The following charts can be used to estimate the size of a thermocompressor. The size is based on the motive, suction, and discharge steam pressures and the required steam flow. The following parameters are used for these estimates:

\[
P = \text{Atmospheric pressure (absolute)} = 1 \text{ bar (typical)}
\]
\[
P_m = \text{Motive steam pressure (absolute)} = \text{gauge pressure} + \text{atmospheric pressure}
\]
\[
P_s = \text{Suction steam pressure (absolute)} = \text{gauge pressure} + \text{atmospheric pressure}
\]
\[
P_d = \text{Discharge steam pressure (absolute)} = \text{gauge pressure} + \text{atmospheric pressure}
\]
\[
M_m = \text{Motive steam flow rate}
\]
\[
M_s = \text{Suction steam flow rate}
\]
\[
M_d = \text{Discharge (total) steam flow rate} = M_m + M_s
\]
\[
E = \frac{P_m}{P_s} \text{ (should be over 1.4)}
\]
\[
C = \frac{P_d}{P_s} \text{ (normally less than 1.8)*)}
\]
\[
R = \frac{M_s}{M_m}
\]

**Sizing Example**

Operating Parameters:

\[
P_m = \text{Motive steam pressure} = 5.9 \text{ barg} + 1 \text{ bar} = 6.9 \text{ bar}
\]
\[
P_s = \text{Suction steam pressure} = 0.35 \text{ barg} + 1 \text{ bar} = 1.35 \text{ bar}
\]
\[
P_d = \text{Discharge steam pressure} = 0.75 \text{ barg} + 1 \text{ bar} = 1.75 \text{ bar}
\]
\[
M_s = \text{Suction steam flow rate} = 9000 \text{ kg/hr}
\]

Calculate Ratios:

\[
E = \frac{P_m}{P_s} = \frac{6.9}{1.35} = 5.1
\]
\[
C = \frac{P_d}{P_s} = \frac{1.75}{1.35} = 1.3
\]

Use these ratios and the sizing graph on the following page to determine entrainment ratio \( R \):

\[
R = \text{Entrainment ratio} = 1.5
\]

Calculate the motive and discharge (total) steam flow rates from the Entrainment ratio \( R \):

\[
\text{Motive steam flow rate} = M_m = \frac{M_s}{R} = \frac{9000}{1.5} = 6000 \text{ kg/hr}
\]
\[
\text{Discharge (total) steam flow rate} = M_d = M_m + M_s = 6000 + 9000 = 15000 \text{ kg/hr}
\]

Determine the size of the thermocompressor using the Discharge (total) steam flow rate and the Discharge steam pressure and the Sizing Table on the following page:

For this example, the thermocompressor size = 12”

**Note:** Consult Kadant Johnson for optimum sizing and thermocompressor performance curves.

(*) For higher compression ratios, please contact Kadant Johnson.
Thermocompressor Sizing Table

<table>
<thead>
<tr>
<th>Nominal Size (inch)</th>
<th>Pd = TCX Discharge Steam Pressure (barg)</th>
<th>Md = Discharge Steam Flow Rate (kg/h)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>1&quot;</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>1.5&quot;</td>
<td>80</td>
<td>120</td>
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<tr>
<td>2&quot;</td>
<td>160</td>
<td>240</td>
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<tr>
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<td>460</td>
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<tr>
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<tr>
<td>36&quot;</td>
<td>82,500</td>
<td>120,000</td>
</tr>
</tbody>
</table>

Thermocompressor Entrainment

- \( R = \frac{M_s}{M_m} \)
- \( E = \frac{P_m}{P_s} \)

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