



**DEPARTMENT OF THE NAVY**  
NAVAL SURFACE WARFARE CENTER  
CARDEROCK DIVISION

NAVAL SHIP SYSTEMS  
ENGINEERING STATION  
5001 S. BROAD STREET  
PHILADELPHIA, PA 19112-1403

IN REPLY REFER TO

9220  
Ser 622/450  
19 FEB 2004

From: Commander, Naval Surface Warfare Center, Carderock Division,  
Philadelphia, PA

To: Commander, Naval Sea Systems Command (05Z9)

Subj: **AUTHORIZATION TO CLEAN HEAT EXCHANGERS USING UNITOR  
DESCALING LIQUID**

- 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 5050-903A, Cleaning Marine Growth from a Component or System Using Safe-D-Scale or RydLyme
  - (c) Commercial Item Description (Draft), Heat Exchanger Cleaning Compound A-A-XX195
  - (d) INTEK Marine Technology, LLC ltr of 29 Jul 03

Encl: (1) Summary of UNITOR Descaling Liquid 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 and contractors, experienced in acid cleaning, are authorized to use the approved descaling solutions to clean heat exchangers in-place, onboard ship. 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 candidate cleaning compound is effective at dissolving scale, is not corrosive to the system metals, and does not interfere with the formation of a protective oxide layer after the cleaning. Products that meet the requirements in the proposed CID will be authorized for use in cleaning non-nuclear surface ship heat exchangers.

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3. INTEK Marine Technologies, LLC submitted test results by reference (d) for UNITOR Descaling Liquid produced by UNITOR Chemicals, Kjemi-Services AS, Borgheim, Norway. The test results show that UNITOR Descaling Liquid meets the requirements in the proposed CID for corrosion rates, scale dissolving effectiveness, and non-interference with the protective oxide layer formation. A summary of the results is tabulated in enclosure (1).

4. Based on the requirements stated in reference (c), UNITOR Descaling Liquid is approved for use by Naval Shipyards and contractors experienced in performing acid cleaning operations for the removal of scale from fouled heat exchangers and coolers on non-nuclear surface ships only. UNITOR Descaling Liquid is a concentrated solution that is diluted to 10% by volume with water for use in cleaning. UNITOR Descaling Liquid is authorized for Naval Shipyard personnel and contractors experienced in acid cleaning only. UNITOR Descaling Liquid is not authorized for Navy personnel use.

5. NSWCCD technical point of contact for boiler water treatment is Ralph Wood, Code 622, Commercial (215) 897-7498, Defense Switched Network 443-7498, email: woodrj@nswccd.navy.mil.



T. M. STECK  
Head, Materials Processes  
and Engineering Branch  
By direction

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62/622(file), 622, 912, 913, 923

**SUMMARY OF UNITOR DESCALING LIQUID RESULTS**

<b>Property</b>	<b>CID Requirement</b>	<b>UNITOR Descaling Liquid 10% Solution</b>
Corrosive effect on copper alloys for 24-hour test at 35°C	90/10 CuNi (UNS#C70600) not more than 20 mpy	6 mpy
	70/30 CuNi (UNS#C71500) not more than 20 mpy	5 mpy
	Tin Bronze (UNS#C92200) not more than 20 mpy	5 mpy
Scale dissolving ability: rapidly dissolve solid calcium carbonate (1 gram in 50 mLs at 25°C)	Less than 1 hour	<30 minutes
Effect on passivation	Original passive surface restored within 30 days of exposure to natural seawater	Pass

mpy – mils per year

Note: Hydrogen ion concentration (pH) of a 10% by volume solution of the use concentration of UNITOR Descaling Liquid is 0.83. This meets the CID requirement of not more than 2.0 pH.