

Engineering Procedure

SAEP-1024

31 July 2005

Chemical Cleaning of New Steam Generating Equipment

Materials and Corrosion Control Standards Committee Members

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Saudi Aramco DeskTop Standards

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1 Scope

- 1.1 This procedure defines the minimum requirements for cleaning all new steam generating equipment such as boilers and heat recovery steam generators (HRSGs) to remove internal construction debris, including oil, grease and mill scale, prior to operation. It also defines the responsibilities of those departments involved with these cleaning activities.
- 1.2 This procedure is supplementary to the steam generating equipment manufacturer's cleaning recommendations. If warranty rights are involved, the selected cleaning procedures are to be discussed with the manufacturer and differences are to be resolved by the project construction agency.

2 Conflicts and Deviations

- 2.1 Any conflicts between this Procedure and other applicable Saudi Aramco Engineering Procedures (SAEPs), Saudi Aramco Engineering Standards (SAESs), Saudi Aramco Materials System Specifications (SAMSSs), Saudi Aramco Standard Drawings (SASDs), or industry standards, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Consulting Services Department of Saudi Aramco, Dhahran.
- 2.2 Direct all requests to deviate from this Procedure in writing to the Company or Buyer Representative, who shall follow internal company procedure [SAEP-302](#) and forward such requests to the Manager, Consulting Services Department of Saudi Aramco, Dhahran.

3 References

The requirements contained in the following documents apply to the extent specified in this procedure.

Saudi Aramco Documents

Saudi Aramco Engineering Procedures

[SAEP-302](#)

*Instructions for Obtaining a Waiver of a
Mandatory Saudi Aramco Engineering
Requirement*

[SAEP-1025](#)

Chemical Cleaning of Boilers

[SAEP-1026](#)

Mothballing/Lay-up Procedures for Boilers

4 Instructions for Cleaning

- 4.1 For all fired or waste heat, water-tube boilers up to a maximum operating pressure of 6.2 MPa (900 psig), the cleaning steps shall comprise of boil out to remove grease and oil, solvents to remove rust and mill scale, and passivation in accordance with [SAEP-1025](#). For fire tube boilers, boilers rated above 6.2 MPa (900 psig), or other boiler types, including heat recovery steam generators (HRSGs) an individual cleaning program shall be drafted using specialist advice available from Consulting Services Department, Dhahran.
- 4.2 For all new steam generating equipment, a thorough inspection shall be conducted before-cleaning in order to determine the most appropriate cleaning procedure.
- 4.2 The solvent cleaning procedure shall be based on the use of inhibited ammoniated citric acid. The inhibited ammoniated citric acid cleaning procedure detailed in the [SAEP-1025](#) is safe and cost-effective for the removal of mill scale. If special circumstances suggest the use of another solvent system (e.g., EDTA, inhibited hydrochloric or hydroxyacetic acids) the proposal shall be approved by Consulting Services Department, Dhahran. Solvent cleaning is a skilled process, and shall only be undertaken by qualified chemical cleaning personnel.
- 4.3 The superheaters, reheaters and economizers of new boilers shall be cleaned separately. This is normally done using steam from another source if necessary, by alternately raising the pressure in the boiler from 4.14 to 6.2 MPa (600 to 900 psig) and rapidly releasing the pressure on a white target until no visible contaminants emerge. For steam cleaning to be effective a velocity of 15 to 30 m/s is required. If the cleaning of these components cannot be achieved cost-effectively by mechanical means, then they shall be chemically cleaned.
- 4.4 After cleaning, the boiler tubes, the superheater tubes, the reheater tubes, and the economizer tubes shall be inspected visually. Remote video boroscope inspection before cleaning and after cleaning will ensure the necessary degree of system cleanliness. Destructive tube sampling is not required to determine cleaning effectiveness.

5 Responsibilities

- 5.1 Project Construction Agency
- 5.1.1 Has the overall responsibility for the cleaning of new steam generating equipment.
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- 5.1.2 Coordinates and obtains the approval of chemical cleaning procedures and formulations from the Consulting Services Department and the Research and Development Center.
- 5.1.3 Installs temporary piping and equipment for the cleaning operation in accordance with [SAEP-1025](#) and provides craft personnel to support the cleaning operation.
- 5.1.4 Provides sufficient condensate or boiler make-up water, and nitrogen at site to accomplish the cleaning operations.
- 5.1.5 Prepares the boiler mechanically.
- 5.1.6 Coordinates chemical cleaning and obtains contractor services from Saudi Aramco's approved list of chemical cleaning contractors.
- 5.1.7 Has the responsibility to arrange with Projects/Operations Inspection and specialist personnel from Consulting Services Department for before-cleaning and after-cleaning inspection.
- 5.2 Operations Engineering
 - 5.2.1 Acts as the technical representative of the proponent.
 - 5.2.2 Advises and assists the project engineer during all cleaning activities involving the boiler and associated equipment.
- 5.3 Projects/Operations Inspection
 - 5.3.1 Performs before-cleaning and after-cleaning inspection.
 - 5.3.2 Monitors corrosion using weight loss coupons.
 - 5.3.3 Maintains history of steam generating equipment chemical cleaning and incorporates relevant reports and data into permanent plant records.
- 5.4 Other Organizations

The responsibilities of the Research and Development Center, Consulting Services Department, regional and boiler laboratories, and chemical cleaning contractor are defined in Section 3 of [SAEP-1025](#) and remain unchanged.

6 Steam Generating Equipment Lay-Up

After chemical cleaning, if the new equipment is not commissioned within five days it is to be laid up per [SAEP-1026](#).

7 Corrosion Control, Water and Chemical Treatment Subcommittee

Ivan Cruz	Coordinator
Mark Moore	Member
Olavo Dias	Member
Robin Tems	Member
Abdulatif Abdulhadi	Member
Abdelhak Kermad	Member
Robert Palmer	Member
Brian Burgess	Member
Tawfiq Al-Ghasham	Member

Revision Summary

29 January 2003	Editorial revision to show the current Standards Committee membership as well as to reflect the name change in the Research and Development Center in Sections 5.1.2 and 5.4. Also, editorial change in Section 4.2. Revised the "Next Planned Update".
28 January 2004	Editorial revision to add Corrosion Control, Water and Chemical Treatment Subcommittee.
31 July 2005	Minor revision to include Heat Recovery Steam Generators in the scope, and update the rosters of the Materials and Corrosion Control Standards Committee and Corrosion Control, Water and Chemical Treatment Subcommittee.