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SUBJECT: Forwards response to 870120 request for addl info on MSIV hydraulic actuator & acceptability of actuator hydraulic fluid when used w/revised actuator design. Revised actuator operations manual will be provided to util by 870215.

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	BWR FOB		1	1	BWR PD3 LA		1	1
	BWR PD3 PD		1	1	HAUGHEY, M	01	2	2
	BWR PSB		1	1	BWR RSB		1	1
INTERNAL:	ACRS	41	6	6	ADM/LFMB		1	0
	ELD/HDS3		1	0	IE FILE		1	1
	IE/DEPER/EPB	36	1	1	IE/DQAVT/QAB	21	1	1
	NRR BWR ADTS		1	0	NRR PWR-B ADTS		1	0
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	REG FILE	04	1	1	RM/DDAMI/MIB		1	0
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REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:870[illegible]0179 DOC.DATE: 87/02/27 NOTARIZED: YES DOCKET #
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AUTH.NAME AUTHOR AFFILIATION
MANGAN,C.V. Niagara Mohawk Power Corp.
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Forwards response to 870120 request for addl info on Moog hydraulic actuator & acceptability of substitute hydraulic fluid when used w/revised actuator design. Revised actuator operations manual will be provided to util by [illegible].

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	BWR FOB	1	1	BWR PD3 LA	1	1
	BWR PD3 PD	1	1	HAUGHEY,M 01	2	2
	BWR PSB	1	1	BWR RSB	1	1
INTERNAL:	ACRS 41	6	6	ADM/LFMB	1	0
	ELD/HDS3	1	0	IE FILE	1	1
	IE/DEPER/EPB 36	1	1	IE/DQAVT/QAB 21	1	1
	NRR BWR ADTS	1	0	NRR PWR-B ADTS	1	0
	NRR ROE,M.L	1	1	NRR/DHFT/MTB	1	1
	REG FILE 04	1	1	RM/DDAMI/MIB	1	0
EXTERNAL:	BNL(AMDTS ONLY)	1	1	DMB/DSS (AMDTS)	1	1
	LPDR 03	1	1	NRC PDR 02	1	1
	NSIC 05	1	1	PNL GRUEL,R	1	1

TOTAL NUMBER OF COPIES REQUIRED: LTTR 33 ENCL [illegible]

NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/301 PLAINFIELD ROAD, SYRACUSE, N.Y. 13212/TELEPHONE (315) 474-1511

January 27, 1987
(NMP2L 0982)

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: Nine Mile Point Unit 2
Docket No. 50-410

Gentlemen:

On January 20,1987, the Nuclear Regulatory Commission staff requested additional information on the Nine Mile Point Unit 2 main steam isolation valve hydraulic actuator and actuator hydraulic fluid. Specifically, the staff requested information on the acceptability of the actuator hydraulic fluid when used with the revised actuator design, fluid service life, and fluid shelf life. The attached report addresses these matters. Further, the Dow 510 Fluid analysis sheets previously transmitted to you in our January 8, 1987 letter have been signed by the Chemistry Supervisor. Also, a revised main steam isolation valve actuator Operations Manual (vendor manual) will be provided for Niagara Mohawk review and use by February 15, 1987.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

C. V. Mangan
Senior Vice President

TPS/pns
1715E
Attachment
xc: Regional Administrator, Region I
Ms. E. G. Adensam, Project Director
Mr. W. A. Cook, Resident Inspector
Project File (2)

B001
1/1

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	]	
	]	
Niagara Mohawk Power Corporation	]	Docket No. 50-410
	]	
(Nine Mile Point Unit 2)	]	

AFFIDAVIT

C. V. Mangan, being duly sworn, states that he is Senior Vice President of Niagara Mohawk Power Corporation; that he is authorized on the part of said Corporation to sign and file with the Nuclear Regulatory Commission the documents attached hereto; and that all such documents are true and correct to the best of his knowledge, information and belief.

C. V. Mangan

Subscribed and sworn to before me, a Notary Public in and for the State of New York and County of Onondaga, this 27th day of January, 1987.

Beth A. Menikheim
Notary Public in and for
Onondaga County, New York

My Commission expires:

BETH A. MENIKHEIM
Notary Public in the State of New York
Qualified in Onondaga County No. 4804074
My Commission Expires August 31, 19[illegible]

ATTACHMENT 1

In the original design of the actuator (mechanical latch design), the hydraulic fluid was used to pressurize the hydraulic cyclinder, thereby moving the piston and compressing the springs to open the MSIV. The fluid performed no function while the main steam isolation valve was in the open position as the hydraulic system was de-energized and the mechanical latch held the valve open. Upon closure, the flow restrictions in the hydraulic system limits the speed of closure to within the 3 to 5 second requirement. The revised design of the actuator uses the hydraulic system to keep the valve open, so that the hydraulic fluid is now constantly under pressure when the valve is open. This increased duty on the fluid will have no adverse effect on its ability to perform.

Dow Corning 510 fluid (the hydraulic fluid utilized) has been tested for effects due to radiation exposure. The 50 centistokes (CS) grade Dow Corning 510 fluid changed viscosity approximately 6% when subjected to 10 megarads. The 100 centistoke grade Dow Corning fluid used in the MSIVs is expected to react similarly. An analytical evaluation was performed to determine the sensitivity of changes in viscosity to system performance. The 6% change in viscosity of the hydraulic fluid over its service life of 40 years will have no effect on actuator performance. Using system parameters of volume, orifice size and viscosity, the flow characteristics will not be altered with small changes in viscosity over long periods and therefore actuator performance is insensitive to changes in viscosity. The actual radiation dose inside primary containment that the fluid would be exposed to is estimated to be 6.5 megarad,

as a result of the normal 40 year exposure, plus 2.3 megarad for the one hour accident exposure, for a 8.8 megarad total integrated gamma dose. The gelation point for the Dow Corning 510 fluid is 170 megarads. External beta dose will have no effect on the hydraulic fluid. The fluid's thermal service limits are -70° to 400°F, bounding the actual main steam isolation actuator normal temperatures of 40°F to 150°F, and accident temperatures of a maximum of 340°F.

The hydraulic fluid presently used in the MSIV actuators is Dow Corning Hydraulic Fluid 510-100. It is a clear, heat stable silicone fluid (see Attachment A specifications). The original fluid prescribed by the valve manufacturer was Fryquel 220. The use of Fryquel fluid was rejected due to its thixotropic behavior and susceptibility to water contamination. The manufacturer performed tests during 1982 including adding water which caused the fluid to form congealed lumps. Since it was considered likely that small amounts of water condensation could be admitted to the hydraulic system during normal operation, Fryquel hydraulic fluid was replaced in October 1982. Other hydraulic fluids were evaluated for acceptability: water-glycol mixtures, water-oil emulsions, and synthetic fluids including phosphate-ester base and halogenated hydrocarbon base fluids. The first two fluids contain water and were rejected as they could result in unacceptable corrosion. In addition fluid properties would change as the water content changes through evaporation or separation. Evaluation of the final group, synthetic fluids, led to the choice of a silicone type fluid.

Phosphate-ester base fluids split to form acids upon exposure to radiation and halogenated hydrocarbon base fluids give off halogen acid vapors. Both groups were unsuitable for use in the MSIV actuator due to corrosion considerations.

A silicone base fluid was chosen because of its thermal stability and its good oxidative behavior under radiation exposure. Dow Corning hydraulic fluid 510-100 was specified by the valve manufacturer as being acceptable for use in the MSIV actuator.

The service life of the fluid in plant will be determined by periodic testing in accordance with Chemistry Maintenance Procedure N2-CSP-17. The shelf life of the fluid when kept at room temperature is indefinite (see Attachment A Specifications). The effect in service operation will be monitored during outages, in accordance with procedures, to detect significant changes in viscosity and accumulation of particulates. The samples will be drawn from the bottom of the reservoir. Although no changes over the service life are expected based on testing performed by Dow Chemical, the surveillance testing of the hydraulic fluid is considered to be added assurance for proper actuator performance.

The fluid is used as a pressure coupling to open the MSIV and control closure speed, and not as a lubricant in a rotating piece of equipment. The use of the hydraulic fluid in the MSIV actuator is not one that would generate particulate in the system because the fluid is essentially static in the system. With the anticipated, infrequent operation of the pumps, the fluid is basically static. However, a filter using a 40 micron element was installed in the original hydraulic system to preclude pump wear and any degradation of the solenoid operated valves. The size of the mesh is considered adequate to collect and remove any contamination in the fluid. Removal of particulate is intended to extend the life of the seals in the hydraulic cylinder, and seats of the SOVs. Any deterioration of these items will result only in an increase in the jockey pump cycle times which will be monitored. Particulate

contamination will not compromise the safety function of the revised hydraulic system.

After further review of the periodic sampling and chemical testing schedule we have reconsidered our commitment in our January 8, 1987 letter. We are revising our sampling and testing schedule to occur once a refueling outage.

This is based upon the following facts: 1) the fluid is essentially in a static condition, 2) a filter is provided to remove particulates, 3) the valve is tested monthly to ensure operability, 4) the main steam tunnel and primary containment are a high radiation area during normal operation, and 5) the fluid is qualified for the application.

ATTACHMENT A

Dow Corning Corporation
Midland, Michigan 48686

Information abo Silicone Fluids

Call Toll Free
1-800-492-2320
PRODUCT INFORMATION DEPT.

DOW CORNING® 510 FLUID

Type ..... Silicone
Physical Form ..... Standard nominal viscosities of 50, 100, and 500 centistokes; special high-viscosity grade of 30,000 centistokes
Special Properties ..... Heat stable; pourable at low temperatures; excellent dielectric strength; water repellent
Primary Uses ..... Lubricating, damping, flotation, impregnating, liquid coupling

DESCRIPTION

Dow Corning 510 fluid is a clear, heat-stable silicone fluid which:

- Remains pourable at very low temperatures
- Is available in standard viscosities of 50, 100, and 500 centistokes; and also in a high-viscosity grade of 30,000 centistokes
- Has a relatively flat viscosity-temperature slope
- Is highly resistant to permanent shear breakdown
- Retains excellent dielectric properties over a wide range of temperatures and frequencies
- Is water repellent and resistant to effects of most gases, salts, dilute alkalis, and acids
- Is soluble in most aliphatic, aromatic, and chlorinated solvents; insoluble in water and most alcohols and glycols

The lower viscosities of Dow Corning 510 fluid are serviceable from −70 to 400 F (−57 to 204 C). As the viscosity increases, the freezing point increases. The highest viscosities of the fluid are serviceable from −60 to 400 F (−51 to 204 C).

USES

Typical applications for Dow Corning 510 fluid include its use as:

- Base oil in low-temperature silicone greases
- An impregnant or lubricant for leather diaphragms and plastic bearings used at low temperatures
- Fluid for liquid coupling in specialized aircraft applications
- Flotation and damping fluid for gyro compasses
- Damping fluid for instruments

TYPICAL PROPERTIES

These values are not intended for use in preparing specifications

	Standard Viscosities (Nominal)			Special High-Viscosity Grade
Physical	50 cs	100 cs	500 cs	30,000 cs
Color, APHA	20	20	20	80
Specific Gravity at 77 F (25 C)	0.965	0.992	0.997	0.99
Volatility, percent by weight†				
after 4 hrs at 482 F (250 C)	2.5	2.5	2.5	3.0
after 48 hrs at 482 F (250 C)	14.0	10.0	6.0	7.0
Viscosity, centistokes				
at 210 F (99 C)	14	26	180	5500
100 F (38 C)	38	77	380	20,000
77 F (25 C)	50	100	500	30,000
−20 F (−29 C)	275	500	2500	–
−50 F (−46 C)	620	1200	6000	–
−70 F (−57 C)	1020	2600	14000	–
Surface Tension at 77 F (25 C), dyne-cm	25.0	24.1	24.4	–
Compressibility, percent, at 6000 psi	–	2.85	–	–
20000 psi	–	7.95	–	–
Radiation Gelation Dosage, megarads	170	–	–	
Sound Velocity at 77 F (25 C), meters per second	1050	–	–	–

† As determined by heating a 35- to 40-gram sample in a 150 milliliter beaker having a bottom area of about 3 square inches.

TYPICAL PROPERTIES—*continued*

	Standard Viscosities (Nominal)			Special High-Viscosity Grade
	50 cs	100 cs	500 cs	30,000 cs
Thermal				
Stiffening Point, degrees, below	−70 C (−92 F)	−70 C (−92 F)	−70 C (−92 F)	–
Gel Time, hours at 482 F (250 C)	240	240	200	–
Coefficient of Expansion cc/cc/degree C, from 0 to 100 C	0.00096	0.00096	0.00096	0.00096
Thermal Conductivity, gm-cal/sec/cm²/degree C differential for 1-cm thickness	0.00035	0.00036	0.00037	0.00037
Specific Heat, cal/gm/degree C at 40 C	–	0.372	0.372	–
100 C	–	0.396	0.396	–
200 C	–	0.436	0.436	–
Spontaneous Ignition Temperature	900 F (482 C)	900 F (482 C)	900 F (482 C)	900 F (482 C)
Electrical				
Dielectric Strength, volts per mil	350	350	350	350
Dielectric Constant at 77 F (25 C), at 10^2 Hz	2.77	2.78	2.80	2.82
10^4 Hz	2.77	2.78	2.80	2.82
Dissipation Factor at 77 F (25 C), at 10^2 Hz	0.0003	0.0003	0.0003	0.0003
10^4 Hz	0.00005	0.00005	0.00005	0.00005
Volume Resistivity, ohm-cm	1×10^{14}	1×10^{14}	1×10^{14}	1×10^{14}

Specification Writers: Please contact Dow Corning Corporation, Midland, Michigan, before writing specifications on this product.

BLENDING

The various viscosity grades of Dow Corning 510 fluid are easily blended to obtain any intermediate viscosity. Approximate proportions needed can be read from the chart.

To use the chart, find a point on the left-hand scale representing the higher viscosity fluid. On the right-hand side, find a point representing the lower viscosity fluid. Connect these points with a line. Draw another line horizontally across the chart at the desired viscosity rating. A third line, drawn vertically across the chart through the intersection of the first two lines, will indicate (on the top and bottom scales) the proportions of different viscosity fluids to use in order to obtain the desired viscosity.

Accuracy will be increased by blending the two fluids which immediately bracket the desired viscosity.

EXAMPLE—

Fluid consistency wanted: 350 centistokes

The standard viscosities most immediately bracketing 350 centistokes are 500 and 100 centistokes. A line is drawn to connect 500 cs on the left-hand scale with 100 cs on the right-hand scale. A dotted line is drawn horizontally at the desired viscosity, 350 centistokes. At the point of intersection, a vertical line is drawn. The proportion of 100 cs viscosity fluid, (22%) is read in the bottom scale, and the proportion of 500 viscosity fluid (78%) at the top.

EXAMPLE—

Fluid consistency wanted: 18,000 centistokes.

Fluids available bracketing this viscosity are 500 cs and 30,000 cs, special high-viscosity grade.

Draw a direct line connecting 30,000 cs and 500 cs. On the horizontal, cut this line with 18,000 cs, the viscosity desired. As shown, 60% 30,000 cs must be blended with 10% 500 cs to get 18,000 cs.

EXAMPLE—

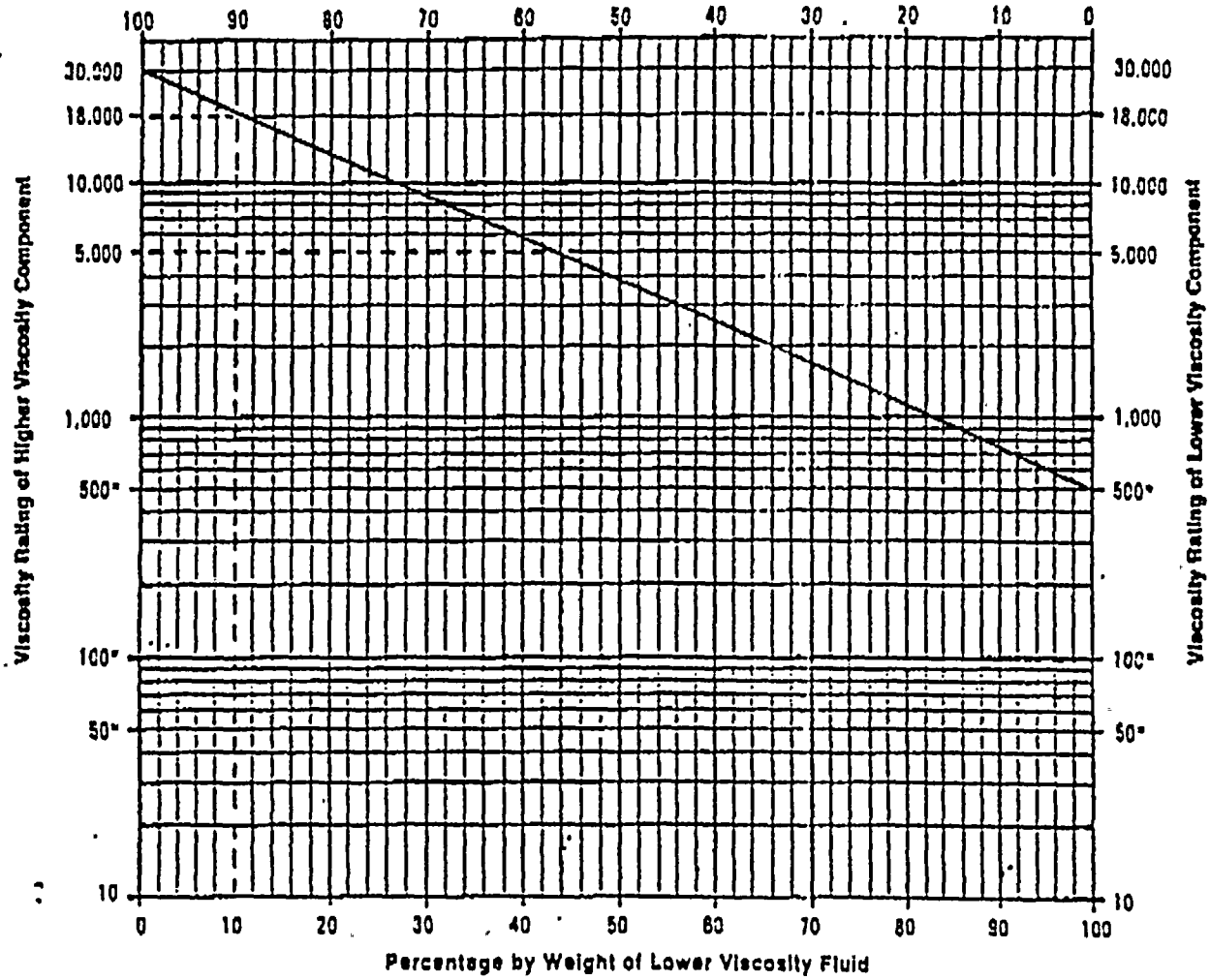
Fluid consistency wantec: 5000 centistokes.

As for 18,000 cs, draw horizontal line to diagonal connecting two bracketing viscosities—500 cs and 30,000 cs. Then, read blending ratio for 500 cs: 56% 30,000 cs, plus 44% 500 cs.

NOTE: Where very precise viscosities are desired, an additional trial-and-error blending procedure may be necessary to reach the exact value needed.

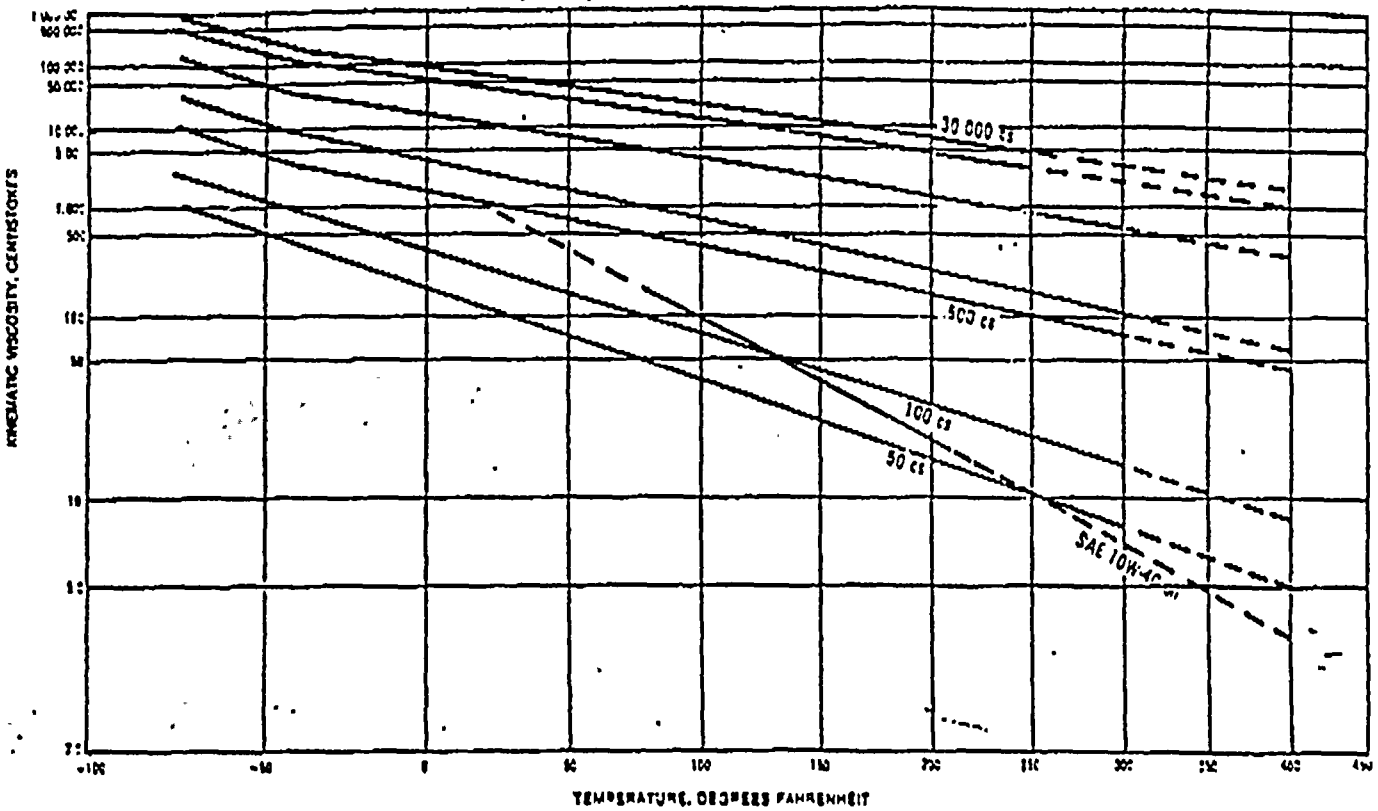
BLENDING CHART

Percentage by Weight of Higher Viscosity Fluid



*Standard or Preferred Viscosity

Viscosity-Temperature Curve for DOW CORNING 510 Fluid



SHIPPING LIMITATIONS

None.

STORAGE AND SHELF LIFE

Dow Corning 510 fluid has no known limits to useful life when stored at 77 F (25 C).

PACKAGING

Dow Corning 510 fluid is available in net-weight containers of 8, 40, and 440 pounds.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN 48640

Printed in U.S.A. Form No. 22-072D-78

DOW CORNING