

## SCOPE

- I 1.1 This practice covers acceptable techniques for chemical and mechanical precommission cleaning of:
  - a. Fired and unfired steam generators having steam outlet pressures of 1800 psig (12500 kPa) and under.
  - b. Compressor suction and interstage systems.
  - c. Steam turbine inlet piping.
  - d. Lube and seal oil piping systems.
  - e. Positive displacement pump suction piping.
- I 1.2 Post cleaning passivation of metal surfaces to prevent pre-startup contamination is also covered by this practice.
- I 1.3 **An asterisk (\*)** indicates that additional information is required. If a job is contracted, this additional information will be furnished by the Purchaser.

## DOCUMENTATION

### PROPOSAL INFORMATION

- \* 2.1 **A specification** describing the services, equipment and procedures proposed shall be furnished to Purchaser for approval by the Owner's Engineer. This specification shall include, but not be limited to, the following:
  - M a. Schematic drawings of the circuits to be cleaned and to be used to introduce and circulate chemicals. Drawings shall indicate size and type of all cleaning connections, and location of post cleaning inspection points.
  - E,O b. Chemicals to be used and method of introduction and disposal.
  - M c. Concentration, temperatures, circulation rates and contact times (min., max. and working level) of chemical solutions to be used.
  - M d. Details of inhibitors to be used, effectiveness of inhibitors against corrosion, and sampling and testing schedule.

Services proposed by the cleaning contractor shall not include operating functions on Purchaser's (or Owner's) equipment or facilities.
- M \* 2.2 **Surface cleanliness standards**, pictorial or actual, shall be furnished to the Purchaser for approval by the Owner's Engineer. Pictorial standards shall be 5 in. x 7 in. (127 x 178 mm) color photos (minimum). Actual standards shall be carbon steel pipe NPS 1-1/2 to 3 (38 - 76 mm) by 12 in. (305 mm) long, fully cleaned and passivated. These standards will be used for the post cleaning inspections per **Par. 5.5**.

### OPERATING RECORDS

- R,M 2.3 **The cleaning contractor shall prepare and maintain a continuous log** of the cleaning operation, recording all aspects including:
  - a. Chemicals used, including inhibitor.
  - b. Temperatures, concentrations and circulation rate of cleaning solutions.
  - c. Test results.

A copy of the log shall be submitted to Purchaser for review with the Owner's Engineer on completion of each cleaning operation.

## CLEANING REQUIREMENTS AND METHODS

R ♦ **3.1** The degree of cleaning and surface preparation required, and acceptable methods to accomplish this are specified below:

| EQUIPMENT                                                                                                                                               | DEGREE OF CLEANING AND SURFACE PREPARATION |                   | ACCEPTABLE METHODS (STEP PROCEDURE IN ORDER GIVEN) |                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------|----------------------------------------------------|-----------------------------|
| <b>Piping Systems Carbon and Low Alloy Steels (&lt; 5Cr):</b><br>Lube and Seal Oil Systems                                                              | A, B, C, D                                 |                   | 3, 4, 5, 6, 7                                      |                             |
| Lube and Seal Oil Systems - Stainless Steel                                                                                                             | A, B                                       |                   | 1, 2                                               |                             |
| Centrifugal and Axial Compressor Suction                                                                                                                | A                                          |                   | 2, 7                                               |                             |
| Reciprocating and Rotary Compressor Suction and Interstage (including vessels, exchangers and pulsation suppression devices, including Stainless Steel) | A, B, C, D                                 |                   | 1 or 2, 7;<br>or<br>3, 4, 5, 6, 7                  |                             |
| Positive Displacement Pumps Suction                                                                                                                     |                                            |                   |                                                    |                             |
| Steam Turbine Inlet: > 625 psig                                                                                                                         | A, B, C, D                                 |                   | 3, 4, 5, 6, 8                                      |                             |
| ≤ 625 psig                                                                                                                                              | A                                          |                   | 8                                                  |                             |
| <b>Steam Generating Equipment:</b><br>Feed Water Line Downstream of Deaerator                                                                           | <b>Steam Outlet Pressure, psig</b>         |                   | <b>Steam Outlet Pressure, psig</b>                 |                             |
|                                                                                                                                                         | <b>&lt; 450</b>                            | <b>450 - 1800</b> | <b>&lt; 450</b>                                    | <b>450 - 1800</b>           |
| Steam Generator                                                                                                                                         | A                                          | A, B, C, D        | 3                                                  | 3, 4, 5, 6                  |
| Superheater, Drainable and Ventable                                                                                                                     | A, B                                       | A, B, C, D        | 3, 4                                               | 3, 4, 5, 6                  |
| Superheater, Non-Drainable and Non-Ventable                                                                                                             | A, B                                       | A, B, C, D        | 1, 3, or 3, 4                                      | 3, 4, 5, 6<br>or<br>1, 3, 8 |
| Superheater, Non-Drainable and Non-Ventable                                                                                                             | A, B                                       | A, B, C           | 1, 3, 8                                            | 1, 3, 8                     |

(corrected 7/29/99)

### Notes:

Symbols used in the above table are:

- A Removal of all loose non-adherent materials together with all adherent material which could break away during operation of the equipment.
- B Removal of oil, greases and protective coatings.
- C Removal of adherent rust and mill scale to leave bare metal.
- D Protection of surface to prevent rust bloom following cleaning and prior to startup.

### (STEP PROCEDURE IN ORDER GIVEN)

- (1) Clean construction techniques:  
For compressor and positive displacement pump piping prior to fabrication:  
Sand or grit blasting for rust and scale removal together with "clean" weld techniques (TIG, MIG, etc.) for all closing welds.  
For steam generators this includes use of cold drawn tubing and cold bending.
- (2) Post fabrication mechanical cleaning:  
Grinding, pigging, sand or grit blasting (except adjacent to machinery), or high pressure (> 5000 psi) water blasting.
- (3) Flushing with fresh clean water to remove trash and debris.
- (4) Alkaline detergent wash for oil and grease removal.
- (5) Solvent cleaning with acids or chelants, for rust and mill scale removal.
- (6) Post cleaning passivation:  
Prevention of after-rusting of cleaned surfaces by chemical treatment.
- (7) **Post cleaning protection:**  
Vapor phase inhibitor coating with a lubricant compatible rust preventive except for nonlubricated compressors and those in refrigeration service; or nitrogen blanket. Systems constructed entirely of stainless steel do not require the above. Blind, plug or cap all piping joints left temporarily disconnected.
- (8) **Steam blow** to ensure removal of loose scale.

### ACCEPTABLE METRIC EQUIVALENTS

|      |      |      |       |       |
|------|------|------|-------|-------|
| psig | 450  | 625  | 1800  | 5000  |
| kPa  | 3100 | 4300 | 12500 | 34450 |