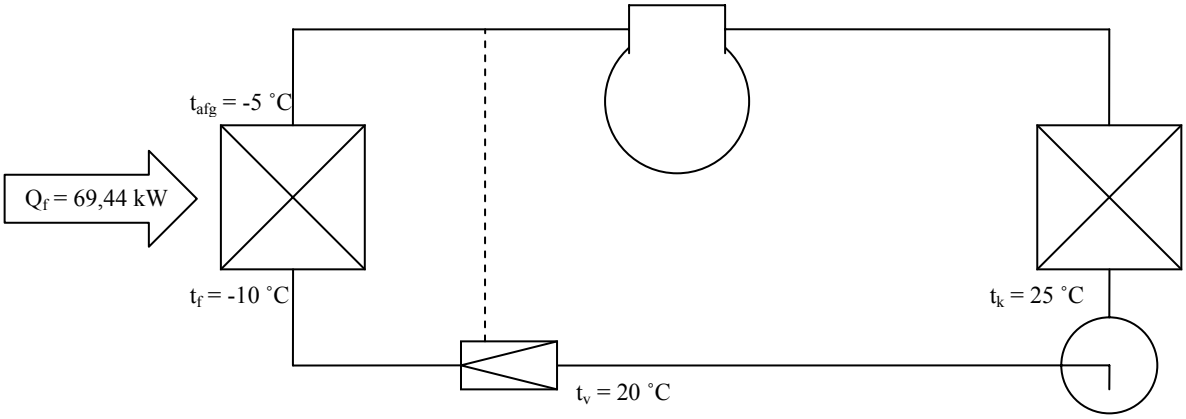
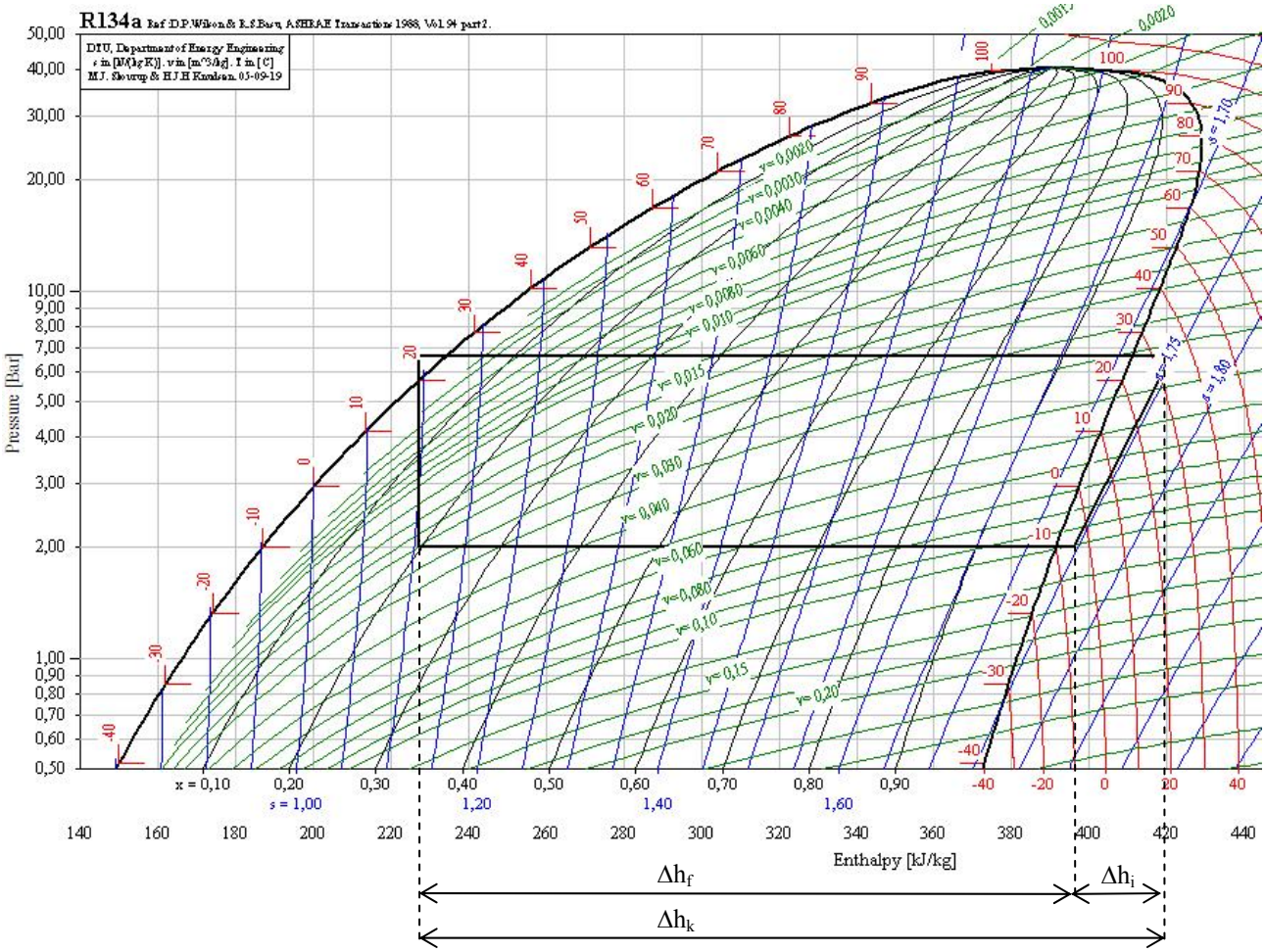
Opg 66

Givet:		
	Kølemiddel	R-134a
	Kuldeydelse	$Q_f = 250000$ [kJ/h] = 69,44 [kW]
	Kompressorens slagvolumen	$q_{vt} = 210$ [m^3/h] = 0,0583 [m^3/s]
	Fordampningstemperatur	$t_f = -10$ [˚C]
	Temperatur efter fordamper	$t_s = -5$ [˚C]
	Kondenseringstemperatur	$t_k = 25$ [˚C]
	Temp. ved tilgang til eks. ventil	$t_{afg} = 20$ [˚C]





Δh_f =	395,678 – 227,235 =	168,443 [kJ/kg]
Δh_k =	420,974 – 227,235 =	193,739 [kJ/kg]
Δh_i =	420,974 – 395,678 =	25,296 [kJ/kg]

66.1 Find den cirkulerede kølemængde:

$$Q_f = m_R \cdot \Delta h_f \Rightarrow \underline{\underline{m_R}} = \frac{Q_f}{\Delta h_f} = \frac{69{,}44}{168{,}443} = \underline{\underline{0{,}412 \left[\frac{kg}{s}\right]}}$$

66.2 Find kompressorens volumetriske virkningsgrad:

v_{sug} aflæst i diagram : $0{,}101 \left[\frac{m^3}{kg}\right]$

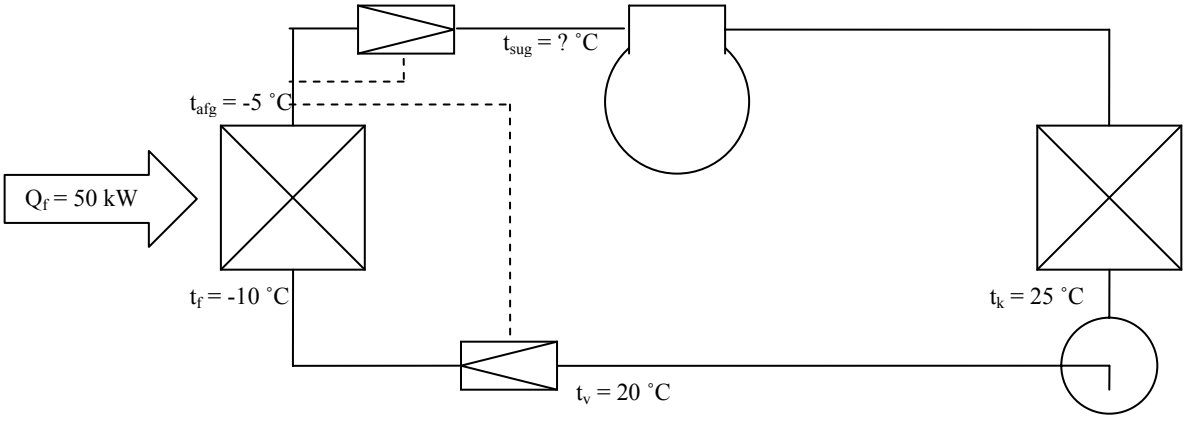
$$v_{sug} = \frac{\dot{V}_R}{\dot{m}_R} \Rightarrow \dot{V}_R = v_{sug} \cdot \dot{m}_R$$

$$\dot{V}_R = 0{,}101 \cdot 0{,}412 = 0{,}0418 \left[\frac{m^3}{s}\right]$$

$$\underline{\underline{\eta_{vol}}} = \frac{\dot{V}_R}{q_{vt}} = \frac{0{,}0418}{0{,}0583} = \underline{\underline{0{,}717}}$$

Anlægget forsynes med kapacitetsregulering ved hjælp af en drøvleventil i sugeledningen. Kuldeydelsen reduceres til 180000 [kJ/h] ved isentalpisk drøvling i sugeledningen ved samme temperatur som ovenfor. Kompressorens volumetriske virkningsgrad er under disse forhold 0,65.

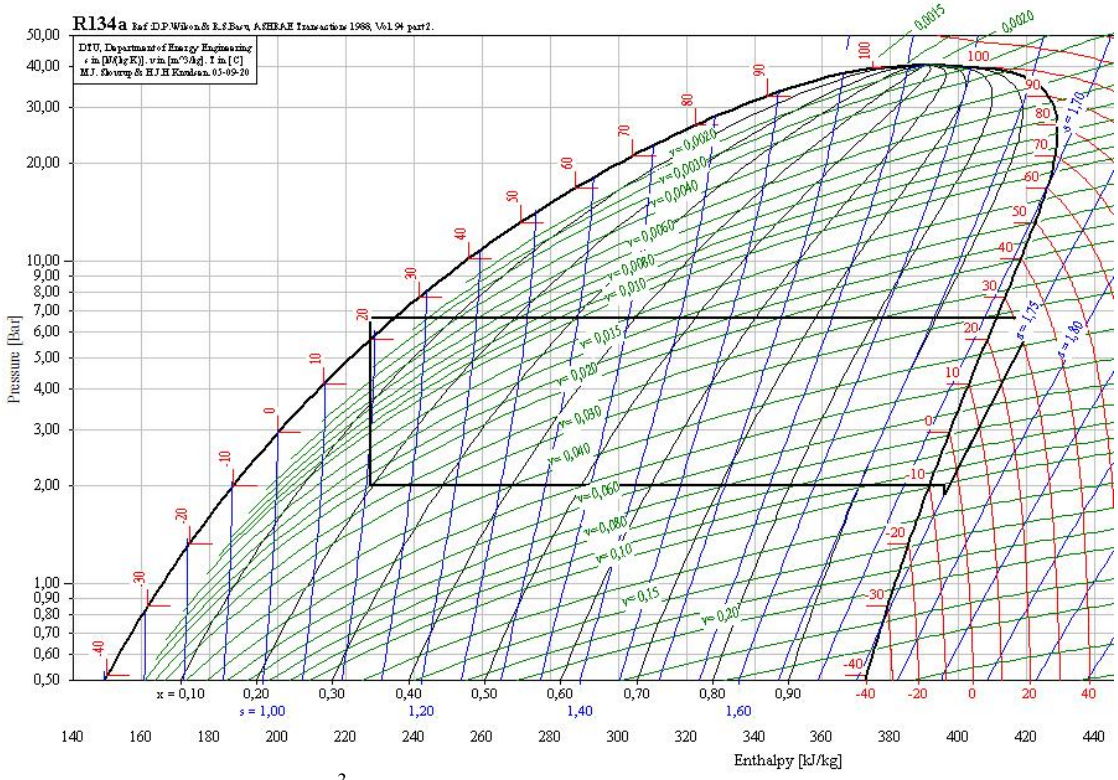
$Q_f =$ 180000 [kJ/h] = 50 [kW]
$\eta_{vol} =$ 0,65



66.3 Find trykket i kompressorens sugeledning efter drøvleventilen.

$$\eta_{vol} = \frac{\dot{V}_R}{q_{vt}} \Rightarrow \underline{\dot{V}_R} = \eta_{vol} \cdot q_{vt} = 0{,}65 \cdot 0{,}0583 = \underline{0{,}0379 \left[\frac{m^3}{s}\right]}$$

$$m_R = \frac{Q_f}{\Delta h_f} = \frac{50}{168{,}443} = 0{,}2968 \left[\frac{kg}{s}\right] \qquad v_{sug} = \frac{\dot{V}_R}{m_R} = \frac{0{,}0379}{0{,}2968} = 0{,}128 \left[\frac{m^3}{kg}\right]$$



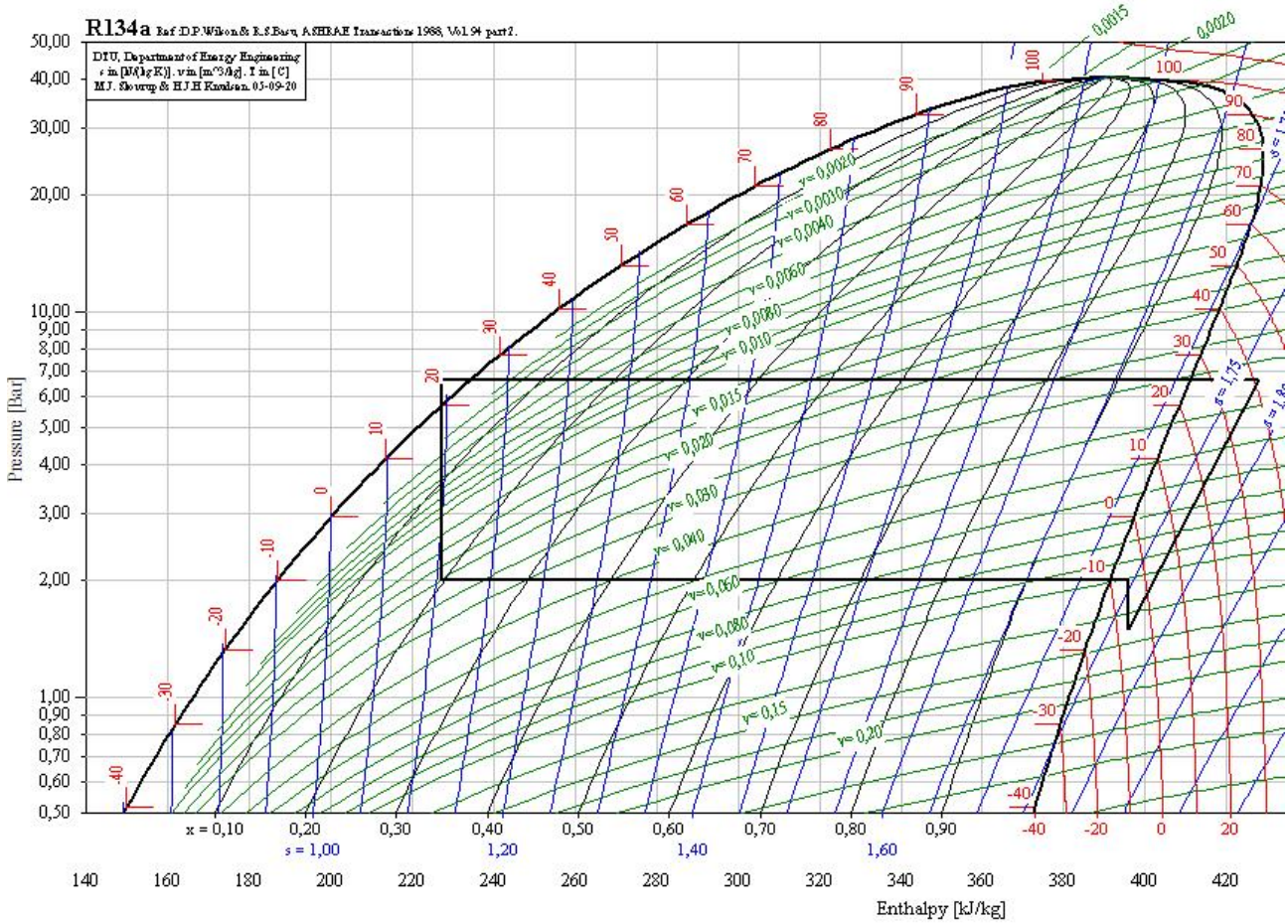
Aflæst ved $v_{sug} = 0{,}128 [m^3/kg]$: $\underline{p_{sug} = 1{,}607 \text{ bara}}$

Temperatur svarende til dette tryk:
$t_{sug} = -6{,}5$ [°C]

66.4 Hvad bliver kuldeydelsen, hvis sugetrykket yderligere reduceres til 1,5 bara, og den volumetriske virkningsgrad er 0,60

p_{sug} = 1,5 bara

η_{vol} = 0,6



$$\eta_{vol} = \frac{\dot{V}_R}{q_{vt}} \Rightarrow \underline{\dot{V}_R} = \eta_{vol} \cdot q_{vt} = 0,6 \cdot 0,0583 = \underline{0,035\left[\frac{m^3}{s}\right]}$$

Aflæst ved: $p_{sug} = 1,5$ bara $\rightarrow v_{sug} = 0,13741[m^3/kg]$

$$m_R = \frac{\dot{V}_R}{v_{sug}} = \frac{0,035}{0,137} = 0,2547\left[\frac{kg}{s}\right]$$

$$\underline{\underline{Q_f}} = m_R \cdot \Delta h_f = 0,2547 \cdot 168,443 = \underline{\underline{42,9[kW]}}$$