Process Sheet

Fixed Plate unit with cooling

This page shows a psychometric process for a typical 100% outdoor air energy recovery unit under standard design conditions. The numbers indicate different stages in the process where there is a transformation of the incoming air condition. The energy saving is compared to the energy needed to achieve the same supply conditions with a basic heating and/or cooling makeup air unit.

### Winter Operation
Plate effectiveness 62%
The fixed plate pre-conditions the air entering the rooftop unit heating coil by heating it. The air entering the heating coil is at a closer temperature to the desired room air, thereby reducing the amount of mechanical heating needed. As a result the heating coil can be downsized compared to a no-recovery process.

1 - 2 pre-heat section
\[ Q_h = 1.08 \times 1000 \times (45 - 10) = 37.8 \text{ mbh} \] (1.5 tons)

### Summer Operation
Plate effectiveness 65%
The fixed plate heat exchanger pre-conditions the air reaching the rooftop unit by cooling it. The air entering the cooling coil is at a closer temperature to the desired room air, thereby requiring less mechanical cooling. As a result the cooling coil can be downsized compared to a no-recovery process.

1 - 2 pre-cool section
\[ Q_c = 4.5 \times 1000 \times (41.4 - 37.4) = 18 \text{ mbh} \] (1.5 tons)

2 - 3 mechanical cooling
\[ Q_t = 4.5 \times 1000 \times (37.4 - 23.2) = 63.9 \text{ mbh} \] (5.3 tons)

### Savings gained by energy recovery

<table>
<thead>
<tr>
<th>Process</th>
<th>Heating</th>
<th>Cooling</th>
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</thead>
<tbody>
<tr>
<td>Heating</td>
<td>37.8 mbh/1000 cfm</td>
<td>1.5 tons/1000 cfm</td>
</tr>
<tr>
<td>Reheat</td>
<td>16.2 mbh</td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td>6.8 tons/1000 cfm</td>
<td></td>
</tr>
<tr>
<td>Energy required without energy recovery</td>
<td>91.8 mbh/1000 cfm</td>
<td>16.2 mbh</td>
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