

MSF evaporator materials evaluation after 20 years in service

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ABSTRACT

Phase 2-A and Phase 2-B of the Al-Jubail multistage flash (MSF) evaporation plants were commissioned in 1982. The two phases consist of 40 desalination units and were designed and built by different contractors. A wide variety of materials was used in the construction of different components of the evaporators, namely, flash chambers (carbon steel, AISI 316L clad carbon steel), heat transfer tubes (90/10 Cu/Ni, Ti), water boxes (AISI 316L clad carbon steel, Al bronze clad carbon steel), tube sheet [90/10 Cu/Ni, AISI 316L clad carbon steel) and tube support (carbon steel and 316L clad carbon steel). The role of design of the flash chamber and venting system on corrosion behavior of the evaporator construction materials was studied. Based on the corrosion rates of the materials at different locations of the desalination units and type and nature of the failures that occurred, the performance of the materials after years in service has been evaluated. The root cause of material failure has also been investigated. The results of the studies indicate that during 20 years operation, the desalination units encountered many corrosion problems. It has been concluded that a good ventilation design will minimize the corrosion in flash chambers. Good operation and maintenance would prolong the lifetime of the flash chambers.

Keywords: MSF evaporator; Flash chamber; Heat exchanger; Heat recovery; Heat rejection; Brine heater; Condenser; Vent system; Corrosion rate; Material performance

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