EFFECT OF INSTALLING NEW MAKEUP SPRAY HEADER

A facility had a demineralized makeup system that normally flowed directly to the condenser and excess condensate spilled over into the condensate/demineralized water storage tank. The original condenser had very poor distribution of the demineralized water: it consisted of a few feet long section of a pipe with a few large openings. Station operations and chemistry personnel noted that the condensate pump discharge oxygen levels were largely a function of the makeup rate. When the makeup rate increased, the condensate dissolved oxygen concentrations increased and baseline levels were high. In order to improve oxygen removal from the makeup in the condenser, we assisted the plant in the design of a spray header which was subsequently installed by station personnel. As indicated if Figure 1, this was merely achieved by extending the existing makeup line to a drilled pipe distributor above the condenser tubes. Since the condenser had stainless steel tubes, concerns of tube erosion due to the water spray were minimal. A different distribution system layout has been planned for a condenser with copper alloy tubes.

Figure 2 presents several graphs of the condensate pump discharge dissolved oxygen levels in the condensate. The dissolved oxygen was monitored continuously with a Swan dissolved oxygen analyzer and a set of readings were reported daily along with other station chemistry data. The top (blue) line in the figure shows daily readings in 2004 (prior to the retrofit). The green line (2006) shows the condensate dissolved oxygen levels after the retrofit and the red line shows the dissolved oxygen levels after some air leaks were fixed. While these dissolved oxygen levels still were a little elevated, this unit is operated on AVT(O) and the condensate/feedwater system is all-steel. Therefore, the slightly higher dissolved oxygen levels were not considered to be a problem. Cation conductivities (not shown) are consistently less than 0.20 µS/cm and the unit does not use a condensate polisher.

It is speculated that some of the problems with dissolved oxygen control at this facility is partially related to subcooling in the condenser. A review of more recent data in 2010 and 2011 (not shown) indicate that the lowest dissolved oxygen levels are experienced in the summer when the average cooling water temperatures are ~79°F and the highest dissolved oxygen levels are in the winter when the water temperatures are <35°F. Only one circulator is operated in cold weather. However, this operating mode is not necessarily sufficient to prevent subcooling.

Figure 1 – Sketch of Makeup Spray Header for Condenser

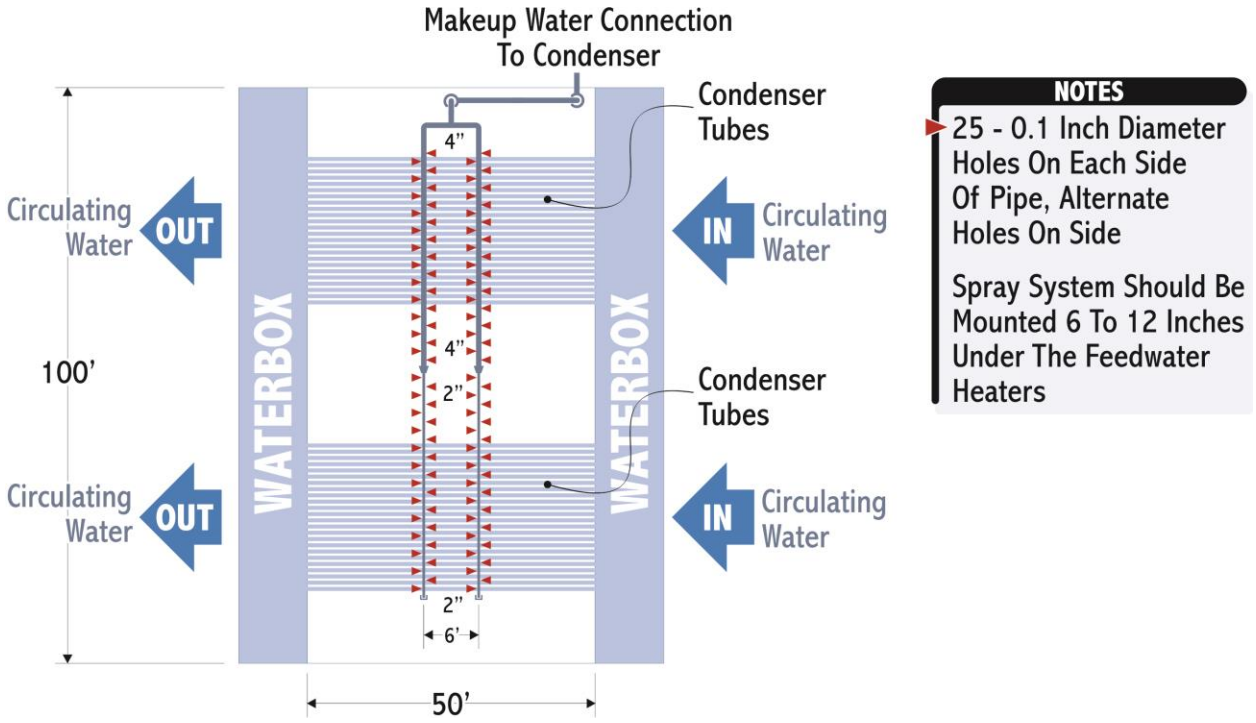
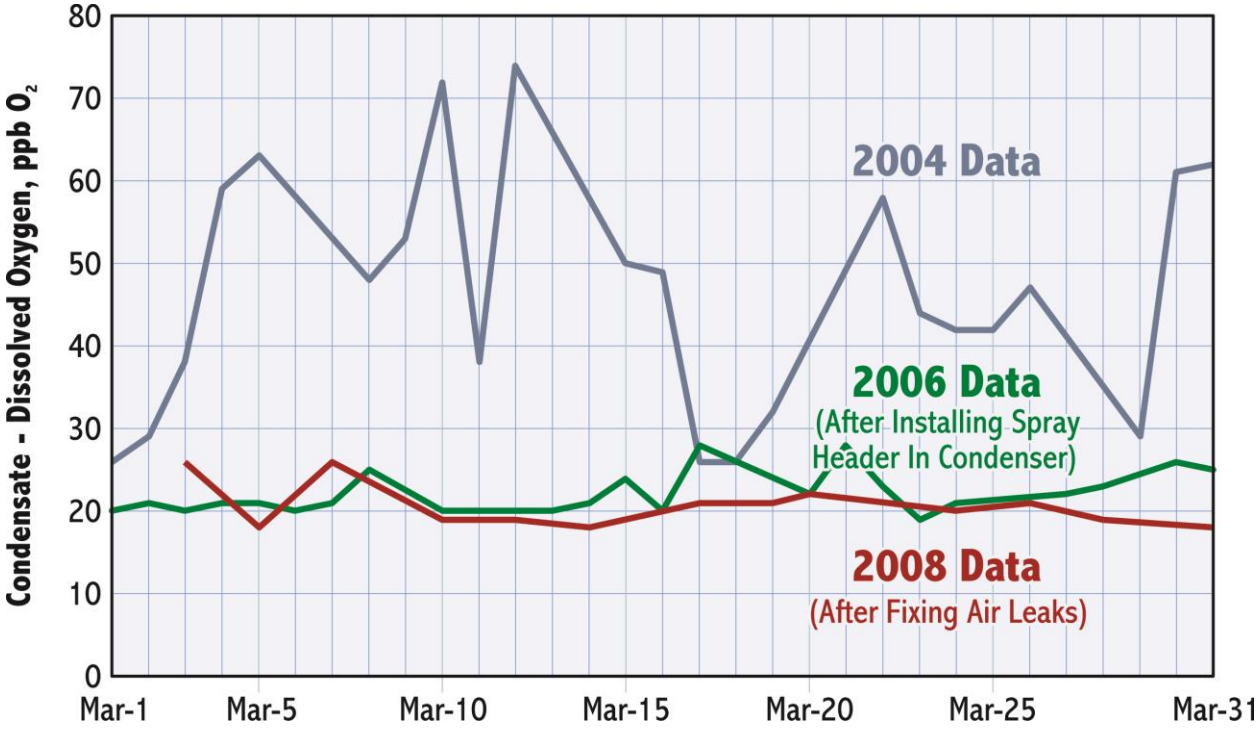


Figure 2 – Improvements in Condensate Dissolved Oxygen



Source

ROBERT D. BARTHOLOMEW, P.E., GARY H. ROBERTS, P.E., Controlling Condensate & Feedwater Dissolved Oxygen & Air Inleakage At The Source, International Water Conference, IWC-12-18, 2012.