

Warmteintegratie in de voedingsmiddelenindustrie

Van idee tot realisatie

Passion for
technology

de kleijn
energy consultants & engineers

ZERO AMBITION

Energy

Fail

Waste

Costs

Maintenance

Emission

Aversion
to waste

ENGINEERING

- Steam/condensate
- Heat pumps
- Cooling installations
- HVAC installations
- Hot/process water
- Heat transfer
- Boilers
- Drying processes
- Etc.

CONSULTANCY

Energy survey

Feasibility study

Heat study

Process optimization

Ventilation survey

Refrigeration survey

Technical inspection

Measurement campaign

***Productiecapaciteit uitbreiding met als doelstelling
geen extra CO2 en NOX uitstoot***

- Pasteurisatie 78 °C
- UHT 130 °C
- CIP 85 °C
- Heetwaterbereiding 80 °C
- Ruimteconditionering 30/50 °C
- 2/6 °C centrale koeling
- 27/37 °C centrale koeling



Analyse warmte- / koudevraag

Vereenvoudigde pinch

1. Overzicht van alle warmte en koude vragers (kW en temperatuur)
2. Directe warmteuitwisseling
3. Warmtepomp

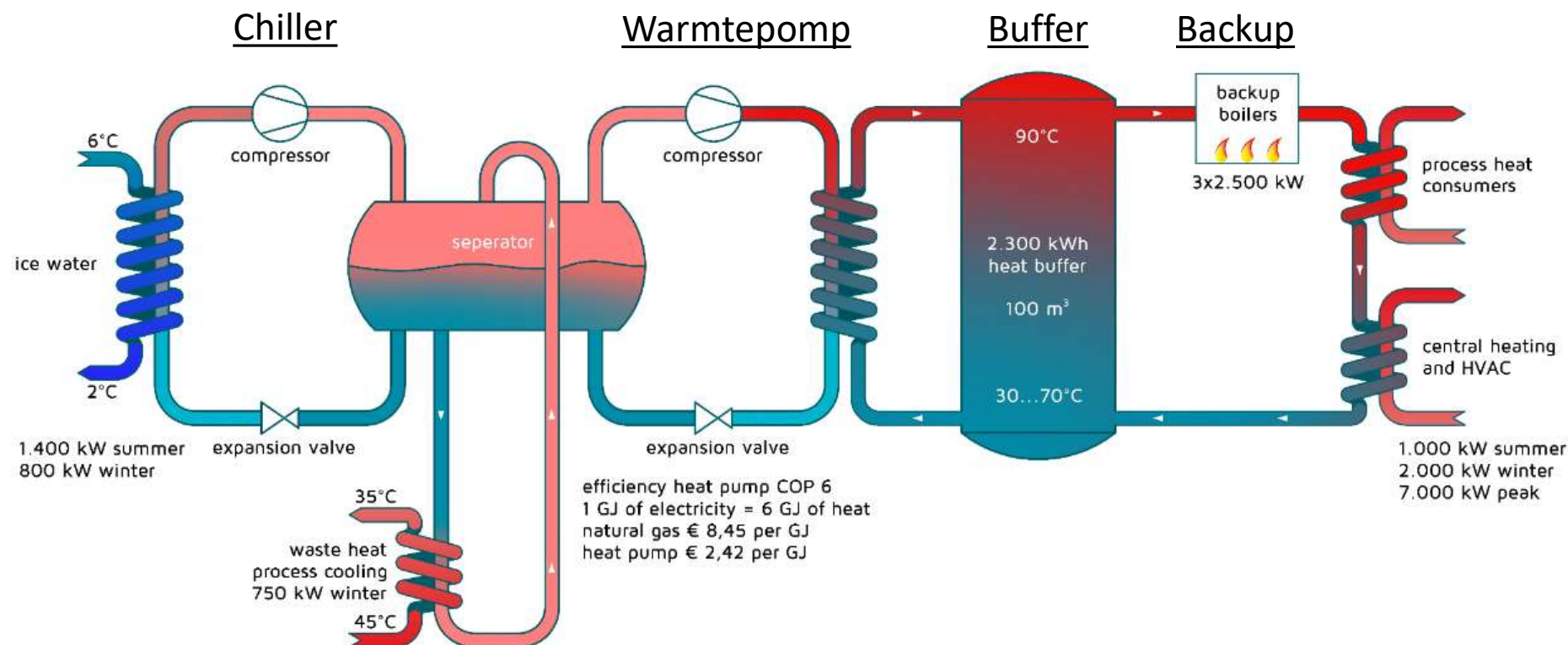
Description	Winter	Inlet/outlet	Summer	Inlet/outlet	Medium	Usage year		
	kW	°C	kW	°C				
Heat sources								
Condenser chiller capacity current	800		1.800		Refrigeration	100%		
Condenser chiller capacity extra future	100	22/22	0	28/28	Refrigeration	100%		
Compressed air heat recovery current	200		200		Water	100%		
Compressed air heat recovery extra future	100	40/90	100	40/90	Water	100%		
Product cooling 1	825	76/30	825	76/30	Product	30%		
Product cooling 2	450	34/64	450	34/64	Product	50%		
Product cooling 3	620	142/101	620	142/101	Flashstoom	22%		
Product cooling 4	600	34/64	600	34/64	Product	50%		
Product cooling 5	830	142/101	830	142/101	Flashstoom	22%		
Product cooling 6	240	35,7/22	240	35,7/22	Product	28%		
Product cooling 7	205	34/20	205	34/20	Product	30%		
Product cooling 8	308	34/20	308	34/20	Product	30%		
Product cooling 9	430	66/20	430	66/20	Product			
Product cooling 10	430	66/20	430	66/20	Product			
Evaporators	267	47/18	267	47/18	Cooling water			
Waste water	500	30/25	500	30/25	Polluted water			
Description	Winter	Inlet/outlet	Summer	Inlet/outlet	Medium	Usage year	Peak	Frequency
	kW	°C	kW	°C			kW	Each month
Heat demand								
Central heating + HVAC current	900	30/50	130	30/50	Heating water		2.841	@-10°C
Pasteur 1	140	65/73	140	65/73	Product		547	97
Pasteur 2	250	60/75	250	60/75	Product		460	Few time each day
Pasteur 3	330	60/75	330	60/75	Product		610	Few time each day
Preparation 1	140	35/65	140	35/65	Product		554	31
Preparation 2	140	35/65	140	35/65	Product		554	31
Preparation 3	140	35/65	140	35/65	Product		0	0
Tracing	135	35	135	35	Product		402	25
Hotwater preparation current	725	10/80	725	10/80			2.200	12
Hotwater preparation future	403	10/80	403	10/80				
CIP 1	128	85	128	10/85	Process water	100%	3.158	
CIP 2	134	85	134				536	
CIP 3	67	85	67				268	
Hot fill CIP several locations							0	
Total	3.632		2.862				12.131	

Analyse warmte- / koudevraag

- Grote pieken i.v.m. batches en CIP
- Zomer/winter profiel
- Bedrijfszekerheid essentieel
- Kansen voor directe warmte uitwisseling
 - Restwarmte perslucht
 - Voorverwarmen heetwater bereiding met restwarmte proceskoeling
 - Warmtepomp op koeling



Pre-engineering



Savings (yearly)

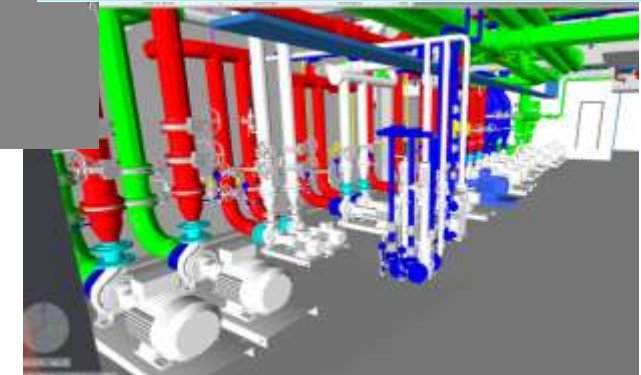
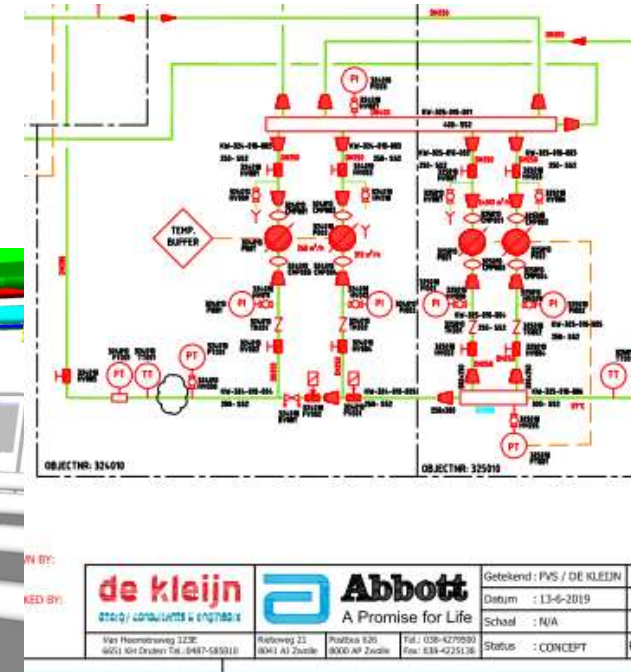
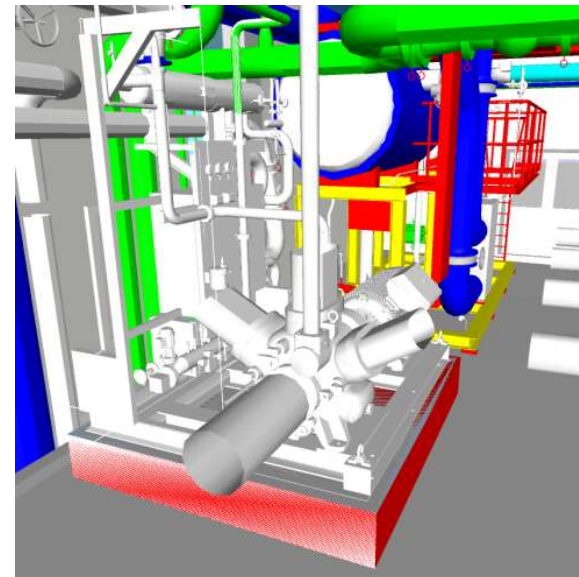
- natural gas: 1.900.000 Nm³
- CO₂ emission: 3.500 Ton
- extra electricity: 2.000.000 kWh
- financial savings: € 380.000

GO / NO GO beslissing

- Investeringskosten en besparingen;
- Vermeden investeringen in stoominstallatie;
- Toekenning DEI subsidie;
- CO₂ & NO_x reductie helpen bij vergunningsverstrekking;
- Toekomstvisie;
- Draagvlak binnen de organisatie.

Detail engineering

- Project aanpak & tendering
- Rol De Kleijn
 - P&ID's
 - 3D model
 - Specificaties hoofdcomponenten en werkomschrijving
 - Functionele omschrijving

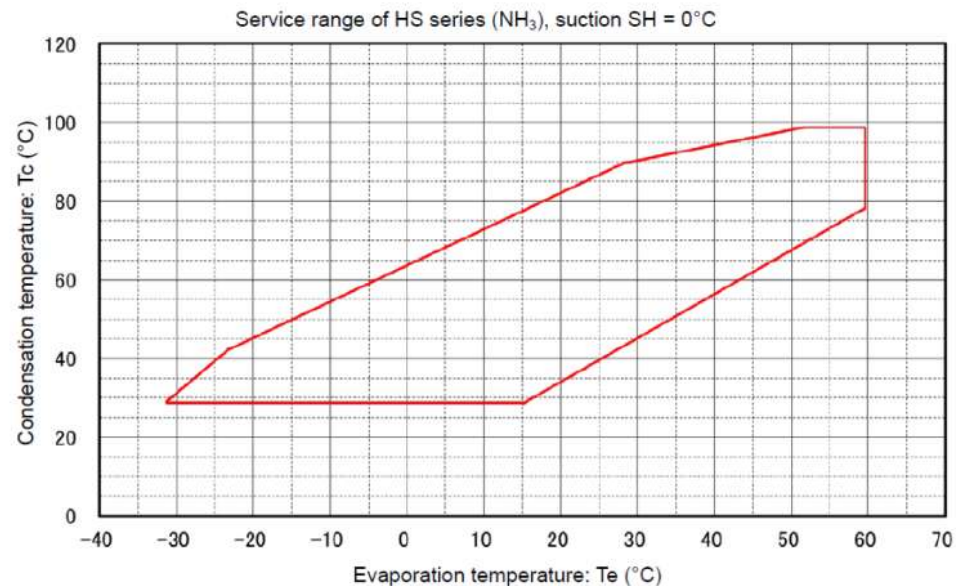


Detail engineering

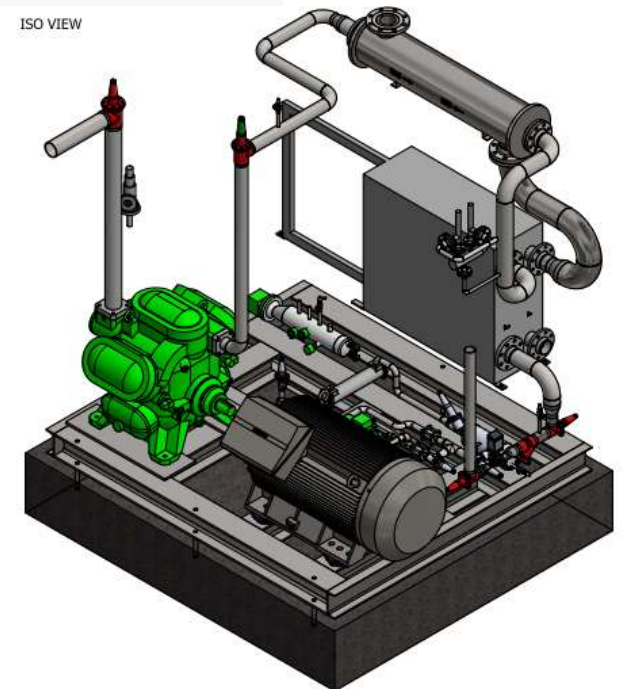
Mycom 6HS series

Hot water capacity
Hot water inlet/outlet temperature
Hot water flow (calculated)

: 2000 kW
: +75/+90°C
: 115 m³/h



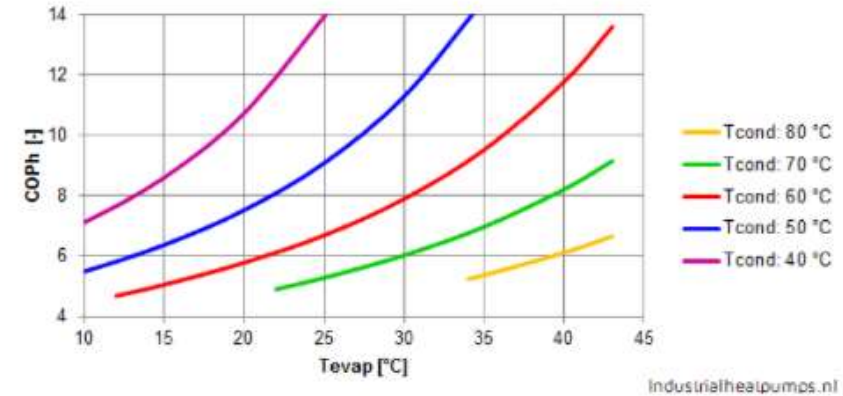
ISO VIEW



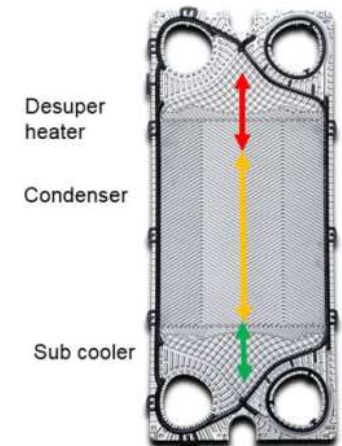
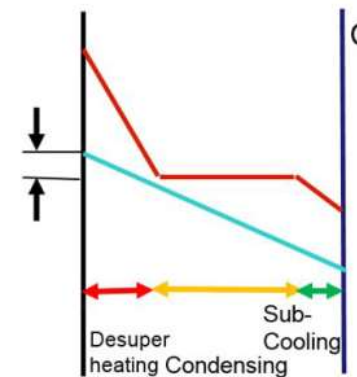
Detail engineering

$$\text{COP}_h = \frac{Q_{\text{useful heat}}}{Q_{\text{electric}}} \approx \frac{Q_{\text{waste heat}}}{Q_{\text{electric}}} + 1$$

- Subcooling
- Desuper heater
- Variabel condenser temperatuur



Condenser
Countercurrently



Detail engineering

- Buffers 100m³ voor fluctuaties in temperatuur en debiet
- Gestratificeerde 90°C tank
- Sideload tank 40 -45 °C
- Gekoeld water aanvoer 2 °C
- Gekoeld water retour 6 °C



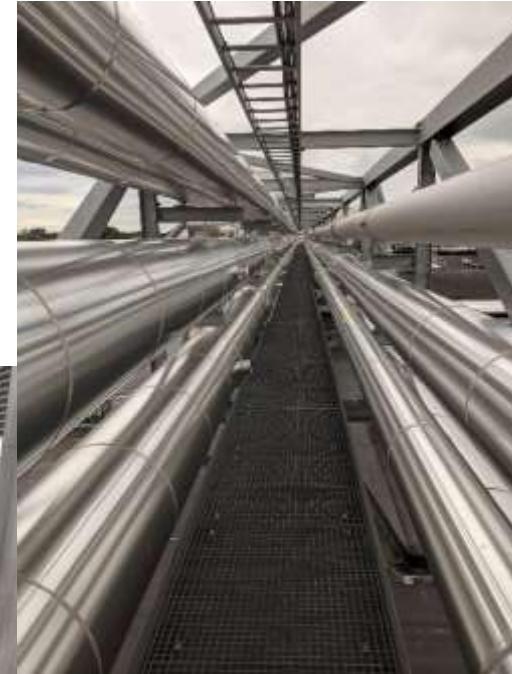
Realisatie

- Klant koopt hoofdcomponenten zelf in
- Werkpakketten
 - Warmtepomp en chiller leverancier
 - Mechanische installatie
 - Elektrische installatie
 - Software integrator



Ingebruikname

- De Kleijn verantwoordelijk voor
 - Commissioning
 - Testen
 - Validatie
 - Training



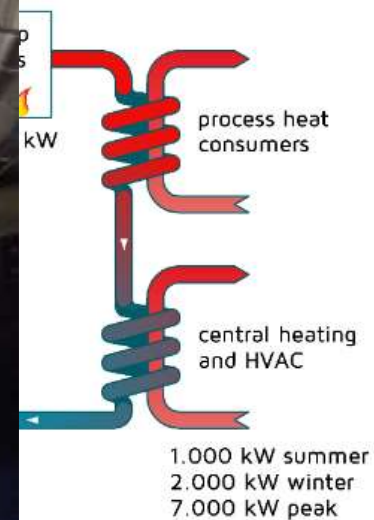
Realisatie



Leerpunten en conclusies

- Leveranciers van procesinstallaties moeten wennen om niet met stoom te werken
- Installaties complexer
- Warmte-/koudevraag analyse essentieel
- Basisinfrastructuur om met meer processen over te stappen
- Piekshaving

Proces van idee naar realisatie



• ***Bedankt voor de aandacht!***

• *Neem bij vragen contact met:*



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