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Utilizing Reclaim Water in Cooling Tower and Air Scrubber Equipment

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Presentation Outline

- Site Description
- Cooling Tower Overview
  - Equipment
  - Water Treatment
- Reclaim System Description
- Project Timeline and Improvements
- Controls and Programming Information
- Questions

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Site Description – Sandia National Laboratories

- Located on Kirtland Air Force Base in Albuquerque, NM
- 952 buildings totaling 6.9 million gross square feet
- Desert climate with an average rainfall of 9” per year

- Water source is Santa Fe group aquifer system
- 35% of Sandia water consumption is due to Ultra Pure water production
- 25% of Sandia water consumption is due to Cooling

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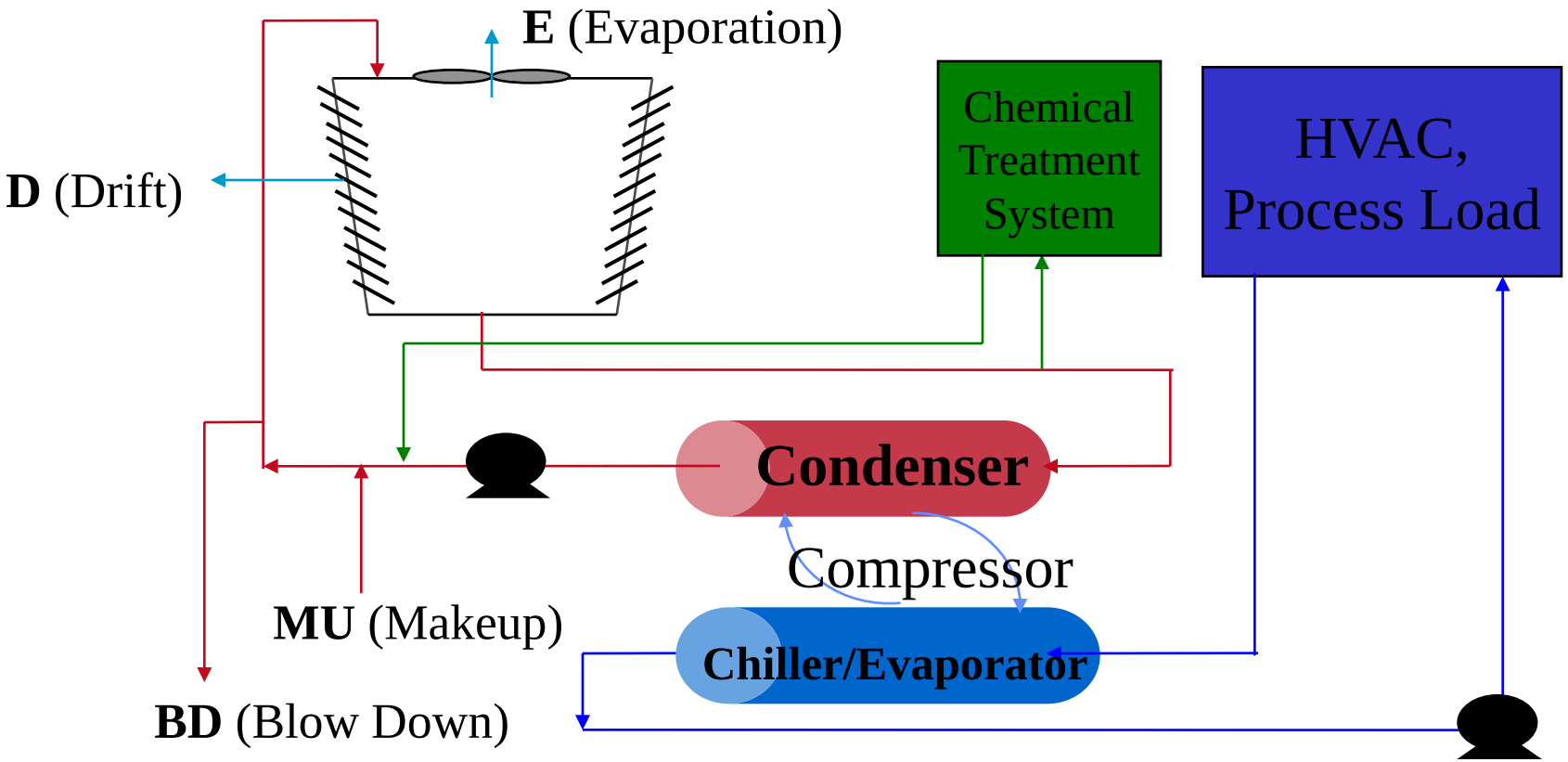
Cooling Tower System

- **Basic System**



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Cooling Tower Treatment

- **Scaling**
  - **Cycles of Concentration**
    - C = (E+D+B)/(D+B)
      - C= Cycles of Concentration
      - E= Evaporation flow
      - D= Drift Loss flow
      - B= Blow Down flow

OR

- C= $\frac{\text{Concentration in CT (Hardness, Silica, etc.)}}{\text{Concentration in MU Water (Hardness, Silica, etc.)}}$

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Cooling Tower Treatment

- **Biological Growth**
  - **Reclaim water needs to be treated with a biocide due to the increased biological activity**
  - **Monitor Biological Activity**
    - **Regular Sample Analysis (Dip Slides)**
    - **Visual inspection of fill for algal growth**
- **Corrosion**
  - **Use of proper chemical and controls minimizes corrosive effects of reclaim water**
  - **Monitor Corrosion**
    - **Install Coupon Rack and LPR Probe**
    - **Regularly inspect Condenser tubes**

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Reclaim System

- 858 North
  - Utilized for Process and Cooling Loads
    - Serves 12 Buildings
  - 3 Air Scrubbers and 4 Cooling Towers
- 858 J Central Utility Building (CUB)-
  - Utilized for Process and Cooling Loads in Process and Cooling Loads
    - Serves 2 Buildings
  - 5 Air Scrubbers and 5 Cooling Towers
- 899A Cub
  - Utilized in Process and Cooling Loads
    - Serves 2 Buildings
  - 4 Cooling Towers and Water Feature

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Project Timeline and Improvements

- Initial Project Start Up-1999
- Infrastructure Connecting Air Scrubbers Installed- 2002
- Reclaim System Shutdown for Chiller Slurry problems 2005
- Chemical Mechanical Polishing (CMP) System Installed- 2007
- MESA complex is constructed and connected to reclaim system- 2007
- Bicarbonate Injection System Enhancement Installed-2008

Project Start Up 1999

- Installed a pump in Acid Waste Neutralization (AWN) Room
- Installed controls for pump:
  - Pump to tanks if conductivity is below 1100 μS/cm
  - Storage Tank level controls
- Installed three 20,000 gallon storage tanks
- Connected gravity feed line from storage tanks to cooling tower sump
- Installed control valves to use well water make up as a backup supply

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Connect Air Scrubbers 2002

- Piping to connect 3 air scrubbers to reclaim system is installed
- Operation controls established for specific processes that cause an excess of Fluoride to enter into the AWN.
- Air Scrubbers use approximately 5 gpm or approximately 2.6 million gallons per year

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Chemical Mechanical Polishing (CMP) System Installed 2007

- CMP waste separation unit is installed
- 5 CMP polisher tools utilizing slurry are piped into the CMP system
- Control Valves installed:
  - If pH is in the allowable range discharge to sanitary sewer system
  - If pH is to be adjusted then send to AWN system and bypass reclaim system for 4 hours after last of slurry is pumped into AWN

MESA Complex Constructed 2007

- Large project - >$300 Million
- 2 New Central Utility Buildings (CUBs) built
  - 858J CUB: 5 cooling towers, multiple chillers, 1 heat exchanger
  - 899A CUB: 4 cooling towers, multiple chillers
- Reclaim water used for both CUBs, scrubbers, and water feature

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Chemical Mechanical Polishing Upgrade 2008

- Slurry contaminated water that requires slight pH adjustments are adjusted utilizing a bicarbonate injection system
- System enlarged to more effectively treat waste stream volume
- The system has not diverted to the sanitary sewer due to slurry contamination since the installation of the upgrade

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Controls Information and Programming

- Conductivity
  - New set point in AWN room:
    - Conductivity > 900 μS/cm: bypass reclaim tanks
    - Conductivity < 700 μS/cm: reclaim sent to cooling tower system
- pH
  - Divert reclaim water unless pH is between 7-8
- Fluoride
  - Divert reclaim water if fluoride is above 15 ppm for more than 30 minutes; bypass reclaim until fluoride < 10 ppm

Reclaim Water Usage

- **Water Savings Due water Reclaimed**

Year	Water Savings in Gallons
1999 to 2004	9,518,000 per year
2005	2,873,000 (Construction)
2006	Under Construction
2007	12,530,000
2008	25,209,294

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Questions

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