Distillation Column Design
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Purpose
Produce a distillation column with equipment set and documentation that will be put to use by OSU CHE students. $100,000 can be saved by constructing it ourselves.

Distillation Background
Distillation is a common unit operation used in industry to separate mixtures. Distillation takes advantage of component volatility differences. As vapor moves up the column it passes through several stages where it is condensed and then vaporized again. After each stage, the concentration of the more volatile component increases.

Assumptions and Constraints
• Experiments are limited to two 3 hour lab periods
  • The column needs to reach steady state in approximately 30 minutes
• There must be a measurable difference (~30 mole %) between distillate and inlet compositions
• Students need to be able to change some parameter(s) (e.g., inlet flow rate, inlet temperature, etc.) and determine how effects the process

University Bench-Mark

<table>
<thead>
<tr>
<th>University Cont. vs. Batch</th>
<th>Packing vs. Trays</th>
<th>Size</th>
<th>System</th>
<th>Measuring Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utah</td>
<td>Cont.</td>
<td>Both</td>
<td>H: 8.2' ; D: 3.8'</td>
<td>EtOH/H2O, H2O/IPA</td>
</tr>
<tr>
<td>UW</td>
<td>Batch w/Reflux</td>
<td>Trays</td>
<td>H: 10'</td>
<td>EtOH/H2O</td>
</tr>
<tr>
<td>MIT</td>
<td>Cont./Batch</td>
<td>Both</td>
<td>H: 4.9' ; D: 3.8'</td>
<td>MeOH/H2O</td>
</tr>
<tr>
<td>OKU</td>
<td>Cont. w/ reflux</td>
<td>Trays</td>
<td>D: 3'</td>
<td>MeOH/H2O</td>
</tr>
<tr>
<td>CU</td>
<td>NA</td>
<td>Trays</td>
<td>H: 3'</td>
<td>Propanol/iso-prop.</td>
</tr>
<tr>
<td>WSU</td>
<td>Cont.</td>
<td>Trays</td>
<td>H: 13' ; D: 4'</td>
<td>EtOH/H2O</td>
</tr>
<tr>
<td>UT</td>
<td>Cont. w/Reflex</td>
<td>Trays</td>
<td>10' x 15' x 20'</td>
<td>EtOH/H2O</td>
</tr>
</tbody>
</table>

Source: upload.wikimedia.org/wikipedia/commons/thumb/c/cc/Colonne_distillazione.jpg/250px-Clonna_distillazione.jpg

McCabe-Thiele Diagram

Future work
• Assemble the column
• Run the distillation system to determine HETP (Height of a Theoretical Transfer Plate)
• Document standard operating procedures and expected experimental results (e.g. flow rates, feed and reboiler temperatures, etc.)
• Detailed notes for T.A.s (e.g. turn on before lab)

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