



NATIONAL PETROCHEMICAL COMPANY
STANDARDS

CONSTRUCTION STANDARD
FOR
PRECOMMISSIONING CHEMICAL CLEANING

NPCS-CS-PI-05

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FIGURE - 1

ANNEXURE - 1

ANNEXURE - 2

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1 SCOPE

- 1.1 This standard covers the minimum requirements for pre-commissioning chemical cleaning and post cleaning passivation treatment of systems and equipment. This standard covers the chemical cleaning of fabricated and erected Carbon Steel piping at plant site prior to commissioning by chemical circulation method. The technical procedure is prepared only for Carbon Steel surfaces. Materials other than Carbon Steel shall not come in contact with pickling solutions.
- 1.2 Piping systems and equipment to be subjected to chemical cleaning shall be indicated on P&ID'S as chemical-cleaned systems. These systems shall be divided into two categories:
- 1.2.1 Sys-terns which require degreasing only.
- 1.2.2 Systems which require degreasing, pickling and passivation.
- 1.3 The equipment and piping requiring chemical cleaning are indicated in figure 1.

2 OBJECTIVE

- 2.1 The objective of this standard is to insure that the internal surfaces of the piping systems and equipment are free of rust, burs, welding slag, grease, debris and mill scales which could result in operating and maintenance problems such as plugging, excessive damage to reciprocating and rotating equipment and corrosion due to the reaction of mill scale with process environment.
- 2.2 This standard specifies -the method of cleaning and passivation of internal surface of piping systems and equipment based on the use of inhibited hydrochloric acid followed by passivation with sodium hexameta-phosphate, prior to taking in service for the first time after installation/fabrication.
- 2.3 The final. result is that the metal surfaces are completely clean, dry and passivated without signs of corrosion.

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3 GENERAL REQUIREMENT

- 3.1 All valves, gaskets, control valves including butterfly valves, filters, venturies, instruments, turbine meters, orifice plates, thermowells, strainer screens, relief valves shall be removed and nozzles blanked off/replaced by spools; whichever applicable.
- 3.2 Reboilers or exchangers, which are part of the process unit, shall not be used for heating of any of the chemical solutions. Heating shall be external to the system being cleaned and by equipment furnished by the chemical cleaning contractor. Steam shall never be introduced in any part of the system.. Overheating shall be avoided.
- 3.3 Process pumps shall not be used to circulate the chemical cleaning solution. All process reciprocating and rotating equipment and their ancillary systems shall be disconnected and blinded off and jumpover lines or spools shall be provided as required to complete the piping circuit. All pumps for handling chemical cleaning, degreasing, neutralising and passivating solutions are to be furnished by chemical cleaning contractor and should operate from a dependable power source.
- 3.4 The chemical cleaning solution must not be allowed to stand undisturbed in any part of the equipment at any time. The filling, circulating, draining flushing and neutralizing operations are to be continuous for each of the system to be treated.
- 3.5 List shall be prepared for those components which are not to be subjected to chemical cleaning. These items shall be dropped and replaced by spools wherever required.
- 3.6 The system shall be connected to temporary chemical cleaning facility in such a way to obtain circulation system which ensures the required performance in terms of heating, velocity, chemical cleaning, flushing and draining.
- 3.7 Chemical cleaning shall be performed after mechanical completion, i.e. construction, flushing and pressure test completed.



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- 3.8 Contractor to specify the methods for the monitoring of chemical-cleaning procedure.
- 3.9 List of services to be supplied to chemical cleaning contractor shall be prepared by contractor, e.g. utilities, disposal, temporary space, loading, unloading, mechanical work, etc.
- 3.10 List of services to be supplied by chemical cleaning contractor shall be prepared, e.g. transport, personnel, chemicals and temporary piping/equipment fittings, flanges, pumps, tanks, heater coils, gaskets, thermometers, hydrometers, valves, test coupons, spares, lab facility with all accessories required for conducting test and safety accessories, etc. Schematic arrangement for chemical cleaning is shown in Figure 1.

4 SEQUENCE OF OPERATION

The sequence of operation shall be as follows:

- 4.1 Flushing with water to remove dirt, dust, loose rust and any foreign matter.
- 4.2 Degreasing.
- 4.3 Inhibited acid circulation.
- 4.4 Neutralization with soda ash/caustic soda.
- 4.5 Rinsing.
- 4.6 Passivation.
- 4.7 Drying.
- 4.8 Preservation.



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5 CHEMICALS

The following chemicals are recommended for use in chemical cleaning operation:

- 5.1 Caustic, Soda-Rayon grade or technical grade.
- 5.2 Hydrochloric acid-commercial/technical grade.
- 5.3 Corrosion inhibitor Rodine-213 special manufactured by M/S Agromore Ltd. or equivalent.
- 5.4 Glassy Sodium meta-phosphate (Sodium-Hexametaphosphate).
- 5.5 Soda Ash, technical grade.
- 5.6 Potable water (alternatively demineralized water) should be used for preparation of chemicals solution and flushing/rinsing operation, etc.
- 5.7 All chemicals used for chemical cleaning should be as per specifications and shall be tested prior to use for cleaning.

6 INSPECTION OF INHIBITOR BEFORE CLEANING

A solution of inhibitor shall be prepared in hydrochloric acid as specified by the manufacturer and shall be tested for:

- a) The inhibitor efficiency.
- b) The effectiveness of the solution in removing mill scale.

The tests shall be conducted as given in Annexure-1.