INTEGRATED ENGINEERING SOLUTION

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Thermal Storage Tank

Cooling systems within residential and commercial buildings assume majority of the total building electricity consumption, up to about 70%. Therefore, cooling systems have great energy-saving potentials. Due to influences of the ambient temperature, occupancy rate, etc., the cooling load of a building is characterized by its discontinuation and instability during a day. In addition, the intermittent cooling load places stress on the cooling system, and causes energy inefficient. These problems can be mitigated with IES Thermal Storage Tank by moderating the peak load and minimizing the corresponding cooling load fluctuations.

Thermal Storage Tank operates like a battery. Instead of storing electro-lytes, it stores thermal energy in the form of chilled water. During off-peak hours, the chilled water enters both the Air Handling Unit (AHU)

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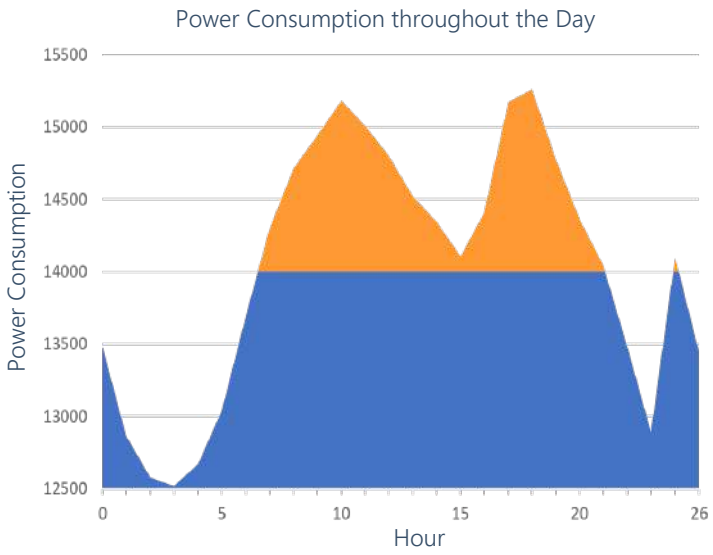
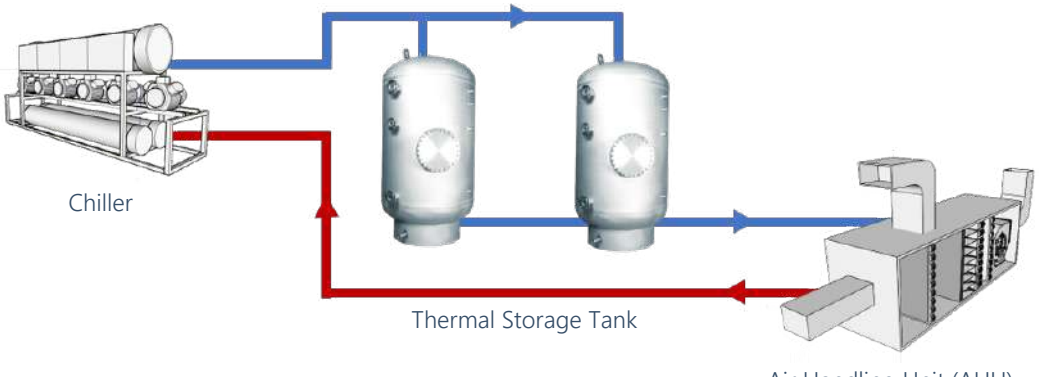
and the Thermal Storage Tank. While during peak hours, the cooling load is shared among the chiller plant and the thermal storage, as the chilled water is discharged. This approach minimizes the electricity consumption fluctuations of the chiller plant.



In addition, the Thermal Storage Tank acts as a buffer tank for the cooling system, which is often adopted by data centers to meet stringent environmental restrictions. During data center operations, temperature and humidity must be maintained at a certain level, which requires cooling system redundancies and back-ups. The Thermal Storage Tank is installed in series with the chiller plant, so that the chilled water is supplied to the AHU through the Thermal Storage Tank. The benefit of the configuration is that when the chiller plant is turned off, i.e. chilled water supply cut-off; the chilled water stored in the thermal storage can serve as back-up. The back-up time is often set as the restart time required by the chiller plant, which also determines the size of the thermal storage tank.



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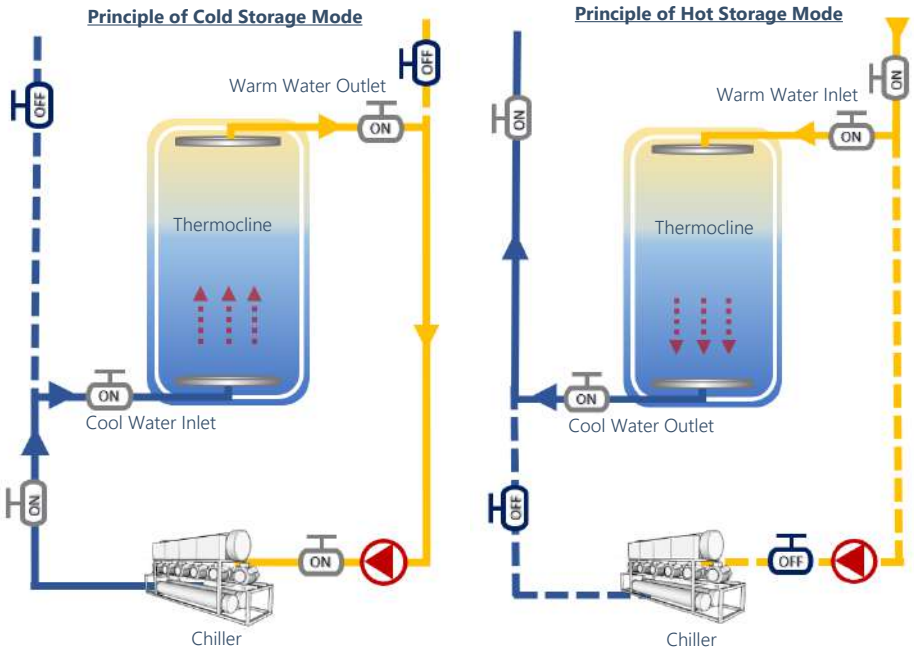
When the chiller plant is turned off, the chilled water is discharged from diffusers at the bottom end of the Thermal Storage Tank, while the high-temperature return water is charged through the diffusers at the top end. Due to the density difference of the chilled water and high-temperature return water, natural stratification may be achieved. The thermocline in the Thermal Storage Tank can well separate the high-temperature return water and the low-temperature chilled water to fully utilize the thermal energy stored. IES has designed a unique diffuser to enhance the thermal stratification in the Thermal Storage Tank. With the unique diffuser, the water flow velocity at the opening can be controlled. Thus, the disturbance effect on thermal stratification is minimized and a thinner thermocline within the Thermal Storage Tank is kept.



The IES unique diffuser in the thermal storage tank guarantees the laminar flow in the tanks and limits the Froude Number to be within 1. Also, the buffer plates are installed at different heights of the tank to minimize the mixing between the chilled water and the high-temperature return water. Temperature data logging system may also be equipped at different heights for purposes of performance monitoring and data collection.

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