CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

1. Category - Check one and indicate New, Existing, or Existing Building Commissioning (EBCx)

☐ Commercial Buildings	☐ New	☐ Existing or	☐ EBCx
Institutional Buildings:			
☐ Educational Facilities	☐ New	☐ Existing or	☐ EBCx
☐ Other Institutional	☐ New	☐ Existing or	☐ EBCx
☐ Health Care Facilities	☐ New	☐ Existing or	☐ EBCx
☒ Industrial Facilities or Processes	☒ New	☐ Existing or	☐ EBCx
☐ Public Assembly	☐ New	☐ Existing or	☐ EBCx
☐ Residential (Single and Multi-Family)			

2. Name of building or project: Zoetis, Chiller Expansion project

City/State: Kalamazoo, MI

3. Project Description: Stand-alone chiller plant supporting pharmaceutical manufacturing

Project Study/Design Period: 11/2015 (Begin date (mm/yyyy)) to 04/2018 (End date (mm/yyyy))

Percent Occupancy at time of submission: 100%

4. Entrant (ASHRAE member with significant role in project):

a. Name: Doyle (Last) Daniel (First) L. (Middle)

Membership Number: 192578

Chapter: Illinois

Region: VI

b. Address (including country): Grumman/Butkus Associates, 820 Davis St., Suite 300

Evanston (City) IL (State) 60201 (Zip) USA (Country)

c. Telephone: (O) 847-328-3555 d. Email: ddoyle@grummanbutkus.com

e. Member's Role in Project: Principal-in-Charge

f. Member's Signature: Dan Doyle

Digitally signed by Dan Doyle
DN: cn=Dan Doyle, o=Grumman/Butkus Associates, ou, email=ddoyle@grummanbutkus.com, c=US
Date: 2018.09.21 11:02:04 -05'00'

5. Engineer of Record: Dan Doyle and Tim Jendrycki, Grumman/Butkus Associates

By affixing my signature above, I certify that the information contained in this application is accurate to the best of my knowledge. In addition, I certify that I have discussed this entry with the owner and have received permission from the owner to submit this project to the ASHRAE Technology Awards Competition.

ZOETIS CHILLER PLANT, ENGINEERING STUDIES AND DESIGN

Project Narrative

Zoetis, an animal pharmaceuticals firm, was created as an independent company through a 2013 spinoff of a Pfizer division. A Pfizer facility in Kalamazoo, MI, became a key manufacturing site for Zoetis. This site has since undergone critical upgrades to support Zoetis' current and future goals.

The submitting engineering firm performed an analysis in 2015 to help the client prioritize improvements. A new chilled water plant was selected as the primary project, needed to allow development of new oral solid dosage (OSD) manufacturing lines, as well as additional planned production and packaging operations.

A single-story, 7,500-square-foot, steel-framed building now houses the new plant, with three water-cooled chillers and room for a fourth future chiller. Site capacity was upgraded from 850 to 1,500 tons of cooling. New cooling towers were installed adjacent to the building, which also holds water-distribution pumps, dedicated switchgear, and a new process compressed air plant. Chilled water system piping was interconnected to existing distribution, which was converted from primary/secondary to variable primary.

The scope also included heating and ventilation for the building and its interior control room, and a restroom. Site electrical distribution was upgraded to 15kV to accommodate expected production upgrades.

Energy Efficiency

The submitting firm analyzed four design options, including air-cooled chillers; constant-speed water-cooled centrifugal chillers; variable-speed water-cooled centrifugal chillers; and premium efficiency variable-speed water-cooled centrifugal chillers. The engineer also considered the pros and cons of putting new chillers inside an existing facility or building a new stand-alone plant.

The premium-efficiency option with magnetic bearing centrifugal chillers in a stand-alone plant was ultimately selected for its life cycle benefits (lowest LCC) and its ability to maximize existing production space.

The chillers have a wide operational range for improved performance during high demand, low demand, and transitional seasonal conditions. Dry coolers were also installed for "free-cooling" during cold weather.

Cooling tower fans are variable speed with automatic switch over to bypass at full speed, eliminating drive losses.

Pipe sizes for condenser water and chilled water were selected for conservative flow velocities and low pressure drop and exceeded ASHRAE 90.1 guidelines.

The compressed air system utilizes air-cooled compressors that reject heat into the building during the winter months for building heating.

LED lighting with motion controls was used throughout the new building.

Indoor Air Quality

This project does not directly impact the indoor environment in the facilities served.

Innovation

The chillers were bid directly to multiple manufacturers, and chillers were selected and pre-purchased based on lowest life cycle cost. Life cycle cost analysis included hourly energy modeling of the site chilled water demand and chiller performance at all operating conditions.

A process-grade control system was installed for the new chilled water system and building control. Programming and graphics include an “energy dashboard” for trending each power-consuming element and displaying total power consumed in kW and kW/ton. Multiple control algorithms have been programmed to test different condenser water temperature strategies to optimize annualized efficiency.

The design of the building included a unidirectional sloping roof, allowing for natural removal of internal heat. The ventilation controls include an “open windows” mode of operation so ventilation can be accomplished without powered exhaust fans.

Operation & Maintenance

The project consolidated two separate chilled water systems into a single system with centralized control and reduced the total number of pumps from 11 to six. The new chilled water plant was sited in a central location close to the maintenance office, allowing easy access.

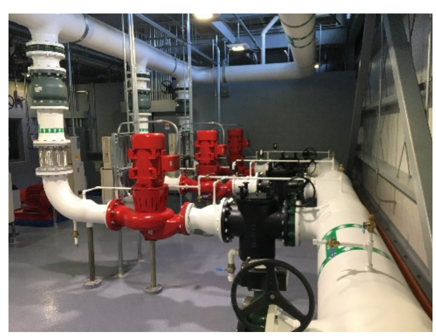
The “free-cooling” system with dry coolers eliminates open cooling tower operation in freezing weather and associated icing issues and outdoor maintenance.

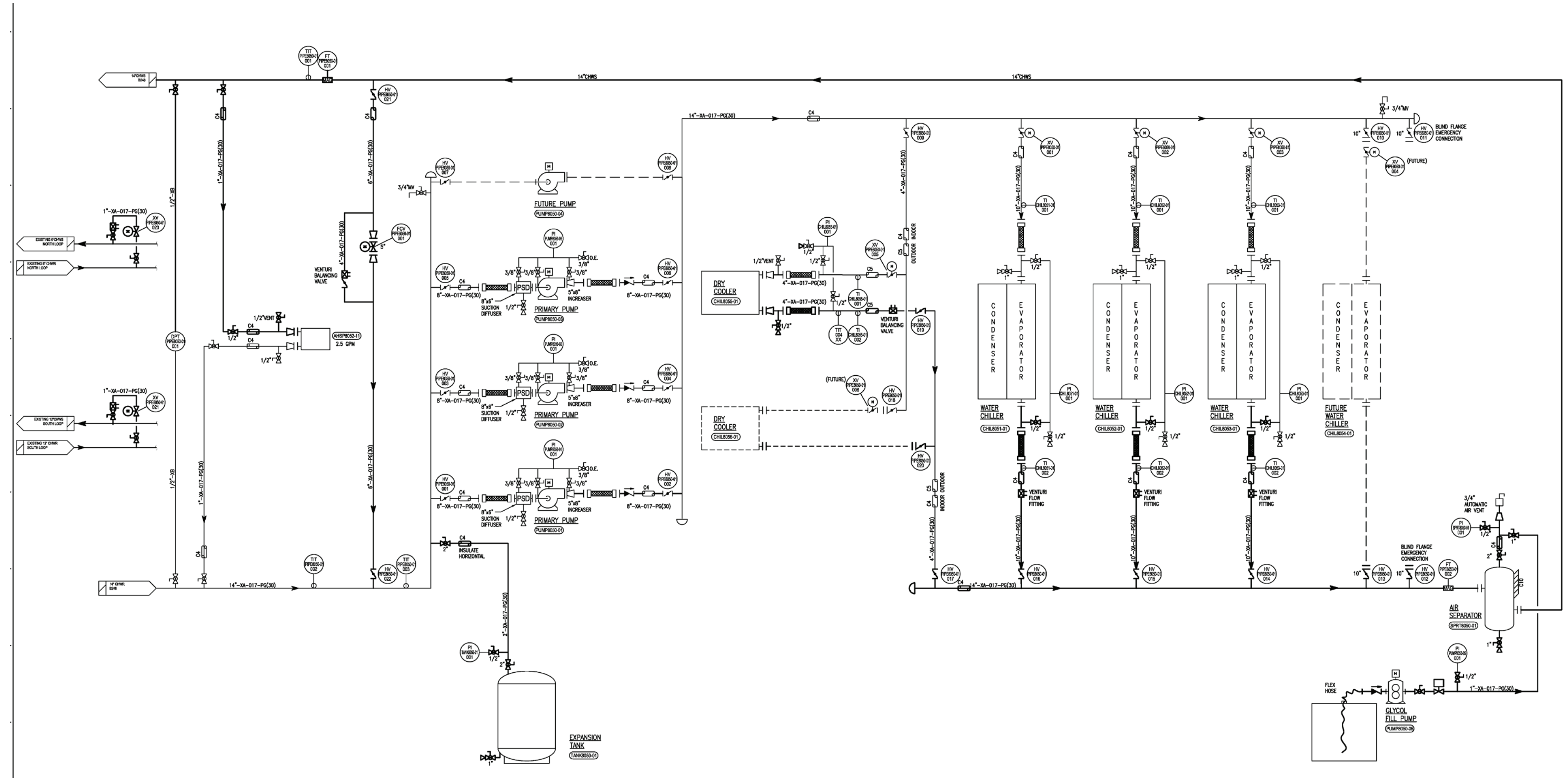
Cost Effectiveness

Projected savings in electricity are predicted to be 33% annually. In addition, maintenance cost savings are estimated at about 40% a year.

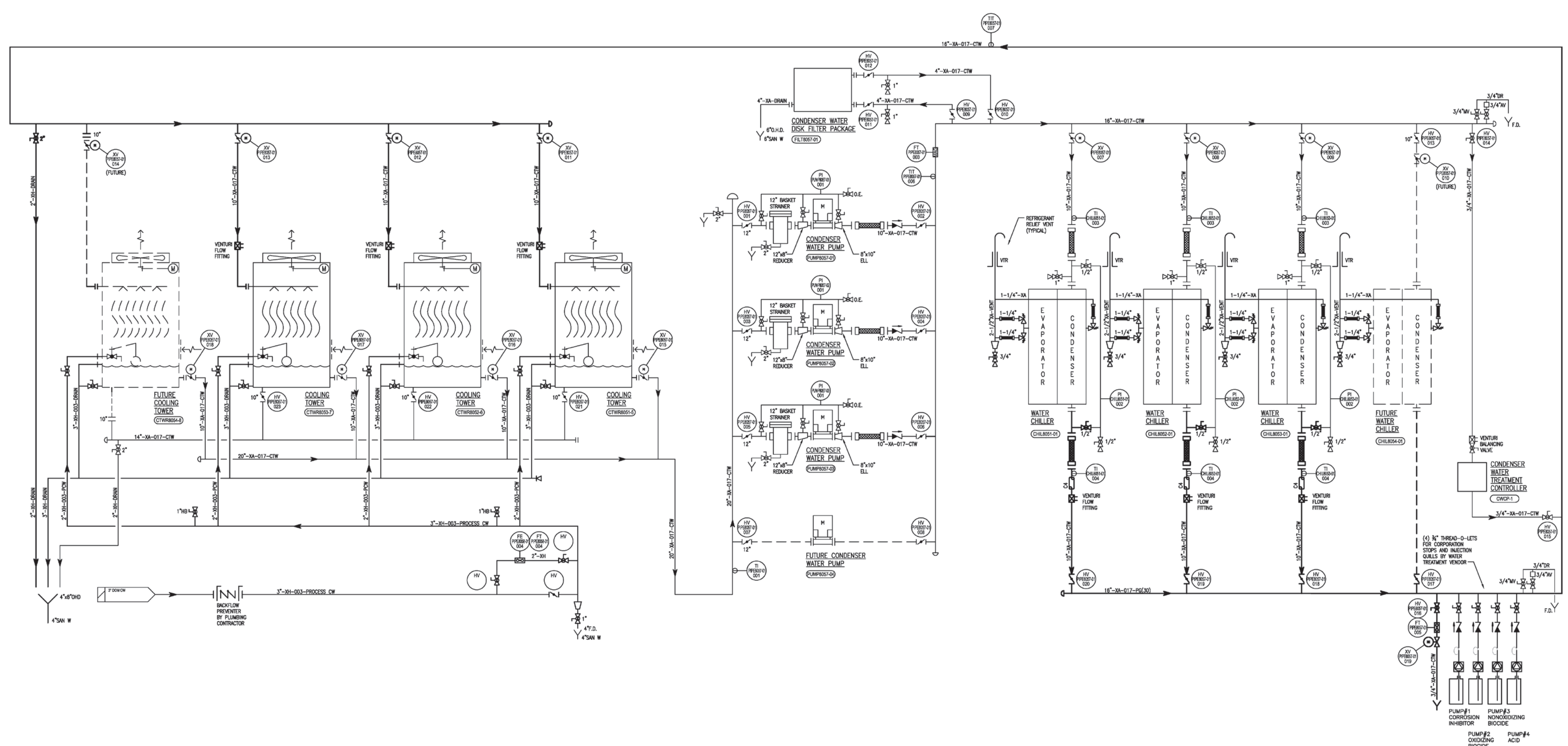
Environmental Impact

Aging chillers that used outdated refrigerant (R-22) were replaced with more modern units using compliant R-134a.





Left: HVAC Flow Diagram, Chilled Water System Piping



Left: HVAC Flow Diagram, Condenser Water System Piping