Essentials of Coating, Painting, and Lining for the Oil, Gas, and Petrochemical Industries

Alireza Bahadori, Ph.D.

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Dedicated to the loving memory of my parents, grandparents,
and everyone who contributed so much to my work over the years

About the Author

Alireza Bahadori, Ph.D., is a member of the research staff of the School of Environment, Science, and Engineering at Southern Cross University in Lismore, NSW, Australia. He received his Ph.D. from Curtin University in Perth, Western Australia. During the past 20 years, Dr. Bahadori has held many process and petroleum engineering positions and was involved in several large-scale projects at the National Iranian Oil Co. (NIOC), Petroleum Development Oman (PDO), and Clough AMEC.

He is the author of about 250 articles and 12 books. His books have been published by many major publishers, including Elsevier.

Dr. Bahadori is the recipient of the highly competitive and prestigious Australian government's endeavour international postgraduate research award for his research in the oil and gas areas. He also received a Top-up Award from the State Government of Western Australia through the Western Australia Energy Research Alliance (WA:ERA) in 2009. Dr. Bahadori serves as an editorial board member and reviewer for a large number of journals.

Preface

The surface preparation process not only cleans steel, but also introduces a suitable profile for applying protective coating. The main task of such coating is to prevent or control the external corrosion of buried or submerged steel structures. The coating isolates metal from contact with the surrounding environment.

Since a perfect coating cannot be assured, cathodic protection is used in conjunction with the coating system to provide the first line of defense against corrosion. And since a properly selected and applied coating should provide 99% of the needed protection, it is of utmost importance to know the advantages and disadvantages of available coatings. The right coating material, properly used, will make all other aspects of corrosion control relatively easy. The number of coating systems available requires careful analysis of the many desired properties for an effective pipe coating.

Therefore, the optimum selection and proper application of protective coatings are vital to successful engineering. During extended periods of time, protective coatings deteriorate as a result of contact with moisture, oxygen, chemicals, fluctuating temperatures, abrasion, pressure, and many other factors. Therefore, proper and timely maintenance is required to get the optimum performance from a protective coating.

Meanwhile, selection and application of maintenance coating is more complicated than for initial construction. Climatic conditions, chemical exposure, available time, budget, health and safety, and grade of surface preparation have a significant influence on the planning of optimum design coating. To select the best coating system to fit the environment or oil condition, knowledge of operating and installation conditions is essential. The steel source and job location may limit the coatings available for each project. The choice of a high-quality applicator is the most important (but alas, also most neglected) consideration. Following coating and applicator selection, inspection at the coating, especially on the job site during construction, will go far in ensuring that a high-quality pipe coating system has been installed.

This engineering book covers the minimum requirements for the design and selection of coating systems for the external protection of pipes, storage tanks, and piling systems that will be buried or submerged in water. The contents define the essential elements of surface preparation, selection of coating systems, and repair of coating defects. It is intended to focus on corrosion protection of steel structures of the oil and gas and petrochemical industries, including refineries, chemical and petrochemical plants, gas plants, and oil exploration and production units.

This book covers the minimum requirements for the linings that will be used in various types of equipment (e.g., vessels, storage tanks, and pipelines). It is intended for use in refineries, petrochemical plants, oil and gas plants, and, where applicable, in exploration, production, and new ventures.

Several nonmetallic lining systems are discussed. They are classified into the following main groups:

Thermoplastic materials
Thermosetting materials
Rubbers
Mineral and bitumen materials

This book gives the essential details about the initial construction and maintenance painting of metal surfaces. It also describes the minimum requirements for the surface preparation and painting of piping, plant, equipment, storage tank, building, and other elements that will be exposed to different corrosive environments. Painting schedules, paint systems, and paint color schedules are included in this respect.

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