

Example Chilled Water System

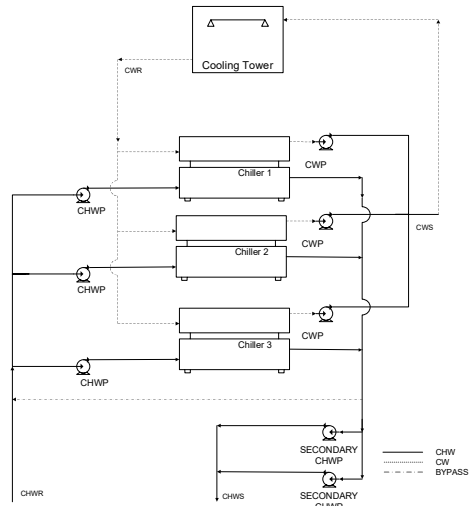
- You have been tasked with a Chilled water system assessment at a food and beverages plant
- The plant Utilities Manager & Utilities Engineer are available to provide information to you about the plant
- Open CWST and input available plant data
- Identify missing data and determine appropriate plant source for this data
- List possible Chilled water system improvement opportunities that you would like to investigate during the energy assessment



Facility Description

- The plant / facility is a large Food & Beverages plant located in the St. Louis, MO area
- The system selected for the energy assessment provides chilled water for process, packaging, air-conditioning plant areas and warehouse storage
- The plant operates a 3-shift per day operation, 8-hour per shift and runs all year round
- Possible shut-downs are planned for periodic maintenance activities
- The Plant Engineering Manager and the Plant Engineer/Maintenance person are available to answer questions and complete the CWST software tool

System Schematic



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Chilled Water System Information

- The facility is 15-20 years old
- It has been a while since an energy assessment was done on the system
- Plant personnel do keep a tab on annual spend / budget for the operations
- The chilled water system has been upgraded with some dashboards and controls for operator / user interface
- Overall, there is a consistent demand on the chilled water system but system is not close to any capacity limitations
- Insulation is generally good but no audit has ever been performed on it
- A maintenance contractor provides regular support (quarterly site visit) to keep the plant in operation without any issues

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Sub-System Information

- Compressors
- Water-cooled condensers
- Chiller barrels (evaporators)
- Cooling tower
- Pumps
 - Primary chilled water
 - Secondary chilled water
 - Condenser Water



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Sub-System Information (Compressors)

- The system is relatively old and maintenance is done on an as-needed basis
- There are two centrifugal compressor chillers – they are run to collect equal operating hours annually but there are times when they are both operating at high loads (>60%)
- Manual operator logs indicate load levels – guide vane positions
- The compressors have capacity control with guide vanes but don't have much instrumentation on the compressors per se
- Compressors are believed to be running in their expected operating ranges



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Sub-System Information (Condensers)

- Maintenance is done on an as-needed basis
- Sometimes with condensers and during the high-load season - scaling does occur in the tubes
- Temperature monitors exist on the supply and return water and manual operator logs provide the information, if required
- A tab is kept on the wet-bulb approach temperature periodically and the maintenance contractor keeps a record of that during the visit



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Sub-System Information (Evaporators)

- Since the system is mostly a closed loop on the chilled water side, maintenance is done only on an as-needed basis
- No issues with evaporator operations and it meets process setpoints always
- Instrumentation is fairly limited on the evaporator but inlet and outlet temperatures and pressure of the refrigerant is measured
- Manual operator logs to provide the information, if required
- A tab is kept on the approach temperature



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Sub-System Information (Cooling Tower)

- The system is relatively old and no upgrades other than basic maintenance and fixing flow nozzle heads, basin cleaning, etc.
- No issues with cooling tower operations
- Fans are controlled automatically to meet setpoint
- Water chemistry is maintained by fixed blowdown
- Water outlet temperature, ambient temperature are monitored and periodically checked with wet-bulb temperature
- Manual operator logs record this information and 10-12°F approach to wet-bulb temperature on the cooling tower is very normal



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Sub-System Information (Pumps)

- The primary chilled water and cooling tower water pumps are constant speed electric motor drives
- The secondary chilled water pumps are variable speed drives
- It is not exactly clear as to how many pumps are needed to run based on the cooling load but enough pumps are run so that all the chillers are satisfied with water flow all the time when they are operating and so also the end-users



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