Prosess 1.1

I) Adiabatisk kompresjon

$T_1 = -45°C$, $P_1 = 8$ bar , $P_2 = 40$ bar

II) Isobar kondensering

$T_3 = 0°C$

III) Avspenning av gass

$P_4 = 8$ bar $\quad x_{1,2} > x_{vap}$

IV) Isobar fordamping -> tilstand I

1a) ~~I) $H_1 = 820$ kJ/kg , $H_2 = 960$ kJ/kg $\Delta H = 140$ kJ/kg~~

II) $H_3 = 500$ kJ/kg , $\Delta H = -336$ kJ/kg

III) $H_4 = 500$ kJ/kg , $\Delta H = 0$

IV) $H_1 = 740$ kJ/kg , $\Delta H = 240$ kJ/kg

I) $H_1 = 740$ kJ/kg , $H_2' = 820$ kJ/kg

$W = \frac{W_{rev}}{\eta} = \frac{80}{0{,}85} = 94$ kJ/kg

$H_2 = H_1 + 94 \frac{kJ}{kg} = 836$ kJ/kg

1b) $W = 94$ kJ/kg (I)

Effekt $= W \cdot \dot{m}$, 10 kW $= 94$ kJ/kg $\cdot \dot{m}$

$\dot{m} = 0{,}1$ kg/s

$Q_c = 240$ kJ/kg (IV)

$Q_c \cdot \dot{m} = 24$ kW

1c) $\frac{Q_c}{W} = 2,4$ (du får 2,4 W kjøling for hver watt arbeid du tilfører systemet)

1d)

$$Q_c \geq Q_H \left(\frac{T_c}{T_H}\right)$$

$$Q_H \leq Q_c \left(\frac{T_H}{T_c}\right)$$

$$W = Q_H - Q_c$$

$$W \leq Q_c \left(\frac{T_H}{T_c} - 1\right)$$

$$\frac{W}{Q_c} \leq \frac{T_H}{T_c} - 1$$

$$\frac{Q_c}{W} \leq \left(\frac{T_H}{T_c} - 1\right)^{-1}$$

$$\frac{Q_c}{W} \leq \left(\frac{-5+273}{-45+273} - 1\right)^{-1}$$

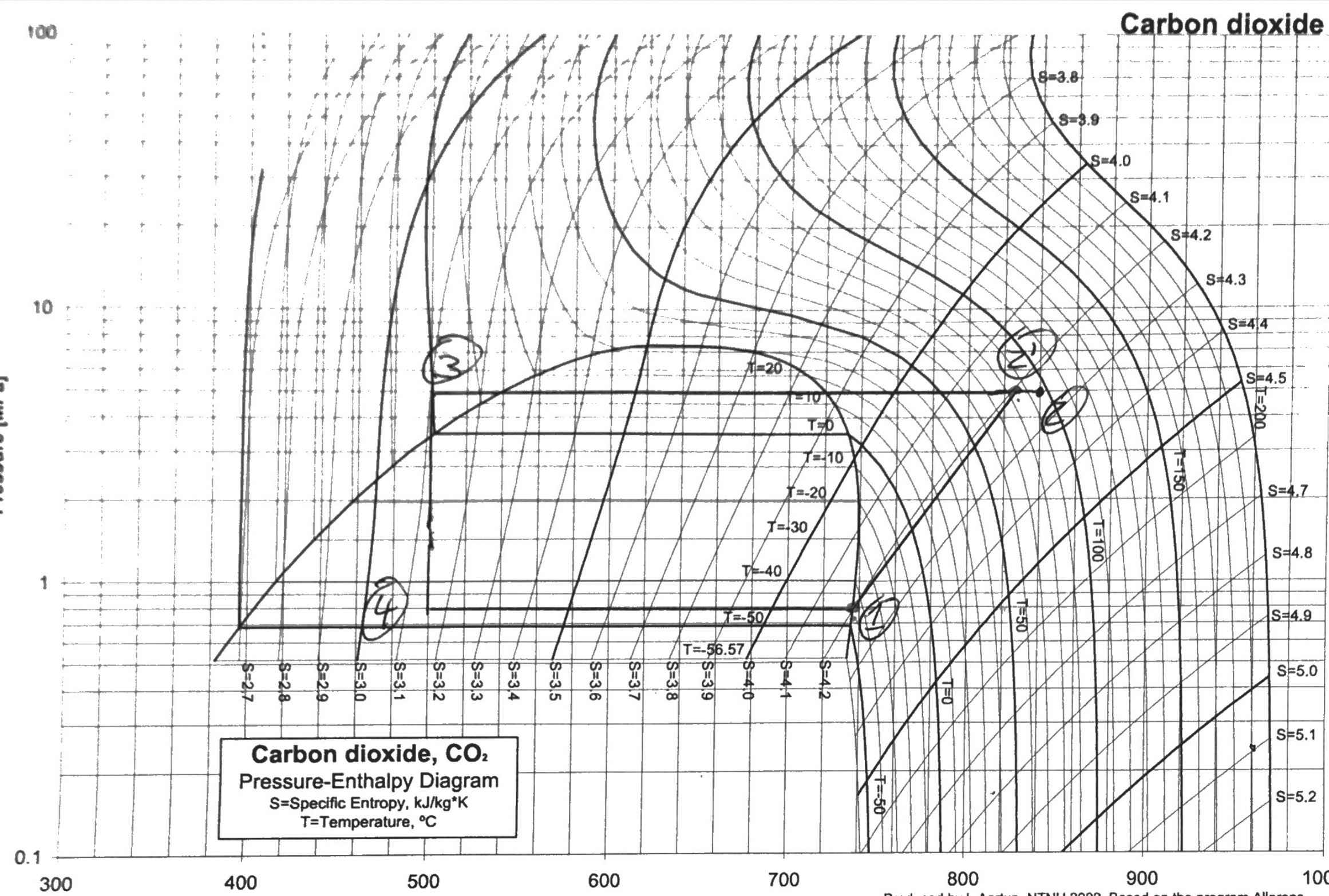
$$\frac{Q_c}{W} \leq 5,7$$

Termodynamisk virkningsgrad:

$$\frac{\text{kjøletallet}}{\text{maks kjøletallet}}$$

$$\frac{2,4}{5,7} = 42\%$$

Kompressoren har virkningsgrad innen 100%


Carbon dioxide
Carbon dioxide, CO2
Pressure-Enthalpy Diagram
S=Specific Entropy, kJ/kg*K
T=Temperature, °C
100
10
1
0.1
300
400
500
600
700
800
900
1000
S=3.8
S=3.9
S=4.0
S=4.1
S=4.2
S=4.3
S=4.4
S=4.5
S=4.7
S=4.8
S=4.9
S=5.0
S=5.1
S=5.2
S=2.7
S=2.8
S=2.9
S=3.0
S=3.1
S=3.2
S=3.3
S=3.4
S=3.5
S=3.6
S=3.7
S=3.8
S=3.9
S=4.0
S=4.1
S=4.2
T=20
T=10
T=0
T=-10
T=-20
T=-30
T=-40
T=-50
T=-56.57
T=200
T=150
T=100
T=50
T=0
T=-50
1
2
3
4