



March 30, 1987
IPN-87-017

John C. Brons
Senior Vice President
Nuclear Generation

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

Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
State Pollutant Discharge and Elimination
System (SPDES) Permit Revision Notification

- References:
1. Letter to Mr. W. Loveridge (New York State Department of Environmental Conservation) from Mr. J. W. Blake (NYPA), dated June 12, 1986, entitled: "Indian Point 3 SPDES Permit No. NY 000 4472, Request for Modification to Use Three Copper Corrosion Inhibitors."
 2. Letter to Mr. W. Loveridge from Mr. J. W. Blake, dated September 24, 1986, entitled: "Indian Point 3 SPDES Permit No. NY 000 4472, Use of Molybdate Corrosion Inhibitors."

Dear Sir:

This letter serves to notify the NRC of the Authority's proposed revision to the Indian Point 3 SPDES Permit regarding the use of copper corrosion inhibitors and of the subsequent approval of this proposed revision. These notifications are being made pursuant to Section 3.2 of the Non-Radiological Environmental Protection Plan.

Reference 1 transmitted to the New York State Department of Environmental Conservation (DEC) a revision to the Indian Point 3 SPDES Permit allowing the use of molybdate-based copper corrosion inhibitors within the closed cycle auxiliary equipment cooling system. Reference 2 transmitted to the DEC confirmation of the DEC verbal approval of the proposed revision. The Attachment to this letter provides a copy of References 1 and 2.

Section 3.2 of the Non-Radiological Environmental Protection Plan requires that proposed changes to the SPDES permit be submitted to the NRC at the time the changes are submitted to

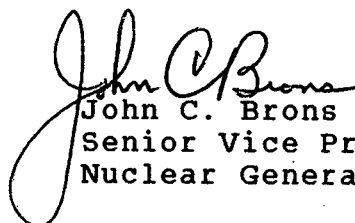
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the DEC and that the approved changes to the SPDES permit be reported to the NRC within 30 days following the date of NRC approval. The notification of the aforementioned proposed change to the SPDES permit and its subsequent approval by the DEC was not transmitted to the NRC within the reporting time period specified in Section 3.2. Additional administrative measures have been implemented to preclude such overdue notifications in the future.

Should you or your staff have any questions regarding this matter, please contact Mr. P. Kokolakis of my staff.

Very truly yours,


John C. Brons
Senior Vice President
Nuclear Generation

cc: Mr. J. D. Neighbors, Sr. Proj. Mgr.
PWR Project Directorate No. 3
Division of PWR Licensing-A
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20014

U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Resident Inspector's Office
Indian Point Unit 3
U.S. Nuclear Regulatory Commission
P.O. Box 215
Buchanan, NY 10511

Attachment to IPN-87- 017
SPDES Permit Revision Notification

New York Power Authority
Indian Point 3 Nuclear Power Plant
Docket No. 50-286



June 12, 1986

Mr. Walter Loveridge P.E.
Chief, Wastewater Facilities Design
Division of Water
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, N.Y. 12233

RE: INDIAN POINT 3 SPDES PERMIT NO. NY 000 4472
REQUEST FOR MODIFICATION TO USE
THREE COPPER CORROSION INHIBITORS


Dear Mr. Loveridge:

In compliance with the conditions stipulated in footnote f on page six of the referenced SPDES Permit, the New York Power Authority requests permission to use three corrosion inhibitors within Indian Point 3's closed cycle auxiliary equipment cooling system. The inhibitors will replace DREWGARD 100 which decomposes within this system below a desirable concentration. The Power Authority wishes to use the following molybdate-based copper corrosion inhibitors:

- DREWGARD 315
- NALCO 8325
- BETZ CORR-SHIELD 736

The following tables respond to DEC's questions, which, per your recent phone conversation with Gene Metti, I understand must be answered prior to modifying any SPDES permit for new chemical usage.

Please contact me at 914/681-6384 or Gene Metti at 6389 should you wish to discuss this submittal, or desire any further information.


Director
Environmental Division

JWB:EH:cav

cc: G. Metti
M. Kerns

Encl.

TABLE 1

No.	Information Requested	DREWGARD 315	NALCO 8325	BETZ CORR- SHIELD 736
1.	Product MSDS	Yes See Attached	Yes See Attached	Yes See Attached
2.	Chemical Composition	MSDS Sections 1 and 2	MSDS Sect.'s 1 and 2	MSDS Sections 1 and 2
3.	Analytical Limits of Detection for Active Ingredients	See	Table	2
4.	Proposed Concentration Frequency and Duration	Although this is a closed system, leakage will require adding approximately 55 gallons of inhibitor per year. 1500-2000 1950-2100 2500-3000 ppm ppm ppm		
5.	Expected Discharge Concentration 1 & 2	0.3 ppm	0.3 ppm	0.3 ppm
6.	Acute Aquatic Toxicity	See Pgs.3&4	of the	Amax Newsletter
7.	Chronic Effect Data for Fish	See	footnote	3

TABLE 1

No.	Information Requested	DREWGARD 315	NALCO 8325	BETZ CORR- SHIELD 736
8.	Bioaccumulation Data	See	footnote	3
9.	Wildlife Toxicity Data	N/A	N/A	N/A
10.	Changes in the physical or chemical properties of the receiving water	The only change is the estimated 0.3 ppm product discharge.		
11.	Degradation Products	See MSDS Section 6	See MSDS Section 9	See MSDS Section 3
12.	New York State Registration	N/A	N/A	N/A

Footnotes:

- 1) ppm as product.
- 2) Based on an estimated leak rate of 10 gpm at 3,000 ppm. This is a closed system with no direct discharge per se.
- 3) The attached Material Safety Data Sheets do not provide this information. However, sodium molybdate is an extremely stable chemical compound considered to be both non-toxic and non-polluting. The overall discussion provided in the Amax Newsletter and each MSDS supports this assertion.

N/A = Not Applicable

TABLE 2

Product	Active Ingredient	Analytical Detection Limits
Drewgard 315	Sodium Molybdate Sodium Hydroxide Tolytriazole Sodium Polyacrylate	1 ppb ¹ Measured as pH See Footnote 3 See Footnote 3
Nalco 8325	Sodium Molybdate Sodium Nitrite Sodium Hydroxide	1 ppb ¹ 1 ppb ² Measured as pH
Betz Corr-Shield 736	Sodium Molybdate Sodium Nitrite	1 ppb ¹ 1 ppb ²

Footnote:

- 1) ppb as MoO₄ - Furnace AA, Reference 1, method 246.2
- 2) ppb NO₂/l - NED Dihydrochloride, Reference 2, Method 419
- 3) Can be measured indirectly through the molybdate concentration

References:

- 1) Methods for Chemical Analysis of Water and Wastes
EPA-6000/4-79-020
- 2) Standard Methods for the Examination of Water and Wastewater,
14th Edition, 1975/APHA-AWWA-WPCF

MATERIAL SAFETY DATA SHEET

5382E

SECTION I

Product Name

DREWGARD® 315 corrosion inhibitor

Emergency Telephone No.

(201) 263-7600

Chemical Description

Aqueous mixture of inorganic and organic corrosion inhibitors

Use

Cooling water treatment

SECTION II COMPOSITION INFORMATION

<u>Component</u>	<u>%</u>	<u>CAS #²</u>	<u>TLV/TWA</u>
Sodium molybdate ¹	Major	1310-73-2	2 mg/m ³ (C)
Sodium hydroxide ¹	Minor		
Tolyltriazole	Minor		
Sodium polyacrylate	Trace		

SECTION III PHYSICAL DATA

Specific Gravity (H₂O=1): 1.25Molecular Wt.: N/ABoiling Point: N/ApH/Concentration: 13.5 (neat)Melting Point: N/AFlash Point (Method): N/ASolubility in Water: CompleteFreezing Point: -11°F/-23°CAppearance and Odor: Clear yellow liquid

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Extinguishing Media

N/A

Special Fire Fighting Procedures

N/A

Unusual Fire and Explosion Hazards

N/A

SECTION V HEALTH HAZARD DATAEffects of Overexposure

CORROSIVE, EYE AND SKIN - Causes Burns

Emergency and First Aid Procedures

EYE & SKIN: Immediately flush with plenty of water for at least 15 minutes. Call a physician. Remove contaminated clothing and shoes, wash clothing before re-use.

SECTION VI REACTIVITY DATAStability: Unstable
 Stable X Conditions to Avoid: N/AIncompatibility (Materials to Avoid)

Strong acids

Hazardous Decomposition Products

N/A

Hazardous: May Occur
Polymerization Will not Occur X Conditions to Avoid:

SECTION VII SPILL OR LEAK PROCEDURESSteps to be Taken in Case Material is Released or Spilled

Absorb with inert material. Flush area with water.

Waste Disposal Method

Dispose of in accordance with local, state and federal environmental regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

Wear protective gloves, goggles and protective outer clothing while handling.

SECTION IX SPECIAL PRECAUTIONSPrecautions to be Taken in Handling and Storing

Avoid breathing vapor. Use with adequate ventilation. Keep container closed. Wash thoroughly after handling.

Other PrecautionsCORROSIVE LIQUID

DREW CHEMICAL CORPORATION

DREWGARD® 315

FOOTNOTES

1. This component is considered hazardous as defined by CAL/OSHA regulations. Information presented and conclusions drawn are based on the product mixture itself and reflects our experience and/or available data. A Material Safety Data Sheet on each constituent hazardous substance identified is available upon request.
2. CAS numbers are noted only for hazardous substances (as defined by footnote 1).
3. Although this component is listed as hazardous, since it is present in a mixture, it is exempt and therefore not subject to CAL/OSHA regulations.

OTHER COMMENTS AND NOTES

N/A = Not Applicable
N/D = Not Determined

S = Skin
C = Ceiling limit

Major = More than 10%
Minor = 1-10%
Trace = Less than 1%

DREWGARD® 315 is a registered trademark of Drew Chemical Corporation

Prepared by:



Michael A. Mullins
Group Leader

Date: March 6, 1984



PRODUCT NALCO 8325 LIQUID

Emergency Telephone Number

Medical (312) 920-1510 (24 hours)

SECTION 1 PRODUCT IDENTIFICATION

TRADE NAME: NALCO 8325 LIQUID

DESCRIPTION: An aqueous blend of nitrite, molybdate, acrylate

NFPA 704M RATING 3 HEALTH 1 FLAMMABILITY 0 REACTIVITY 0 OTHER
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

SECTION 2 HAZARDOUS INGREDIENTS

Our hazard evaluation has identified the following chemical ingredient(s) as hazardous under OSHA's Hazard Communication Rule, 29 CFR 1910.1200. Consult Section 14 for the nature of the hazard(s).

INGREDIENT(S)	CAS #	APPROX. %
Sodium hydroxide	1310-73-2	1-10
Sodium nitrite	7632-00-0	20-40
Sodium molybdate	7631-95-0	1-10

SECTION 3 PRECAUTIONARY LABEL INFORMATION

CAUTION: May be harmful if swallowed. May cause irritation to skin and eyes. Avoid contact with eyes, and prolonged or repeated contact with skin. Do not take internally.

Empty containers may contain residual product. Do not reuse container unless properly reconditioned.

SECTION 4 FIRST AID INFORMATION

EYES: Immediately flush for at least 15 minutes while holding eyelids open. Call a physician at once.

SKIN: Immediately flush with water for at least 15 minutes. For a large splash, flood body under a shower. Call a physician at once.

INGESTION: Do not induce vomiting. Give water. Call a physician at once.

INHALATION: Remove to fresh air. Treat symptoms. Call a physician at once.

NOTE TO PHYSICIAN: No specific antidote is known. Based on the individual reactions of the patient, the physician's judgment should be used to control symptoms and clinical condition.

CAUTION: If unconscious, having trouble breathing or in convulsions,

The logo for NALCO, featuring the word "NALCO" in a bold, sans-serif font.

MATERIAL SAFETY DATA SHEET

PRODUCT NALCO 8325 LIQUID

Emergency Telephone Number

Medical (312) 920-1510 (24 hours)

SECTION 4 FIRST AID INFORMATION

(CONTINUED)

do not induce vomiting or give water.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression, and convulsions may be needed.

SECTION 5 HEALTH EFFECTS INFORMATION

PRIMARY ROUTE(S) OF EXPOSURE: Eye, Skin

EYE CONTACT: Can cause severe irritation.
SKIN CONTACT: Can cause severe irritation.
INGESTION: Can be fatal.

SYMPTOMS OF EXPOSURE:

CHRONIC: Sodium nitrite. Causes formations of methemoglobinemia leading to cyanosis and possible death if ingested. Repeated ingestion of small amounts causes blood pressure to drop, rapid pulse, headaches and visual disturbances. Causes central nervous system effects, (e.g. headaches, tremors, drowsiness and convulsions).

SYMPTOMS OF EXPOSURE: A review of available data does not identify any symptoms from exposure. not previously mentioned, or identified in Section 6 or 14.

AGGRAVATION OF EXISTING CONDITIONS: Sodium nitrite. Pregnant women are particularly sensitive to methemoglobinemia.

SECTION 6 TOXICOLOGY INFORMATION

ACUTE TOXICITY STUDIES: No toxicity studies have been conducted on this product.

SECTION 7 PHYSICAL AND CHEMICAL PROPERTIES

COLOR: Amber	FORM: Liquid	ODOR: None
DENSITY:	10.9 lbs/gal.	
pH (NEAT) =	13.3 pH (at 1%) = 11.4	ASTM E-70
VISCOSITY:	9 cps @ 60 Degrees F	ASTM D-2983
FREEZE POINT:	-6 Degrees F	ASTM D-1177
FLASH POINT:	Greater than 220 Degrees F (PMCC)	ASTM D-93

NOTE: These physical properties are typical values for this product.

NALCO

MATERIAL SAFETY DATA SHEET

PRODUCT **NALCO 8325 LIQUID**

Emergency Telephone Number

Medical (312) 920-1510 (24 hours)

SECTION 8 FIRE AND EXPLOSION INFORMATION

FLASH POINT: Greater than 220 Degrees F (PMCC) ASTM D-93

EXTINGUISHING MEDIA: Not applicable.

UNUSUAL FIRE AND EXPLOSION HAZARD: None.

SECTION 9 REACTIVITY INFORMATION

INCOMPATIBILITY: Avoid contact with strong acids (eg. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) which can generate heat, splattering or boiling and the release of toxic fumes.

STORAGE: Storage tanks should be stainless steel or polyethylene.

THERMAL DECOMPOSITION PRODUCTS: In the event of combustion CO, CO₂, may be formed. Do not breathe smoke or fumes. Wear suitable protective equipment.

SECTION 10 PERSONAL PROTECTION EQUIPMENT

RESPIRATORY PROTECTION: If it is possible to generate significant levels of vapors or mists, a NIOSH approved or equivalent respirator is recommended.

For large spills, entry into large tanks, vessels or enclosed small spaces with inadequate ventilation, a pressure-demand, self-contained breathing apparatus is recommended.

VENTILATION: General ventilation is recommended. Additionally, local exhaust ventilation is recommended where vapors, mists or aerosols may be released.

PROTECTIVE EQUIPMENT: Wear gloves, boots, apron and a face shield with chemical splash goggles (ANSI Z 87.1 requirements and selection of gloves, goggles, shoes, etc.). A full slicker suit is recommended if gross exposure is possible.

The availability of an eye wash fountain and safety shower is recommended.

If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Discard contaminated shoes and leather items.

PRODUCT NALCO 8325 LIQUID

Emergency Telephone Number

Medical (312) 920-1510 (24 hours)

SECTION 11 SPILL AND DISPOSAL INFORMATION

IN CASE OF TRANSPORTATION ACCIDENTS, CALL THE FOLLOWING 24-HOUR TELEPHONE NUMBER (312-920-1510)

SPILL CONTROL AND RECOVERY:

Small liquid spills: Contain with absorbent material, such as saw dust, clay, soil or any commercially available absorbent. Shovel reclaimed liquid and absorbent into recovery or salvage drums for disposal. Refer to CERCLA in Section 14.

Large liquid spills: Dike to prevent further movement and reclaim into recovery or salvage drums or tank truck for disposal. Refer to CERCLA in Section 14.

DISPOSAL: If this product becomes a waste, it meets the criteria of a hazardous waste as defined under the Resources Conservation and Recovery Act (RCRA) 40 CFR 261. Hazardous Waste D002.

As a hazardous liquid waste, it must be solidified before disposal in a landfill (Hazardous Waste Treatment, Storage and Disposal facility). Can be deep-well injected in accordance with local, state and federal regulations.

SECTION 12 ENVIRONMENTAL INFORMATION

If released into the environment, see CERCLA in Section 14.

SECTION 13 TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME/HAZARD CODE - HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
ORM-E NA 9188

CONTAINS - SODIUM NITRITE

SECTION 14 REGULATORY INFORMATION

The following regulations apply to this product.

FEDERAL REGULATIONS:

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200:
Based on our hazard evaluation, the following ingredients in this product are hazardous and the reasons are shown below.

Sodium hydroxide - Severe irritant



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MATERIAL SAFETY DATA SHEET

PRODUCT NALCO 8325 LIQUID

Emergency Telephone Number

Medical (312) 920-1510 (24 hours)

SECTION 14 REGULATORY INFORMATION

(CONTINUED)

Sodium nitrite - Systemic effects

Sodium molybdate - Irritant

Sodium hydroxide = TWA 2 mg/m³ ACGIH/TLV

Molybdenum = TWA 5 mg/m³ (soluble compounds as Mo) ACGIH/TLV

CERCLA/SUPERFUND, 40 CFR 117, 302:

This product contains sodium nitrite, a Reportable Quantity (RQ) substance and if 400 pounds of product are released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D. C. (1-800-424-8802).

TOXIC SUBSTANCES CONTROL ACT (TSCA):

The chemical ingredients in this product are on the 8(b) Inventory List (40 CFR 710).

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA), 40 CFR 261 SUBPART C & D:

If this product becomes a waste, it does meet the criteria of a hazardous waste as defined under RCRA 40 CFR 261 (consult Section 11).

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15/ formerly Sec. 307, 40 CFR 116/formerly Sec. 311:

This product contains the following ingredient(s) covered by the Clean Water Act:

Sodium nitrite - Section 311

Sodium hydroxide - Section 311

CLEAN AIR ACT, 40 CFR 60, SECTION 111, 40 CFR 61, SECTION 112:

This product does not contain ingredients covered by the Clean Air Act.

STATE REGULATIONS:

MICHIGAN CRITICAL MATERIALS:

This product does not contain ingredients listed on the Michigan Critical Materials Register.

STATE RIGHT TO KNOW LAWS:

The following states identify the ingredients shown below as hazardous:

California, Illinois, Pennsylvania - Sodium nitrite

California, Illinois, - Sodium molybdate

Regulated in those states using the TLV for sodium hydroxide as a criteria for listing.



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MATERIAL SAFETY DATA SHEET

PRODUCT NALCO 8325 LIQUID

Emergency Telephone Number

Medical (312) 920-1510 (24 hours)

SECTION 15 ADDITIONAL INFORMATION

None

SECTION 16 USER'S RESPONSIBILITY

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to ensure safe workplace operations. Please consult your local sales representative for any further information.

SECTION 17 BIBLIOGRAPHY

SEE NALCO'S MSDS SECTION DESCRIPTION

PREPARED BY: John J. Kasper, MSc., Toxicologist
DATE ISSUED: 05/22/86

BETZ LABORATORIES, INC.
4636 SCHEMICK ROAD TREVCOSE, PA. 19047

BETZ MATERIAL SAFETY DATA SHEET

24 HOUR EMERGENCY TELEPHONE (HEALTH OR ACCIDENT) 215/355-3300

PRODUCT: CCRR SHIELD 736

(PAGE 1 OF 3)
EFFECTIVE DATE 2-85

PRODUCT APPLICATION : WATER-BASED CORROSION INHIBITOR.

-----SECTION 1-----HAZARDOUS INGREDIENTS-----

INFORMATION ON PHYSICAL HAZARDS, HEALTH HAZARDS, PEL'S AND TLV'S FOR SPECIFIC PRODUCT INGREDIENTS AS REQUIRED BY THE OSHA HAZARD COMMUNICATIONS STANDARD ARE LISTED. REFER TO SECTION 4 (PAGE 2) FOR OUR ASSESSMENT OF THE POTENTIAL ACUTE AND CHRONIC HAZARDS OF THIS FORMULATION.

SODIUM NITRITE***;CAS#7632-00-0;CORRODIZER;POTENTIAL BLEED TOXIN, REPRODUCTIVE TOXIN AND NEUROTOXIN;TOXIC(CRNL INGESTION);PEL:NONE; TLV:NONE.

SODIUM MOLYBDATE***(MOLYBDIC ACID, DISODIUM SALT);CAS#76-95-0;POSSIBLE RESPIRATORY IRRITANT;PEL=5MG/M3(AS MC);TLV=5MG/M3(AS MC).

-----SECTION 2-----TYPICAL PHYSICAL DATA-----

PH: AS IS	(APPRX.) 12.8	ODOR: MILD
FL.PT.(DEG.F): >200	SETA(CC)	SP.GR.(70F)OR DENSITY: 1.184
VAPOR PRESSURE(MMHG): NO		VAPOR DENSITY(AIR=1): NC
VISC CPS70F: 4.2		SOLUBILITY(WATER): 100
EVAP.RATE: <1 ETHER=1		APPEARANCE: YELLOW
PHYSICAL STATE: LIQUID		FREEZE POINT(DEG.F): 14

-----SECTION 3-----REACTIVITY DATA-----

STABLE

THERMAL DECOMPOSITION (DESTRUCTIVE FIRES) YIELDS ELEMENTAL OXIDES.

PRODUCT: CORR SHIELD 736

-----SECTION 4-----HEALTH HAZARD EFFECTS-----

ACUTE SKIN EFFECTS *** PRIMARY ACUTE OF EXPOSURE

MODERATELY IRRITATING TO THE SKIN

ACUTE EYE EFFECTS ***

SEVERE IRRITANT TO THE EYES

ACUTE RESPIRATORY EFFECTS ***

MISTS/AEROSOLS CAUSE IRRITATION TO UPPER RESPIRATORY TRACT

CHRONIC EFFECTS OF OVEREXPOSURE***

PROLONGED OR REPEATED EXPOSURES MAY CAUSE BLOOD CELL DAMAGE AND
REPRODUCTIVE SYSTEM TOXICITY; PROLONGED OVEREXPOSURE MAY CAUSE CNS
DEPRESSION.

MEDICAL CONDITIONS AGGRAVATED ***

NOT KNOWN

SYMPTOMS OF EXPOSURE ***

MAY CAUSE REDNESS OR ITCHING OF SKIN.

PRECAUTIONARY STATEMENT BASED ON TESTING RESULTS ***

MAY BE TOXIC IF ORALLY INGESTED.

-----SECTION 5-----FIRST AID INSTRUCTIONS-----

SKIN CONTACT***

REMOVE CONTAMINATED CLOTHING. WASH EXPOSED AREA WITH A LARGE QUANTITY OF
SOAP SOLUTION OR WATER FOR 15 MINUTES

EYE CONTACT***

IMMEDIATELY FLUSH EYES WITH WATER FOR 15 MINUTES. IMMEDIATELY CONTACT A
PHYSICIAN FOR ADDITIONAL TREATMENT

INHALATION EXPOSURE***

REMOVE VICTIM FROM CONTAMINATED AREA TO FRESH AIR. APPLY APPROPRIATE
FIRST AID TREATMENT AS NECESSARY

INGESTION***

DO NOT FEED ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSIVE VICTIM
DO NOT INDUCE VOMITING. IMPEC. CONTACT PHYSICIAN. DILUTE CONTENTS OF
STOMACH USING 3-4 GLASSES MILK OR WATER

-----SECTION 6-----SPILL, DISPOSAL AND FIRE INSTRUCTIONS-----

SPILL INSTRUCTIONS***

VENTILATE AREA, USE SPECIFIED PROTECTIVE EQUIPMENT. CONTAIN AND ABSORB
ON ABSORBENT MATERIAL. PLACE IN WASTE DISPOSAL CONTAINER. THE WASTE
CHARACTERISTICS OF THE ABSORBED MATERIAL, OR ANY CONTAMINATED SOIL,
SHOULD BE DETERMINED IN ACCORDANCE WITH RCRA REGULATIONS.
FLUSH AREA WITH WATER. WET AREA MAY BE SLIPPERY. IF SC, SPREAD
SAND OR GRIT.

DISPOSAL INSTRUCTIONS***

WATER CONTAMINATED WITH THIS PRODUCT MAY BE SENT TO A SANITARY
SEWER TREATMENT FACILITY, IN ACCORDANCE WITH ANY LOCAL AGREEMENT, A
PERMITTED WASTE TREATMENT FACILITY OR DISCHARGED UNDER A NPDES PERMIT
PRODUCT(S) IS)-

INCINERATE OR BURY IN APPROVED LANDFILL

FIRE EXTINGUISHING INSTRUCTIONS***

FIREFIGHTERS SHOULD WEAR POSITIVE PRESSURE SELF-CONTAINED BREATHING
APPARATUS (FULL FACE-PIECE TYPE).

DRY CHEMICAL, CARBON DIOXIDE, FOAM OR WATER

BETZ MATERIAL SAFETY DATA SHEET (PAGE 3 OF 3)

PRODUCT: CCRR SHIELD 736

-----SECTION 7-----SPECIAL PROTECTIVE EQUIPMENT-----

VENTILATION PROTECTION***

ADEQUATE VENTILATION TO MAINTAIN AIR CONTAMINANTS BELOW EXPOSURE LIMITS

RECOMMENDED RESPIRATORY PROTECTION***

IF VENTILATION IS INADEQUATE OR SIGNIFICANT PRODUCT EXPOSURE IS LIKELY,
USE A RESPIRATOR WITH DUST/MIST CARTRIDGES

RECOMMENDED SKIN PROTECTION***

RUBBER GLOVES

REPLACE AS NECESSARY

RECOMMENDED EYE PROTECTION***

SPLASH PROOF CHEMICAL GOGGLES

-----SECTION 8-----STORAGE AND HANDLING PRECAUTIONS-----

STORAGE INSTRUCTIONS***

KEEP CONTAINER CLOSED

PROTECT FROM FREEZING. IF FROZEN, THAW COMPLETELY AND MIX

THOROUGHLY PRIOR TO USE

HANDLING INSTRUCTIONS***

IMMEDIATELY REMOVE CONTAMINATED CLOTHING, WASH BEFORE REUSE
ALKALINE. DO NOT MIX WITH ACIDIC MATERIAL.

-----SECTION 9-----FEDERAL REGULATIONS-----

OSHA(29CFR)-FOR RESPIRATORY PROTECTION USE PROPERLY FITTED MSHA/NIOSH
APPROVED RESPIRATORY EQUIPMENT WITHIN USE LIMITATIONS. OTHERWISE, USE SUPPLIED
AIR APPARATUS.

CWA(40CFR)REPORTABLE QUANTITY: AS IS PRODUCT (HAZARDOUS SUBSTANCE)
101GAL (SODIUM NITRITE)

RCRA(40CFR): IF DISCARDED, THIS MATERIAL BEARS HW1# D002

DOT(49CFR)CLASSIFICATION: NOT APPLICABLE

NFPA/HMS : HEALTH - 2 ; FIRE - 0 ; REACTIVITY - 0 ; SPECIAL - ALK

THIS DOCUMENT IS PROVIDED TO SUPPLY ALL THE INFORMATION NECESSARY TO COMPLY
WITH OSHA HAZARD COMMUNICATIONS REGULATIONS, AND RIGHT-TO-KNOW REQUIREMENTS.
WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO
BE ACCURATE AS OF THE DATE HEREOF, BETZ LABORATORIES, INC. MAKES NO WARRANTY
WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

HAROLD M. PERSH
ENVIRONMENTAL INFORMATION COORDINATOR

MOLY CORROSION INHIBITORS

December 1982 Vol. 2, No. 1

Molybdate Antifreeze Suitable for Aluminum and Cast Iron Engines

Automobile manufacturers are planning to make increased use of aluminum for vehicle weight reduction and subsequent fuel economy. Typical of the components expected to be affected are the cylinder head, water pump housing, and radiator; all of which are contacted by the engine coolant (antifreeze). Historically, specific inhibitors have been used to protect each area from corrosive attack. These have proved to be largely ineffective in the case of aluminum, however. Coolant formulators, therefore, were forced to devise new inhibitor packages which are suitable for both existing and new cars.

The successful use of molybdate as a corrosion inhibitor in automotive engine coolants was first disclosed in 1939. Investigators at Carbide and Carbon Chemical Corp. reported that an antifreeze liquid could be prepared consisting of an alcohol and soluble molybdate salt which would afford effective protection for all metals of the usual cooling system, including iron, copper, brass, and solders. Further work in 1957 showed the additional advantage resulting from the incorporation of benzotriazole, principally for yellow metals corrosion control.

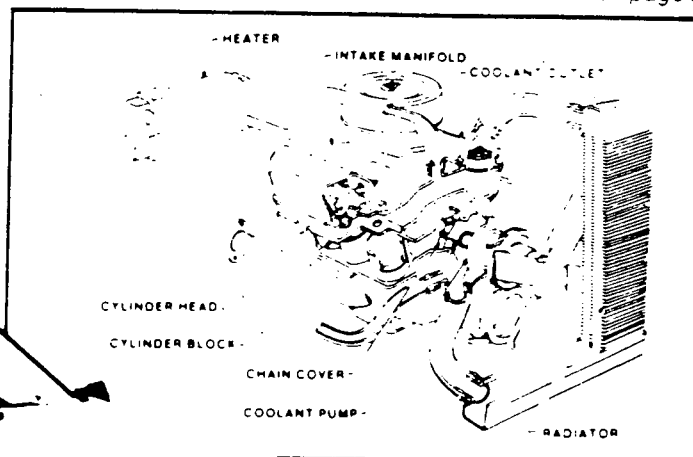
This basic data plus a fleet test conducted by Climax between the fall of 1956 and the spring of 1961 led to the

development of a commercial molybdate-containing antifreeze by Union Carbide Corp. The product could best be characterized as providing premium performance at a premium price. Manufacture was discontinued in the mid-1960s in favor of a single Prestone product. During its lifetime the molybdate antifreeze was most notably used to factory-fill new Cadillac automobiles.

Experience of the type described, plus recent laboratory data indicating that molybdate is an effective inhibitor for aluminum, suggests a possible solution to the present problem. Standard ASTM glassware, aluminum heat transfer corrosion, and water pump cavitation tests were all used to measure the performance of various experimental antifreeze compositions with and without molybdate.

Coolant inhibitors which are a combination of molybdate, phosphate, borate, nitrate, and tolyltriazole have now proved

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Schematic diagram of the cooling system of a conventional gasoline engine.



The Toyota Celica Supra, as well as other Toyota cars, now use an engine coolant that contains sodium molybdate. Courtesy Toyota Motor Sales, U.S.A.

Molybdate Inhibits Closed Cooling Waters

Closed cooling systems service a large number of industrial requirements such as jackets of stationary engine and chilled and hot water loops for air conditioning and heating units. Unlike open recirculating systems, they are typically called upon to function with minimal attention for extended periods of time. If corrosion products form, they are not removed by regular lowdown and accumulation of such deposits can foul heat transfer surfaces and further accelerate corrosion.

To avoid any buildup of corrosion products, the closed system corrosion inhibitor is called upon to provide effective protection, and retain its properties during the relatively long periods between servicing. The inhibitor should also be environmentally acceptable to permit disposal of the cooling water when the system is drained, or in the event of an emergency dump or leakage.

Industrial closed cooling waters also experience a wide range of pH, temperature, hardness, and dissolved oxygen levels. Consequently, treatment programs must be versatile enough to accommodate a broad range of operating parameters in addition to their normal functions.

Considering these demanding criteria, it is not surprising that sodium molybdate is finding increased use as a corrosion inhibitor in closed cooling water treatments. Molybdate's superior corrosion protection for mixed metallurgy, and exceptional thermal and chemical stability are especially apropos. Also important is molybdate's compatibility with essentially all commonly used dispersants, biocides and scale suppressants.

While the development of commercial closed cooling water treatments based on sodium molybdate is more recent than corresponding cooling tower water treatments, a



These large pumps are parts of the aqueous-glycol cooling system associated with a major new automobile assembly plant. Courtesy Mogul Corporation

number of successful field applications, like those described below, have now been reported. These have established molybdate-containing products as the preferred choice of several water service companies.

At a major new auto assembly plant, the Chief Power House Engineer specified that the closed cooling treatment system must have a low corrosion rate, ease of control, as well as long-term stability. The 20% glycol containing loop operates at temperatures ranging from -7 to 93 C (20 F to 200 F); flow rate is approximately 121,120 liters/min (32,000 gal/min). Untreated corrosion rates on this primarily iron system are in excess of 1.3 mmpy (50 mpy). To satisfy the Chief Engineer's requirements, a molybdate treatment was applied to this 1,050,000 liter (275,000 gallon) pressurized system. Iron corrosion rates during the first year's operation on molybdate have remained below 0.025 mmpy

Molybdate Antifreeze—

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to be protective of the collective metals used in current design automobile cooling systems. Sodium molybdate has been specifically shown to reduce the corrosion of conventional and high-lead solders and cast iron. It also inhibits aluminum heat transfer and cavitation erosion corrosion.

Work by two of the major domestic auto makers supports these contentions. In addition, Ford Motor Company claims that sodium molybdate can be used to resist pitting corrosion of radiator-grade aluminum, and General Motors Corporation cites molybdates' resistance to depletion as an important advantage.

Today, various combinations of corrosion inhibitors can be used to produce ethylene glycol engine coolants which will meet the stringent requirements for both aluminum and cast iron engines. Molybdate appears destined to become part of

this technology, and is, in fact, already used in proprietary coolant formulations produced by the major U.S. automobile manufacturers, as well as others in both Europe and Japan.

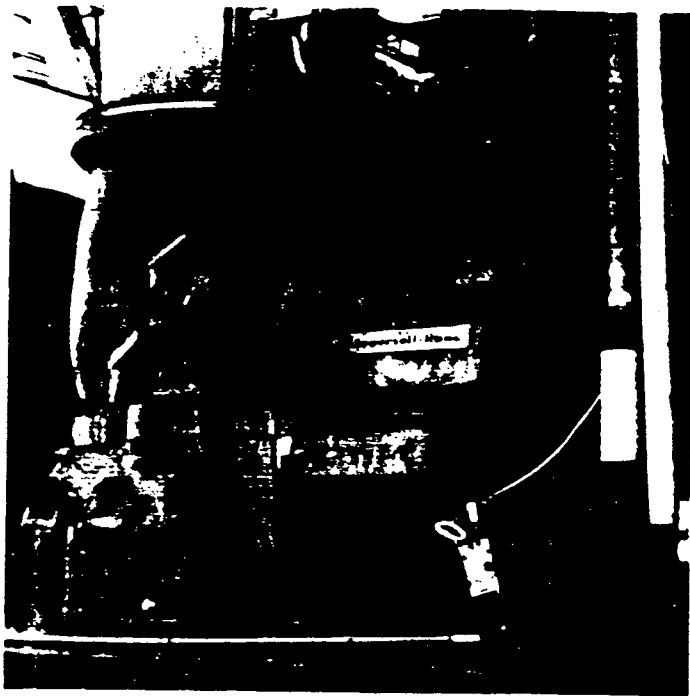
Related References

"The Effectiveness of Automotive Engine Coolant Inhibitors for Aluminum," R.R. Wiggle, V. Hospadaruk, E.A. Styloglou, *Materials Performance* 20, 6, (1981).

"The Development of an Antifreeze Coolant for Aluminum and Cast Iron Engines," L.C. Rowe, R.L. Chance, M.S. Walker, *NACE Paper* 264 (1982). Available from Climax Molybdenum Company. Ask for bulletin C-128.

"Some Effects of Molybdate in Automotive Engine Coolants," M.S. Vukosovich and F.J. Sullivan, *NACE Paper* 265 (1982). Available from Climax Molybdenum Company. Ask for bulletin C-129.

(1 mpy); currently they are 0.003 mmpy (0.12 mpy). Heat transfer, as well as flow rates have remained constant. Performance of the closed loop is easily monitored using corrosion test coupons and field analysis for the Mo concentration level.



This gas compressor services a petroleum refinery fluidized bed catalytic cracker process unit.
Courtesy Betz Laboratories

A midwest petroleum refinery was using a nitrite borate product to treat their gas compressors; the system cooled the compressor servicing a fluidized catalytic cracker process unit. Cooling was provided by a fin-fan apparatus; the water temperature was 55 to 60 C (130 to 140 F). The system was extremely difficult to inhibit because of sulfide contamination due to process leaks. The nitrite borate program was not able to provide adequate protection, giving mild steel corrosion rates of 2.0 to 2.3 mmpy (80 to 90 mpy). To reduce copper levels in the contaminated system, the cooling system was flushed out and filled with city water and methanol as antifreeze. A sodium molybdate-containing product was selected to treat the system because of its superior corrosion inhibiting properties and its resistance to sulfide degradation. Since then, corrosion rates have been between 0.13 and 0.20 mmpy (5 and 8 mpy) for mild steel. Refinery personnel are so pleased with the performance of the molybdate treatment in this severely corrosive system that it is now being applied to all the closed-cooling systems at this refinery.

The inhibitor supplier has recently indicated that in gas compressor closed-loop systems without sulfide contamination, typical corrosion rates using the same product are 0.0076 mmpy (0.3 mpy).

Related References

"New Molybdate-Based Treatment Protects Closed Cooling Systems," F.C. Sessa and R.M. Post, *The Betz Indicator*, Vol. 52, No. 3, p. 9; 1981.

"Molybdate Inhibitors for Problem Cooling Waters," D.R. Robitaille, *Chemical Engineering*, 89 (20) 139 (1982). Available from Climax Molybdenum Company. Ask for bulletin C-131.

"Electrochemical Aspects of the Corrosion Inhibition of Mild Steel by Molybdate," M.A. Stranick, *Fourth International Conference on the Chemistry and Uses of Molybdenum*, Colorado School of Mines, Golden, Colorado, August 1982.

Molybdenum and Toxicity

Molybdenum, though considered a heavy metal, is unlike chromium and many other heavy metals in that it is tolerated, even required, in various concentrations by many life forms. Molybdenum is an essential micronutrient for nearly all plant forms, and probably animals as well. When molybdenum is not available in the soil, it must be added in sufficient amounts through fertilizers, foliar sprays, or seed treatments for optimal growth to take place. For many years, molybdenum and its compounds have been used in steels and alloys, fertilizers, pigments, catalysts, lubricants, corrosion inhibitors, ceramics, metal surface treatments, and laboratory reagents with no record of poisoning. Molybdenum compounds are characterized as nontoxic in U.S. Public Health Bulletin 293; and by the Occupational Safety and Health Act. Molybdenum compounds have been used in medical treatments, and are prescribed in vitamin and mineral mixtures. An acute toxicity study with zinc and calcium molybdate paint pigments shows they have a low order of toxicity. Certain soluble molybdates were declared to have extremely low or even negligible toxicity, and the New Drug Institute reported that sodium molybdate is considerably less irritating than sodium dichromate and that it presents no dermal or local hazard.

The sensitivity of typical fish and fish food to sodium molybdate was the subject of acute toxicity tests conducted under static bioassay conditions according to the Fish Bioassay Procedure prescribed in the 1970 edition of *Standard Methods (APHA)*. Table 1 shows that the 96 h TL_{50} values for the test fish range from over 6700 to greater than 10,000 mg/l; and the "no effect" levels for which no adverse symptoms appeared range from 2400 to 7500 mg/l. To put these numbers in perspective, typical "no effect" levels for DDT residues and chromates are 0.01 and 50 mg/l, respectively. Table 2 compares the 48 h TL_{50} toxicity of sodium molybdate and sodium dichromate toward rainbow trout and *Daphnia*. It is clear that sodium molybdate is considerably safer than sodium dichromate in water systems.

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Molybdenum and Toxicity—

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Table 1: Acute Toxicity of Sodium Molybdate

	TL ₅₀ mg/l		No Effect mg/l
	24h	96h	
Bluegill (<i>Lepomis macrochirus</i>)	10,000	6790	2400
Rainbow Trout (<i>Salmo gairdneri</i>)	10,000	7340	3200
Channel Catfish (<i>Ictalurus punctatus</i>)	10,000	10,000	7500
Fathead Minnow (<i>Pimephales promelas</i>)	10,000	7630	5600
	24h	48h	
Water Flea (<i>Daphnia magna</i>)	3370	3220	1800
Scud (<i>Grammarus fasciatus</i>)	4800	3940	1800

Table 2: Comparative Acute Toxicity

Chemical	Species	Test, h	Toxicity, mg/l (TL ₅₀)
Molybdate	Rainbow Trout	96	7340
Chromate	Rainbow Trout	96	285
Molybdate	Daphnia	48	3220
Chromate	Daphnia	48	3

Related References

- "Molybdenum-Physiological Effects in Plants and Animals," P.C.H. Mitchell, Department of Chemistry, The University of Reading, England.
- "The Human Toxicity of Certain Trace Elements," D.B. Louria and A.A. Browder, *Annals of Internal Medicine*, 76,(2) 307 (1972).
- "Dangerous Properties of Industrial Materials," N.I. Sax, Reinhold Publishing Corp., New York, 1957, p. 913.

Additional Literature

The following additional literature on molybdates is available from Climax Molybdenum Company. Please address all requests to:

Kurt H. Miska
Editor: Moly Corrosion Inhibitors
Climax Molybdenum Company
P.O. Box 1568
Ann Arbor, Michigan 48106

Sodium Molybdate Corrosion Inhibitor—An Update, by D.R. Robitaille, Oct. 1980, 18 pages C-107

Laboratory and plant evaluations of sodium molybdate for use in open cooling tower waters are described. Favorable steel, copper and brass corrosion rates have been maintained in a large number of commercial installations.

Simple Molybdates of the Elements, by G.A. Tsigdinos and F.W. Moore, January 1981, 28 pages C-110

Information on the preparation, structure, properties and uses of these compounds. Only the hexavalent state of molybdenum is covered.

The Biological Role of Molybdenum, by R.J.P. Williams, F.R.S., Inorganic Chemistry Laboratory, Oxford, UK, 1978, 14 pages, Unnumbered

A Primer on Molybdenum in Life Processes, 12 pages, Unnumbered
A brief summary of the effects of Mo on plants, animals, fish and people.

Editor:

Assistant Editor:

Kurt H. Miska
Donna Kruzich

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September 24, 1986

Mr. Walter Loveridge, P.E.
Chief, Wastewater Facilities Design
Division of Water
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, N.Y. 12233

RE: Indian Point 3 SPDES Permit No. NY 000 4472
Use of Molybdate Corrosion Inhibitors

Dear Mr. Loveridge:

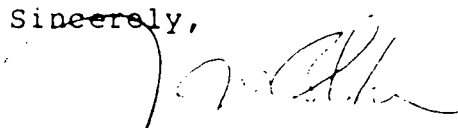
By letter dated June 12, 1986, the Power Authority requested permission, pursuant to footnote f on page six of the referenced permit, to use three new copper corrosion inhibitors in place of Drewgard 100. The molybdate inhibitors: Dewgard 315, Nalco 8325 and Betz Corr-Shield 736, are for use within Indian Point's closed cycle auxiliary equipment cooling system.

Subsequently, on July 30th, Ed Holman of my staff phoned you regarding the status of our request. During this conversation, you granted your approval to start use of the aforesaid inhibitors within the closed cycle system.

This letter confirms the results of the July 30th, 1986 conversation, and will provide Indian Point with written documentation of your approval.

Please call either Gene Metti (914/681-6389) or Ed Holman (6408) if you have any questions.

Sincerely,


John W. Blake, Ph.D.
Director
Environmental Division

JWB:EH:cav

cc: Gene Metti
Jim Gillen
Matt Kerns
Chrono