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Standard
Recommended Practice

Selection of Metallic Materials to Be Used in All Phases of Water Handling for Injection into Oil-Bearing Formations

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Foreword

This NACE standard recommended practice is a guide for selecting corrosion-resistant materials for the supply, storage, pumping, and injection of water encountered in oilfield operations where external or subsea exposure to salt water is not a consideration. These recommendations are also applicable to metals used in conjunction with carbon dioxide (CO_2) injection systems. Special metallic materials are required for many water-handling systems; however, a thorough evaluation of the water in each operation should be conducted to determine whether such materials are required. The materials and metal property requirements given in this standard are based on a review of field data. Each system should be evaluated to determine the applicability of the stated material. This standard is intended to aid manufacturers, suppliers, and users of oilfield equipment in the selection of materials.

This standard was originally prepared in 1975 by NACE Task Group T-1F-7, a component of NACE Unit Committee T-1F on Metallurgy of Oilfield Equipment. This standard was revised in 1991 and revised again in 1998 by Task Group T-1F-27, and is published by NACE International under the auspices of Group Committee T-1 on Corrosion Control in Petroleum Production.

In NACE standards, the terms *shall*, *must*, *should*, and *may* are used in accordance with the definitions of these terms in the NACE Publications Style Manual, 3rd. ed., Paragraph 8.4.1.8. *Shall* and *must* are used to state mandatory requirements. *Should* is used to state that which is considered good and is recommended but is not absolutely mandatory. *May* is used to state that which is considered optional.

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Contents

Section 1: General

1.1 This standard has been prepared as a guide to the selection of corrosion-resistant metallic materials to be used in all phases of handling water for injection into oil-bearing formations. Included in the application of this standard are metallic materials used in conjunction with CO_2 injection systems.

1.2 The materials tabulated are only those frequently used for the purposes shown in the tables and are not implied to be the only materials suitable for the stated purposes.

1.3 This standard is not intended to provide complete material specifications for design purposes. This standard cannot cover the selection of materials for every possible situation.

1.4 Nonmetals are not covered in this standard, but when nonmetals are a solution, they are listed as such for the specific effectiveness they may provide. This standard considers only the corrosion aspects of material selection.

1.5 NACE Standard MR0175[(1)] Paragraph 1.2, "Applicability," states that materials selection for water-handling facilities is outside the scope of the standard. While this standard for water handling for injection into oil-bearing formations does address materials selection for water with hydrogen sulfide (H_2S), some materials named in both standards may not agree in metallurgical condition or hardness. These differences reflect the differences in the effects of the environments covered by the two standards.

1.6 This standard does not cover mechanical properties or temperature limitations. The purchaser should specify these requirements and the supplier should be responsible for supplying material that meets these requirements.

1.7 Coatings and coating performance are outside the scope of this standard.

Section 2: Economic Choices and Benefits

2.1 The most appropriate economic choice of materials in a particular situation depends on the initial installed cost and the expected lifetime of the material as well as operating and treatment costs. Short sections and long lifetimes tend to favor more corrosion-resistant materials, while extensive systems and shorter lifetimes tend to favor less expensive materials coupled with other means of protection such as chemical treatments. The external environment can also be a factor. The variables are very complex.

2.2 When more corrosion-resistant materials are used, the operating cost of water-handling operations decreases and more constant and effective injection of water results. The avoidance of leaks can also reduce environmental costs, and greater reliability of materials solutions may be required in particular circumstances.

Section 3: Other Considerations

3.1 Particular care shall be taken to ensure proper use of the recommended materials.

3.1.1 The use of combinations of materials that would be subject to galvanic corrosion shall be avoided. Special care must be taken to avoid small anode/large cathode combinations.

[(1)] NACE Standard MR0175 (latest revision), "Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment" (Houston, TX: NACE International).