

SENSIBLE EQUIPMENT COMPANY, INC.

1015 Webster Avenue
Phone: (407) 296-8068

E-Mail: KLE@TRICOIL.COM

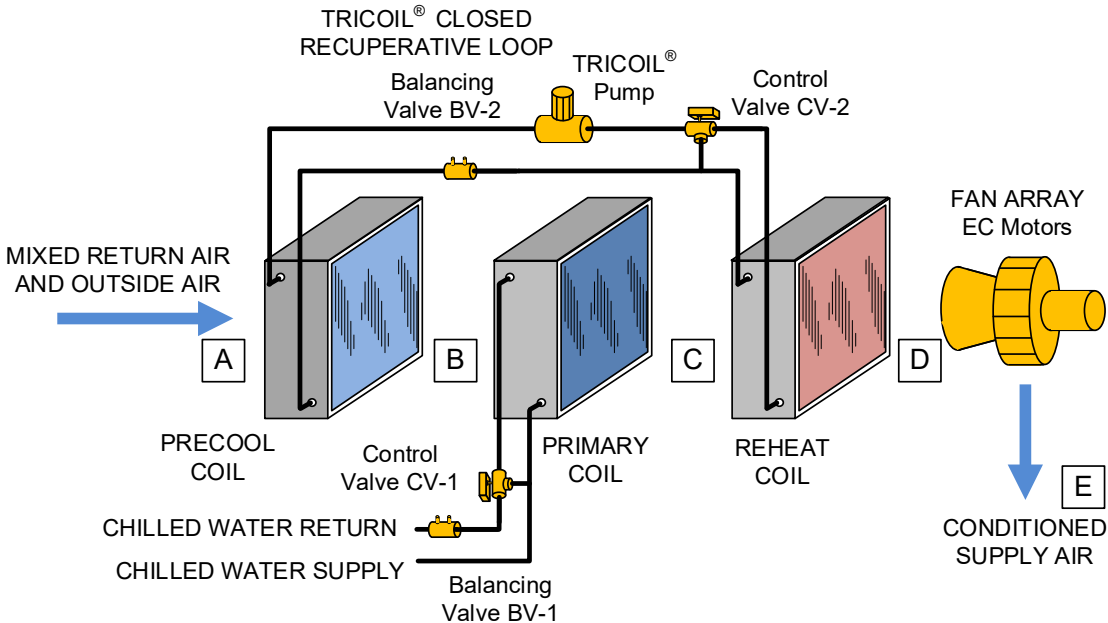
Orlando, Florida 32804
Fax; (407) 217-1607

GENERAL BACKGROUND INFORMATION

TRICOIL® METHOD OF AIR CONDITIONING

The TRICOIL® Method is a cost effective, energy efficient enhancement to the standard air conditioning process for the purpose of improving the indoor air quality through the control of humidity. When appropriately fitted, the TRICOIL® method also provides control of new energy for preheat and supplemental reheat. The TRICOIL® method does not replace the standard air conditioning process, but enhances the ability of the air conditioning system to respond to changes in the dehumidification requirement. For this reason, the TRICOIL® method is ideal for use in humid climates where humidity control is imperative for the wellbeing of the occupants.

The TRICOIL® Method is a recuperative process. That is, through the use of the three-coil series airflow arrangement, the air conditioning air stream is used as both a heat sink (reheat coil) and a heat source (precooling coil). When the TRICOIL® Method is operating in a closed loop manner, the heat transfer from the precooling coil is equal to heat transfer to the reheat coil. In this manner, by transferring heat from the air stream, the precooling coil recuperates the heat necessary for the heat transfer to the air stream by the reheat coil.

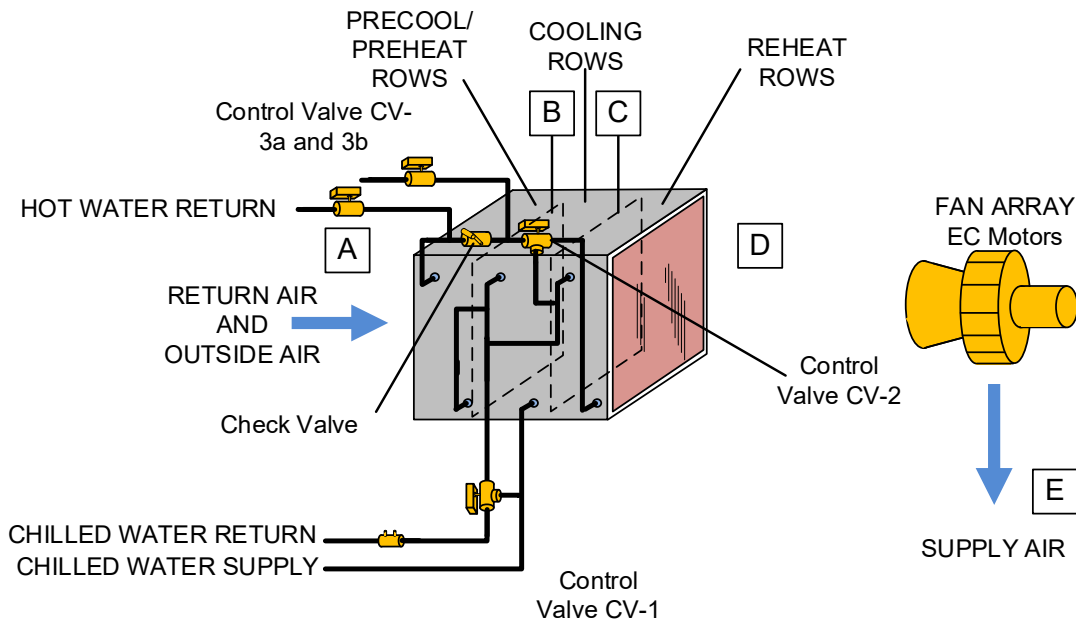


This is not merely a heat recovery process. The heat transfer is accomplished around the main cooling coil. All of the heat transfer to the reheat coil is from the precooling process. The precooling reduces the cooling required of the chilled water coil and subsequently reduces the cooling required from the chilled water plant; an energy saving process. Heat recovery is not a function of this process. The heat used for reheat is not a traditional form of heat recovery

The total cooling of the TRICOIL® configured air conditioning system is the cooling provided by both the precooling coil and the primary cooling coil. However, the primary cooling system, be it chilled water or direct expansion cooling, is sized to the requirements of the primary coil only. The precooling effect of the TRICOIL® Method may significantly reduce the primary cooling required. In this manner the size of the main chilled water plant or the size for the condensing unit may be reduced, resulting in a first cost savings and operating cost savings. It is important to study the coincident cooling and reheat requirements prior

to selecting the primary cooling equipment. Only the heat transferred from the precooling coil at peak total cooling operation can be used to reduce the size of the primary cooling coil. Peak reheat requirement typically does not correspond to peak total cooling requirements. In some applications, there is no reheat required at the time of peak total cooling. In this instance there would be no credit taken for precooling when selecting the size of the primary cooling system.

A special condition of a chilled water system has the chilled water share with the primary and precooling coils. This optimizes the size of the coil. This can be made even more efficient by merging all three coils into one. The fin sheets are continuous through the entire coil. The combination coil is specially circuited for all three functions; precooling, primary cooling and reheat. The pressure in the chilled the chilled water supply is used to flow water though all coil circuits. A booster pump may be added when the chilled water supply pressure is insufficient to achieve desired flow



Water is used as the heat transfer medium of the TRICOIL® Method. The use of water has several benefits. No refrigerant other than that required by the primary cooling system are required. The TRICOIL Method works with standard hot water heating or heat recovery systems. The hot water heat can be used in the precooling coil for a preheat function. This is useful for cold climate application where preheat is used for freeze protection. The hot water can be used in the reheat coil to supplemental heat transferred from the precooling coil. This is beneficial for 100% outside air systems and similar cases where reheat is needed alongside cool entering air, which otherwise limits available reheat.

The TRICOIL® Method can be applied to any air conditioning system including systems requiring 100% outside air. 100% outside air systems may be selected for direct room temperature and humidity control or they may be selected as preconditioning means where the TRICOIL® configured 100% outside air unit is used in combination with multiple recirculation air unit. For additional information on the TRICOIL® Method applications visit our web site at www.tricoil.com or www.tricoilgov.com.

This is how the TRICOIL® Method works:

- 1 Precooling: Mixed or 100% outside air enters the precooling coil. The air is used as a heat source. Cool water in the precooling coil increases in temperature as the air decreases in temperature. Depending on the entering air conditions, moisture may condense out of the air stream in the precooling coil. For most applications a drain pan should be provided for the

precooling coil. The water that is warmed in the precooling process is transferred by a piping system to the reheat coil.

- 2 Primary Cooling: The air leaving the precooling coil enters the primary cooling coil. The primary coil is sometimes called the driver coil because this coil "drives" the recuperative process. Without the operation of the primary cooling there would not be temperature differential to drive the heat transfer between the precooling coil and the reheat coil. The primary cooling process may be chilled water or direct expansion. Heat pump applications have also been used.
- 3 Reheat: The air leaving the primary coil enters the reheat coil. The warm water that is transferred from the precooling coil is used as a source of heat for the reheat process. The water decreases in temperature as the air stream increases in temperature to satisfy the dehumidification requirements. The water, cooled by the reheat process, is transferred back to the precooling coil by the piping system to complete the recuperative heat transfer.
- 4 Exhaust Air Heat Recovery: An optional exhaust air heat recovery coil may be used to provide preheat, precool and/or supplemental reheat for dehumidification depending on the specific application...
- 5 TRICOIL[®] Loop Pump(s): The pump provides the water flow from the precooling coil to the reheat coil and to the heat recovery coil when provided. Pump operation is specific to individual project requirements. The pump can operate continuously or can be cycled on and off on demand for reheat. The water flow rate to the reheat coil can be modulated through variable pump speed, or by a reheat coil by-pass valve. Refer to the operating sequence for the specific operation. Pump maybe eliminate if there is sufficient pressure in the chilled water supply and the alternate piping method is applied.
- 6 Primary Heating: The TRICOIL[®] Method is often used to provide space heating. Hot water for heating can come from a central plant or from a locally mounted hot water heater. Instantaneous water heaters are typically used for locally mounted heat. Refer to the project drawings and schedules for the type of hot water heat for this project. All of the instantaneous heaters have integral controls that maintain a fixed leaving heater water temperature when the heater is active. A water flow switch at the heater enables the heater to operate only when there is sufficient water flow through the heater.
- 7 Hot Water Flow: When the locally mounted heaters can accept variable water flow, the TRICOIL[®] pump is often used to provide the water flow through the locally mounted water heaters. This will depend on the water flow and pressure required by the heater. When required, a separate hot water loop pump is used to provide a constant water flow rate in the hot water loop flow. Refer to the project drawings for the type of pump arrangement.
- 8 Heating Hot Water Valve: A modulating hot water valve is used to regulate the amount of hot water that is to be introduced into the TRICOIL[®] loop. The valve will modulate to control the supply air and/or the space air temperature at set point. Refer to the operating sequence for specific operating sequences.

Other considerations concerning the piping system are:

- Piping Systems: The TRICOIL® loop and the heating hot water loop are hydronic piping systems. Water treatment is required as with any other standard hydronic system of the same type and use. In some applications the TRICOIL® Method uses domestic hot water for the primary heating means. If this is the case the loop pipe should be made of copper and the treatment should consist of chlorination in the same manner as the domestic hot water system. If the piping system is open to a heating hot water plant or to a chiller water plant, treat the piping in the same manner as the central plant water is treated. If the piping system is isolated in its own closed loop, treated the system as a standard closed loop piping systems.
- Piping System Pressurization: Pressurization is required to remove air from the TRICOIL® and heating water pipe loop. If the piping system is isolated from the central plant or if direct expansion systems are used, a water supply should be provided to maintain a minimum static pressure on the piping system. A pressure regulating valve, a pressure relief valve, a backflow prevent or, and an expansion tank will be required. If the piping is directly connected to a heating hot water central plant, pressurization is provided by the central plant water supply. If the primary cooling is chilled water pressurization may be provided by the chilled water supply. Provide a single pipe, ¾" diameter from the chilled water supply pipe to the TRICOIL® loop pipe for pressure control. Provide an isolation valve in this line. Leave the valve open for normal operation.