



Characteristics and prevention of bio-fouling of reverse osmosis membrane

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Abstract

Taking reverse osmosis (RO) of chemical water treatment workshop (CWTW) system in Handan Thermal Power Plant (HTPP) for an example, cleaning and anatomy experiments were carried out and the characteristics and prevention of the RO membrane bio-fouling were investigated using the conventional, SEM-EDX and FT-IR analysis methods. The results show that the main reasons for the RO membrane bio-fouling are high organic matter content, total number of bacteria and SDI of influent. The structure of the serious bio-fouling membrane is generally meshy and coupling, in which main ingredients are many kinds of organics such as albumin, the benzene rings, fatty-acids and so on. The static cleaning experiments indicate there's a chemical fouling process called inorganic matrix to coarseness stage of the membrane surface before the RO membrane is contaminated by microorganisms. According to the structural features of the RO membrane bio-fouling, the cleaning method should be taken that the RO membrane is cleaned by an alkali agent followed by an acid agent and then disinfected. The practical application has proved that the pressure difference of RO system can return to the initial state and the permeate flux close to the design value taking the method, which met the desired effect.

Key words: *Bio-fouling, Coarseness stage, Reverse osmosis (RO)*

1. Introduction

Reverse osmosis(RO) technology have a wide range of applications in the seawater and brackish water desalination, boiler water treatment, preparation of pure water and pharmaceutical water and wastewater treatment, but the RO membrane fouling and deterioration has always been one of bottlenecks of the technology development (Lin and Zhang, 2000; Heikholeslam, 1999; Ane and Beatson, 2000; Amjad, 1999) . Five distinct

types of membrane fouling are typically identified in most RO literatures including bio-fouling, organic fouling, chemical fouling, particles and colloids fouling, however the bio-fouling with its particularity in several types of RO membrane fouling is an important reason for the operation difficulties in water treatment by RO technology (Flemming, 1997; Vrouwenvelder *et al.*, 2001; Baker and Dudley, 1998; Li *et al.*, 2006; Li, 2007). The international studies of RO membrane bio-fouling mainly dates from the late 1990s to this early century (Flemming, 1998; Sung *et al.*, 2003; Andrew *et al.*, 2001). The formation