New PHE applications in construction & HVAC
Static head isolation
Static Head isolation

- A temperature gradient present in different levels
- Different sizing of AHU / FCU required
- Reduces pressure head in piping
Static head isolation
Static Head isolation

- No temperature gradient, Same parameters for HVAC
- Consistent temp at all levels
- High pressure rating of piping, valves
District heating / cooling
District heating / cooling

- Plate Heat Exchanger part of ETS in each building / station
- Heat transferred from the central utility
- Separate energy meters in individual buildings / stations.
Cooling Tower Isolation
Cooling Tower Isolation

- Cooling tower water prone to ingress of impurities
- Risk of fouling / clogging of condensers
- Fouled condenser reduces chiller efficiency
- Plate heat exchanger Installed to isolate cooling tower and condenser
- Plate Heat Exchangers are easily cleaned
Water from Cooling Tower can foul a lot
Case for Cooling Tower Isolation

Additional Energy Cost required due to Fouling in Condenser Tubes in 500 TR chiller

This data is based upon actual kilowatt per ton data as a function of the fouling factor (hr.ft\(^2\).\(^{\circ}\)F/Btu) by a chiller manufacturer.
Cooling Tower Isolation

- Single pass construction desired for easy dismantling.
- Use 1 bar pr. Drop / 50 Pa shear stress at wall for low fouling
- Prepare for cleaning-in-place
- The materials are normally AISI 316/NBR.
- Can be installed with central chiller units.
- Can be installed using individual unitary heat pumps
A case for “free cooling”
• CHW supply temp can increase with reduction in ambient temp

• CHW supply temp can further increase with reduction in load
Chiller bypass during moderate temp
“Free Cooling”
Chiller bypass during moderate temp
“Chiller – Free Cooling”

• AHUs designed for dual duty

• Peak summer – full load, lower CHW temp

• Cold / Moderate weather – less load, higher CHW temp

• Condenser bypass during moderate temp

• Reduced power consumption

• Good savings when favorable wet bulb conditions
Colony Square, Atlanta

57% Energy Savings,
Full Payback < 18 Months
“The $49,000 original installed cost of the system will be recovered in about 8.4 months. The series piping system for the SUPERCHANGER unit increased the savings by 15-20% over a parallel set up.”

(Customer feedback)
Washoe Medical Center, Reno

- The SUPERCHANGER unit was designed to replace the existing steam-operated liquid absorption chiller for eight months of the year, thereby saving the hospital about $250,000 in avoided annual natural gas outlays.

- The liquid absorption chiller was originally operated year-round to produce chilled water for cooling the facility. It used approximately 6,000 pounds of steam per hour to produce 320 tons of air conditioning. The hospital paid as much as $50 an hour for the natural gas to operate the chiller.
Isolation + Chiller Bypass

- Condenser bypass during moderate temp
- Reduced power consumption
- Good savings when favorable wet bulb conditions
- Also protects condenser from contaminated cooling tower water
Natural Source as cooling water

- Cooling tower replaced by natural source
- Ideal for moderate temp
- Reduced power consumption
- Good to protect against biological fouling, solids
Thermal storage

- When air conditioning load is low, such as at night
- When air-conditioning load is highly non-uniform
- When differential power tariffs during day / night
- Operate chiller at optimum / maximum capacity
- Utilize the extra chiller capacity during low load
- Cool water in a storage tank for use later when load is heavy
- Water / glycol used in these storage tanks
Thermal Storage

Diagram showing a heat exchanger system with components labeled as Chiller, Condenser, Evaporator, Plate Heat Exchanger, Chilled Water Storage Tank, and Air Handling Units.
Thermal storage – multiple strategies

Full Storage Isolation

Partial storage / Load

Partial-storage load: demand-limiting
Ice Storage
Ice storage systems

- The latent heat of fusion is much larger than specific heat
- Flow rates and thus also pipe dimensions can be reduced
- The LMTD is increased (Melting without temp change)
- Better storage possibilities
- Static systems:
  - Ice formation and melting without physical removal
- Dynamic system
  - Ice harvested, stored energy recovered by circulation.
  - Ice in form of tubular ice / ice flakes / ice slurry
Domestic Water cooling / heating

- Very high efficiency
- Can be used in heating / cooling mode
- Waste heat can be used.
Waste heat recovery from condenser water

- Condenser bypass during moderate temp
- Reduced power consumption
Solar Collector fluid isolation

- For closed loop solar collector systems
- For Non-freeze fluids as well as high boiling liquids
- Change of fluid inexpensive
- Plate Heat Exchangers ideal choice due to high heat transfer.
- Close temp approach possible.
Geo-thermal heating

- Ground water is generally dirty and corrosive.
- Plate Heat Exchangers, ideal with corrosion resistant plates
- Low fouling tendencies reduce maintenance
THANK YOU