

1. Rankine cycle: saturated steam

A boiler generates a saturated steam flow with 100 t/h. The steam will be expanded in a turbine following by an condenser and a feed water pump.

- Write a process scheme and a draft in T,s–diagram
- Calculate the steam moisture at turbine outlet, the input and output heat and the process thermal efficiency while the given parameters (below), neglecting pumping energy and assuming isentropic expansions.
- Calculate the turbine power output.
- as b) but assume a turbine efficiency of 92%.
- as b) but assume a complete separation of the condensate at intermediate pressure.
- as b) include the pumping energy.

	ϑ_s °C	s' kJ/kgK	s'' kJ/kgK	h' kJ/kg	h'' kJ/kg
p_{\max} 4 MPa	250	2,79	6,06	1087	2799
\bar{p} 0,5MPa	152	1,86	6,82	640	2748
p_{\min} 0,012Mpa	50	0,69	8,08	207	2591

2. Rankine cycle: superheated steam

Calculate the thermal efficiency, the steam moisture at turbine outlet as well as the specific work and heat for a superheated rankine cycle with $p_{\max}=20\text{MPa}$, $T_{\max}=600^\circ\text{C}$ and $p_{\min} 0.005\text{MPa}$. Use the given T,s–diagram and also ThermoFluids software (or a steam table).

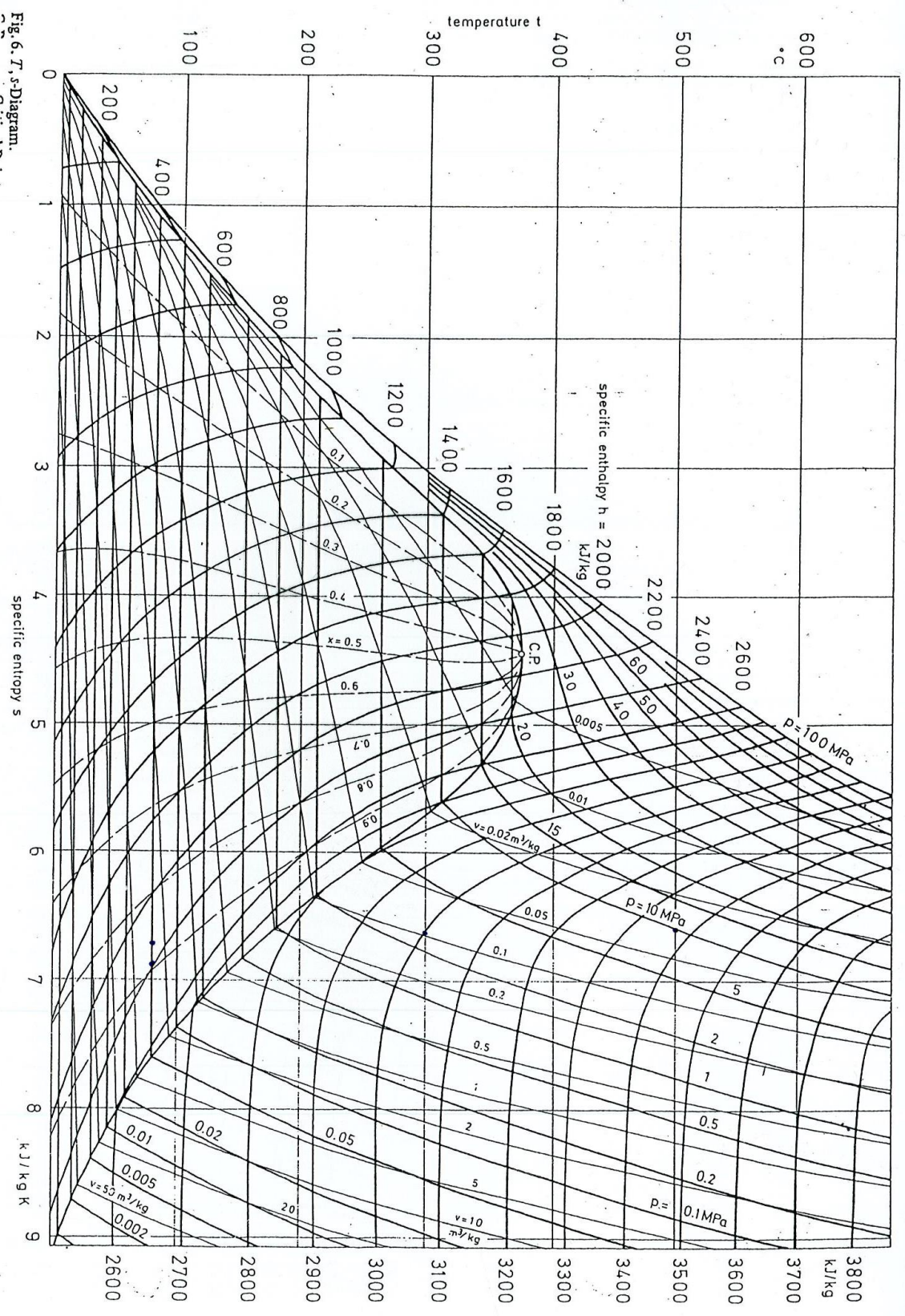


Fig. 6.7. T - s Diagram.