SAE International

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1781 MAY2013

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Superseding J1781 NOV2006

Ship Systems and Equipment – Materials for Fluid Systems

RATIONALE

J1781 has been reaffirmed to comply with the SAE five-year review policy.

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1. SCOPE

The scope of this Recommended Practice is to delineate groups of materials for which there is considerable fabrication and operating experience in the sea water environment. In addition, some of the more promising materials for possible future applications are covered.

1.1 Purpose

The purpose of this Recommended Practice is to define materials for use in fluid systems of marine vehicles, including submersibles and advanced surface craft. This report is more particularly directed to the designer of fluid power and piping systems on board marine vehicles.

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2. REFERENCES

2.1 Applicable Publications

The following publications form a part of the specification to the extent specified herein. The latest issue of the documents shall be used except in those cases where an invitation for bid or procurement contract specifically identifies the issues in effect on a particular date.

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE AMS 2447 Coating, Thermal Spray High Velocity Oxygen/Fuel Process

SAE J1777 General Environmental Considerations for Marine Vehicles

SAE J1778 Ship Systems and Equipment—Recommended Practice for Hydraulic Fluid Selection

SAE J1779 Ship Systems and Equipment—Hydraulic System Design Criteria for Marine Vehicles

SAE J2280 Ship Systems and Equipment—Fasteners—Selection and Identification Requirements

2.1.2 Department of Defense Publications

Available from U.S. Government, DODSSP, Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-2179, http://assist.daps.dla.mil/quicksearch/.

MIL-B-24480 Bronze, Nickel-Aluminum (UNS C95800) Castings for Seawater Service

MIL-STD-438 Schedule of Piping, Valves, Fittings and Associated Piping Components for Submarine Service

MIL-STD-777 Schedule of Piping, Valves, Fittings and Associated Piping Components for Naval Surface Ships

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 150/B 150M Aluminum Bronze Rod, Bar and Shapes

ASTM B 677 Standard Specification for UNS N08925, UNS N08354, AND UNS N08926 Seamless Pipe and Tube

ASTM G 82 Standard Guide for Development and Use of a Galvanic Series for Predicting Galvanic Corrosion Performance

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 Industry Reports

DTIC No. ADA055609—Materials Study for High Pressure Sea Water Hydraulic Tool Motors; Mechanical Technology Inc., Latham, NY, April 1, 1978, available from DTIC (see 2.2.3)

Fink, F.W. & Boyd, “Corrosion of Metals in Marine Environments,” MCIC-78-37/March 1978, Battelle's Columbus Laboratories, Columbus, OH, September 1977

2.2.2 Publications

Metal Boat Quarterly “Marine Metals Reference” Summer 1997, Box 991, Port Townsend, WA 98368, http://www.kastenmarine.com/mbqMetRef.pdf

2.2.3 U.S. Government Reports

Available from Defense Technical Information Center, ATTN: DTIC-BR, Suite 0944, 8725 John J. Kingman Road, Fort Belvoir, VA 22060-6218, Tel: 1-800-225-3842 (Assistance--selection 3, option 2), http://stinet.dtic.mil/info/s-stinet.html.

DTIC No. ADA020974—Mechanical Properties and Seawater Behavior of Nitronic 50 (22 Cr-13N9-5Mn) by I.L. Caplan, David W. Taylor Naval Ship R&D Center, Bethesda, MD, Report 4554, January 1976

Handbook of Hydraulic Systems for Deep Ocean Applications, W. E. Schneider and J. A. Sasse, David W. Taylor Naval Ship R&D Center, Annapolis, MD 21402, February 1981

3. MARINE ENVIRONMENT

Exposure of fluid power system components to the marine environment on board marine vehicles varies in severity from application to application. While the working fluid, i.e., hydraulic oil or sea water is the prime consideration, the external environment is also critical. The environment may range in severity from slight moisture condensation in air conditioned cabins to severe salt water spray at air inlets, from occasional wetting down in bilges and on weather decks to continuous immersion in external locations below waterline. Wet/dry cycles are often more adverse than continuous wetting by seawater because of such factors as oxygen and lack of cathodic protection when dry. Corrosion rates double with every 10 °C increase in seawater temperature, and can be accelerated by stray electric currents, such as from welding. Mineral deposits, industrial wastes and marine life such as barnacles and micro-organisms may vary from place to place of operation. (See SAE J1777 for additional information.)

Table 1 identifies material properties to be considered in the selection of materials to be used in the marine environment.