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NAVAL SURFACE WARFARE CENTER
CARDEROCK DIVISION

NAVAL SHIP SYSTEMS
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IN REPLY REFER TO
9220
Ser 61/10-371
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From: Commander, Naval Surface Warfare Center, Carderock Division,
Philadelphia, PA

To: Commander, Naval Sea Systems Command (05Z41)

Subj: **AUTHORIZATION TO CLEAN SEAWATER SYSTEMS USING
SUBLIME-WATER SCALE SOLVENT®**

Ref: (a) Technical Manual for Repair of Heat Exchangers, Coolers, And Distilling
Plants, NAVSEA S9531-BH-MMI-010 Heat Exchanger
(b) Uniform Industrial Process Instruction 5050-903C, Cleaning Marine Growth
from a Component or System Using Safe-D-Scale or RydLyme
(c) Commercial Item Description, Heat Exchanger Cleaning Compound A-A-
59782 of 27 Sept 2005
(d) Summit Industrial Products ltr of February 15, 2010
(e) Naval Research Laboratory Report 3900, Ser 6130/1025 of 18 Aug 2010

Encl: (1) Summary of SUBLIME Results

1. Reference (a) approved the use of specific commercial descaling solutions to remove hard fouling from the seawater side of heat exchangers on non-nuclear, surface ships. The commercial products are acid solutions, typically containing hydrochloric or phosphoric acid, which are used at room temperature to dissolve sea scale (calcium carbonate and magnesium hydroxide) and to dissolve or loosen sea life (sea grass, mussels, and barnacles). These commercial descaling solutions are significantly more effective at removing hard fouling than the mechanical cleaning methods or the previous acid procedures. Shipyards, contractors, and Regional Maintenance Center personnel experienced in acid cleaning, are authorized to use the approved descaling solutions to clean heat exchangers on non-nuclear surface ships. The procedures for on site cleaning by shipyards and contractors were developed by Puget Sound Naval Shipyard and are given in reference (b).

2. A commercial item description (CID) for Heat Exchanger Cleaning Compound, reference (c), was developed to screen the candidate descaling solutions. The proposed CID requires testing to confirm that the descaling agent is effective at dissolving scale, does not affect the system non-metal materials, is not corrosive to the system metals, and does not interfere with the formation of a protective oxide layer on copper alloys after the cleaning. Products that meet the requirements in the proposed CID are authorized for use in cleaning non-nuclear surface ship heat exchangers.

3. Summit Industrial Products of Tyler TX submitted test results by reference (d) showing that

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their product, Sublime–Water Scale Solvent, meets the corrosion requirements and does not affect the non-metallic parts found in the seawater systems. Reference (e), are the results of Naval Research Laboratory test showing that cleaning with Sublime does not interfere with the reformation of the protective oxide layer. A summary of the results is tabulated in enclosure (1).

4. Based on the requirements stated in reference (c), Sublime–Water Scale Solvent manufactured by Summit Industrial Products is approved for use by Naval Shipyards, contractors, and Regional Maintenance Center personnel experienced in acid cleaning seawater system components on non-nuclear surface ships.

5. NSWCCD-SSSES technical point of contact for acid cleaning is Melissa Harris, Code 615, Commercial (215) 897-1233, DSN 443-1233, email: Melissa.A.Harris@navy.mil.



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Head, Coatings, Corrosion Control and
Functional Materials Branch
By direction

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SUMMARY OF SUBLIME-WATER SCALE SOLVENT RESULTS

Property	CID Requirement	Summit Water Scale Solvent
Corrosive effect on copper alloys for 6-hour test at 35°C mpy = mils per year	90/10 CuNi (UNS#C70600) not more than 20 mpy	15 mpy
	70/30 CuNi (UNS#C71500) not more than 20 mpy	13 mpy
	Tin Bronze (UNS#C92200) not more than 20 mpy	15 mpy
Scale dissolving ability: rapidly dissolve solid calcium carbonate (1 gram in 50 mLs at 25°C)	Less than 1 hour	8-minutes
Effect on passivation	Original passive surface restored within 30 days of exposure to natural seawater	Pass
Hydrogen-ion concentration (pH) of 10% Solution	pH less than 2.0	pH <2

Effect of Sublime on Non-Metallic Componentes

Non-Metallic Material 72-hour Exposure	Hardness Change	Volume Change percent
Synthetic Rubber, NBR, BUNA-N (Acrylonitrile-butadiene, 70-hardness)	-1	+1.17
Nitrile Rubber, NBR (Acrylonitrile-butadiene, 88-hardness)	0	+0.60
Fluorocarbon Rubber (Viton, FKM, 75-hardness)	-2	+0.82
Polychloro-trifluoroethylene (PCTFE)	-2	+0.32
Delrin AF	-1	+0.79
Nylon 101 (Polyamide Type 6/6)	0	+1.4
Tetrafluoroethylene Resin (TFE)	0	+1.37