Temadag DTI 2012

Løsninger til energibesparelser og reducering af CO2 udslip i dampsystemer

Thomas Maurin, Teknisk Chef
Danmark & Sverige

First for Steam Solutions

EXPERTISE | SOLUTIONS | SUSTAINABILITY

Spirax Sarco Ltd.

- 4.500 mennesker i mere end 30 lande, der alle arbejder med samme ide:

Energi og miljørigtige løsninger!

  - Europa betjenes primært fra England, Frankrig og Italien.
  - Forskningscenter i England
  - Egne afdelinger for at kunne kommunikere det væsentlige: Energibesparelser og reducering i CO2 udslip!

Spirax Sarco Danmark

- 18 personer
  - 4 eksterne salgsingeniører der kan dække hele Danmark
  - Intern salgssupport
  - Teknisk support
  - Lager og værksted
  - Serviceafdeling, 4 serviceingeniører, drift og vedligehold, energiaudits, gennemgang vandudladere, positionerer og andre energiforbrugene udstyr.
  - Rådgivning til kunder og rådgivere.
  - Hjemmeside: www.spiraxsarco.com/dk

Det moderne dampanlæg

- Langt de fleste fabrikker oplever et stigende pres for at reducere deres energiforbrug og CO2 udslip
- For at imødekomme disse krav må vi have nogle simple løsninger
- Den moderne fabrik burde ikke opleve flashdampspild eller lukke varmt vand ud i kloakken
- Det skal opsamles og genanvendes
- Genanvendelsen bør altid kunne forbedre effektiviteten I processen

Største områder med energitab

Flashdamp tab

Varmetab fra forurenet vand

Varmetab fra køletårne

Varmetab fra proces udluftning

Varmetab fra forurenet kondensat

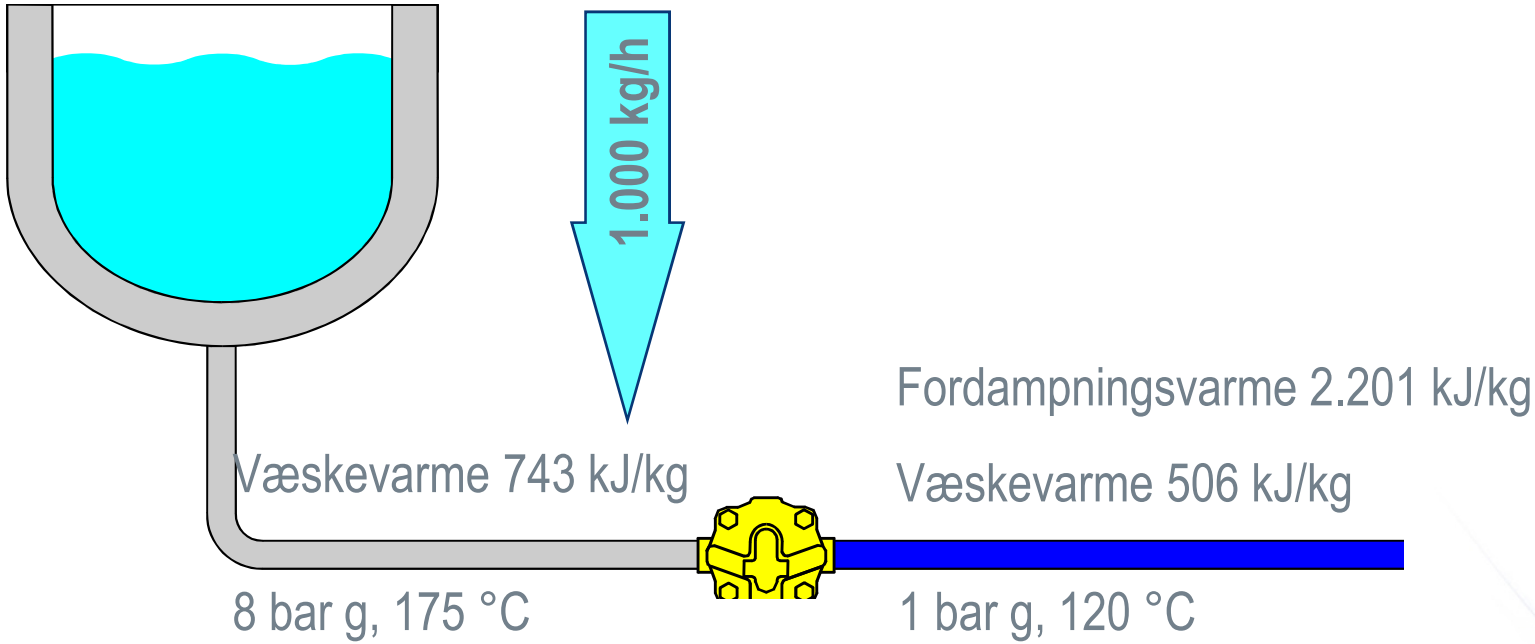
Hvad er damp?

Damptryk		Temperatur	Entalpi kJ/kg			Volumen tør mættet
			Væskevarme	Fordampnings-varme	Total varme	
bar	**kPa**	**ºC**	**h_f**	**h_{fg}**	**h_g**	**m^3 /kg**
0	0	100	419	**2.257**	2.676	1,673
1	100	120	**506**	2.201	2.707	0,881
2	200	134	562	2.163	2.725	0,603
3	300	144	605	2.133	2.738	0,461
4	400	152	671	2.108	2.749	0,374
5	500	159	641	2.086	2.757	0,315
6	600	165	697	2.066	2.763	0,272
7	700	170	721	2.048	2.769	0,24
8	800	175	**743**	**2.031**	2.774	0,215
9	900	180	763	2.015	2.778	0,194
10	1000	184	782	2.000	2.782	0,177
11	1100	188	799	1.986	2.785	0,163
12	1200	192	815	1.973	2.788	0,151
13	1300	195	830	1.960	2.790	0,141
14	1400	198	845	1.947	2.792	0,132

Hvad er flashdamp

- **Hvad er flashdamp (også kaldet genfordampning)?**
- Flashdamp opstår når kondensat ledes fra et højere tryk til et lavere tryk og derved vil noget af det genfordampe.
- Ved atmosfærisk tryk kan vand ikke eksisterer ved mere en 100 °C - dvs. kommer kondensatet fra 180 °C skal der afgives 80 °C og det sker ved genfordampning – eller flashdamp!
- Hvis denne flashdamp ikke udnyttes opstår der et varmetab ud gennem den nærmeste udluftningsledning
- Det samme sker når der bundblæses fra en dampkedel (8 barg / 175 °C). Her vil der også være et kortvarigt varmetab, som man skal forsøge at genanvende

Hvad er flashdamp



Regnestykket:

Fordampende væskevarme = 743 – 506 kJ/kg = 237 kJ/kg ➡

$$\frac{237\ kJ/kg}{2.201\ kJ/kg} \times 100 = 10{,}7\ \%\ Flashdamp$$ ➡ *1000 kg/h x 0,107 = 107 kg/h Flashdamp*

107 kg flashdamp svare til 65 kW!

Flashdamptab

Løsninger til udnyttelse af flashdamp

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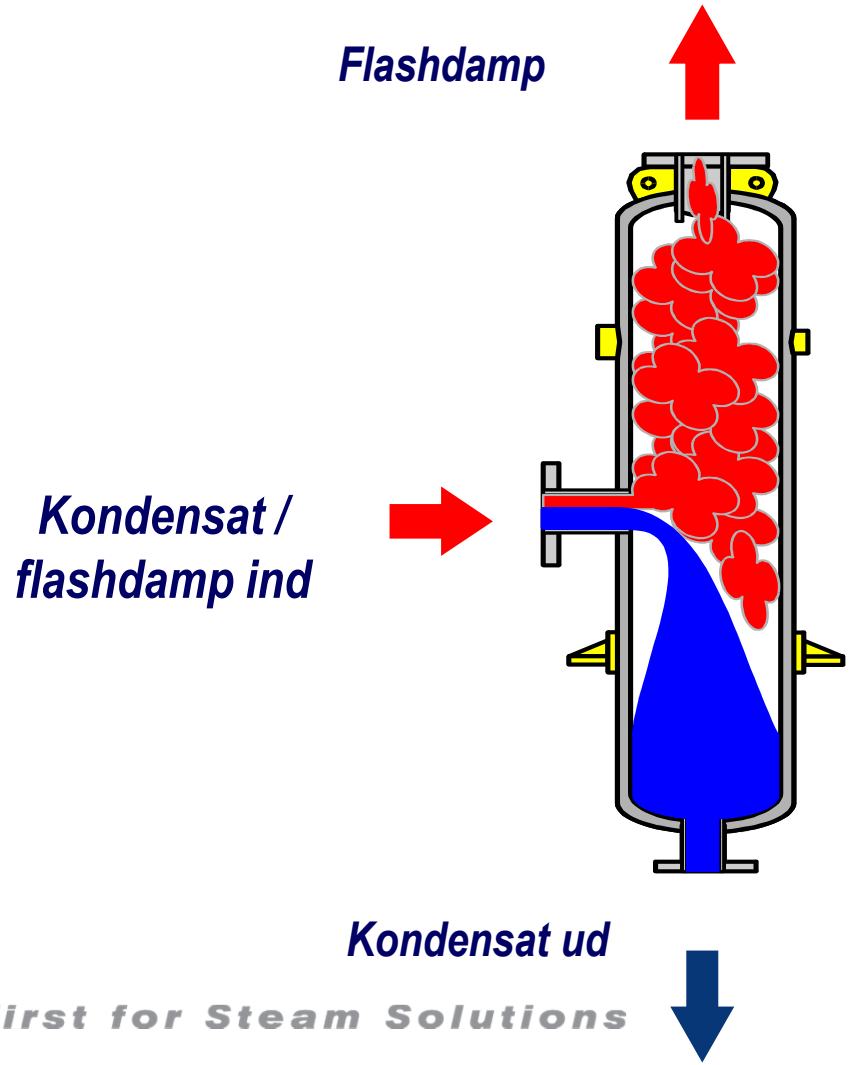
Adskillelse af flashdamp fra kondensat via flashdampbeholder



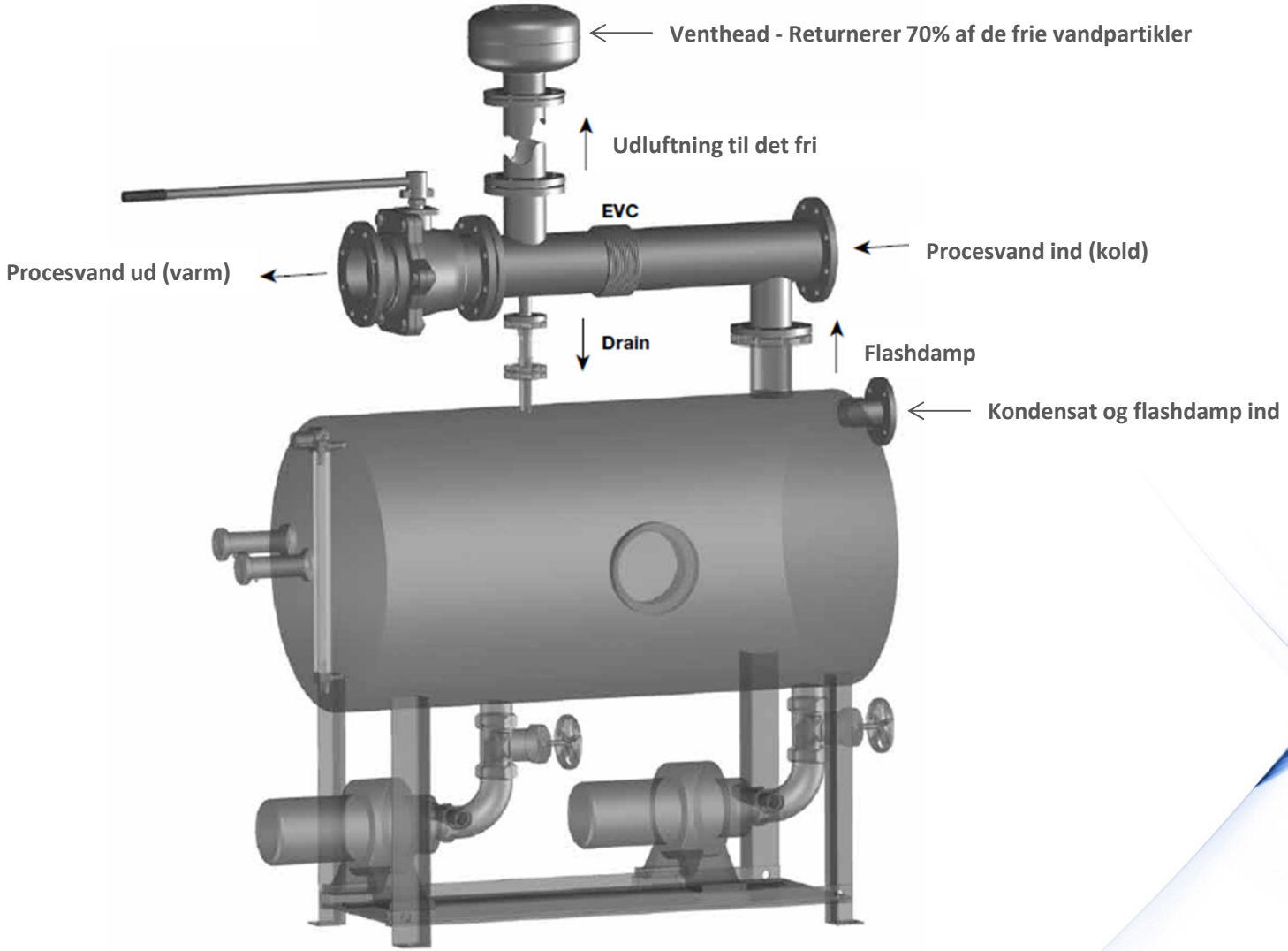
- Adskiller dampen og kondensatet i kondensatrøret.
- Genfordampningens maksimale fremløbshastighed i tanken er 3 m/s.
- Takket være den lave fremløbshastighed i tanken adskilles dampen og kondensatet godt.
- Kondensat falder til bunds og dampen strømmer opad.
- Kondensat udledes fra tanken vha. en svømmervandudlader.

Hvor kan flashdamp udnyttes?

Typiske anvendelsesformål:

- Opvarmning af brugs- og procesvand
- Procesopvarmning
- Opvarmning af fødevand
- Forvarmning af luft
- Luftbefugtning

Flashdamp Condenser



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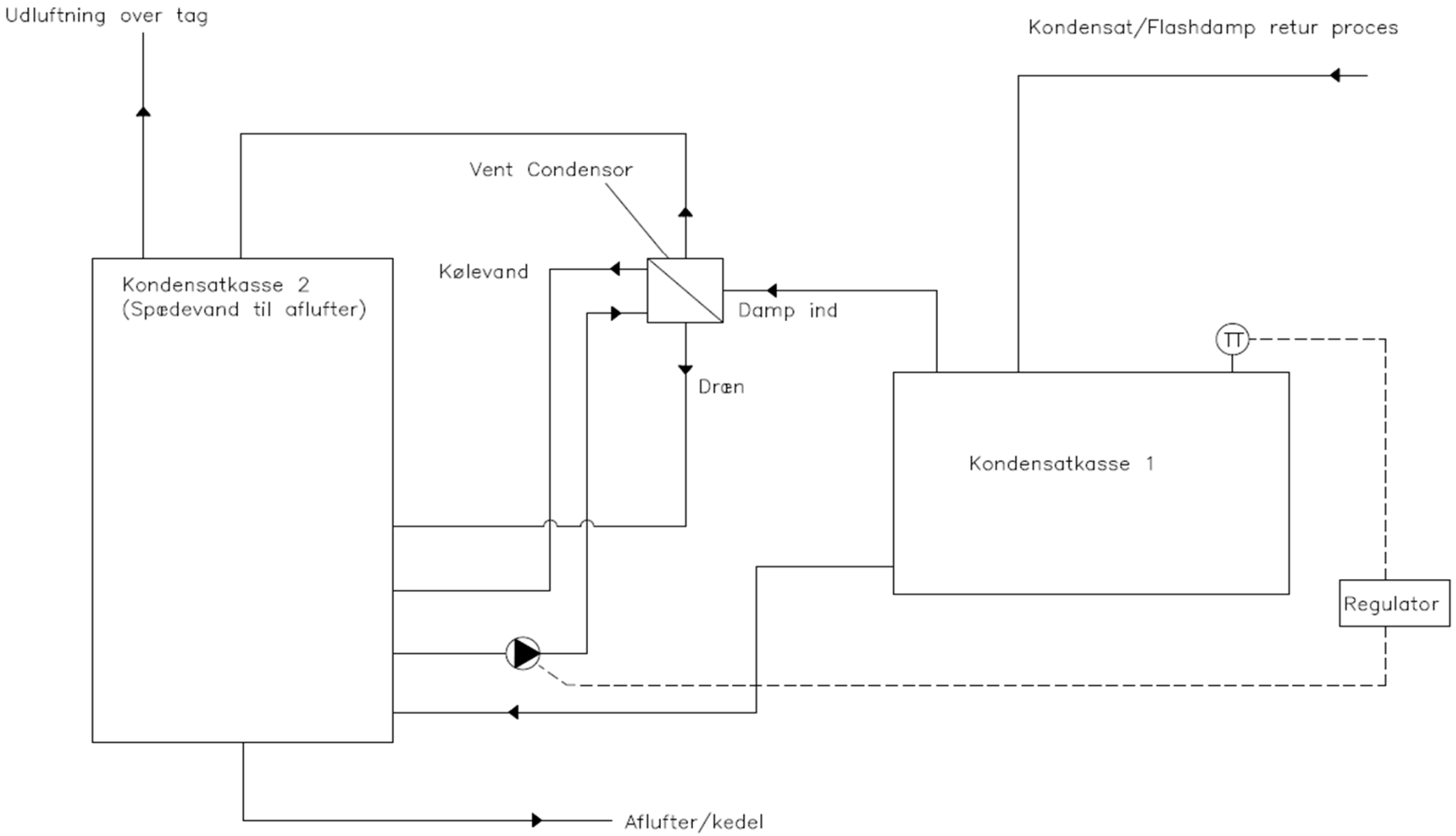
Flashdamp Condenser, Principskitse



Løsninger med optimal energiudnyttelse

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Udnyt dampen bedst muligt

- Kondenser dampen ved lavest muligt damptryk/temperatur
- Her har du højeste energiindhold pr. kg. damp der kondenseres
- Dimensioner varmeveksler så der ikke opstår flashdamp. Men vær opmærksom på drænløsningen
- Færre belægninger (mindre service)

Damp tryk		Temperatur	Entalpi kJ/kg			Volumen tør mættet
			Væskevarme	Fordampnings -varme	Total- varme	
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introducing

the new **Spirax EasiHeat™**

incorporating SIMS technology

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the new Spirax EasiHeat™ HTG

& the new Spirax EasiHeat™ DHW

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meeting the challenge **of managing energy costs**

Spirax EasiHeat™ **HTG**

a complete, compact, ready to use steam to water heat transfer package with innovative monitoring system

delivers superior energy efficient performance

lowers costs, tackles waste and mitigates environmental impact

programmable timer further increases efficiency

touchscreen SIMS technology as standard

First for Steam Solutions

the more **energy efficient** alternative

Spirax EasiHeat™ **HTG**

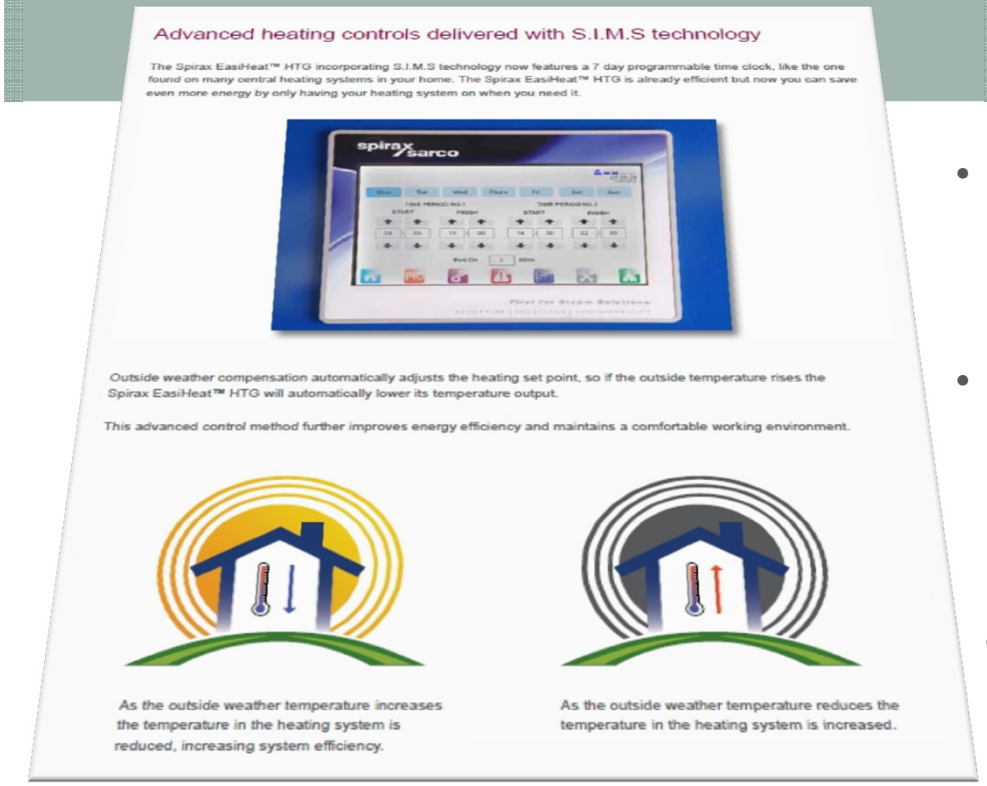
First for Steam Solutions

Benefits

- energy efficient – helps reduce costs and reduces CO_2
- components precisely sized to provide optimum performance
- compact – core unit occupies on 1.8m^3, up to 3.9m^3 for the largest output unit
- low cost of ownership – high quality low maintenance components reduce maintenance, and seldom requires annual insurance inspection
- quicker, easier installation

the more **energy efficient** alternative

Spirax EasiHeat™ **HTG**



Advanced heating controls delivered with S.I.M.S technology

The Spirax EasiHeat™ HTG incorporating S.I.M.S technology now features a 7 day programmable time clock, like the one found on many central heating systems in your home. The Spirax EasiHeat™ HTG is already efficient but now you can save even more energy by only having your heating system on when you need it.

Outside weather compensation automatically adjusts the heating set point, so if the outside temperature rises the Spirax EasiHeat™ HTG will automatically lower its temperature output.

This advanced control method further improves energy efficiency and maintains a comfortable working environment.

As the outside weather temperature increases the temperature in the heating system is reduced, increasing system efficiency.

As the outside weather temperature reduces the temperature in the heating system is increased.

- features a 7 day programmable time clock so you can have your system on only when needed
- outside weather compensation auto-adjusts the heating set point, so if the outside temperature rises the system will lower its temperature output
- advanced control method further improves energy efficiency and maintains a comfortable working environment

meeting the challenge **of managing energy costs**

Spirax EasiHeat™ DHW

a complete, compact and energy efficient heat transfer solution

delivers constant supply of domestic or process hot water at a stable temperature on demand

… even with sudden load changes

reduces energy costs, tackles waste, and mitigates environmental impact

touchscreen SIMS technology as standard

the more **energy efficient** alternative

Spirax EasiHeat™ **DHW**

Benefits

- energy efficient – helps reduce costs and reduces CO_2
- instantaneous hot water without storage – reduces energy loss, reduces risk of Legionella growth
- compact – core unit occupies on $2m^3$, up to $3.8m^3$ for the largest output unit

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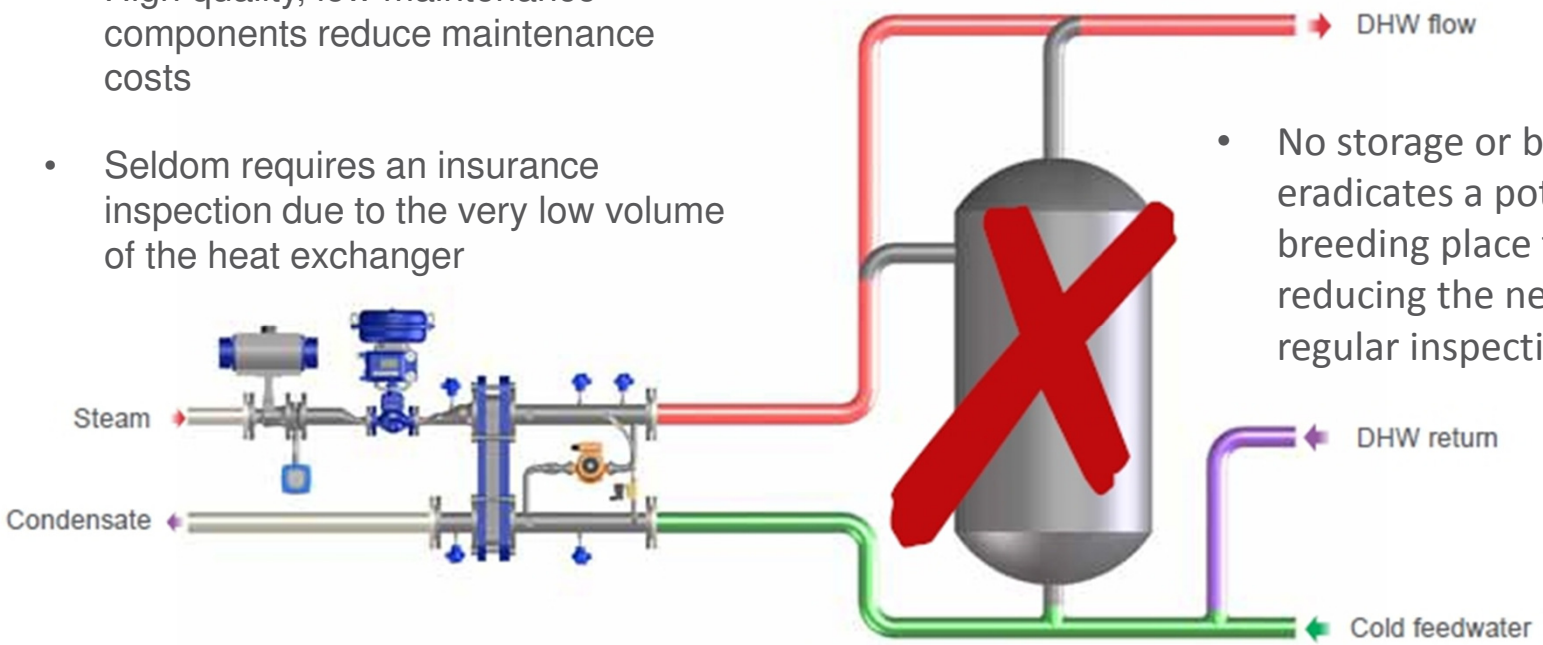
the more **energy efficient** alternative

Spirax EasiHeat™ **DHW**

- High quality, low maintenance components reduce maintenance costs
- Seldom requires an insurance inspection due to the very low volume of the heat exchanger



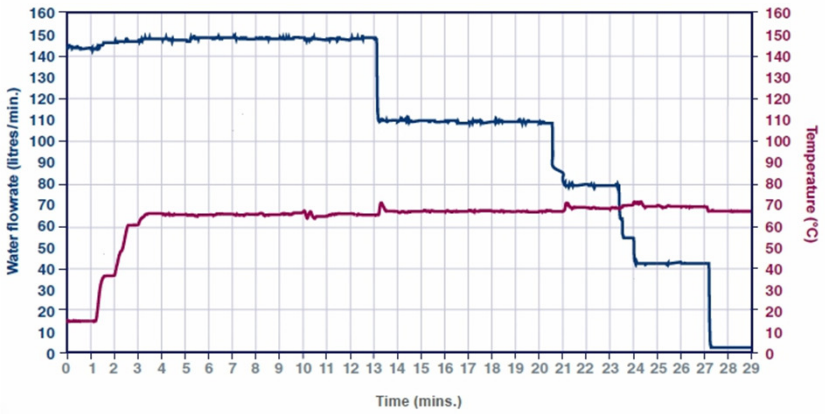
- No storage or buffer tanks - eradicates a potential breeding place for bacteria, reducing the need for regular inspections

the more **energy efficient** alternative

Spirax EasiHeat™ **DHW**

The Spirax EasiHeat™ DHW performance (with no buffer tank or storage vessel)

The graph below shows the performance of the Spirax Easiheat™ DHW on instantaneous duty. The application is water heating, with a high secondary temperature rise and large sudden load changes; a duty typical of process hot water. The graph shows that even with the large sudden load changes, a safe, constant hot water temperature is maintained.



Water flowrate
This is the flowrate of cold water being delivered to the Spirax EasiHeat™ DHW.

Water temperature
This is the temperature of hot water being delivered by the Spirax EasiHeat™ DHW.

The graph illustrates the performance of the Spirax EasiHeat™ DHW on instantaneous duty.

The application is water heating, with a high secondary temperature rise and large sudden load changes; a duty typical of process hot water.

The graph shows that even with the large sudden load changes, a safe, constant hot water temperature is maintained.

Spirax EasiHeat™ **key features**

- no waste design
- compact design
- touch screen control
- unique Spirax intelligent control
- pre-assembled tested unit
- integrated communications

Introducing SIMS technology

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Spirax EasiHeat™ incorporating SIMS technology

> “We wanted to make energy, CO_2 and carbon information readily available to the customer. With S.I.M.S technology, Energy Managers have access to key information to produce their reports simply and quickly.”

Chris Rowlands,
Group Product Manager for Heat Transfer Solutions

SIMS technology is the new energy monitoring system which allows interrogation of energy, CO_2 and carbon data from any location.

A wide number of communication protocol options provides the Spirax EasiHeat™ with the flexibility to integrate with many existing communication and building management systems.

S.I.M.S technology **key features**

7” colour, intuitive **touch screen control** with advanced graphics as standard

Complete **visual access** to all parameters. Easy to interrogate and obtain the required data

No complex controls – SIMS technology can be operated with limited previous controls & instrumentation experience

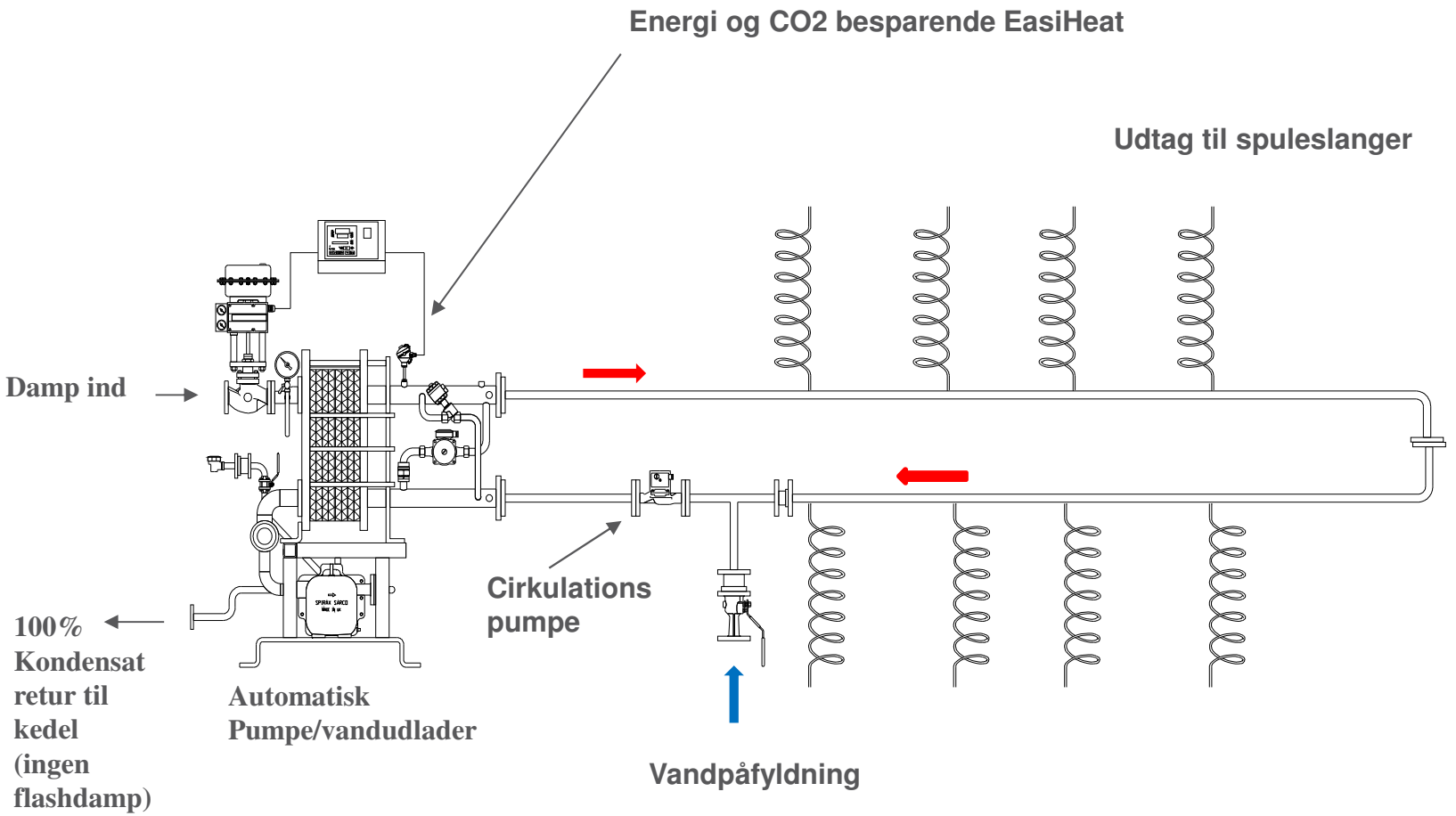
Access and control from **any location**, globally

Compatible with Ethernet, Modbus, Profibus, CANopen, EtherCAT and many more

Optional web server allows **secure remote access** to monitor and control the unit via standard web browser

Generates text or email alerts if an event occurs or as a service reminder

Rengøringssystem UDEN varmtvandsbeholder



Energi og CO2 besparende varmeveksling

Sizing Suite Program

DHW | HTG

Domestic Hot Water

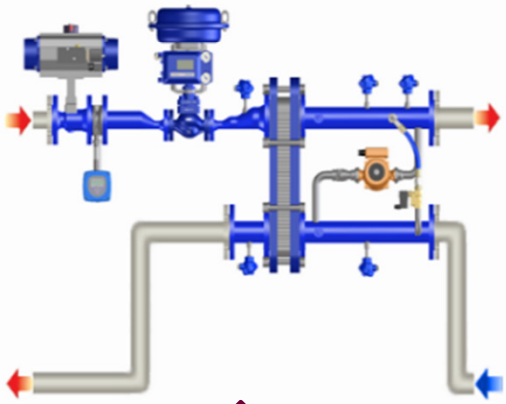
Primary

Line Pressure 8 bar gauge

Design Steam Flow 857,02 kg/h

System Backpressure 0,3 bar gauge

Condensate Temperature 95 °C



Secondary

Output Temperature 65 °C

Pre-Heated Temperature 16,65 °C

Flow Rate 7.82 m³/h

Power Requirement 500 kW

Input Temperature 10 °C

Exit temperature with no sub-cooling

Flash steam loss with no sub-cooling

Cost of steam per 1,000 kg

Usage

Hours Per Day

Hours Per Year

Sub-cooling 59,28 °C

New Steam Load 753,44 kg/h

am loss with sub-cooling 0 kg/h

Fuel Natural Gas

Tilbagebetalingstid kan blive meget attraktiv! Jo mere du bruger den mere du bruge veksleruniten desto hurtigere betaler den sig hjem

Saving 236664,91 kWh

CO2 Saving 44,97 tonnes/year

Carbon Saving 12,26 tonnes/year

Total An

New Annual Stea

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Ny energibesparende Easiheat - Priseksempel

Type EHD3PPNPT-HLG1-ER1: Pris kr. 331.678,00

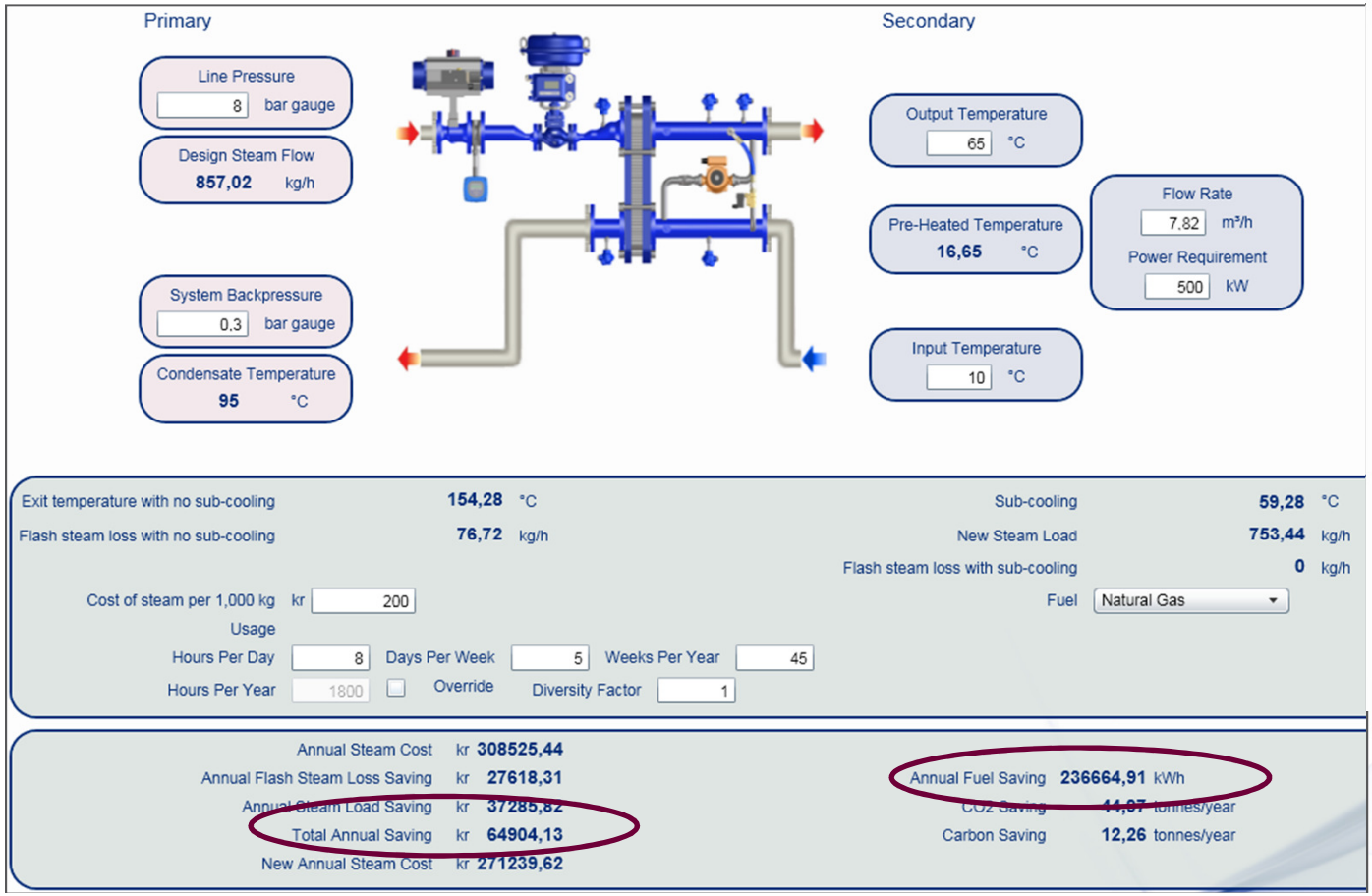
- High limit
- APT14
- Dampmåler (energimåler)
- SIMS teknologi: Level 1; SMS + E-mail

Varme Facts

- Dampforbrug: 753 kg/h (Normalt 857 kg/h)
- Årlige driftsbesparelser: 64.904 kr. (i forhold til ikke - energibesparende løsninger)
- Energitilskud v/25 øre pr. kW: 236664 x 0,25 = 59.166 kr.

Tilbagebetalingstid

- Salgspris inkl. tilskud: 331.678 – 59.166 = 272.512 kr.
- Tilbagebetalingstid: 272.512 / 64.904 = **4,2 år**



Løsninger med effektiv varmeveksling af returkondensat

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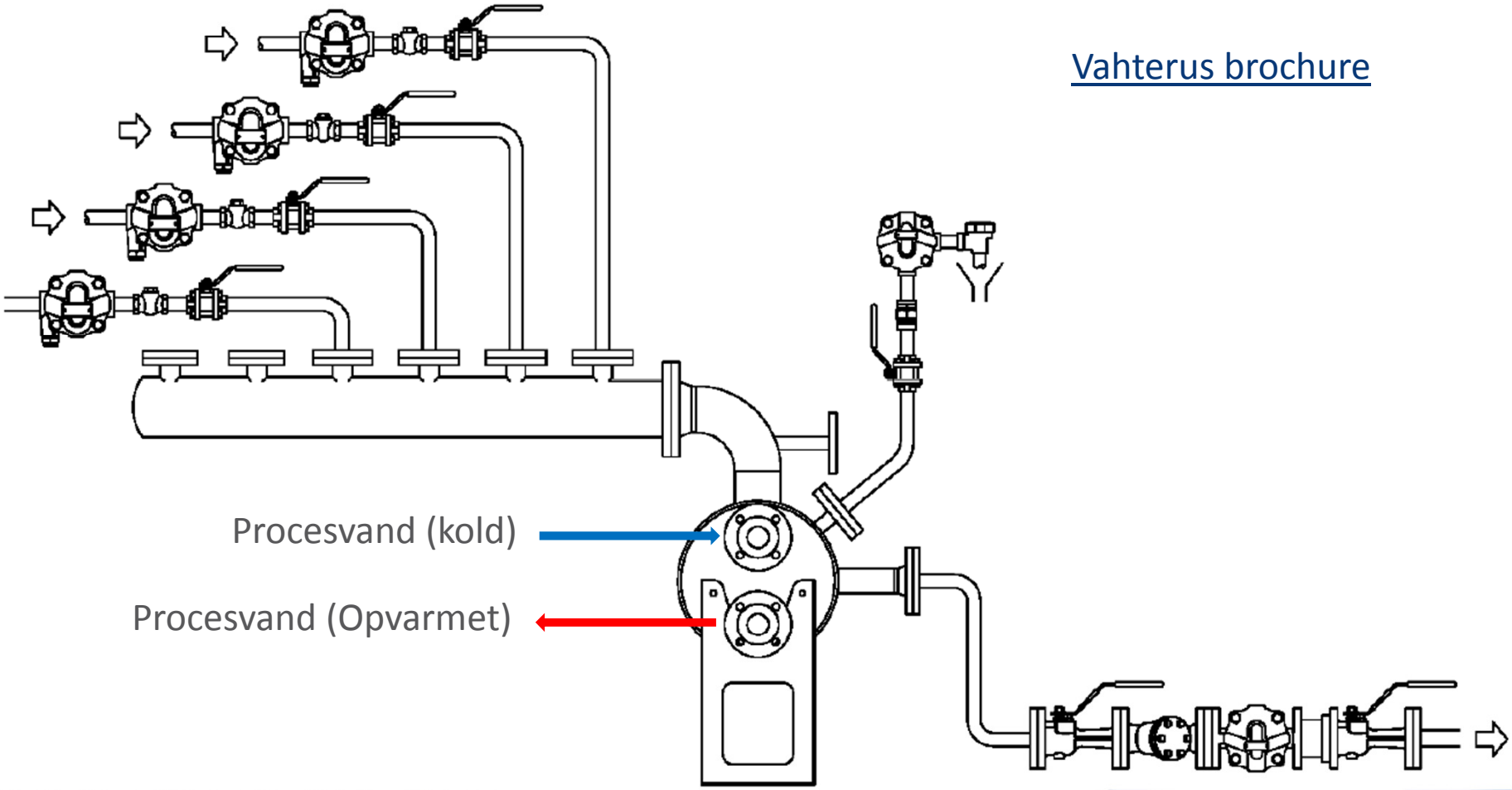
ICHRU
Inline Condensate Heat Recovery Unit

Vahterus brochure



ICHRU
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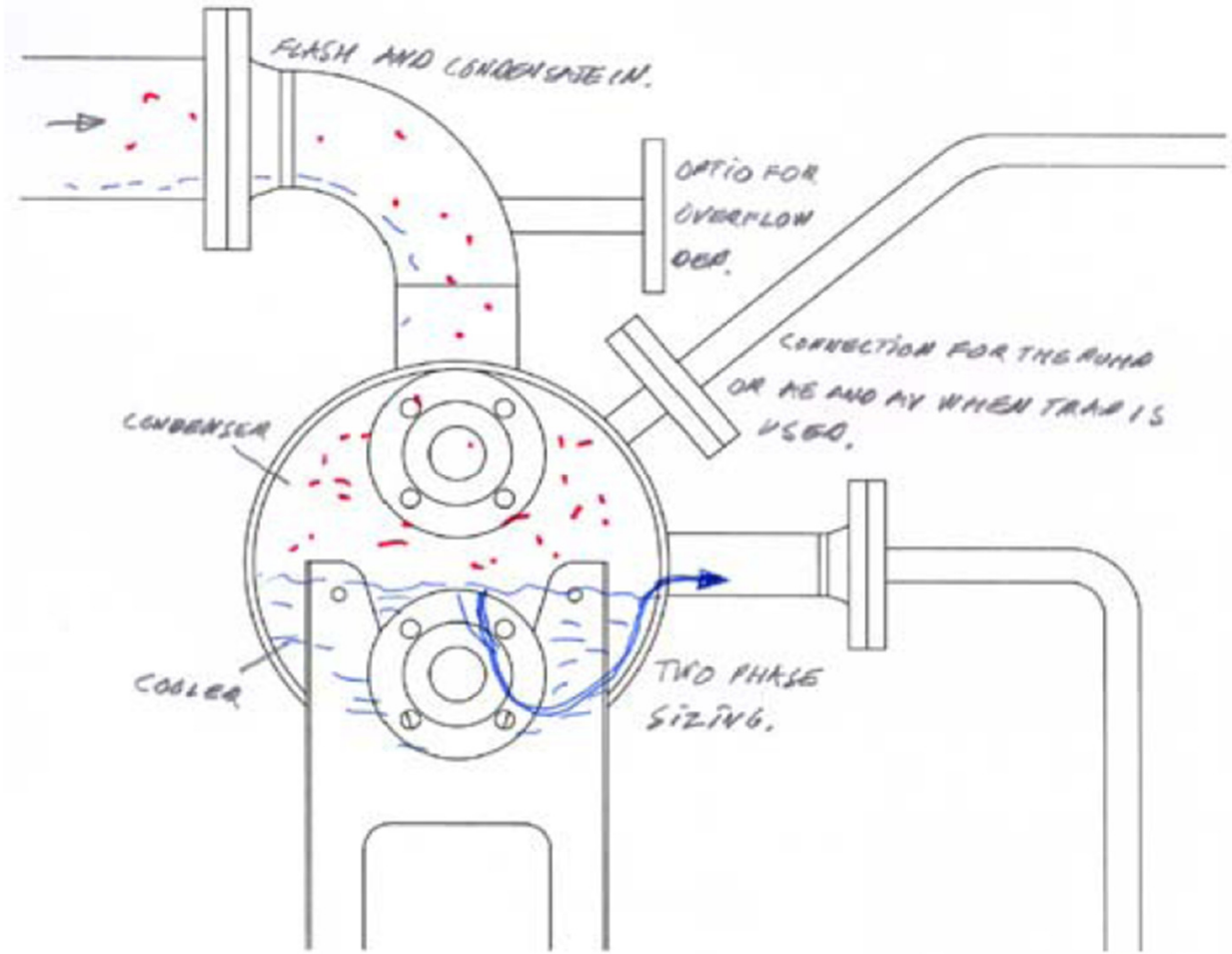

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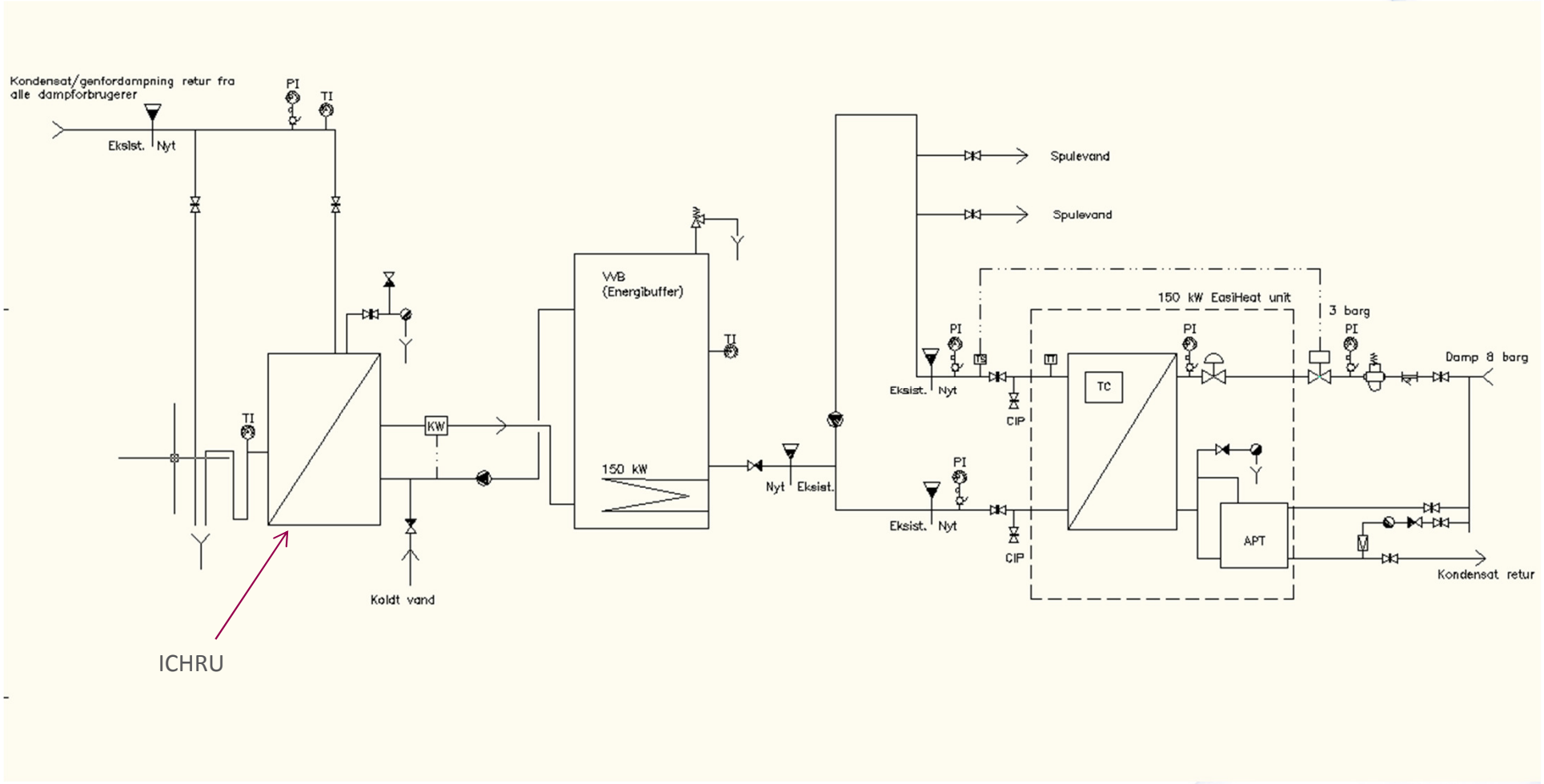
ICHRU Installationseksempel



Standard FREME Unit

- Prisvindende!

IChemE Awards for innovation and excellence 09 Winner

CARBON TRUST INNOVATION AWARDS 2009 FINALIST

THE CIBSE LOW CARBON PERFORMANCE AWARDS | 2010

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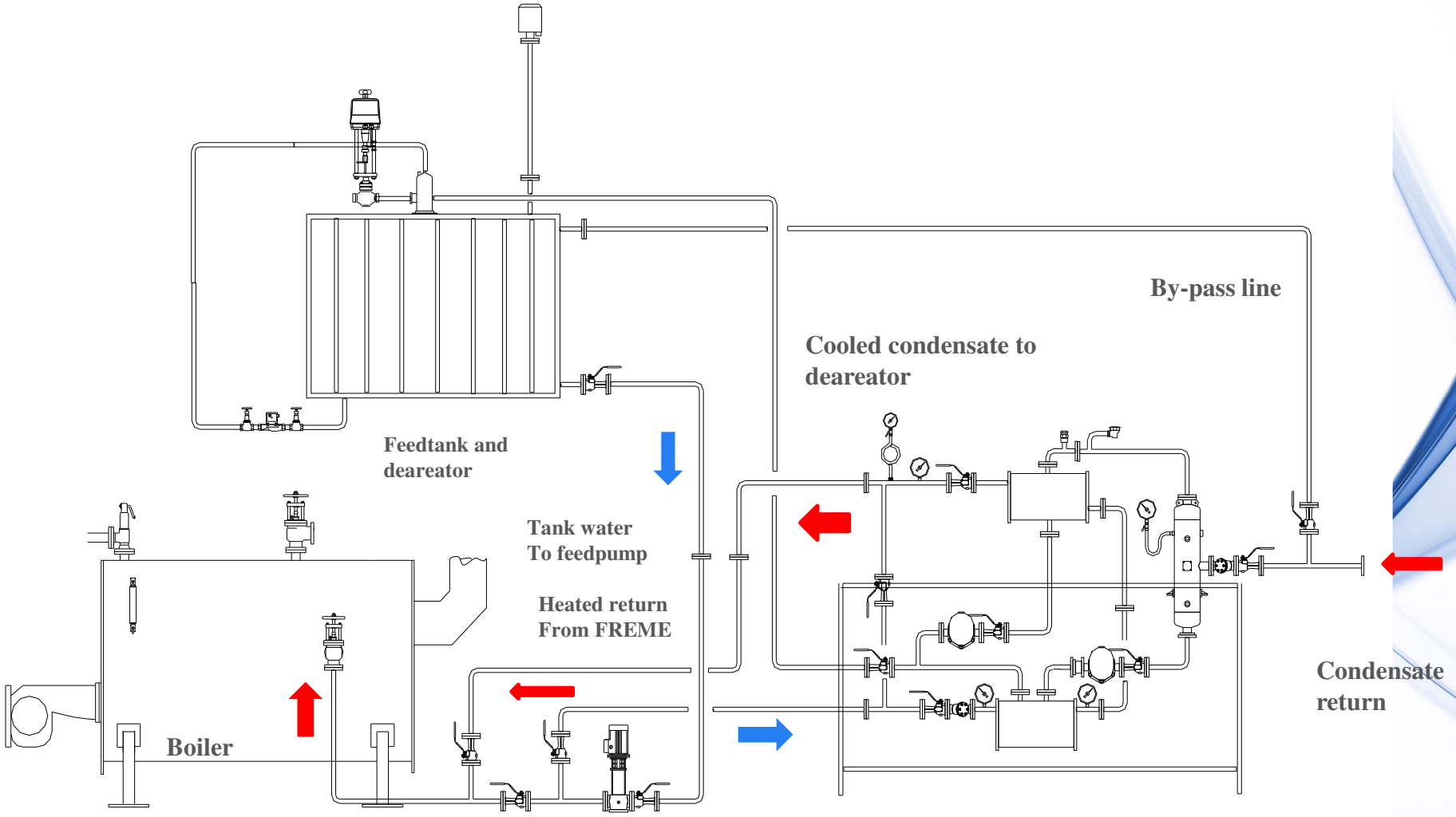
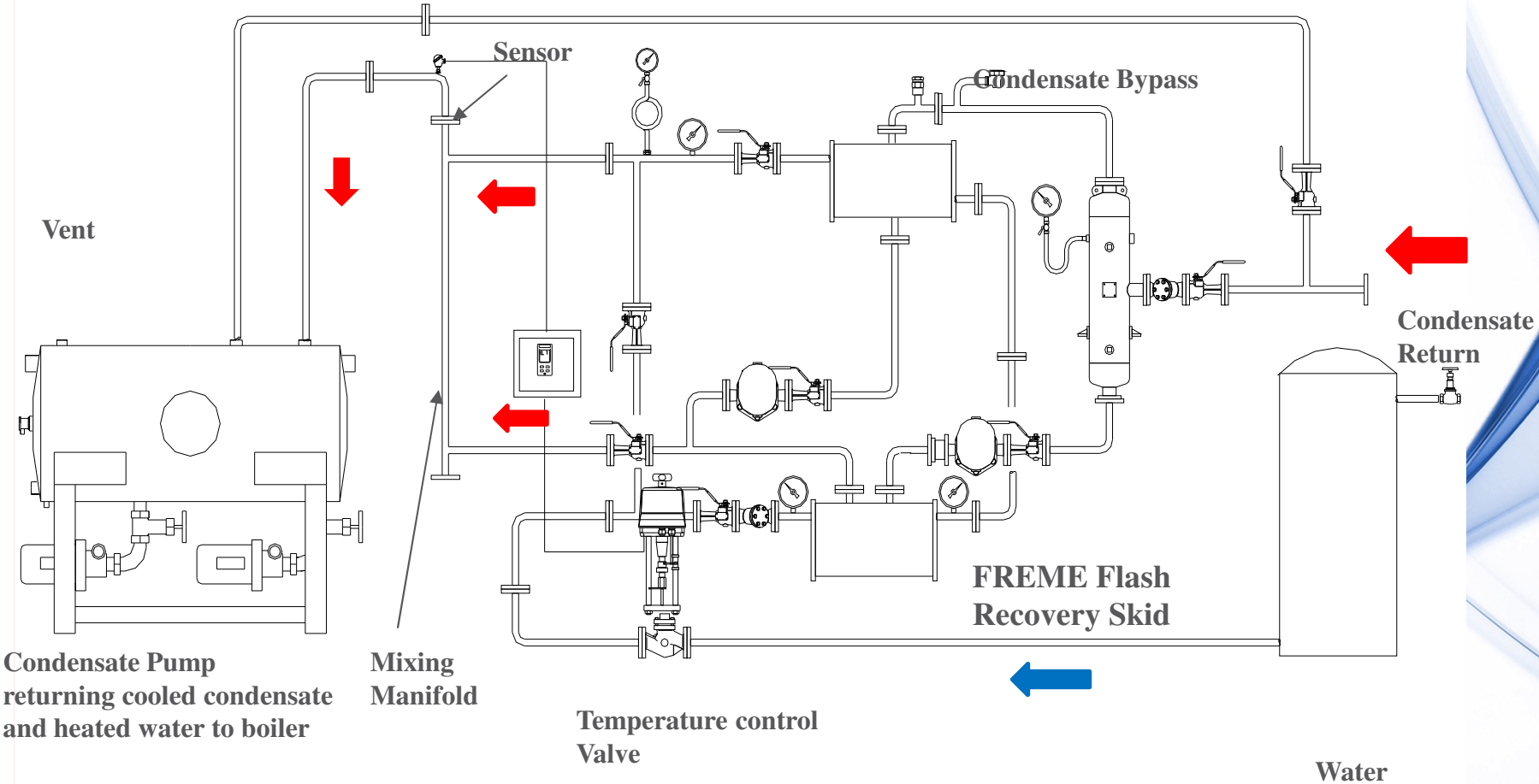
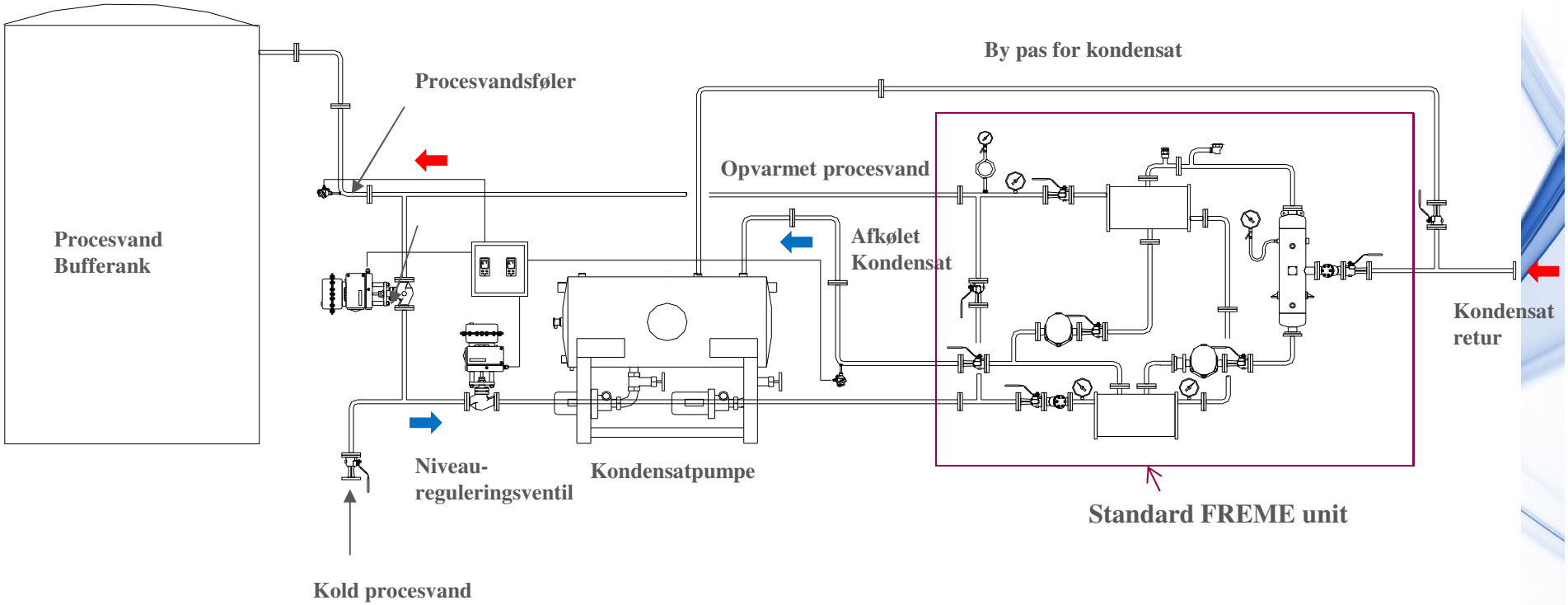
Standard FREME Flash Recovery Package: Boiler Application



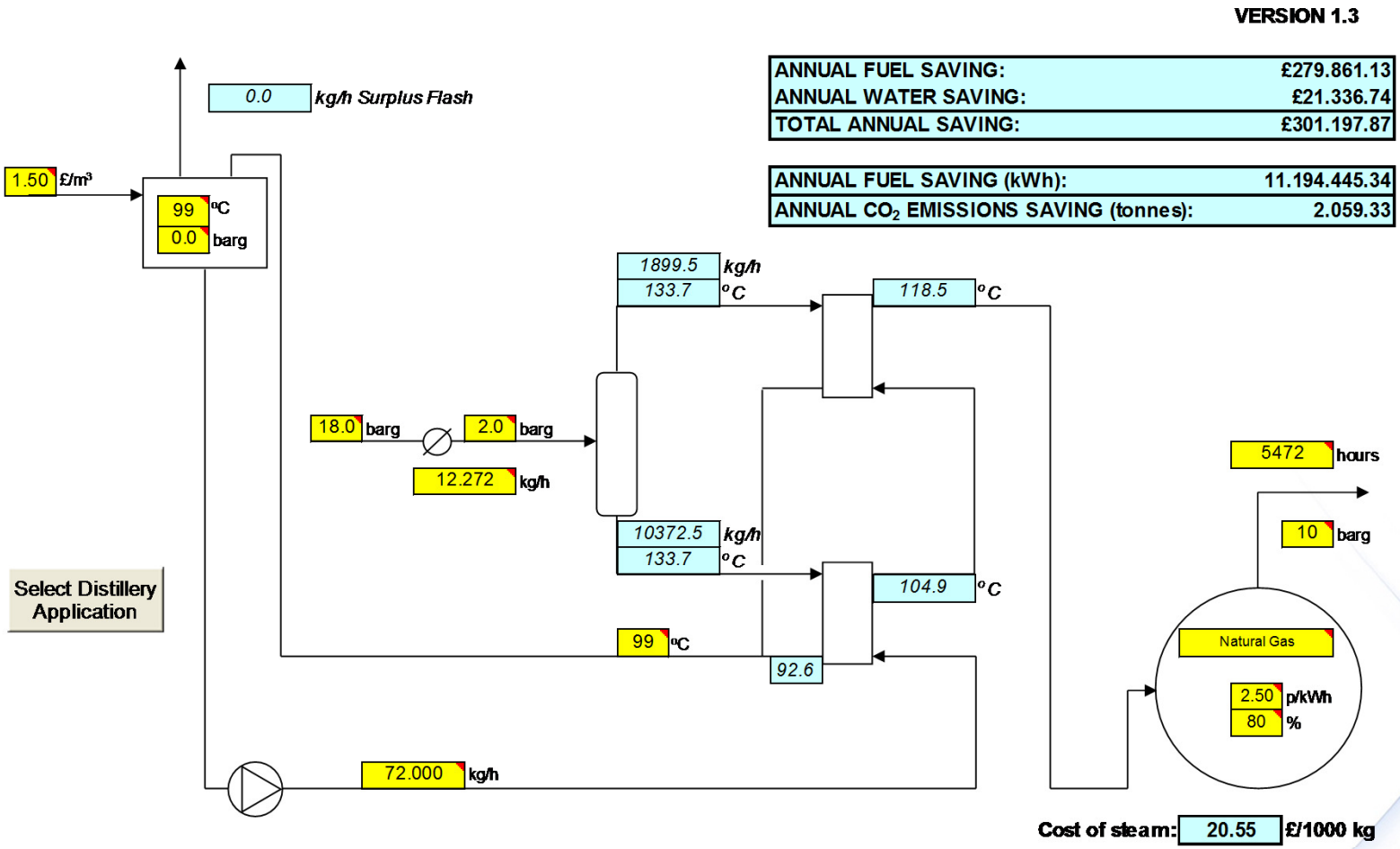
Standard FREME Flash Recovery Package: Boiler Feedwater Heater



Standard FREME Unit: Procesvandsforvarmer



Konfigurering af FREME Unit



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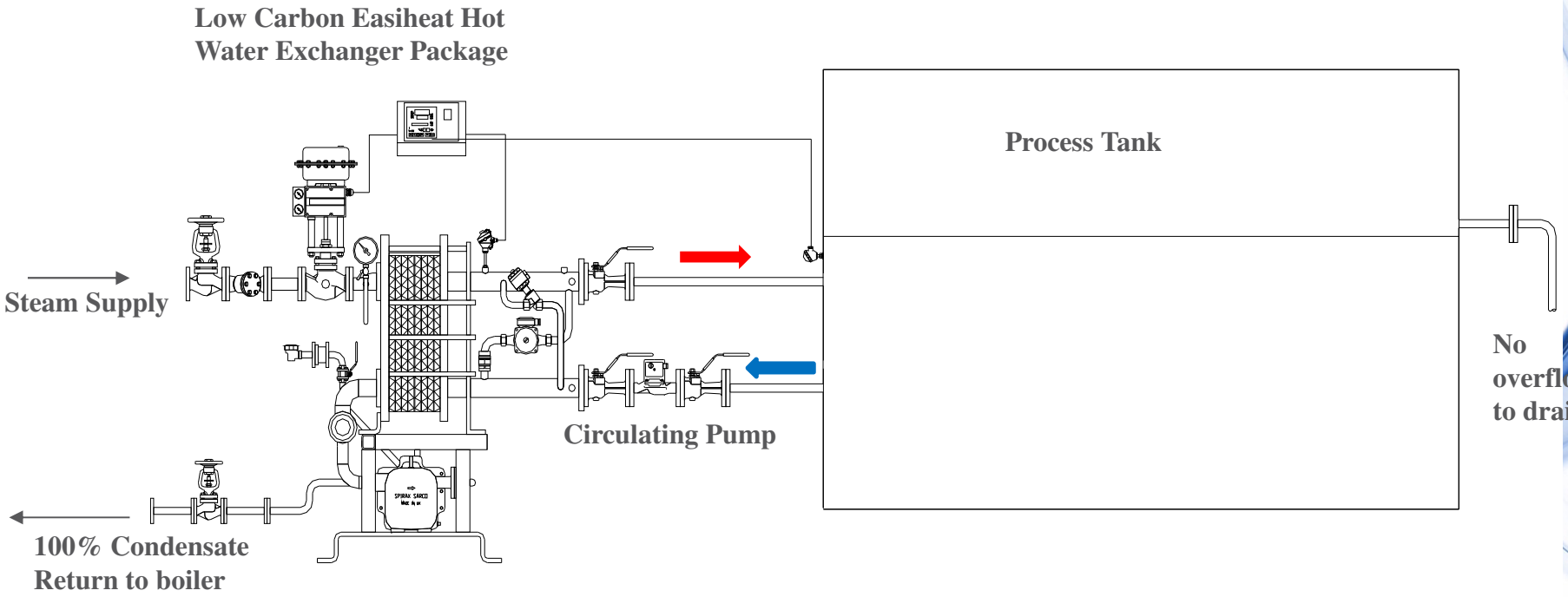
De Mulder - cuts energy costs by 20%

- De Mulder & Sons in Nuneaton is a by-product processing plant
- A flash steam recovery system is delivering direct energy savings of 10%, plus a further 10% of indirect savings

External Heater replacing heating coil or direct injection on Process Tank



Heat Recovery from Effluent

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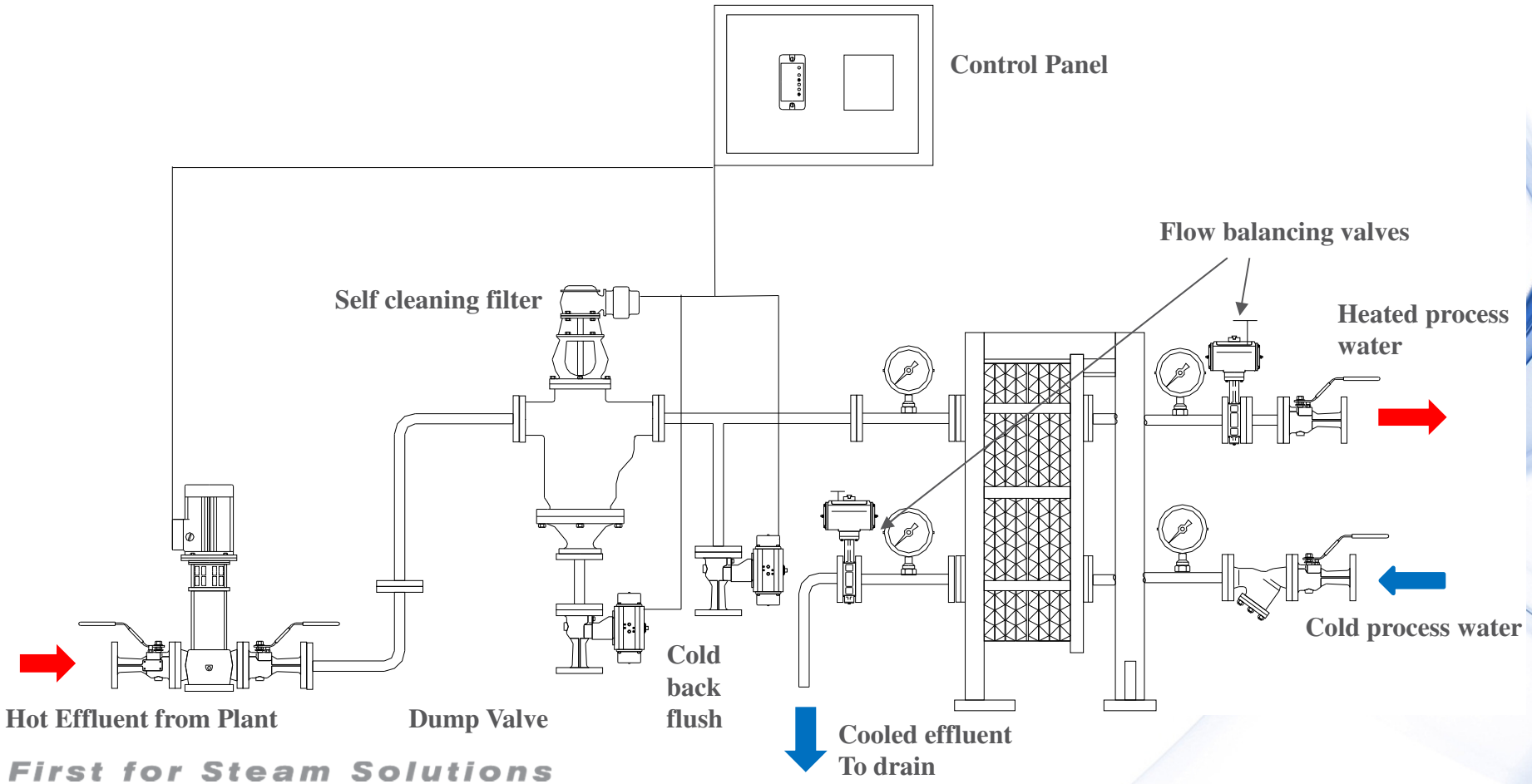
Problems associated with hot effluent going to drain

- High quality energy going to drain
- Effluent contaminated with solids
- Effluent treatment costs
- Cold water on re-fill of process
- Longer heat up times.
- Start up can cause boiler priming or lockout
- Steam starvation on heat up can cause quality problems elsewhere in plant

Effluent Heat Recovery system



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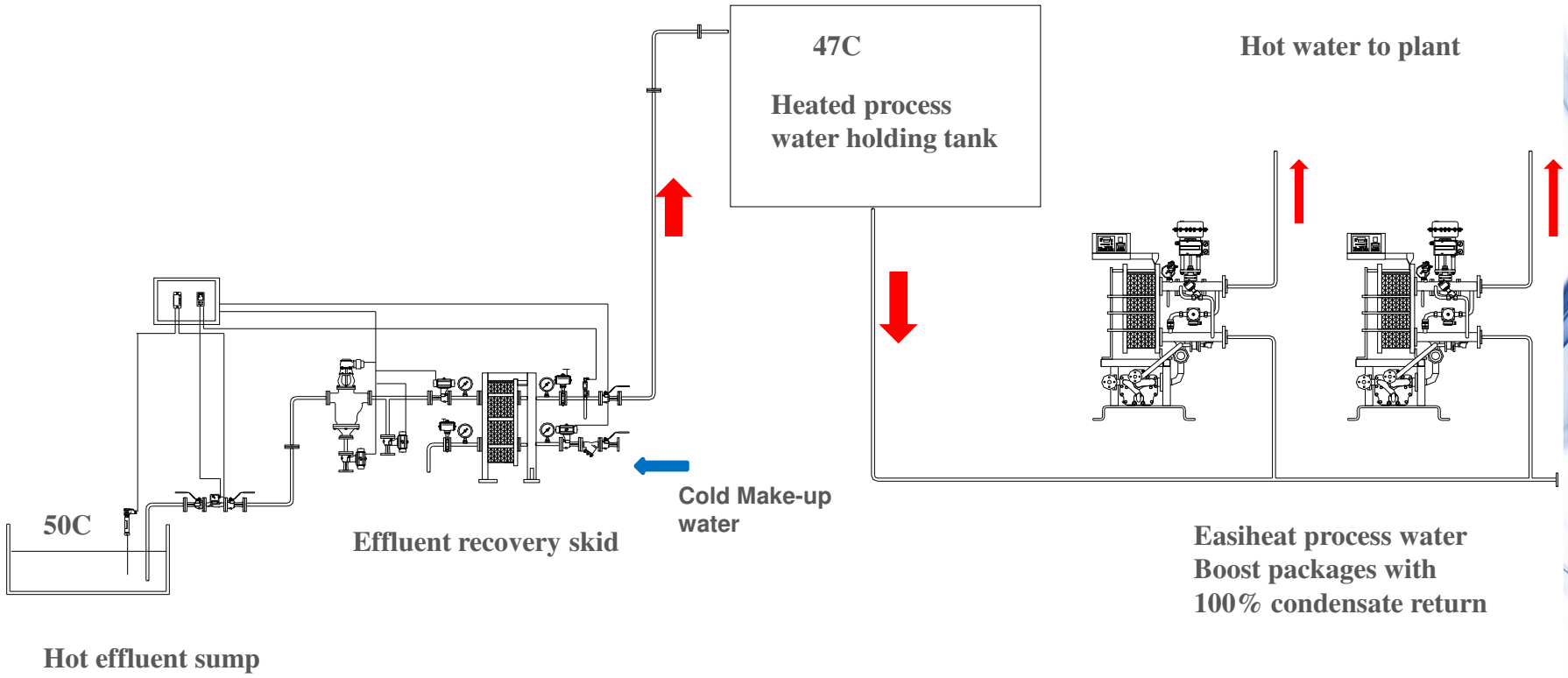
Process Plant with Effluent Heat Recovery System



Heinz – saves ?? a year

- Heinz saving 1,500 kW on heat recovery package

""It's been in place for 18 months now and we are seeing excellent results from the heat recovery,"

Barry Aspey

Utilities Manager for Heinz

Heat Recovery from Cooling Towers

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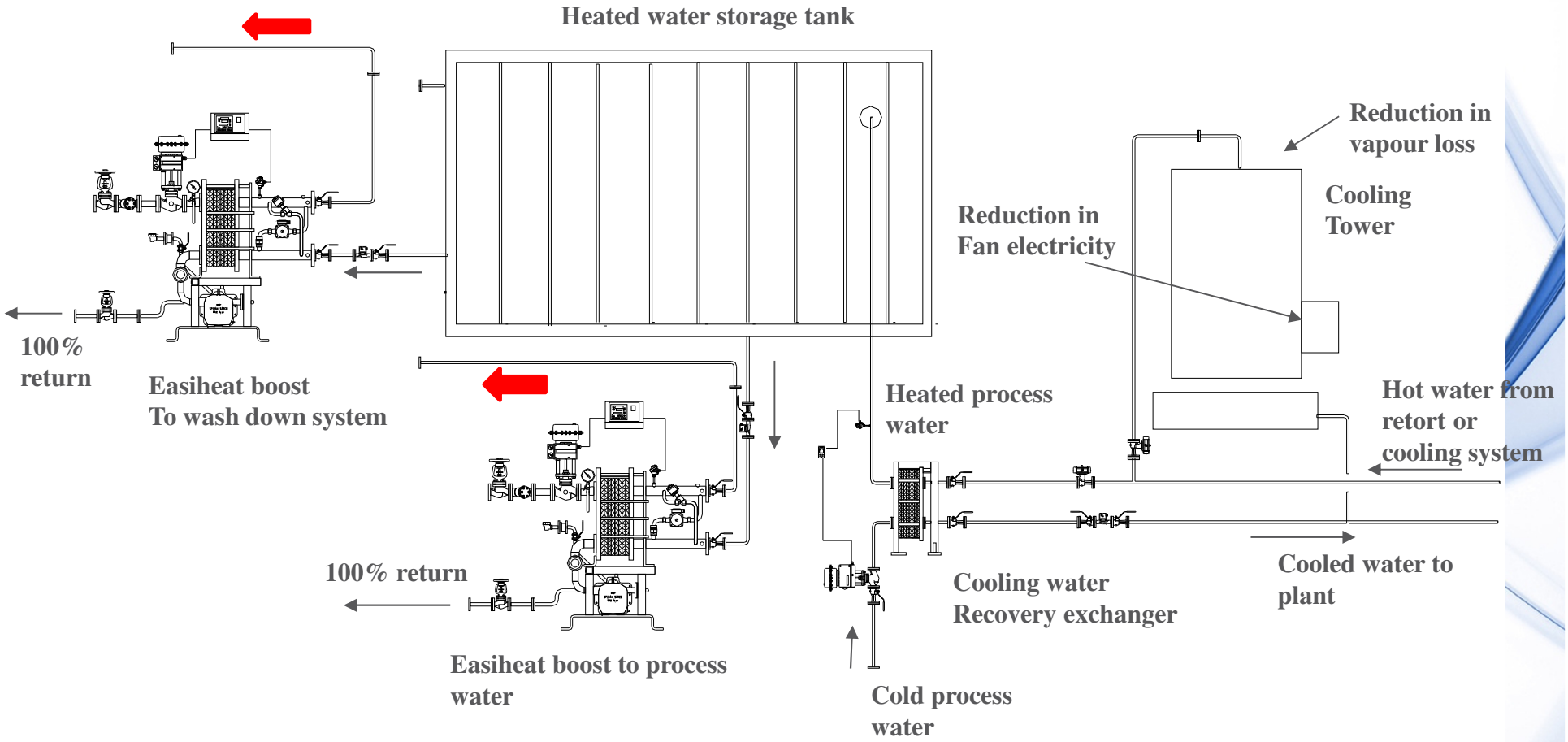
Losses from Cooling Tower Heat Recovery

- Electrical running costs from cooling tower fans
- Vapour loss from cooling tower
- Heat normally lost at cooling tower
- Chemical dosing of cooling tower
- Flash losses from water heaters

Cooling tower heat recovery system



Heat Recovery from Process Vents

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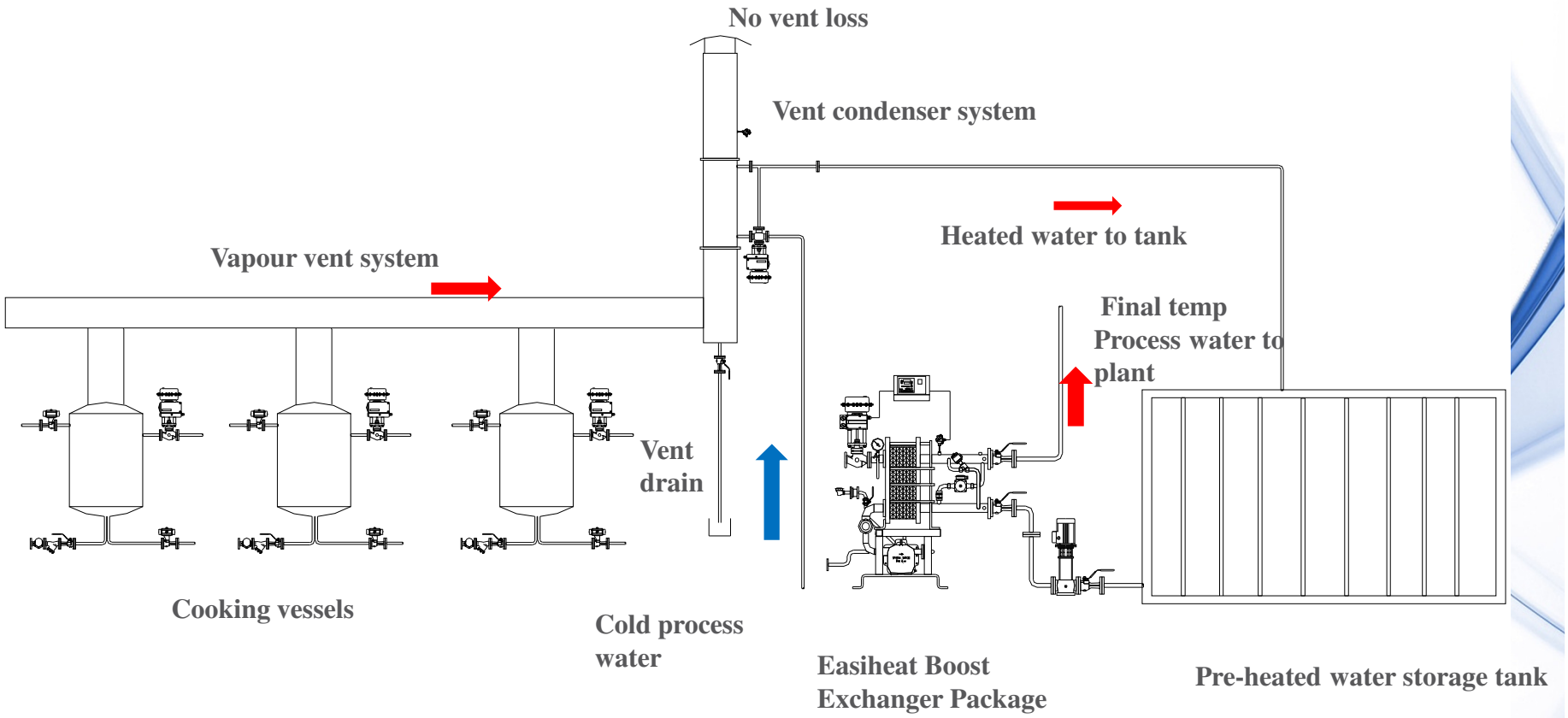
Heat recovery from process vents



Heat Recovery from Contaminated Condensate

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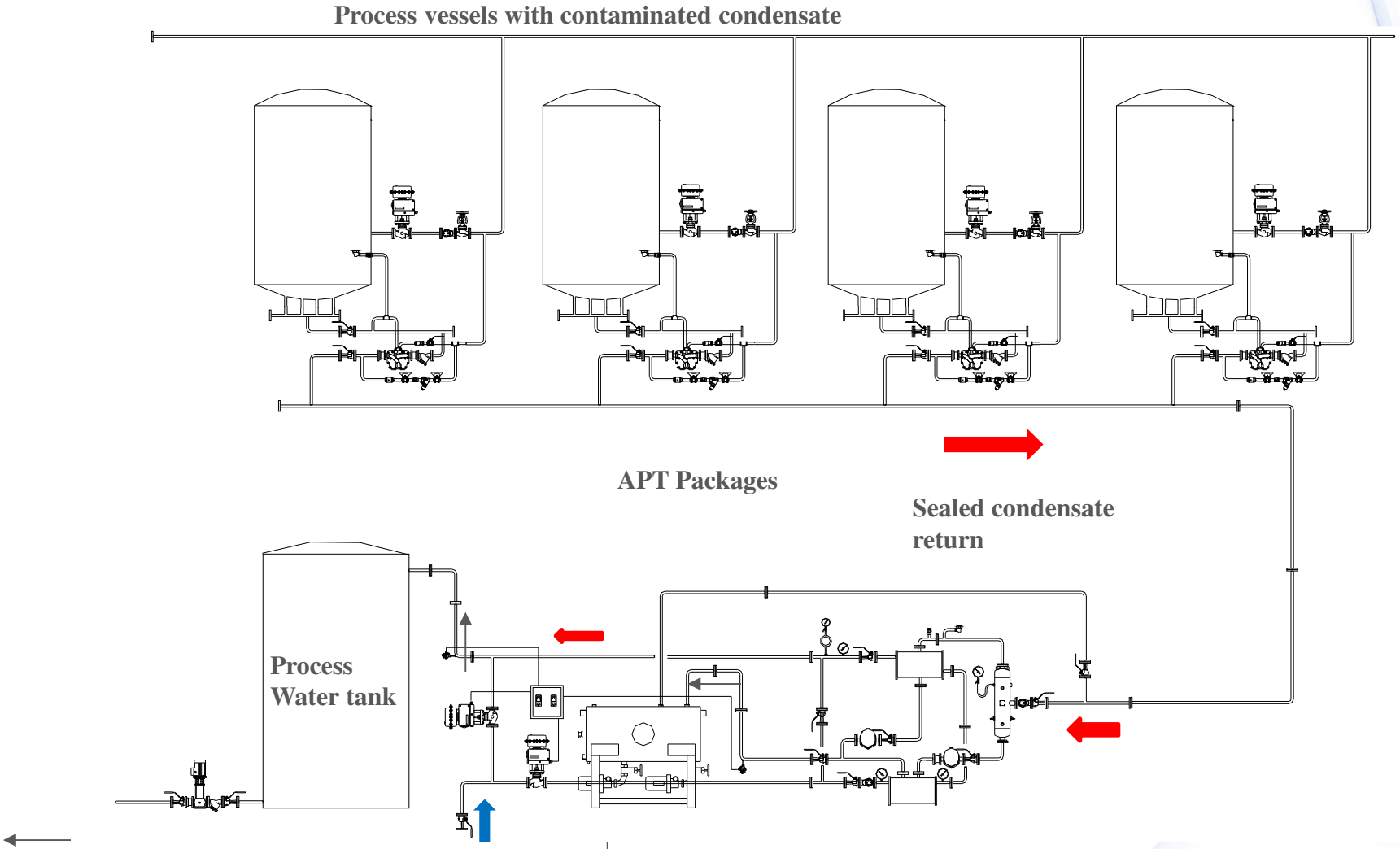
Contaminated Condensate

- Normally dumped to drain
- May contain contaminates not suitable for the boiler feed
- Condensate flashes off at point of discharge
- Remaining condensate at boiling point
- Must be cooled to 42C before entering drainage system
- Usually operates 24/7
- A large loss of energy and CO2

Heat Recovery from Contaminated Condensate



Løsninger til dampdistributionen

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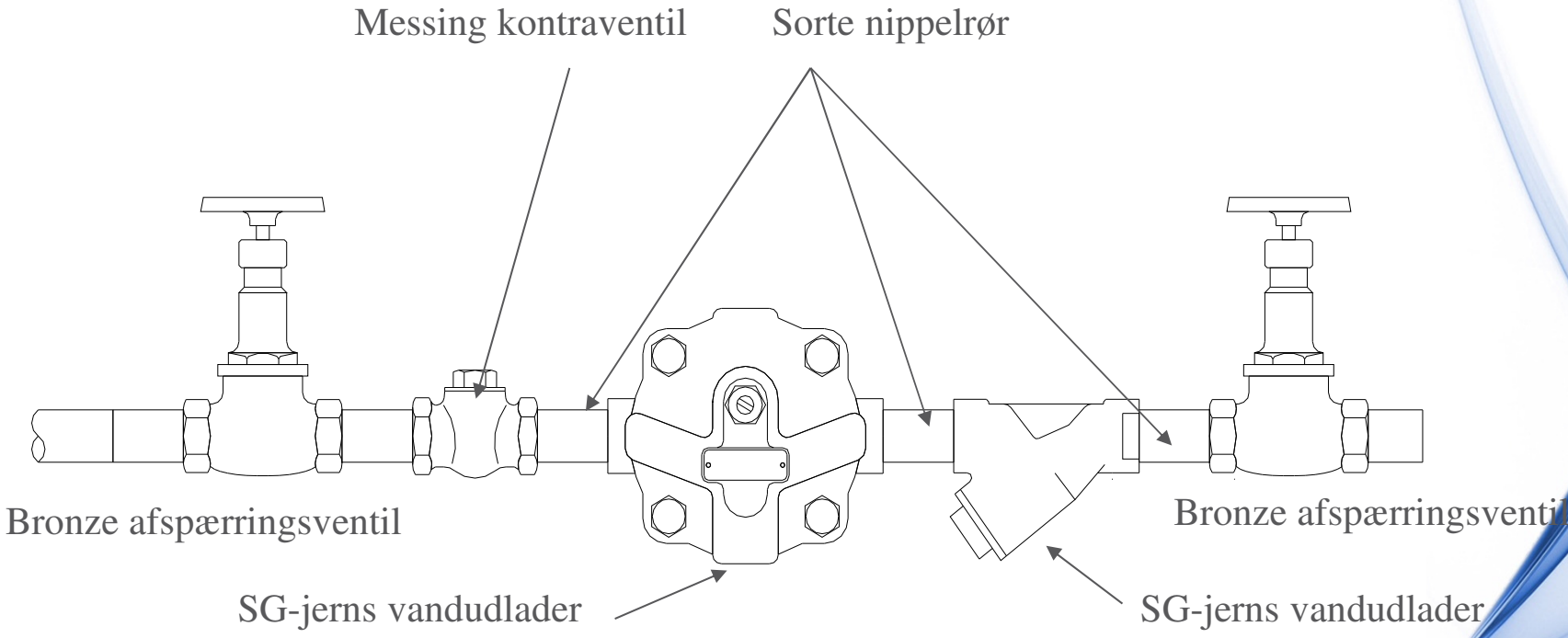
Energibesparelser ved dampdistribitionen

- Vandudladerkontrol 2 gange årligt
- Reducere dampspild, energispild og CO2 udledning
- Forbedret varmeoverføringseffekt

Gennemsnitlig tilbagebetalingstid.

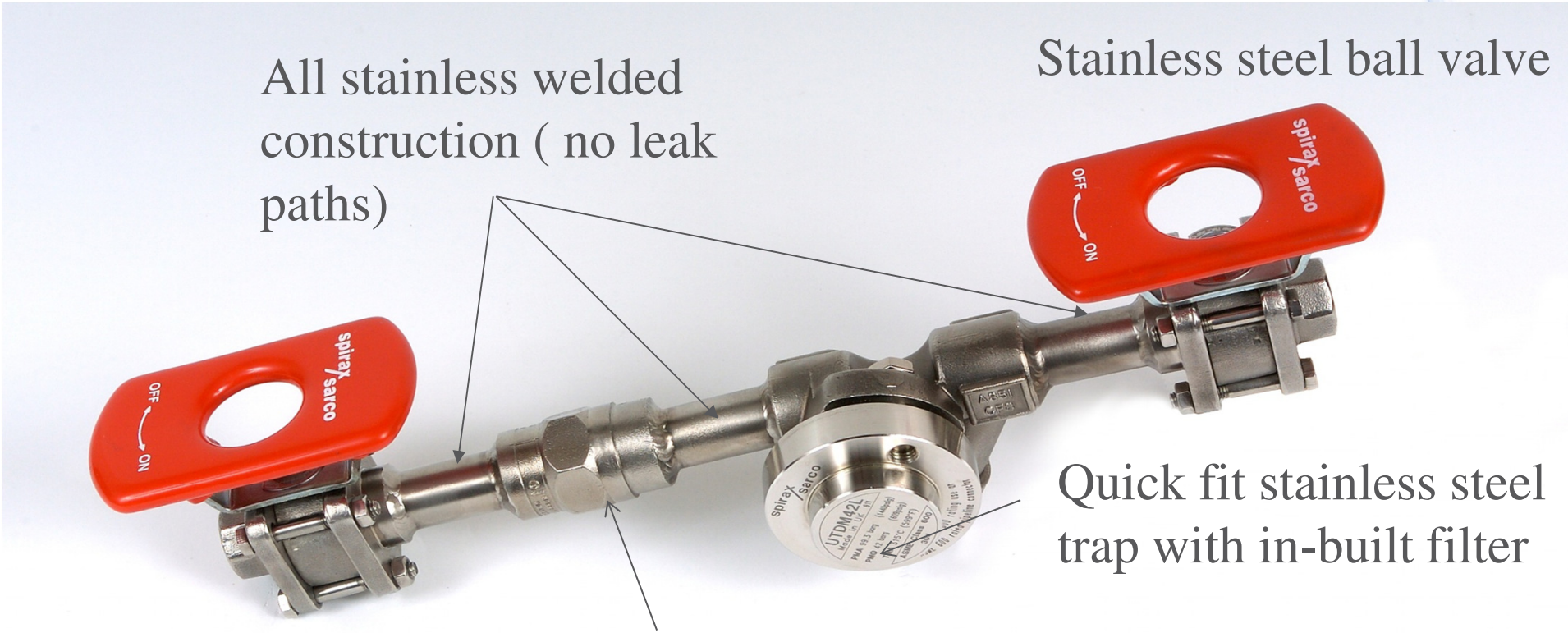
4 måneder!

Standard vandudladerstation



- **10 Potentielle lækage steder**
- **5 Komponents skal installeres**
- **Multible materialetyper**

Moderne vandudladerstation



Konklusion

- Disse er kun nogle få af de tilgængelige løsningerne
- Systemerne kan leveres i samlede enheder for at lette installationen og eliminerer installationsfejl
- Reduktion af energiforbruget og CO2 i anlægget er let opnå og der kan oftest opnås attraktive tilskud til de energibesparende installationer
- Procesforbedring opnås altid

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Spørgsmål

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