nuclear power reactors.
93-71	Fire at Chernobyl Unit 2	09/13/93	All holders of OLs or CPs for nuclear power reactors.
93-70	Degradation of Boraflex Neutron Absorber Coupons	09/10/93	All holders of OLs or CPs for nuclear power reactors.
93-69	Radiography Events at Operating Power Reactors	09/02/93	All holders of OLs or CPs for nuclear power reactors and all radiography licensees.
93-68	Failure of Pump Shaft Coupling Caused by Temper Embrittlement during Manufacture	09/01/93	All holders of OLs or CPs for nuclear power reactors.
92-16, Supp. 2	Loss of Flow from the Residual Heat Removal Pump during Refueling Cavity Draindown	08/23/93	All holders of OLs or CPs for nuclear power reactors.
93-67	Bursting of High Pressure Coolant Injection Steam Line Rupture Discs Injures Plant Personnel	08/16/93	All holders of OLs or CPs for nuclear power reactors.
93-66	Switchover to Hot-Leg Injection Following A Loss-of-Coolant Accident in Pressurized Water Reactors	08/16/93	All holders of OLs or CPs for pressurized water reactors.

OL = Operating License
CP = Construction Permit

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Enclosures:
1. Current/Torque Changes from 25 to 180 Centigrade
2. List of Recently Issued NRC Information Notices

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NAME:	TGScarbrough	RJKiessel	DGable	GHMarcus for	BKGrimes
DATE:	08/23/93	9/ 1/93	9/ 1/93	9/8/93	9/ 93

Document Name: NRCIN.391

for.

Additional information concerning motor operator performance can be found in NRC inspection report 99900100/93-01 issued June 28, 1993.

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On May 13, 1993, Limitorque issued a "Potential 10 CFR 21 Condition" report which contained a tabulation of motor types and expected torque reductions for ambient temperature increases from 25°C to 180°C. This tabulated data is attached as Enclosure (1). Limitorque has since indicated that the torque reductions would only be applicable for motors in ambient conditions above 40°C as the motors are designed to deliver full rated torque up to 40°C.

Limitorque has stated that the torque reduction is linear with respect to temperature. The Limitorque table also contains information on the expected reduction in locked rotor current at elevated temperatures. The reduced locked rotor current would provide a slightly higher motor terminal voltage. This would improve the calculated reduced voltage motor performance, however, not nearly enough to compensate for the torque reduction due to elevated temperature. Also, Limitorque stated that motor temperature rise due to prior motor energization and motor run time (valve stroke time) must be accounted for.

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Enclosure 1: Current/Torque Changes from 25 to 180 Centigrade

Distribution:

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NAME:	CERossi*	TGScarbrough	BKGrimes	
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OFFICIAL RECORD COPY DOCUMENT NAME: G:\INFONOT.JBJ

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