Breakdown of an evaporator during a leak test at a seawater desalination plant

Type of Insurance:

EAR

Description of damaged item:

Damage to a boiler and evaporator frame

Cause of Loss:

(1) Faulty operation

Claim Cost

3.7 million USD

Description of Incident and Loss Prevention Measures initiated:

On the day of the loss event, leak tests (hydrostatic tests) were being performed on the evaporators. Whilst filling desalination unit 19 to the level of the pre-condenser, the operating staff were suddenly startled by loud noises. They immediately stopped the filling process and began looking for the source of the noises. They inspected the underside of the evaporator units and found that both the boiler and the frame supporting the evaporator unit were badly distorted in the area of units 10 to 21.

The steel frame securing the boiler was damaged along half of its length. The majority of the equipment in the boiler had to be replaced. Inside the boiler there are 180 supporting columns between the floor and the ceiling. Small cracks were found at the base of 56 columns in 15 of the 21 units. There were major cracks up to 570 mm wide on 37 columns. This is also where the most severe distortions to the boiler occurred. The weld seams were badly damaged and the supporting structured was distorted and distended. In spite of the severe damage, the entire desalination unit remained in place. It was possible to perform all the repair work on site.

Outline the interesting or unusual aspects of this claim or problems experienced during settlement:

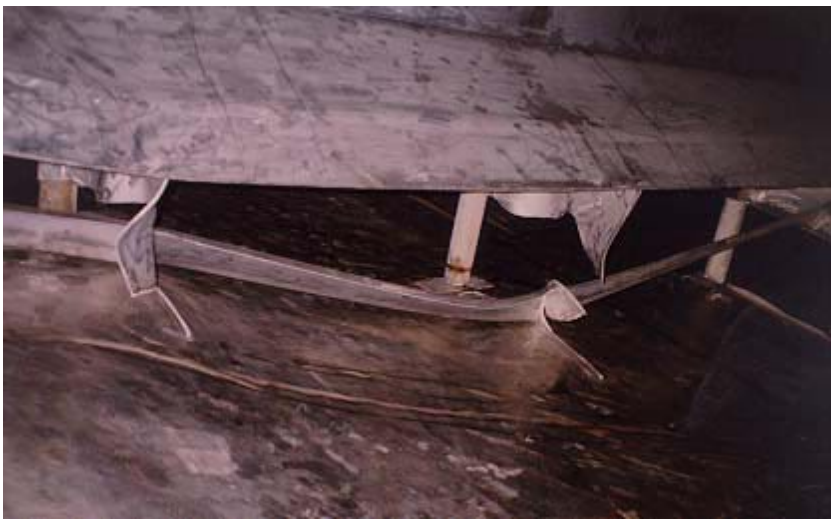
A leak test involves filling a desalination unit with water to the level of the pre-condenser using the suction pipes. If a desalination unit is to be filled with water, all the steam tubes running from the upper side of the evaporator stages to the condensers must be opened; the air that is displaced by the incoming water is then able to escape into the surroundings and is not trapped in the suction pipes.

Before the technician opened the ventilation valve for the final filling of the distillation column, he checked to see whether the valves were opened in accordance with the regulations. However, he had only opened the pre-condenser valve and the motor-driven ventilation valve 10% because he assumed this would reduce the amount of

water escaping as soon as the desalination unit was completely full. Consequently, the air displaced during the filling process could not escape quickly enough. Finally, substantial pressure built up inside the desalination unit, and this, together with the pressure from the water that had been pumped in, was too much for the underside of the boiler and the supporting structure. The equipment inside the evaporator (chambers, supporting structure, etc.) was damaged by the pressure. In an investigation carried out later, it was found that the pressure had risen to 3.5 bars during the filling process. This was far in excess of the design pressure of 1.5 bars.

A simple pressure valve on the upper side of the boiler could have prevented this loss – which was the result of human misjudgement – from assuming such large dimensions.

Deformation of H-beams and fractured welds



Deformation of separation wall and fractured seams

Source: Desalination Plants – Technological development, Risks affecting Engineering Insurers and Claims Experience – IMIA Paper WGP57 (08): Typical Loss Examples

http://www.imia.com/downloads/imia_papers/WGP57_2008.pdf