Operating and First Costs with Primary, Primary/Secondary (Buildings or Plants), Primary/Secondary/Tertiary and Primary with Booster System

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Chilled Water Distribution System

- Over the years engineers have designed many different ways to distribute the chilled water system
  - Primary Pumping
  - Primary Secondary Pumping
  - Primary Secondary Tertiary Pumping
  - Primary pumping with booster system
  - Push Pull pumping
Chilled Water Distribution System

Many of the distribution system are copied from Hot water Distribution system.

- What is the optimum design that meets our mission of
  - Safe
  - Reliable
  - Sustainable
  - And Cost effective infrastructure
- Let’s review it together
Chilled Water Distribution System

What are the key issues in designing and operating chilled water distribution system

- Remember…… The major difference between Air and Water that water can not be

- Subsequently for all methods accept for primary pumping and primary with booster, supply and return chilled water mixes based on the pumping flow for each loop
Primary only Pumping System

Primary Pump
Primary / Secondary Pumping System

Primary Pump
Secondary Pumps
Sub Stations at buildings (TYP)
Primary with Booster Pumping System

- Primary Pump
- Booster Pumps
Basic 1970’s Era Chiller Plant Design

Chiller → Decoupler Line → Building Loads

Primary Pump → Secondary Pump
Current Design Used on Many Large District Chilled Water Systems

- Chiller
- Primary Pump
- Secondary Pump
- Decoupler Line
- Energy Transfer Station
- Building Pump
- Building Loads
Modern Variable Volume Primary Chiller Plant Design

Chiller → Variable Speed Primary Pump → Building Loads

Chiller

Building Loads

Variable Speed Primary Pump
Improve Chilled Water $\Delta T$

- **Primary CHW Pumps**
  - PH 4&5: 80 FT, 60 HP
  - PH 6B: 100 FT, 100 HP
- **Chillers**
- **Secondary CHW Pumps**
  - PH 4&5: 200 FT, 400 HP
  - PH 6B: 125-180 FT, 100-250 HP
- **Bypass CHWS&R**
  - To / From Load

Temperatures:
- 54°F
- 42°F
- 46°F
- N.C.
Distribution System Summary

- Only variable primary pumping system with or without booster pump is the optimum system
  - Does not allow mixing of water causing increase in chilled water supply temperature or reducing chiller
  - All the pumping controls remains with the Central plant
  - Simple controls
  - Ensures no loss of chiller operating capacity
  - Allows chillers to run at efficient operating point
  - No valuable space is required from buildings
Thank You

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