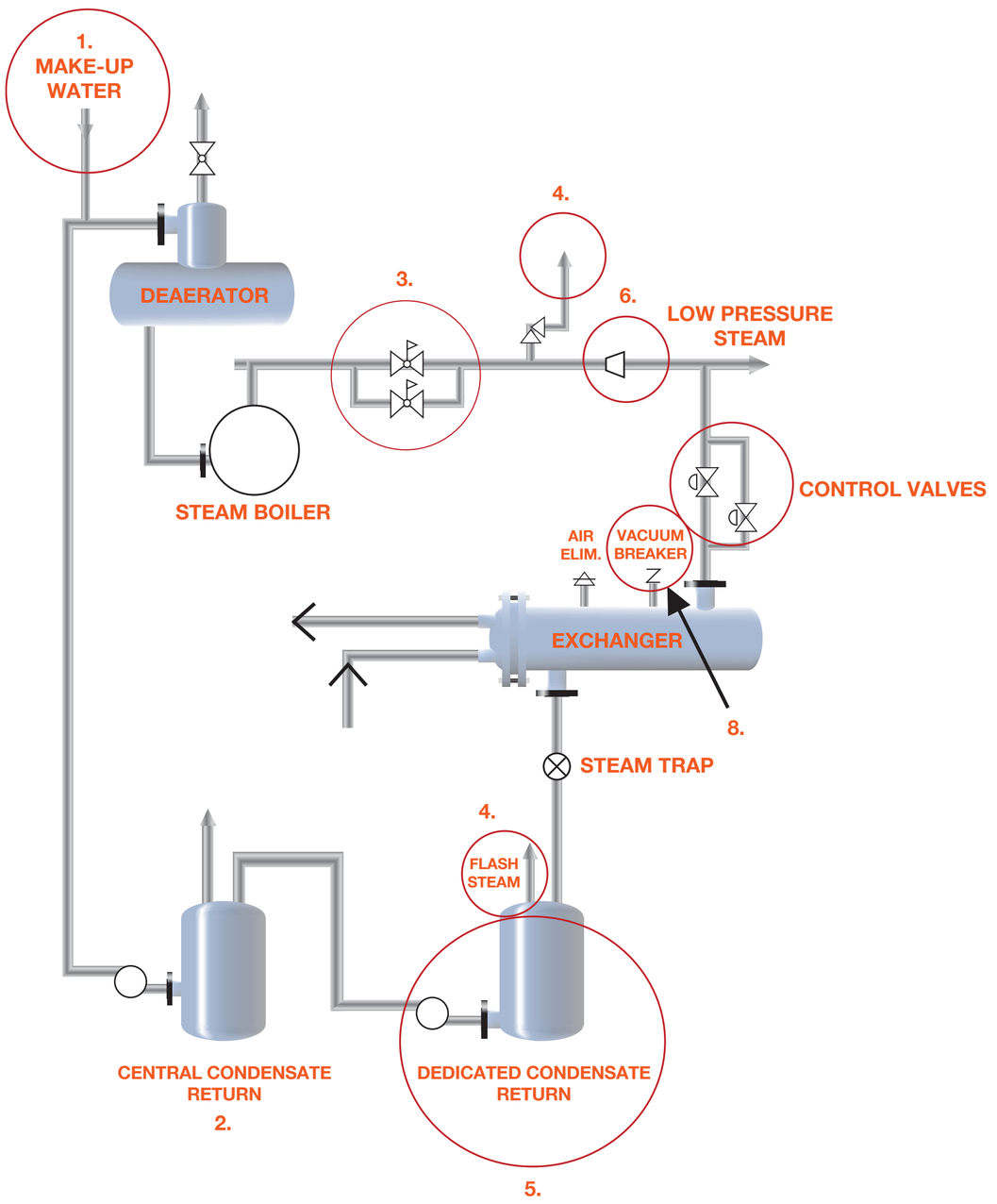
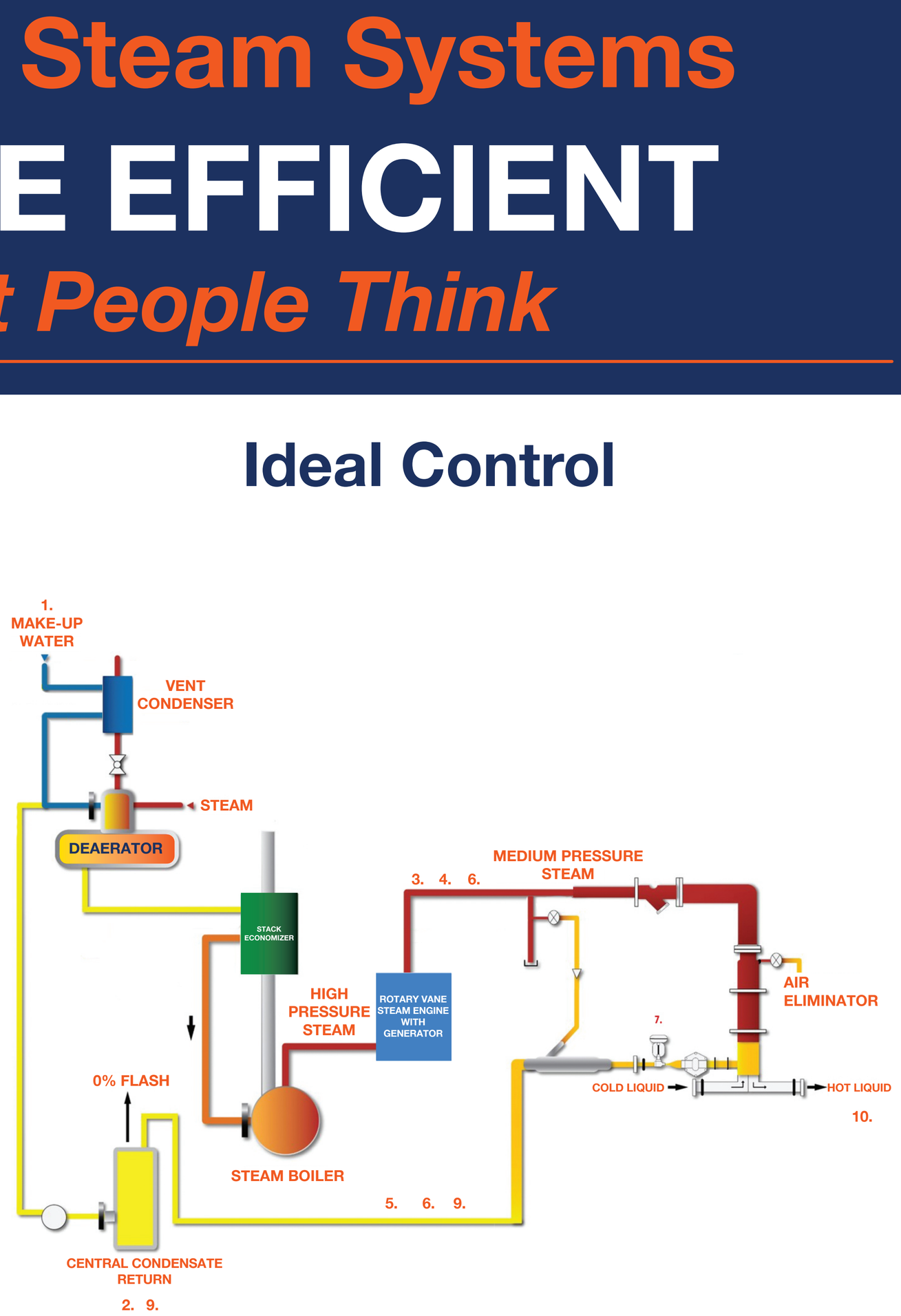
Closed Loop Steam Systems
ARE MORE EFFICIENT
Than Most People Think

Conventional Control



Ideal Control



1. **LESS MAKE-UP WATER**
   The boiler gets back more condensate so you use less fresh water. This also means less softening, chemical treatment, and surface blow down.

2. **CONDENSATE PUMPS LAST LONGER**
   Condensate that is “too hot” causes pump cavitation and seal leaks.

3. **NO STEAM PRV STATION**
   The Ideal Control System can use high, medium or low pressure steam directly.

4. **NO STEAM VENT LINES TO THE ROOF**
   Many times the vent piping is the most expensive part of the entire system. The Ideal Control System can eliminate the need for safety relief valve, flash tank and condensate receiver vents.

5. **NO PUMPING SUB-STATION**
   The conventional heater will utilize a pump to push the condensate back to a central return station. The pump will require electricity or steam power, again using more energy. This power source will need a control system and isolation.

6. **SMALLER STEAM INLET AND CONDENSATE RETURN LINES**

7. **SMALLER CONTROL VALVE**

8. **VACUUM BREAKER**
   The Ideal Control System runs at constant pressure and a vacuum breaker is not needed. Independent site testing demonstrated at least six times less corrosion rate.

9. **0% FLASH**
   5.4% TO 20% ENERGY SAVING AND GREENHOUSE GAS REDUCTION

10. **STABILITY OF SET POINT TEMPERATURE ± 2°F**

ENERGY SAVING between **5 to 20%**

Can Be Used On **HIGH OR LOW PRESSURE STEAM**

NO STEAM PRESSURE REDUCING VALVE STATION

No Need of a STEAM SAFETY VALVE

No Dedicated Condensate Pump & No Flash Tank

COMPLETE STEAM CLOSE LOOP SYSTEM With No Vents To The Roof & No Flash Lost

EASY INSTALLATION with **VERY LOW FOOTPRINT & LOW MAINTENANCE**

6+ TIMES LESS CORROSIVE On Condensate Piping

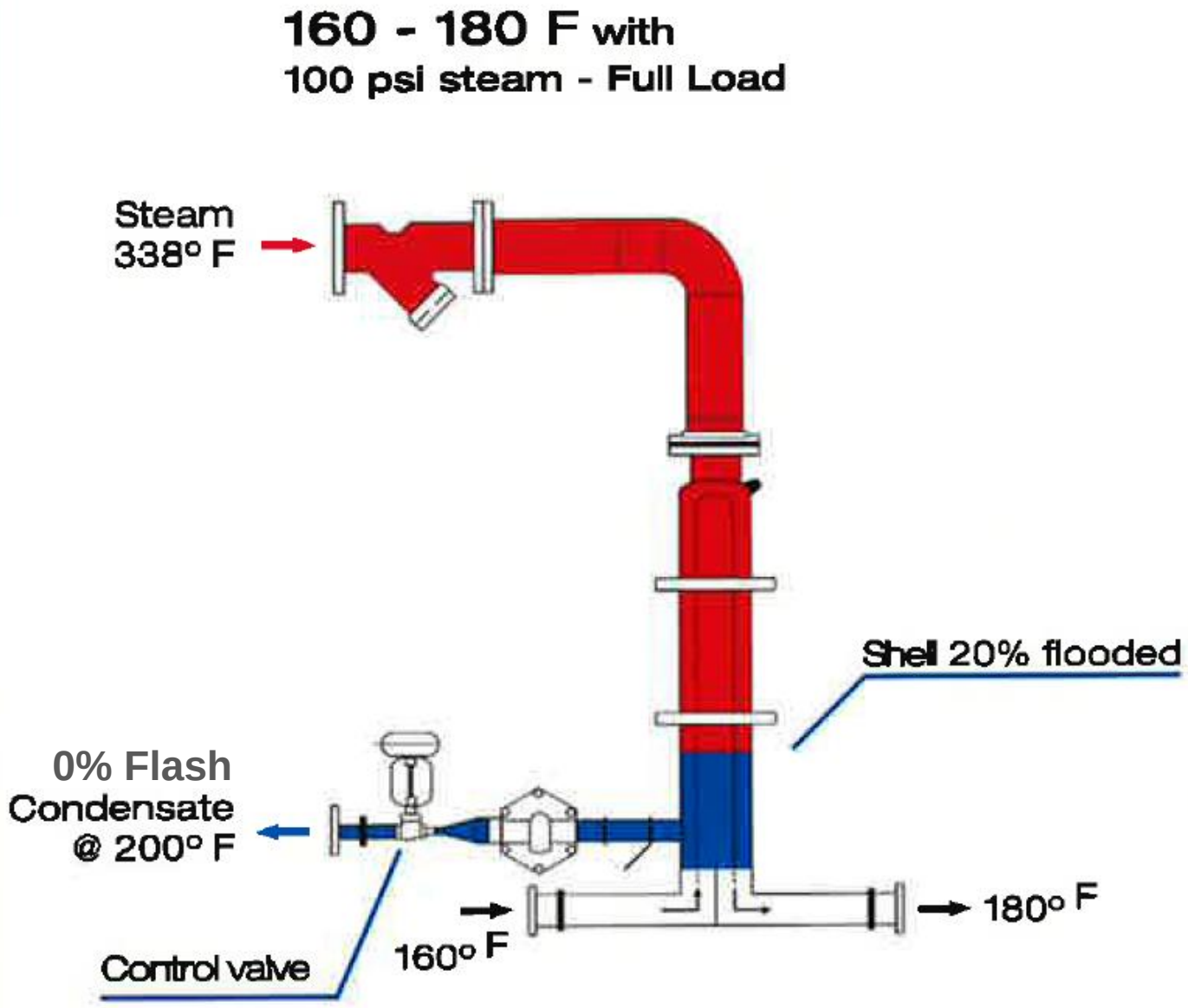
Maxi-Therm.net

Exhibit #90

CampusEnergy2018 | SHARING SOLUTIONS, SUSTAINING OUR FUTURE

Manufacturer of Innovative Concepts

Vertical Flooded, Sub-cooled Heat Exchanger Concept



Steam Table

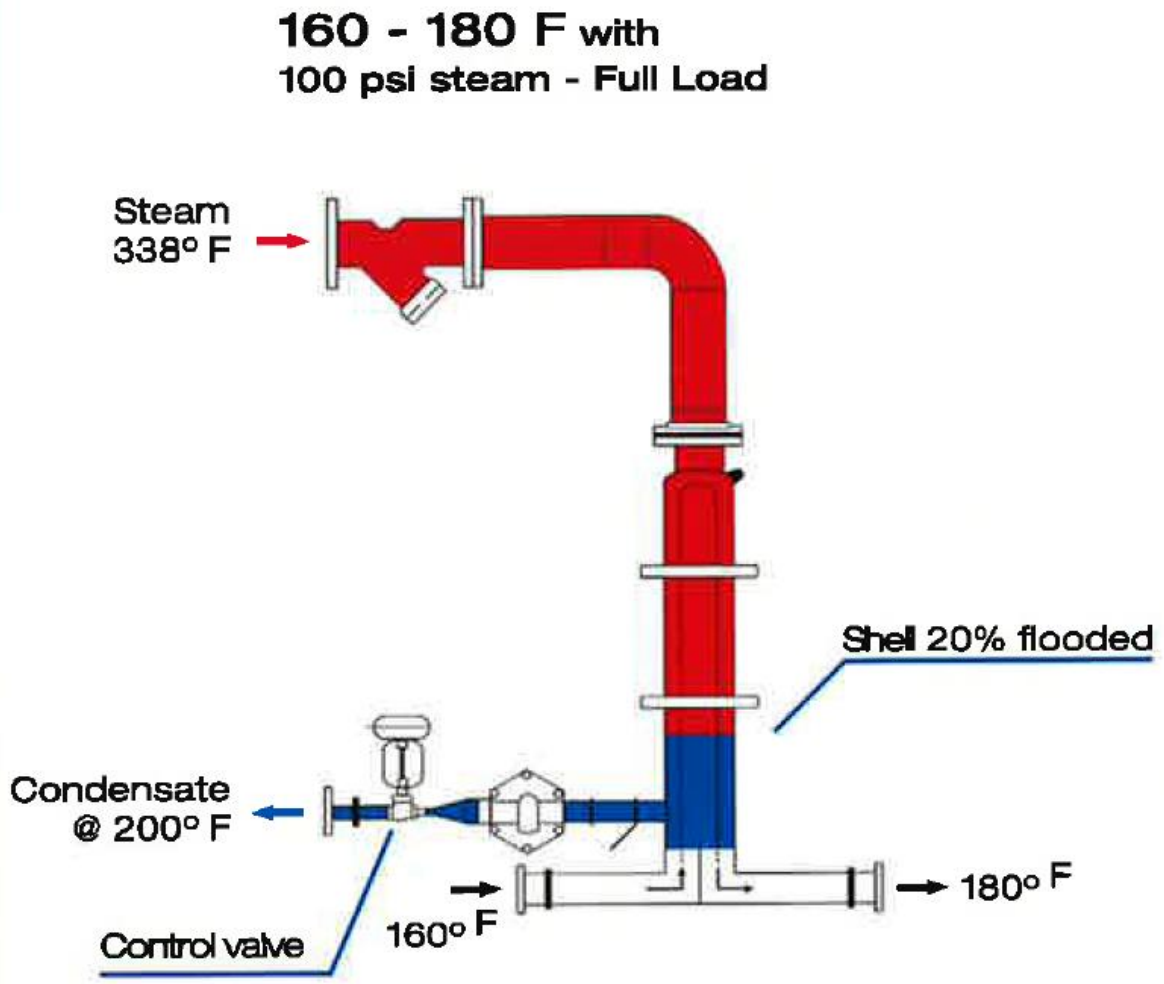
Pressure PSIA	Pressure PSIG	Saturation Temp. °F	Heat (BTU/lb)			Volume Steam (ft^3/lb)
			Sensible	Latent	Total	
0	-14.7	32	0	1075	1075	3306
5	-9.6	162	130	1001	1131	74
10	-4.6	193	161	982	1143	38
13	-1.7	206	174	974	1148	30
14.7	0	212	180	970	1150	27
30	15	250	218	945	1163	14
115	100	338	308	880	1188	4
215	200	388	362	837	1199	2
615	600	486	472	732	1203	0.8

PERCENT (%) FLASH STEAM

Percent Flash Steam produced when condensate is discharged to atmosphere (0 PSIG) or into a flash tank controlled at various pressures

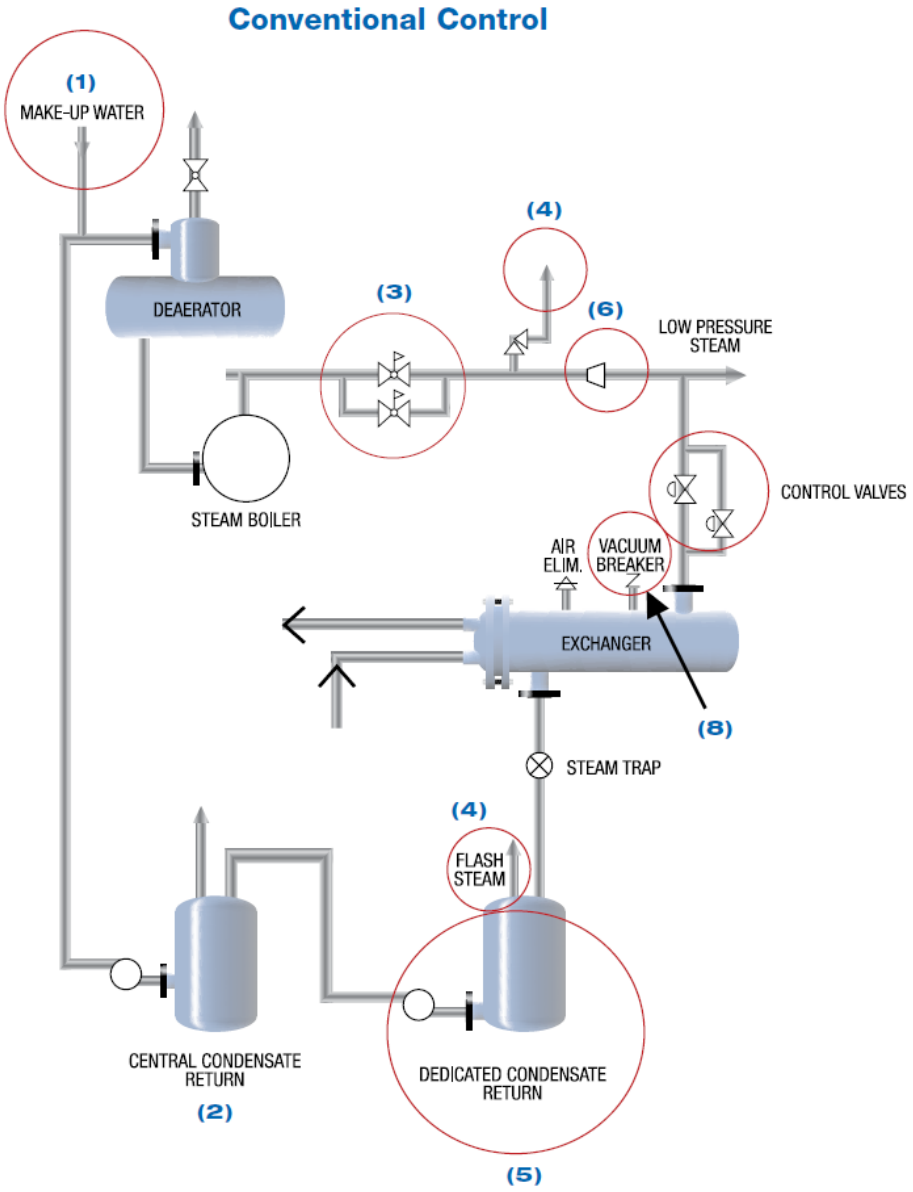
Condensate Pressure (PSIG)	Flash Tank Pressure (PSIG)								
	0	5	10	20	30	40	60	80	100
5	1.6	0.0							
10	2.9	1.3	0.0						
15	3.9	2.4	1.1						
20	4.9	3.3	2.1	0.0					
30	6.5	5.0	3.7	1.7	0.0				
40	7.8	6.3	5.1	3.0	1.4	0.0			
60	10.0	8.5	7.3	5.3	3.7	2.3	0.0		
80	11.8	10.3	9.1	7.1	5.5	4.2	1.9	0.0	
100	13.3	11.8	10.6	8.7	7.1	5.8	3.5	1.6	0.0
125	14.9	13.5	12.3	10.4	8.8	7.5	5.3	3.4	1.8
150	16.3	14.9	13.7	11.8	10.3	9.0	6.8	4.9	3.3
200	18.7	17.3	16.2	14.3	12.8	11.5	9.4	7.6	6.0
250	20.8	19.4	18.2	16.4	14.9	13.7	11.5	9.8	8.2
300	22.5	21.2	20.0	18.2	16.8	15.5	13.4	11.7	10.2
350	24.1	22.8	21.7	19.9	18.4	17.2	15.1	13.4	11.9
400	25.6	24.2	23.1	21.4	19.9	18.7	16.7	15.0	13.5

0% Flash
200°F Condensate Return



Hot Water Generation

Steam to Liquid



Vertical Flooded

1 = Less Make-Up

2 = 0% Flash

3 = No Steam PRV

4 = No Safety Relief to Roof

5 = No Condensate Receiver Pump

6 = Smaller Pipe Size

7 = Smaller Control Valve

8 = No Vacuum Breaker

9 = Energy Savings of
Over 5.4% up to 20%

10 = Stability of Set Point 2°F

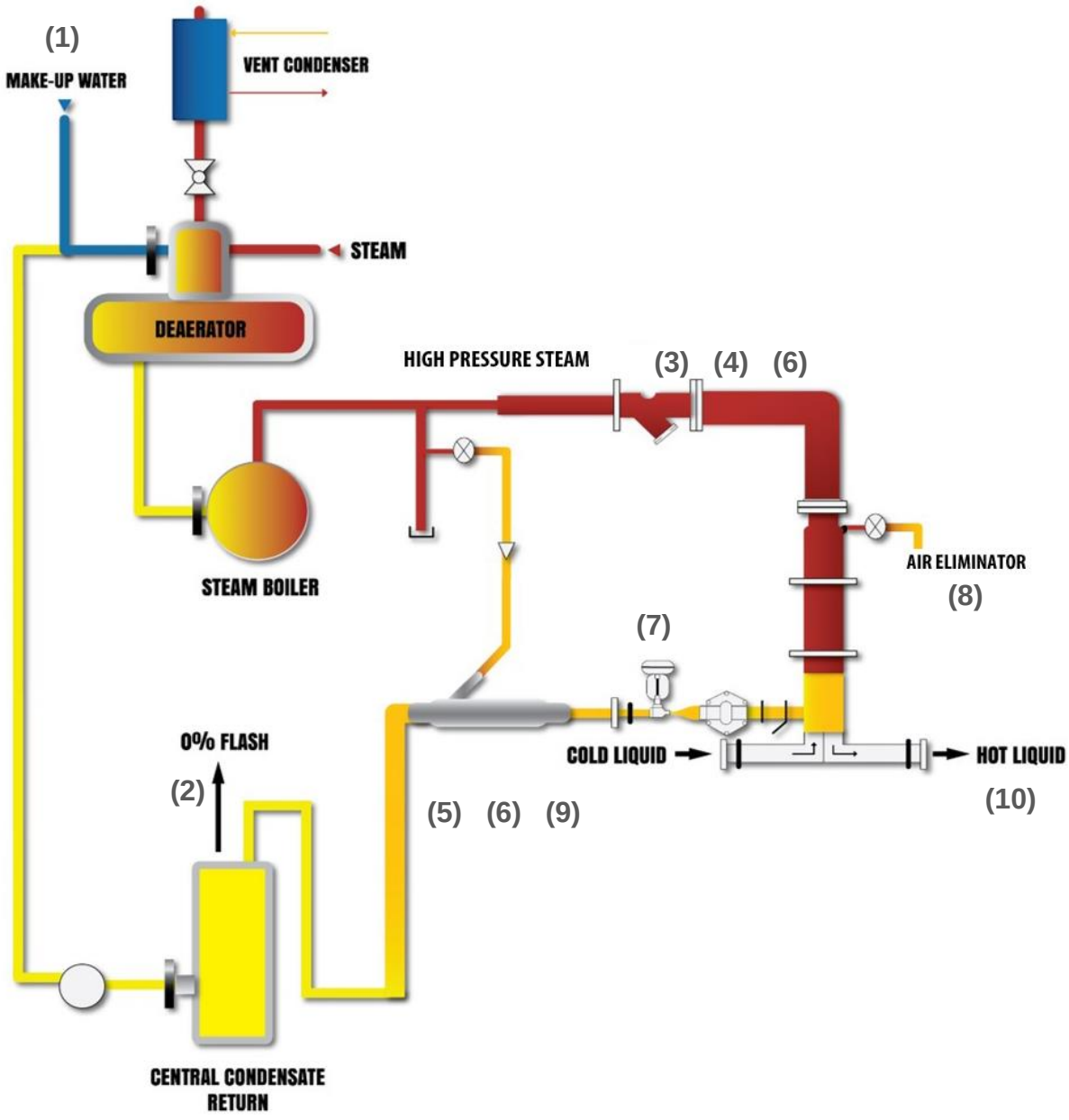


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Exhibit #90

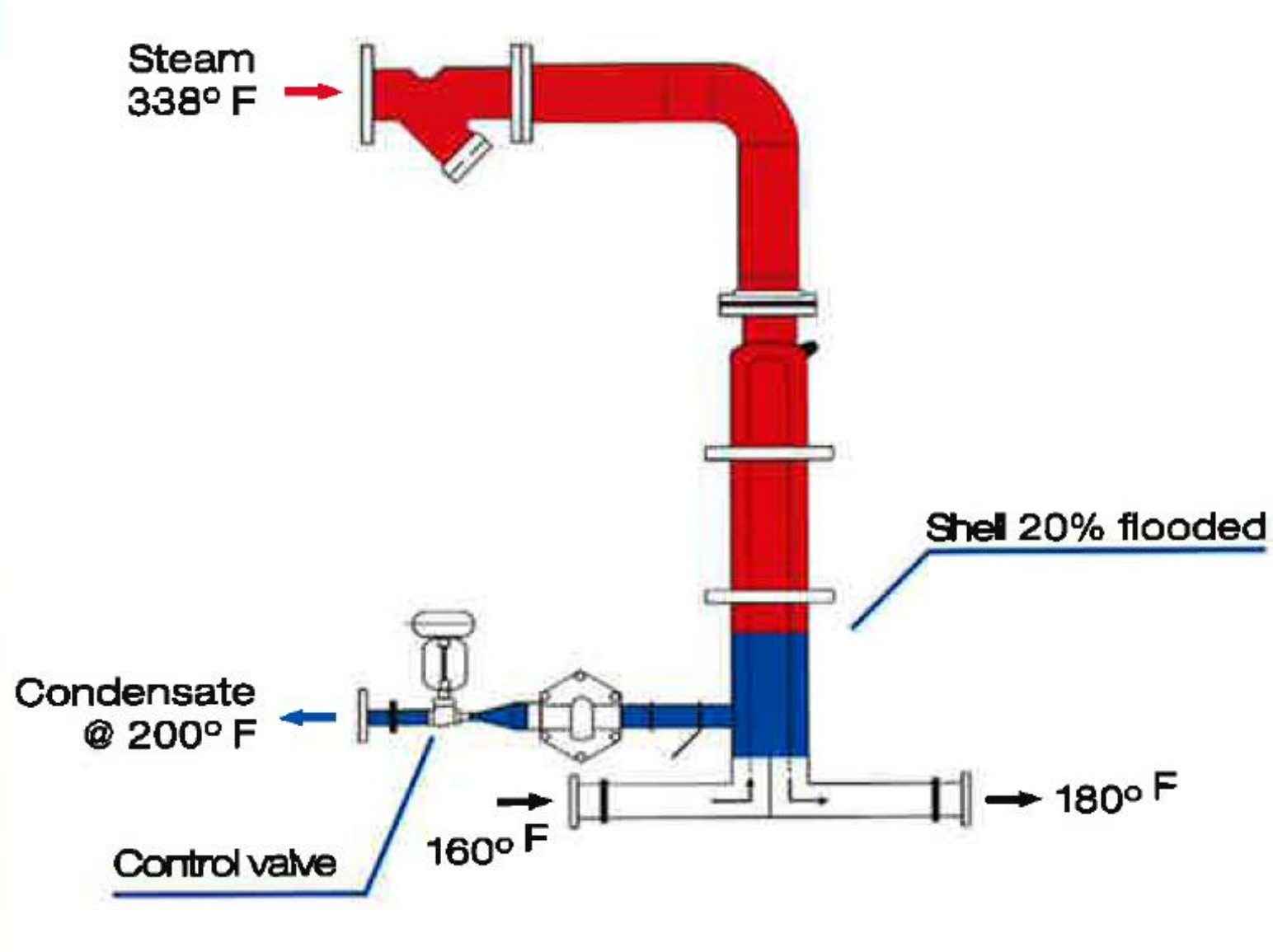
The Ideal Control Concept

Vertical Flooded Heat Exchanger

Features an oversized vertical shell and tube heat exchanger that uses LATENT and SENSIBLE heat of steam to heat a liquid.

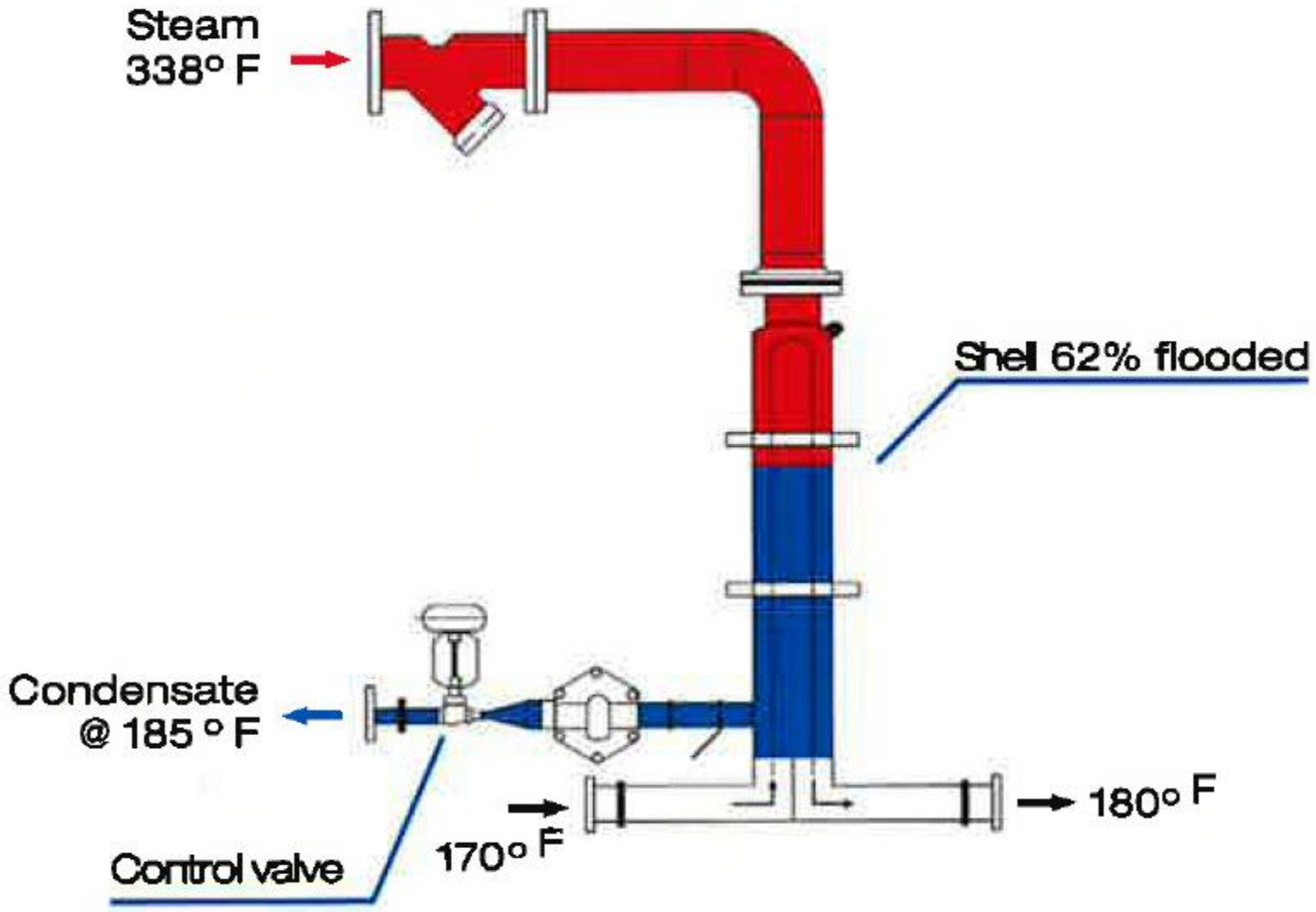
160 – 180 F with
100 psig steam

Full Load



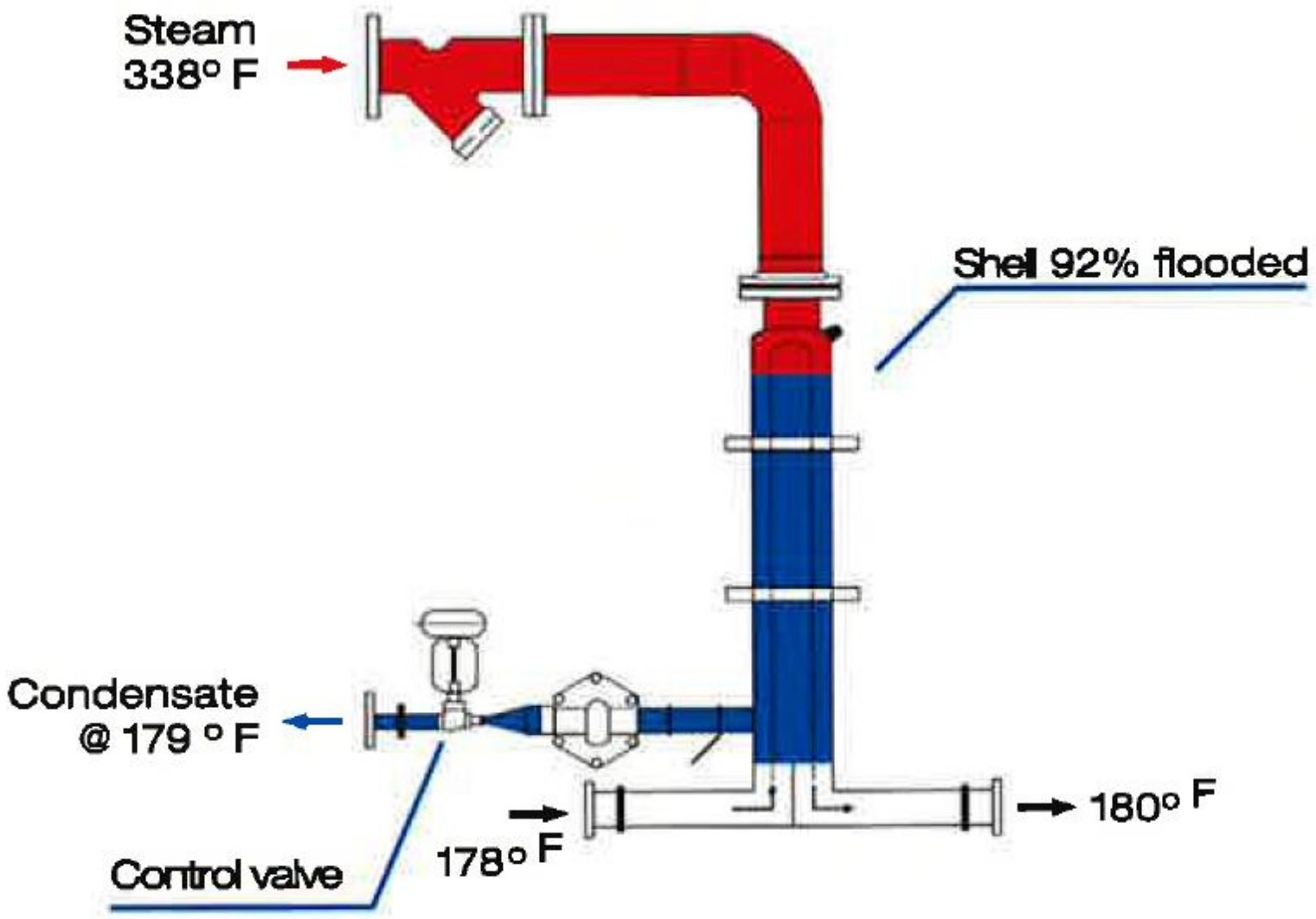
160 – 180 F with
100 psig steam

50% Load



160 – 180 F with
100 psig steam

10% Load



160 – 180 F with
100 psig steam

No Load

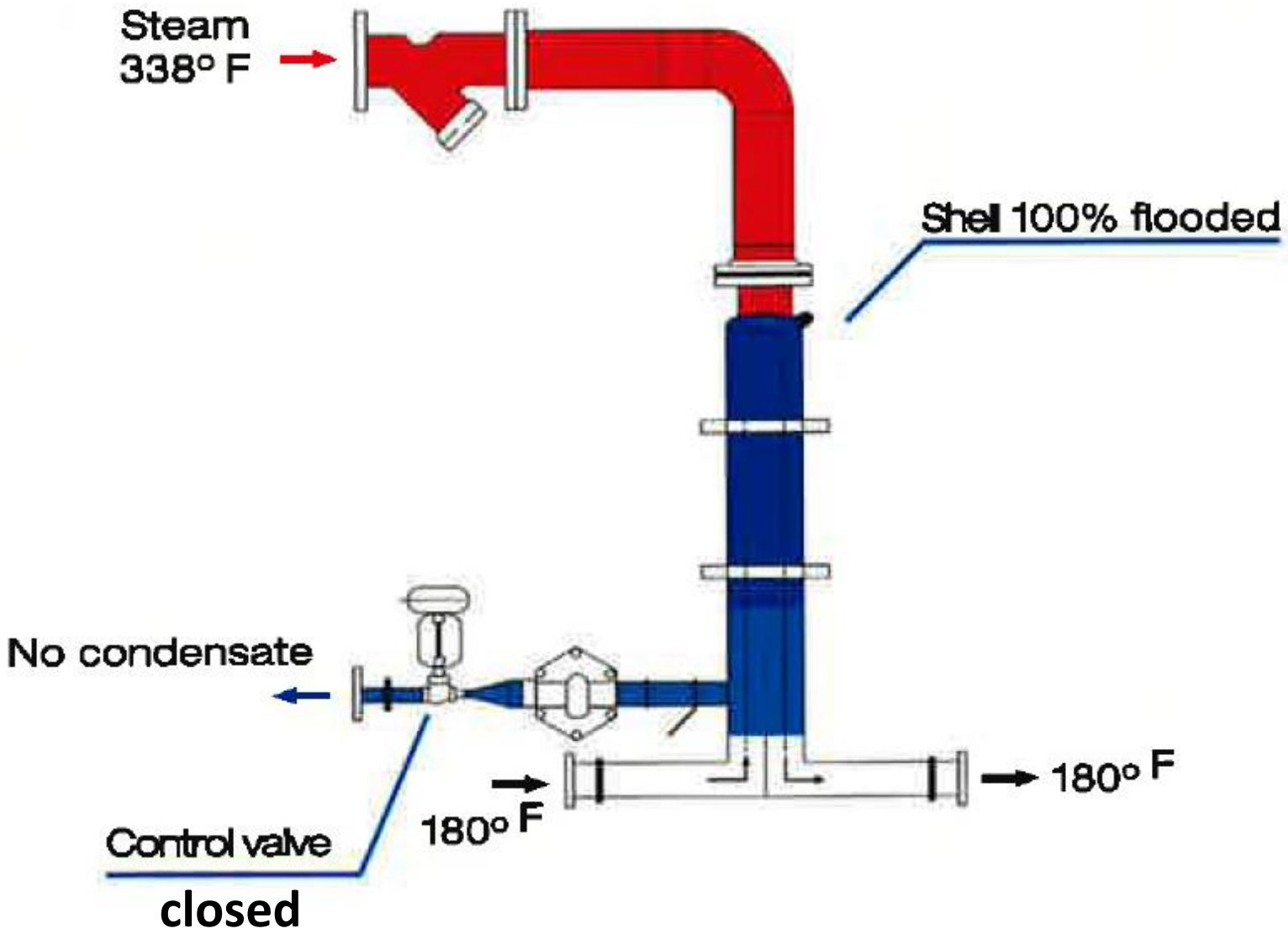


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Exhibit #90

Building Heat Ultimate Package

Capacity: 900 usgpm of 40% propylene glycol, 220’ of head, from 120 to 185°F using 175 psig steam.

Overall dimensions (L x W x H): 156” x 76” x 151”

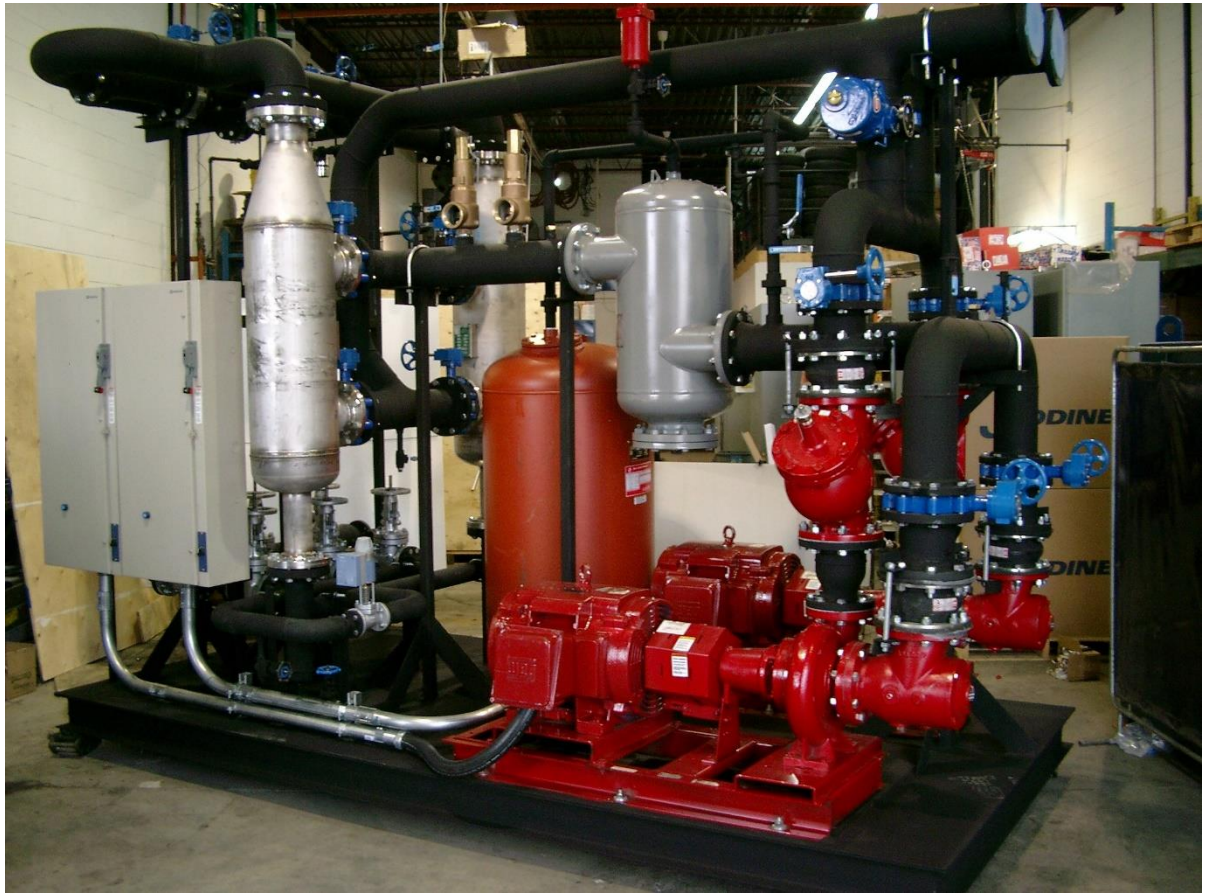

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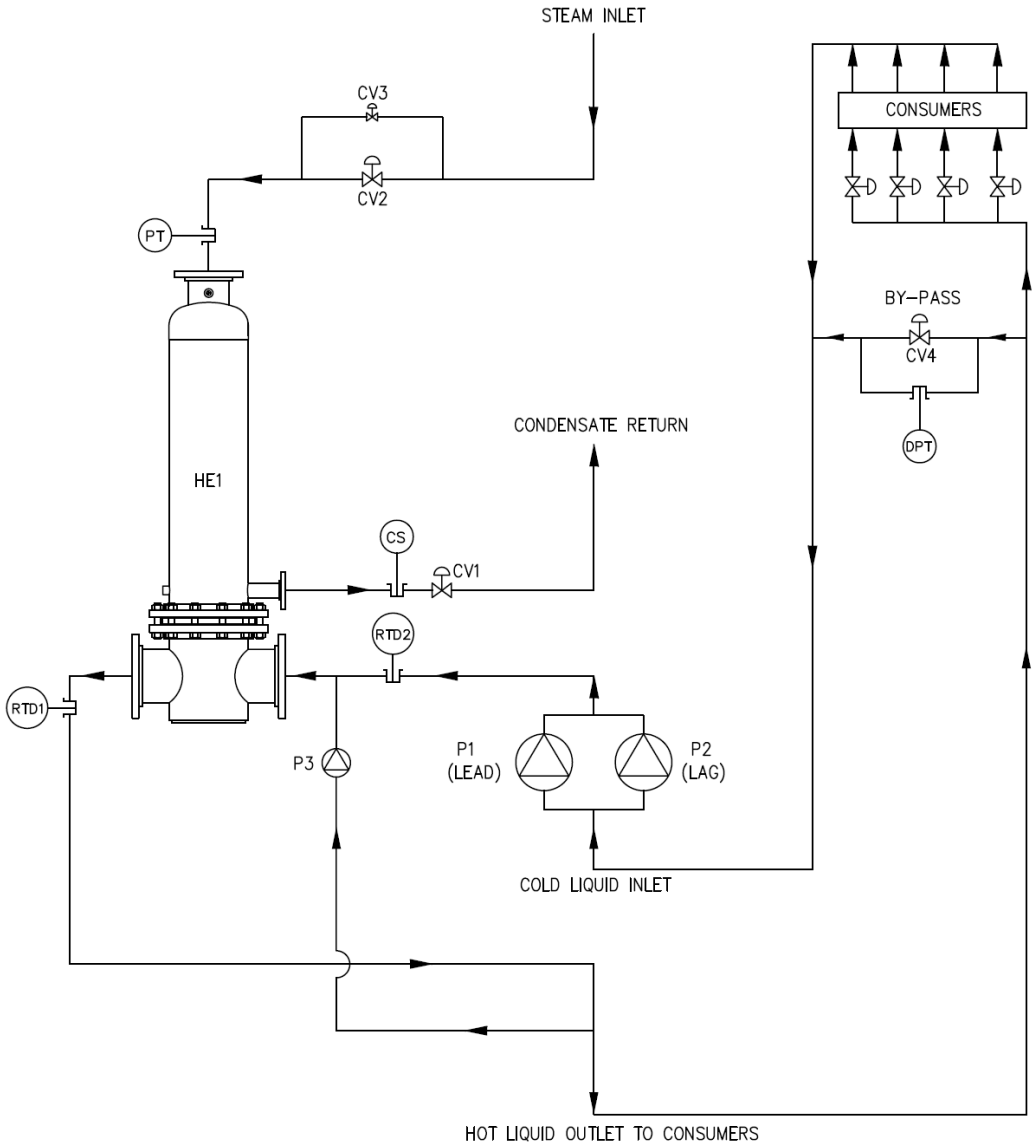
Exhibit #90

Building Heat Base Unit

Capacity: 550 usgpm of 40% propylene glycol from 146 to 180°F using 125 psig steam.

Overall dimensions (L x W x H): 76” x 51” x 76”


STEAM INLET
CV3
CV2
PT
CONSUMERS
BY–PASS
CV4
DPT
CONDENSATE RETURN
HE1
CS
CV1
RTD2
RTD1
P3
P1
(LEAD)
P2
(LAG)
COLD LIQUID INLET
HOT LIQUID OUTLET TO CONSUMERS

Building Heat Base Unit

Capacity (each):
2200 usgpm of water from 150 to 180°F using 125 psig steam.

Overall dimensions
(L x W x H): 87” x 46” x 99”

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Exhibit #90

Building Heat Base Unit

Capacity (each):
1900 usgpm of water from
93 to 120°F using 80 psig steam.

Overall dimensions
(L x W x H): 89” x 52” x 86”

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Exhibit #90

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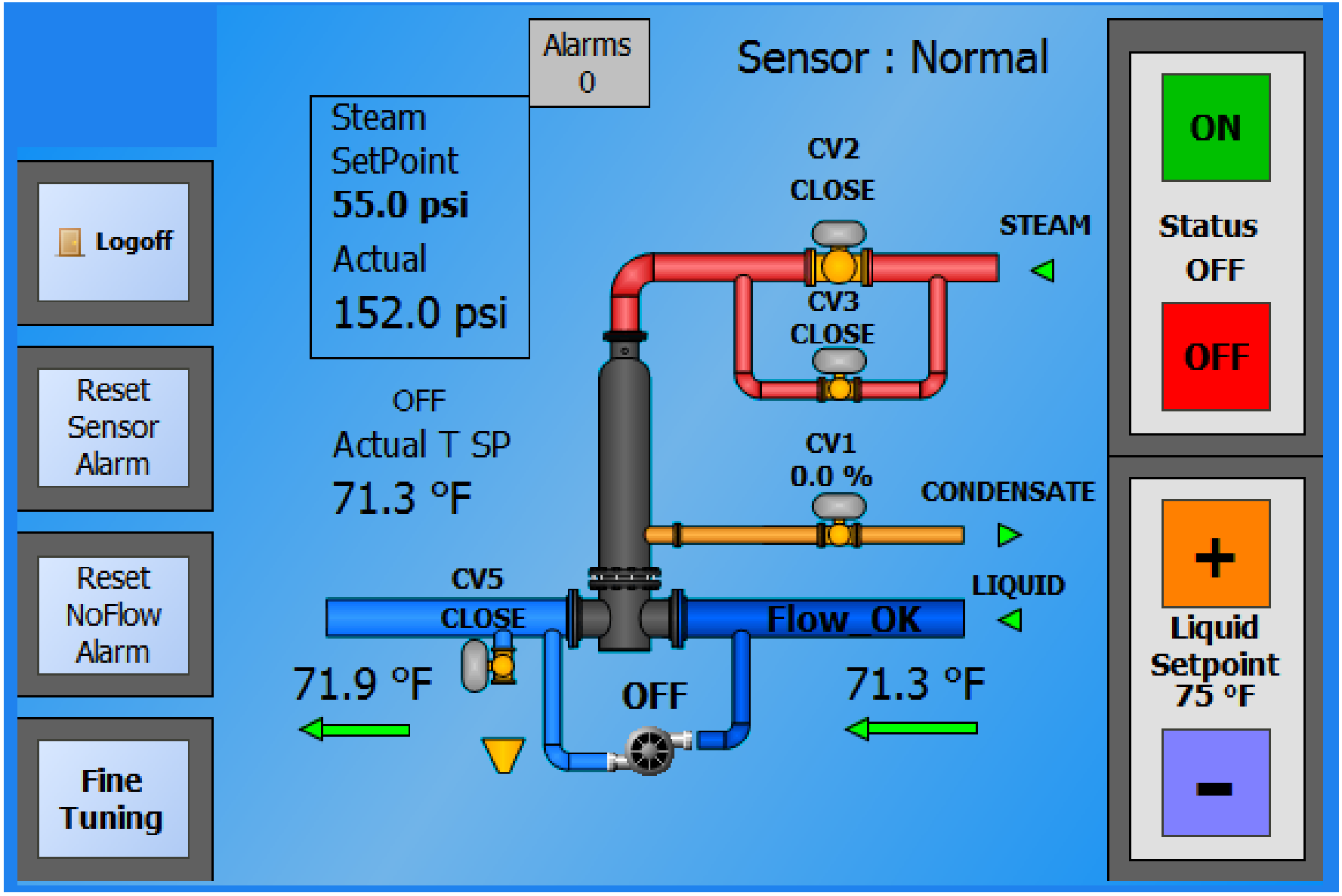

Logoff
Reset Sensor Alarm
Reset NoFlow Alarm
Fine Tuning
Alarms 0
Sensor : Normal
Steam SetPoint
55.0 psi
Actual
152.0 psi
OFF
Actual T SP
71.3 °F
CV2
CLOSE
STEAM
CV3
CLOSE
CV1
0.0 %
CONDENSATE
CV5
CLOSE
LIQUID
Flow_OK
71.9 °F
OFF
71.3 °F
ON
Status
OFF
OFF
+
Liquid Setpoint
75 °F
-

Flooded Steam-to-Water Vertical Heat Exchanger

ASHRAE Journal – June 2005
Innovation Awards "Honorable Mention" by ASHRAE AHR Expo 2005

A flooded steam-to-water heat exchanger… uses a new, efficient technology to optimize the net output energy produced from steam, which is a different approach than conventional shell-and-tube heat exchangers.

By modulating the condensate, the flooded vertical heat exchanger varies the exchange surface.

The energy input of the flooded vertical heat exchanger is 85% of the conventional heat exchanger for the same net energy produced.

The exchanger has a stable temperature set-point by modulating the condensate, not the steam.

Reduced Corrosion

Re: Corrosion Question

Lately we have asked our customers if our flooded design is more or less corrosive on return lines?

Attached is a report of a corrosion test performed by an independent firm in 2007 at a hospital in Montreal.

The test compared an existing conventional horizontal heat exchanger and a new Maxi-Therm vertical flooded heat exchanger installation.

The test was conducted by a chemical consultant using black iron (alloy C1010) corrosion coupons. After 94 days of exposure the measured corrosion rated for the Maxi-Therm system was 2.36 mills per year while the conventional method system was 14.63 mills per year. The conventional system is 6.2 times more corrosive!

Per industry standards any result below 3 mills per year shows a good protection of the condensate system. Visual surface observation of the coupon did not denote any pitting corrosion mechanism, which is a positive point.

Maxi-Therm is a constant steam pressure design therefore no vacuum breakers are required. A conventional method system must use vacuum breakers which allows air in to break the vacuum, during low loads, cooler condensate absorbs the air which leads to return line corrosion.

	Maxi-Therm	**Conventional**
Metallurgy	Black Iron	Black Iron
Days exposed	94	94
Corrosion MPA (Mills per year)	2.36	14.63

Advantages for using a Vertical Flooded, Sub-cooled Heat Exchanger

Less required infrastructure than the conventional method

Lower Installation Cost: 20 to 50%

Lower Maintenance Costs: 30% to 60%

Lower Chemical Treatment Costs: Less Air infiltration

Safe Device: Rated for the full pressure of the system

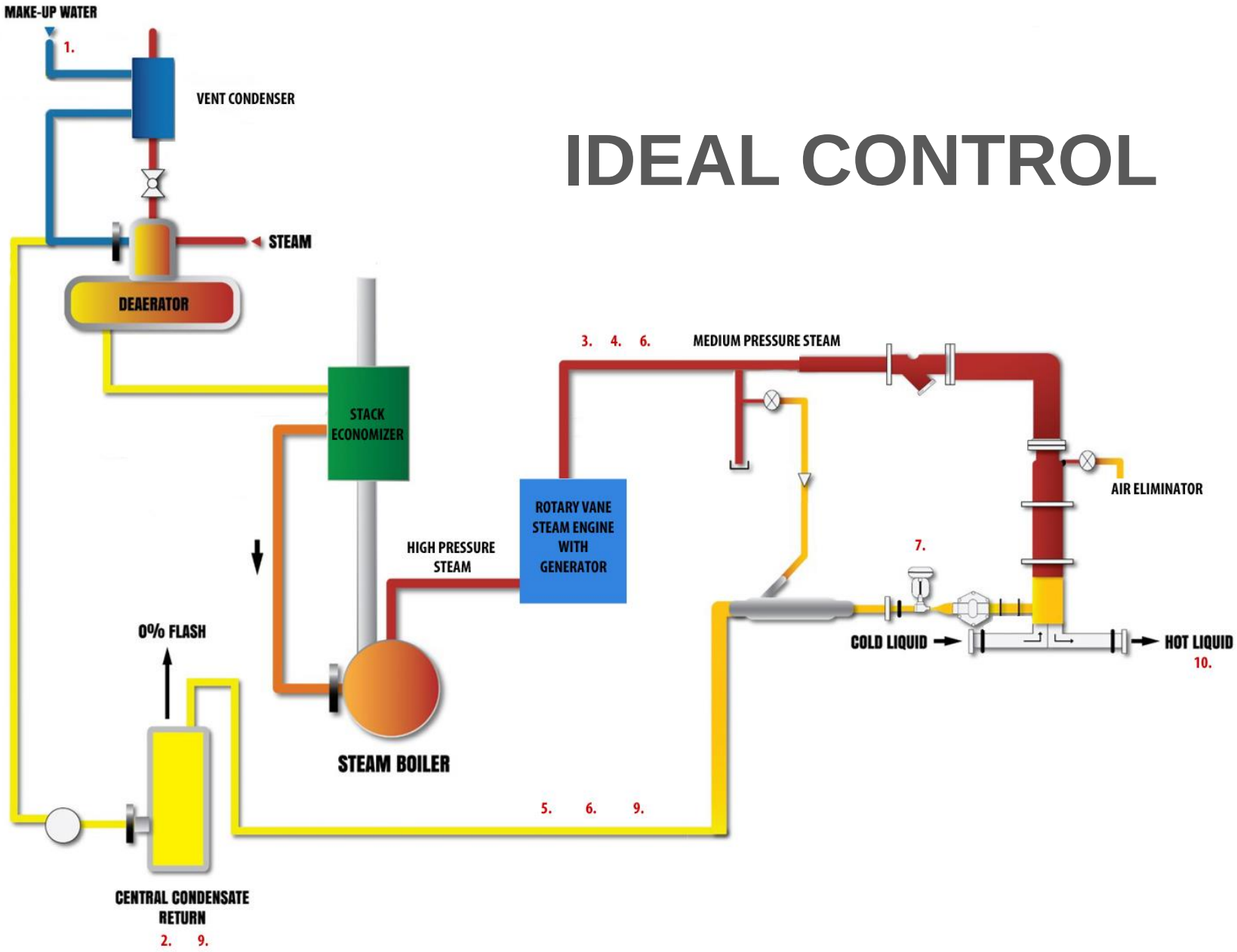
Energy Savings: 5% to 20%

Space Savings: up to 40%

Tighter Temperature Control: +/- 2F

Higher Turndown: 50:1

IDEAL CONTROL



Thank you for your Attention