

Impact of Air-Cooled Condenser on Comanche 3 Steam Cycle Chemistry Design



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EPRI Guidelines for Supercritical Unit

- **pH 8.0 – 8.5 with ammonia addition**
- **Oxygenated treatment**
- **Condensate polishing in hydrogen form**

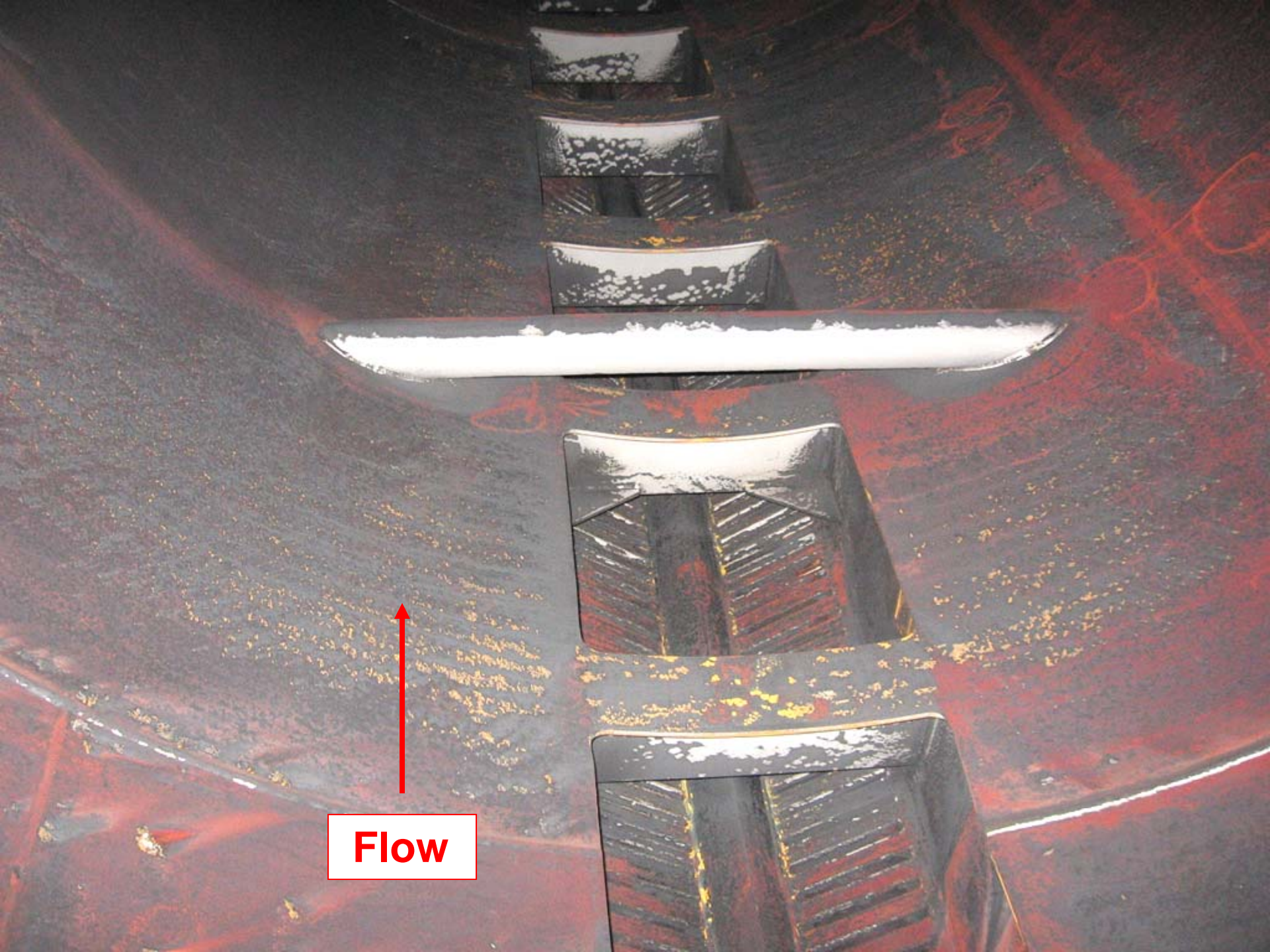
Assumes evaporative water cooling.

Units with Air-Cooled Condensers:

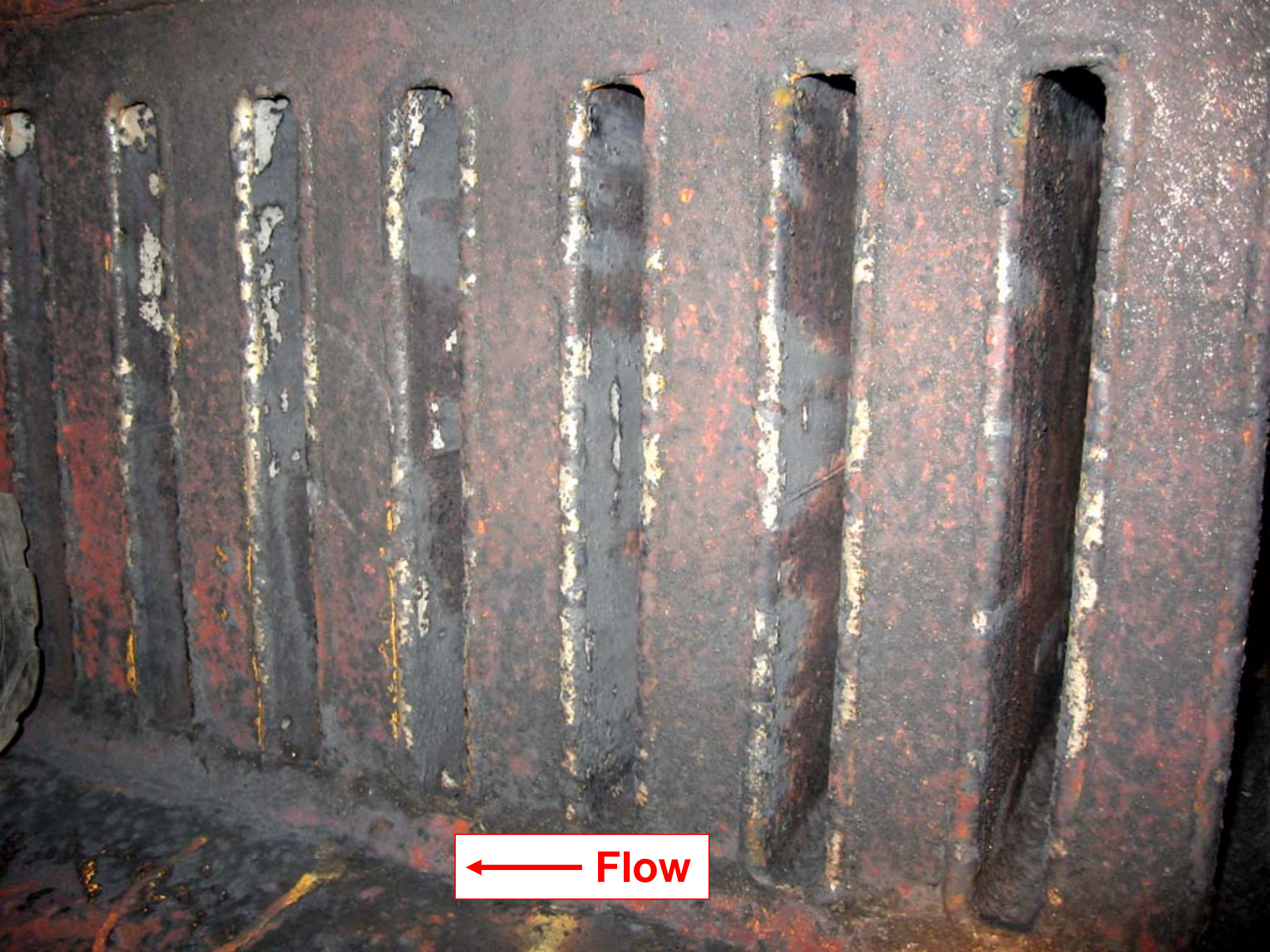
**Must address corrosion product release
from large carbon steel surface area**

Iron release from ACC: particle filtration

- **Condensate particulate filter**
 - Prevent polisher resin fouling
 - Reduced capacity
 - Increased cost for off-site resin regeneration
 - Minimize iron transport to steam generator tubing
 - Deep flow polishers not effective for particulate removal
 - Disposable cartridges costly

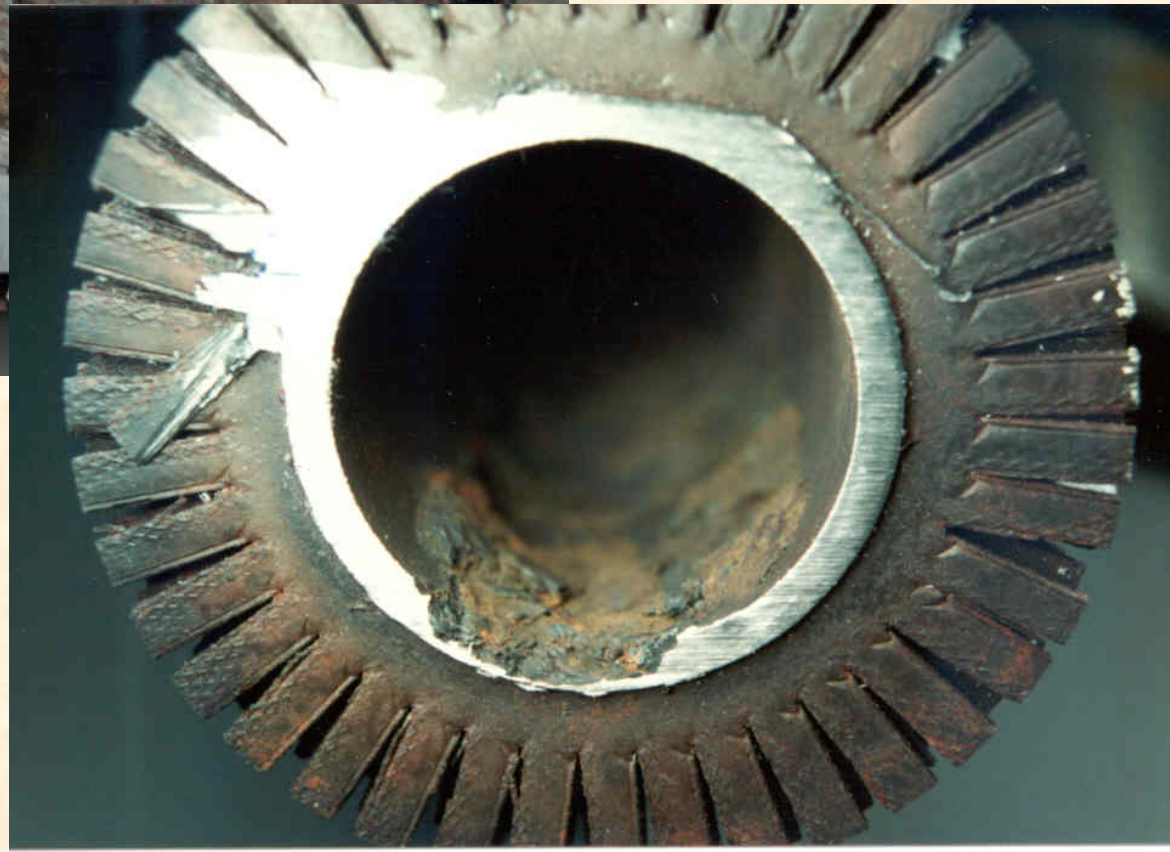
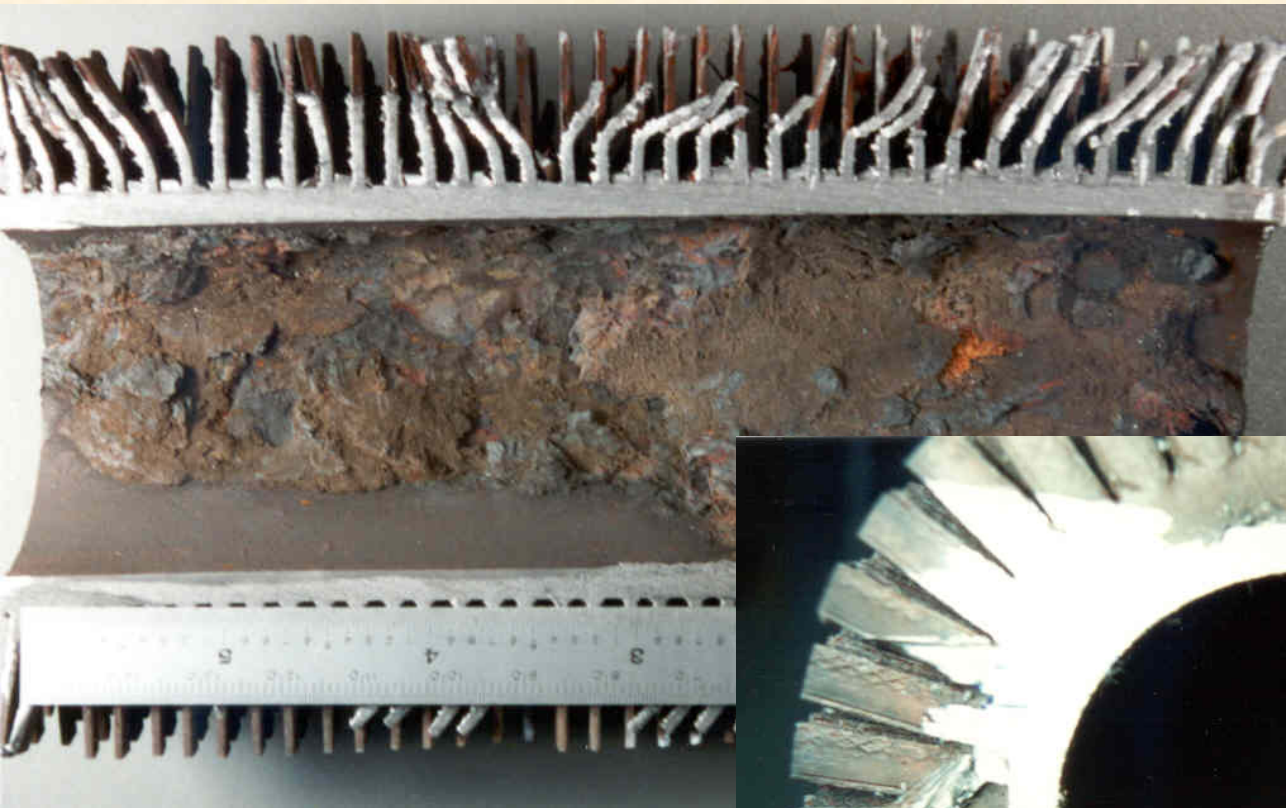


Flow



← Flow

Consequences of particulate transport



Iron release from ACC: pH elevation

- **Higher pH to reduce iron release from ACC: 9.6 – 10.0**
 - Ammonia feed more than 10X design
 - Necessary to operate polisher cation resin in ammonium form
 - Offsite resin regeneration returned in ammonium form
 - Poor contaminant retention
 - Rapid response to contamination from WCC required

Increased air inleakage with ACC

- **Increased carbonate in condensate**
 - **Anion resin exhaust on carbonate**
 - **Increased off-site regeneration expense**
 - **2:1 Anion:cation ratio in polisher**

Condensate Deaerator



Condensate Deaerator



Polisher operating challenges

- **Rapid response required for cooling water contamination from WCC**
- **Monitor source of elevated cation conductivity**
 - Ion chromatograph for chloride, sulfate etc.
 - Carbon analyzer
- **Avoid high pH fluctuations**
- **Off-site resin regeneration expense minimization**

ACC impact depends on unit type & design:

- **combined cycle**
 - more tolerant of particles and air ingress
 - high pH operation typically simple
- **once-through supercritical**
 - low tolerance for particles
 - impact of leaks on polisher
 - impact of high pH operation on polisher

Conclusions

Steam Cycle Chemistry is an important factor to be considered in the design and operation of power plants with air-cooled condensers.