Case 1 using a specific expansion ratio

expansion ratio: expansion := 35 ending specific volume: ve := inlet2.expansion

expansionpressure := 14.696 initial guss doesn't need close but have to have one.

expansionpressure := root(ST_ptdata(expansionpressure, inlet5, 5, 1)2 − ve, expansionpressure) Find the ending pressure

Expansion point properties ep := ST_ptdata(expansionpressure, inlet5, 5, 1) exhaust := ST_ptdata(14.699, ep4, 4, 1)

Pressure 156.437 P2 := ep1 H2 := ep4 P3 := exhaust1 H1 = 614.485 H2 = 572.97

27.7% vapor (flashed to steam) v2 := ep2 U2 := ep3 v3 := exhaust2 U1 = 605.854 U2 = 549.334

Note the enthalpy change from 614.485 BTU/lb to 572.97 BTU/lb. Normally we would use the

enthalpy difference to compute output work. (H1 − H2) J + (P2 − P3) v2 = 32420.605 ft lb/lb Partial

expansion includes constant pressure (P2 − P3) v2 = 122.254 work below EOP

Case 2 expanding to 14.696 PSIA

ep := ST_ptdata(14.696, inlet5, 5, 1) Get the point properties

expansion ratio: expansion := ep2/inlet2 expansion = 395.753

Pressure 14.696 P2 := ep1 H2 := ep4 H2 = 513.925

34.4% vapor (flashed to steam) v2 := ep2 U2 := ep3 U2 = 488.827

output work enthalpy difference. H1 − H2 = 100.56 BTU/lb
These are equivalent to using your flash steam methods

**Case 3 using a specific expansion ratio constant enthalpy**

expansion ratio: \( \text{expansion} := 35 \)  
ending specific volume: \( \text{ve} := \text{inlet}_2 \cdot \text{expansion} \)  

\[
\text{expansionpressure} := 14.696 \quad \text{initial guess doesn't need close but have to have one.}
\]

\[
\text{expansionpressure} := \sqrt{\text{ST_ptdata}(\text{expansionpressure, inlet}_4, 4, 1)} \cdot 2 - \text{ve, expansionpressure}
\]

Find the ending pressure

Expansion point properties
\[
\text{ep} := \text{ST_ptdata}(\text{expansionpressure, inlet}_4, 4, 1) \quad \text{exhaust} := \text{ST_ptdata}(14.699, \text{ep}_4, 4, 1)
\]

\[
\begin{pmatrix}
178.883 \\
372.566 \\
0.817 \\
587.446 \\
614.485 \\
0.855 \\
0.316
\end{pmatrix}
\]

End of expansion properties.

Pressure 178.883 \( P_2 := \text{ep}_1 \quad H_2 := \text{ep}_4 \quad P_3 := \text{exhaust}_1 \quad H_1 = 614.485 \quad H_2 = 614.485 \)

31.6% vapor (flashed to steam) \( v_2 := \text{ep}_2 \quad U_2 := \text{ep}_3 \quad v_3 := \text{exhaust}_2 \quad U_1 = 605.854 \quad U_2 = 587.446 \)

Note the enthalpy change from 614.485 BTU/lb to 572.97 BTU/lb. Normally we would use the enthalpy difference to compute output work. \( (H_1 - H_2) \cdot J + (P_2 - P_3) \cdot v_2 = 131.143 \text{ ft lb/lb} \)

\( H_1 - H_2 = 0 \)

**Case 4 expanding to 14.696 PSIA constant enthalpy**

\[
\text{ep} := \text{ST_ptdata}(14.696, \text{inlet}_4, 4, 1)
\]

Get the point properties

expansion ratio: \( \text{expansion} := \frac{\text{ep}_2}{\text{inlet}_2} \)  
expansion = 514.774

\[
\begin{pmatrix}
14.696 \\
212 \\
12.005 \\
581.838 \\
614.485 \\
0.959 \\
0.448
\end{pmatrix}
\]

End of expansion properties.

Pressure 14.696 \( P_2 := \text{ep}_1 \quad H_2 := \text{ep}_4 \quad H_2 = 614.485 \)

44.8% vapor (flashed to steam) \( v_2 := \text{ep}_2 \quad U_2 := \text{ep}_3 \quad U_2 = 581.838 \)

output work enthalpy difference. \( H_1 - H_2 = 0 \text{ BTU/lb} \)