BALTIMORE CONVENTION CENTER

► VEOLIA NORTH AMERICA’S CHILLED WATER PLANT #1

► STAKEHOLDERS
  • Veolia Energy North America
  • Baltimore Convention Center
  • City of Baltimore
  • MSA
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► VEOLIA NORTH AMERICA – BALTIMORE

• 4 CHILLED WATER PLANTS
• 10 MILES OF DISTRIBUTION PIPING
• 50 CUSTOMERS
• 12 MILLION SQUARE FEET
• 33,000 TONS OF CHILLED WATER CAPACITY
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Basics of New Plant

- Plant Chilled Water Capacity: 5,400 Tons
  - Chilled Water = 35°F / 52°F  → (17°F DT)

- Plant Ice Building Capacity: 3,660 Tons
  - Chilled Water = 20°F / 32°F  → (17°F DT)
  - Ice Building > 48,000 Tons Hrs in 14 Hrs

- Ice Melt Mode Generates an Additional 4,600 Tons and Totals 10,000 Tons

- 25% Ethylene Glycol

- (3) 1,800 Ton Chillers (CHW Mode)
- (9) Cooling Towers
- (4) 3,700 GPM Condenser Water Pumps
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► EXISTING PLANT
  • REPLACE EXISTING AGING CHILLED WATER GENERATING EQUIPMENT
  • EXISTING COMPONENT SYSTEM:
    ▪ (6) 900 TON REFRIGERANT (R22) COMPRESSORS
    ▪ (3) 1800 TON EVAPORATORS (STACKED)
    ▪ 5400 TONS OF REFRIGERANT CONDENSERS

► EFFICIENCIES (ICE BUILDING)
  • OLD PLANT: 1.4 KW/TON
  • NEW PLANT: 0.85 KW/TON
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► CHALLENGES
  - SPACE
  - SOUND / VIBRATION
  - SITE ACCESS
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- LIMITED SPACE FOR EQUIPMENT
- MAINTENANCE / CLEARANCE / EGRESS

- CHILLERS
- TOWERS
- PUMPS
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- Chillers - Limited space for egress / maintenance / clearance

  - Elevated platform and wall openings to facilitate tube pull

  - Additional height required a roof pop up above chillers for piping and maintenance
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► CHILLERS - LIMITED SPACE FOR EGRESS / MAINTENANCE / CLEARANCE

• REMOTE MOUNTED COMPRESSOR STARTERS

• ALTERNATING ORIENTATION FOR SHARED NEC CLEARANCE

• INDUSTRIAL EQUIPMENT ACCESS
CHILLERS - LIMITED SPACE FOR EGRESS / MAINTENANCE / CLEARANCE

- REMOTE MOUNTED COMPRESSOR STARTERS
- ALTERNATING ORIENTATION FOR SHARED NEC CLEARANCE
- INDUSTRIAL EQUIPMENT ACCESS
Cooling Towers

- Replace existing evaporative condensers

- New COUNTER FLOW Cooling Towers
  - Allow more GPM / SQ FT
  - Still Vertically Limited due to sight lines
  - Free area required around towers

- Egress / Access
  - Platforms
  - 30" condenser water piping
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PUMPS
- NPSH_A / NPSH_R

- 1800 RPM => 23 Ft NPSH_R
- 1200 RPM => 4 Ft NPSH_R

\[ NPSH_A = H_A \pm H_Z - H_F + H_V - H_{VP} \]
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CHALLENGES WHEN DESIGNING A CENTRAL PLANT WITHIN A SENSITIVE MEETING SPACE.

- NOISE / VIBRATION
  - Establish a baseline with testing
- VIBRATION ISOLATION
- STRUCTURAL ANALYSIS
- LOW NOISE FANS
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Schedule

- **Prepurchase Long Lead Items**
  - Chiller
  - Cooling Tower

- **Chilled Water Plant #1 is Required for Peaking**
  - Plant could only be shut down after September and had to be up and running by April of the following year.

- **Equipment Deliveries Must Be Permitted / Coordinated with the City**
  - Site Access
    - Timing
    - Weekends Only
  - Multiple Lifts
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► LIFTS
RECAP

- Need to be creative when dealing with tight spaces
- Understanding the maintenance limitations
- Tower Optimization for footprint
- Noise and Vibration
- Restricted site access
QUESTIONS?

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