Reheat systems for commercial buildings

What is a reheat system?
To help keep people productive and comfortable, commercial buildings need heating, cooling, outdoor air for ventilation, and air circulation. A reheat system is one of several types of Heating, Ventilating and Air-Conditioning (HVAC) systems found in commercial buildings. The primary advantage of a reheat system is that it can provide relatively precise control of space temperature and humidity. The main disadvantage is that a reheat system is energy intensive, especially if not optimized. Reheat systems are often found in larger buildings such as offices, institutional buildings, medical facilities and laboratories.

Reheat system air flow types
Reheat systems can be either Constant Volume (CV) or Variable Air Volume (VAV) and use either electric or hot water reheat coils. As the terms suggest, VAV systems vary the air flow rate in response to the changing heating and cooling load of the space, while a CV system maintains a constant air flow rate. A VAV reheat system is expected to be more energy efficient than a constant volume system. However, if the VAV system is running as a constant volume system because of its design, construction or maintenance, it will use more energy.


How a reheat system works
A reheat system works by cooling air to a temperature low enough to condense or remove moisture (for humidity control) and to offset the largest heat gain generated anywhere in the building. The cold (~50°F - 55°F) air is pushed out everywhere in the building and then warmed up throughout the reheat system, depending on the space cooling needs. This system provides the flexibility of delivering different amounts of cooling to different zones at different times.

In many large commercial buildings, different parts of the building will have significantly different cooling needs at the same time of day. For example, during a summer morning after a cool night, the perimeter of a building (the part exposed to the outside walls) may only need a small amount of cooling, while the interior zone containing many people and lots of office equipment and computers may need considerably more cooling.

(Continued on reverse.)
A reheat system consists of ductwork connecting an air handling unit (AHU) or rooftop unit (RTU) to reheat coils dispersed throughout the building. The RTU or AHU houses dampers for mixing air, filters, perhaps a preheating coil, a cooling coil, a fan, variable frequency drives and controls in a common housing. Ductwork leaves the RTU/AHU and is branched and routed to all parts of the building. At each room or zone (a group of rooms) a VAV box and reheat coil deliver the needed temperature and air flow for that space.

**Reheat system life cycle cost considerations**

Hot water reheat systems typically have lower operating costs than electric reheat systems, but are a bit more expensive to install. However, costs can vary over time. A hot water reheat system includes water piping, valves, coils and pumps. An electric system includes circuit breakers, wire and coils.

Example based on the following assumptions:

- 20 reheat coils (3.1 kW and 10,500 Btu/hr)
- 10,000-square-foot to 20,000-square-foot building
- Running at full load of 500 hours per year
- Natural gas cost $0.60/therm; electric cost $0.14/kWh

<table>
<thead>
<tr>
<th></th>
<th>Electric coils</th>
<th>Hot Water Coils</th>
<th>Difference</th>
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<tbody>
<tr>
<td>Purchase cost</td>
<td>$20,500</td>
<td>$28,800</td>
<td>$8,300</td>
</tr>
<tr>
<td>Operating cost</td>
<td>$4,300/yr</td>
<td>$680/yr</td>
<td>$3,680/yr</td>
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In new construction, the payback is 2.3 years. Using net present values, this hot water system saves $36,500 compared to an electric reheat system over 15 years.