

Cleaning Air-Cooled Condensers Case Studies

ACC Users Group October 4-6, 2016

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Yellowstone Power Plant Air Cooled Condenser





- Each module contains
 - 1 fan
 - 6 finned tube bundles
- ACC has 10 module consisting of
 - 8 condensing cells
 - 2 reflux cells
- Finned tube bundles have
 - 211 galvanized coated carbon steel oval tubes in a 3 tube arrangement



• 26 foot

CONCO

- 10 bladed
- 2 speed gear reduced motor
- Fans turn at
 - 125 RPM fast mode
 - 63 RPM slow mode
- Fan motors have reverse contacts
 - Reverse fans in severe winter



Center of ACC





Tubes – Frozen and Degraded from Debris Trapped Behind Support Beams





Frozen Burst Tube





Holes in Top of Tube Connections to Steam Header





Removal of Outer Tubes – Gain Access to Inner Row Tube Leaks





Leaks in Tubes at Lower Condensate Header Connections





Environmental problems

- Wind
- Debris
 - Cotton from cottonwood trees
 - Ash
 - Coke dust
 - Other debris
- Cold weather
- Hot weather



YPP's Solutions

- Use of underground cable shrink wrap and aluminum duct tape
 - Patch major leaks in tubes
- Use of sleeve inserts and outer sleeves
 - Fix tube to header connection leaks
- Sandblasting and pressure washing of tubes
 - Remove debris from finned areas



YPP's Solutions Continued

- Use of epoxy paints
 - Help preserve and close pin hole leaks
 - Steam header connections
 - Condensate headers
- Wind Fence
- Wind Wall



Cable Shrink Wrap – Repair Major Holes in Tubes





Tube Sleeve Inserts and Outer Couplers





Epoxy Paint

Holes in Tube Headers



Holes Repaired and Epoxy Painted





Wind Fence





Wind Wall





Plant Conditions

- Plant burns coker gas from refinery
- Steam produced sent back to refinery
- Harsh winter partially froze coker gas line
 - Created blockage in the line
 - High pressure behind the blockage



Problem

- When blockage broke free
 - Pressurized oil leaked through the Loop Seal Stack
 - Oil covered
 - Outside surface of the ACC unit
 - Surrounding areas



Oil on Surface of Unit





Oil Covers Unit





Additional Problem

- Truck spilled fly ash near the ACC unit
- Ash sucked into the ACC fans
- Under side of fins coated with oil and ash
- Oil acted like a glue



Ash Covers Fins Underneath Unit





Initial Attempt to Clean

- Plant attempted to clean unit using:
 - Cleaning system installed with unit
 - High pressure water
- Cleaning was unsuccessful



Cleaning using De-Greaser

- ACC cleaning system brought to plant
 - Capable of higher pressure adjustable
- Bundles presoaked with bio-degradable degreaser
- Unit cleaned using a higher pressure with ACC cleaning system



ACC Cleaning System





ACC Cleaning System: Riding the Rails





View from Inside Unit





Results





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Results





Haverhill

- Issue unable to effectively clean unit
- Standard ACC cleaning system did not fit
- Had to modify entire unit
- Cleaning system had to fit between fans and unit



- Vertical ACC unit
- Consists of 78 fans
- Rectangular structure
- Fans on each of the 4 sides
- Fans are 2 high on each side
- ACC structure on the top of Main Building

























Standard ACC Cleaning Equipment







ACC System Modifications







ACC System Installation







ACC System Installation





ACC System Installation











Questions

