Chemical Foam Cleaning

of Steam Turbines
What is Chemical Foam Cleaning of Steam Turbines

- A proven chemical cleaning process used to remove unwanted deposits from steam path components using foam as the delivery system
  - Off line procedure
  - No disassembly required
  - Entire process completed in 24 hrs or less
  - Performed on turning gear
Effects Of Deposits On Turbine Blades

- Blades are of an airfoil design for efficiency
- Deposits change the shape of the blade
- Increases the surface area
- Reduces clearance between blades
- Effects the flow across the surface
- Reduces blade efficiency
Primary Superheater Tube Sample
Copper Deposits on HP Nozzle
Copper Removing Solution

- CuSol 1™ (removes copper oxide)
  - Ammonia Bicarbonate
  - Ammonium Hydroxide
- Foaming Agent (surfactant)
- Oxidizer: Hydrogen Peroxide or Gaseous Oxygen
  - Used to convert elemental copper of copper oxide
  - Injected directly into the foam
Typical Cleaning Sample Profile

- Drain sample during steam warming
- Drain sample at start of chemical injection
- Drain samples during chemical stage
Typical Chemical Cleaning Set-up
Pre-engineering study required

- On-site study (2 days)
- Generate site specific cleaning procedure
- Recommend modifications
  - Injection technique
  - Venting of the turbine
  - Sealing of the shaft glands & valve stems
  - Condenser protection
    - Turbine drain isolations
Foam Equipment Required
Foam Exiting Turbine - 360° coverage
Example of Efficiency Change

- After Foam Cleaning
- After Grit Blasting

7 year period

Efficiency [%]

5/90 9/91 1/93 6/94 10/95

Time
Example of Megawatt Increase

After Foam Cleaning

After Grit Blasting

7 Year Period
Questions Please

Thank You For Attending