ON-LOAD SPONGE BALL CLEANING SYSTEM

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Contents

1. Introduction

Prior to their application in MSF Desalination Plants, on-load sponge ball cleaning systems have, since 1953, been used successfully in power plant condensers and other tubular heat exchangers using cooling waters from the sea, rivers, lakes, or cooling towers.

The system uses sponge rubber balls of diameters larger than the tube diameters, which are injected into the inlet and, by being pressed through the tubes, remove depositions.

After passing the heat exchanger the balls will be separated from the main cooling water flow and re-injected into the inlet.

For the application of on-load sponge ball cleaning systems in MSF Desalination Plants, two different circuits can be seen:

(a) Heat Rejection Section
(b) Brine Heater and Heat Recovery Section

Refer to Figure 1.

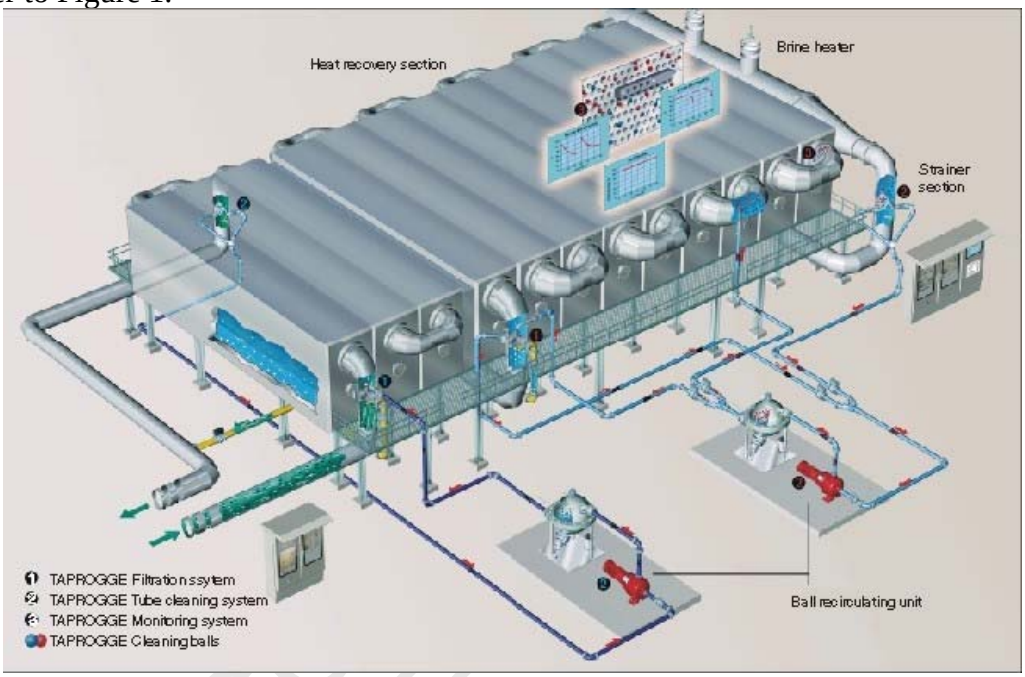

Figure 1. On-load sponge ball cleaning systems in MSF desalination plants.

2. Types and Effects of Depositions in Tubes

2.1. Heat Rejection Section

Seawater as used for the distillation process carries micro and macrofouling of different types into the system, the nature of which could be anorganic (sludge, industrial waste) or, if not heavily chlorinated, organic (bacteria, fungi, algae, hydroids, mussels, fishes). This type of waterborne fouling, if not prevented, will result in a decrease in the heat transfer rate and in some cases cause tube erosion/corrosion, as well as corrosion beneath the deposits.

2.2. Brine Heater and Heat Recovery Section

Here the major problem is alkaline scaling which is formed by the crystallization of supersaturated salts on heated surfaces, reducing the heat transfer and brine recirculating flow. Tube fouling in these sections results in an increase in steam consumption and/or decrease in product water.

Acid dosing to destroy the bicarbonate ions which are the cause of scaling can be an effective countermeasure but this practice adds a risk of enhanced plant corrosion. Treatment with chemical additives prevents the formation of hard scales, however will cause sludge deposition in the tubes again reducing heat transfer.

The combined use of chemical additives and an On-Load Sponge Ball Cleaning System has proven to be the most cost-effective means to avoid tube fouling. Optimization of chemical dosing rates and Ball Cleaning System operation will minimize operational costs.

3. Arrangement of Systems

3.1. Heat Rejection Section

The system is designed for continuous operation and cleaning frequencies of 12 passes per hour and tube. The actual number of passes per day basically depends on fouling conditions and tube material.

3.2. Brine Heater and Heat Recovery Section

For operating the equipment in the brine heater and heat recovery section, there are significant differences compared with the equipment operating in the heat rejection section.

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