

### Aufgabe 1

geg:  $\dot{m} = 0,3 \frac{\text{kg}}{\text{s}}$

$$m_{\text{1ges}} = 5755 \text{ kg}$$

$$x_D = 0,005$$

$$T_{\text{ein}} = 70^\circ\text{C} = 343,15 \text{ K}$$

$$T_{\text{aus}} = 100^\circ\text{C} = 373,15 \text{ K}$$

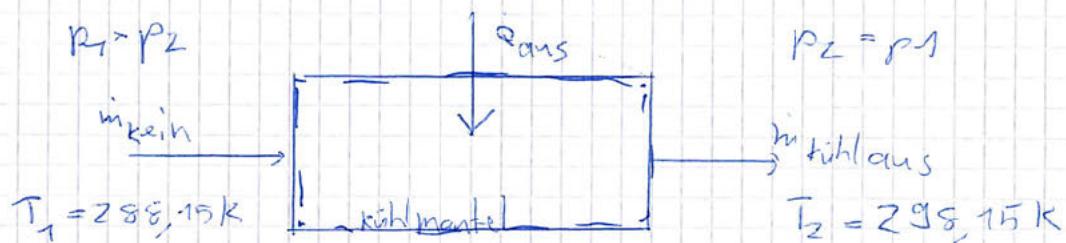
$$T_{\text{reakt}} = 100^\circ\text{C} = 373,15 \text{ K}$$

$$\dot{Q}_R = 100 \text{ kW}$$

8

$$T_{\text{kein}} = 288,15 \text{ K}$$

$$T_{\text{aus}} = 298,15 \text{ K}$$



perkolate Flüssigkeit

Energiebilanz um Kühlmantel

$$\text{O} = \dot{m} [h_1 - h_2] + Q - \cancel{W^0}$$

st.  $Q_{ab} = \dot{m} [h_2 - h_1]$

$$= \dot{m} \int_{T_1}^{T_2} c_i f dT \xrightarrow{\text{if } (p_2/p_1)} \text{O}$$

$$= \dot{m} c_i f (T_2 - T_1)$$

Energiebilanz um Reaktor

$$\text{O} = \dot{m} [h_e - h_a] + \dot{Q}_R + \dot{Q}_{ab} - \cancel{W^0}$$

$$Q_{ab} = \dot{m} [h_a - h_e] - \dot{Q}_R$$

Category	Sub-Categories	Definition	Impact on Project	
			Positive Impact	Negative Impact
Resource Allocation	Human Resources	Efficient allocation of skilled labor leads to faster completion and cost savings.	Efficient completion of tasks.	Overwork leading to burnout and decreased productivity.
Resource Allocation	Financial Resources	Proper budgeting ensures timely project delivery without financial strain.	Stable financial performance.	Cost overruns due to mismanagement.
Project Scope	Scope Creep	Expanding the project scope can lead to increased functionality and user satisfaction.	Enhanced product features.	Excessive scope expansion can lead to schedule delays and cost increases.
Project Scope	Scope Definition	Clear definition of project boundaries prevents misunderstandings and scope creep.	Consistent project goals.	Scope ambiguities leading to disputes and rework.
Project Timeline	Timeline Management	Strict adherence to timelines ensures timely delivery of project milestones.	On-time delivery of milestones.	Delays due to poor planning or resource constraints.
Project Timeline	Timeline Flexibility	Flexibility in timelines allows for adaptation to unexpected challenges.	Smooth handling of crises.	Overreliance on flexibility leading to missed deadlines.
Communication	Internal Communication	Effective communication within the team fosters collaboration and shared understanding.	Team cohesion and efficiency.	Miscommunication leading to errors and inefficiencies.
Communication	External Communication	Clear communication with stakeholders maintains trust and support.	Stakeholder satisfaction.	Communication breakdowns causing stakeholder dissatisfaction.
Technology	Tool Adoption	Adopting appropriate tools streamlines processes and improves efficiency.	Efficient workflow.	Tool integration issues leading to system downtime.
Technology	Technology Integration	Integrating various technologies creates a cohesive system for better management.	Centralized data access.	Incompatibilities between different technologies.
Quality Assurance	QA Processes	Robust QA processes ensure high-quality deliverables.	Reliable product quality.	QA fatigue leading to overlooking critical bugs.
Quality Assurance	QA Tools	Using specialized tools enhances the effectiveness of QA efforts.	Efficient bug tracking.	Tool limitations causing false positives or negatives.
Risk Management	Risk Identification	Identifying potential risks allows for proactive mitigation strategies.	Reduced risk exposure.	Failure to identify risks leading to surprises.
Risk Management	Risk Mitigation	Developing effective mitigation plans minimizes the impact of identified risks.	Contingency planning.	Over-reliance on mitigation plans.
Stakeholder Management	Stakeholder Engagement	Engaging stakeholders keeps them informed and involved in the project.	Stakeholder buy-in.	Resistance from stakeholders due to lack of engagement.
Stakeholder Management	Stakeholder Analysis	Understanding stakeholder needs and interests informs communication and decision-making.	Stakeholder satisfaction.	Failure to analyze stakeholders leading to conflicts.
Change Management	Change Requests	Handling change requests gracefully leads to a more adaptable project.	Smooth evolution of the project.	Overzealous change requests causing chaos.
Change Management	Change Control	Controlled change management ensures changes are implemented effectively.	Consistent project direction.	Failure to control changes leading to scope creep.
Performance Monitoring	Performance Metrics	Monitoring key metrics provides insights into project health.	Early detection of issues.	Focus on metrics leading to tunnel vision.
Performance Monitoring	Performance Reporting	Regular reporting keeps all stakeholders updated on progress.	Transparent communication.	Over-reporting causing information overload.
Project Closure	Closure Planning	Planning for closure ensures a smooth transition to post-project phases.	Successful project closure.	Failure to plan for closure.
Project Closure	Closure Activities	Conducting closure activities formally closes the project loop.	Official project end.	Failure to perform closure activities.

Aufgabe 2.

$$w_L = 200 \frac{m}{s}$$

$$P_0 = 0,191 \text{ bar}$$

$$T_0 = -30^\circ\text{C}$$

$$q_B = 1135 \frac{\text{kJ}}{\text{kg}}$$

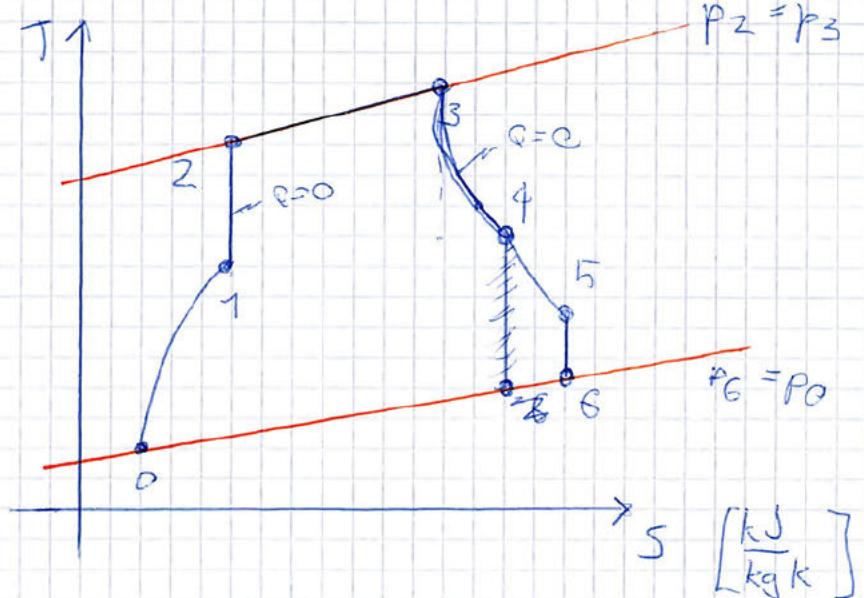
$$T_{B3} = 1289 \text{ K}$$

Luft als perfektes Gas

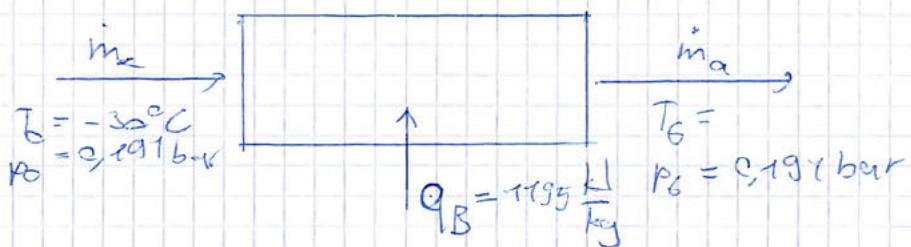
a)

[K]

$T \uparrow$



b) Energiebilanz um Triebwerk



$$\frac{T_6}{T_5} = \left( \frac{P_6}{P_5} \right)^{\frac{n-1}{n}} \Rightarrow T_6 = T_5 \cdot \left( \frac{P_6}{P_5} \right)^{\frac{n-1}{n}} \quad n = 1,4$$

$$T_6 = \cancel{565,6 \text{ K}} = 328,07 \text{ K}$$

$$0 = m(h_e - h_1) + Q - \cancel{w^0}$$

~~$$0 = m(h_e - h_B + \frac{(w_e - w_a)^2}{2}) + Q - \cancel{w^0}$$~~

~~$$0 = 2(h_e - h_B) + (w_e - w_a)^2 + Q$$~~

$$2(h_B - h_e) - Q = (w_e - w_a)^2$$

$$\cdot \sqrt{2(h_a - h_e) - q} = w_e - w_a$$

$$w_a = w_e - \sqrt{2(h_a - h_e) - q}$$

$$w_e = \sqrt{2 c_p (T_b - T_0) + q}$$

$$200 \frac{m}{z} - \sqrt{2 \cdot 1006 \frac{J}{kg K} (568,6 - 243,15) K - 1195 \frac{J}{kg}}$$

$$0 = m [h_e - h_a + \frac{(w_e^2 - w_a^2)}{2}] + Q - \vec{M}^0$$

$$0 = h_e - h_a + \frac{(w_e^2 - w_a^2)}{2} + q_B$$

$$\cancel{\sqrt{2(h_a - h_e) - q_B}} = w_e^2 - w_a^2$$

$$h_a = w_a$$

$$w_a^2 = w_e^2 - 2(h_a - h_e - q_B)$$

$$w_e^2 = 2(c_p(T_b - T_0) + q_B) + w_e^2$$

$$w_a^2 =$$

$$w_a^2 = 2(h_e - h_a + q_B) + w_e^2$$

$$= 2(c_p(T_b - T_0) + q_B) + w_e^2$$

$$w_a = \sqrt{w_a^2} =$$

Aufgabe 2.

b)

$$0 = \cancel{[h_5 - h_6 + \frac{w_h^2 - w_c^2}{z}]} + \cancel{\alpha} - \cancel{w}^0$$

$$\therefore w_6^2 = z(h_5 - h_6) + w_h^2$$

$$2c_p^{ig}(T_5 - T_6) + w_h^2$$

$$w_6 = \sqrt{2 \cdot 1,006 (931,9 \text{ kJ} - 328,07 \text{ kJ}) + 220 \frac{\text{km}}{\text{s}}}$$



### Aufgabe 3

$$T_{G_1} = 500^\circ\text{C}$$

$$V_{G_1} = 3,14 \text{ L}$$

$$c_v = 0,633 \frac{\text{kJ}}{\text{kg}\cdot\text{K}}$$

$$M_g = 50 \frac{\text{kg}}{\text{kmol}}$$

$$m_{EW} = 0,1 \text{ kg}$$

$$T_{EW} = 0^\circ\text{C}$$

$$x_{Eis} = 0,6$$

a)  $p_{G_1} = \frac{F}{A}$

$$A = \left(\frac{D}{2}\right)^2 \pi$$

$$F = m_{EW} \cdot g + m_k \cdot g$$

$$p_{G_1} = \frac{(m_{EW} + m_k) \cdot g}{\left(\frac{D}{2}\right)^2 \pi} + p_0 = 1,4 \text{ bar}$$

$$p_{G_1} \cdot V_{G_1} = m R T_{G_1}$$

$$m = \frac{p_{G_1} \cdot V_{G_1}}{\frac{R}{M_g} \cdot T_{G_1}} = 3,42 \text{ g}$$

b)

$p_{G_2} = p_{G_1} = 1,4 \text{ bar}$ , Druck von aussen auf das Gas hat sich nicht geändert.

$x_{Eis} > 0 \Rightarrow$  nicht alles Eis ist geschmolzen  $\rightarrow T_{EW_1} = T_{EW_2}$

$T_{EW_2} = 0^\circ\text{C} = T_{G_2}$ , ~~kein Wärmestrom~~ Temperaturen sind gleich

c)  $dU = Q - W$

$$\frac{W}{m} = \int p dV$$

$$u_2 - u_1 = c_v(T_2 - T_1)$$

$$\rightarrow 281,22 \text{ J} = m p (V_2 - V_1) = 0,972 \text{ kJ}$$

$$\Rightarrow dU = 316,5 \frac{\text{kJ}}{\text{kg}}$$

$$V_2 = \frac{m R T_2}{p_{2g}} = 1,11 \text{ L}$$

$$Q = dU + W$$

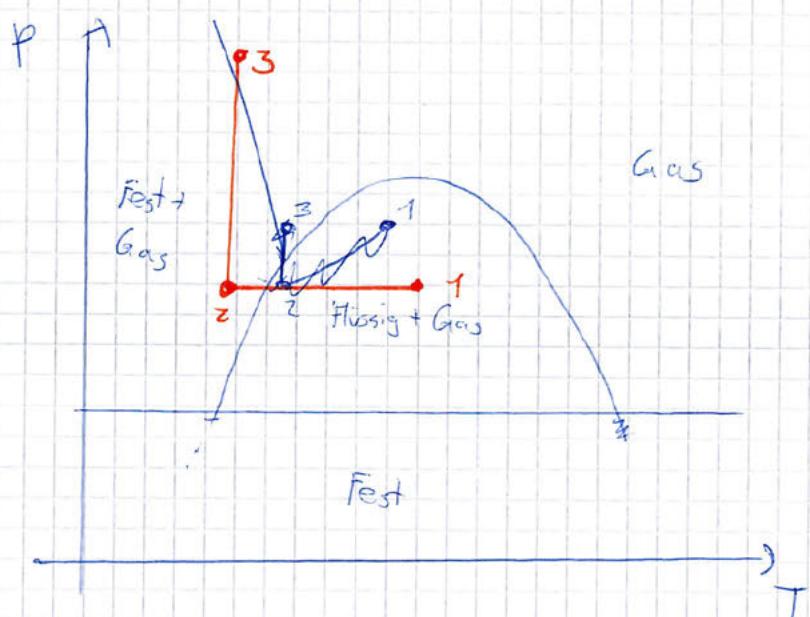
$$Q = m dU + W = \underline{\underline{316,52 \text{ J}}} \quad \underline{\underline{2052 \text{ J}}}$$

$$m dU = 108 \text{ kJ}$$



## 2D Aufgabe 4

a)



b)

$$s_2 = s_3$$

$$p_3 = 8 \text{ bar}$$

$$x_2 = 1$$

$$x_4 = 0 \quad p_4 = 8 \text{ bar}$$

Energiebilanz um Kühler

$$0 = m [h_1 - h_2] + Q - \cancel{W}^0 \quad T_{41q} \\ h_q = h_4(8 \text{ bar}, x=0) = 93,42$$

$$s_2 = s_3 = s_3(8 \text{ bar}) = s_2(x=1) = 0,966 \frac{\text{kJ}}{\text{kgK}} \quad \text{Adiabatische Prozess:} \\ 0 = m [h_4 - h_1] \\ h_4 = h_1$$

Energiebilanz um Kompressor

$$0 = m(h_2 - h_3) + \cancel{Q}^0 - W \quad W = m \int p$$

