

# **Hot water generation**

**Steam to liquid  
Building heat  
& domestic (double wall)**

# Hot water generation

## Steam to liquid



### The Maxi-Therm concept

We developed our patented, award-winning Vertical Flooded Heat Exchanger based on a proven system used in Europe for over 25 years – but we innovated to enhance its performance.

Like the European design, our Vertical Flooded Heat Exchanger features an oversized vertical shell & tube heat exchanger « **A** » that uses **LATENT & SENSIBLE** heat of steam to heat a liquid.

Because it is oversized, the heat exchanger becomes flooded with condensate that is evacuated at a preset subcooled temperature (usually 200°F), making it possible to optimize use of the **SENSIBLE HEAT OF STEAM AND ELIMINATE THE OCCURRENCE OF FLASH STEAM**. A condensate control valve « **B** » varies the level of condensate in the heat exchanger according to the process load « **D & G** » resulting in a 5.4% to 20% energy savings and reduction of greenhouse gas.

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### Maxi-Therm's patented innovations

When developing our system, we identified two major issues with the European system:

1. The steam pressure must always be lower than the liquid pressure.
2. There is no guarantee of stability of the heated liquid outlet set point temperature, which results in a high level of wasted energy, thereby compromising cost-effectiveness.

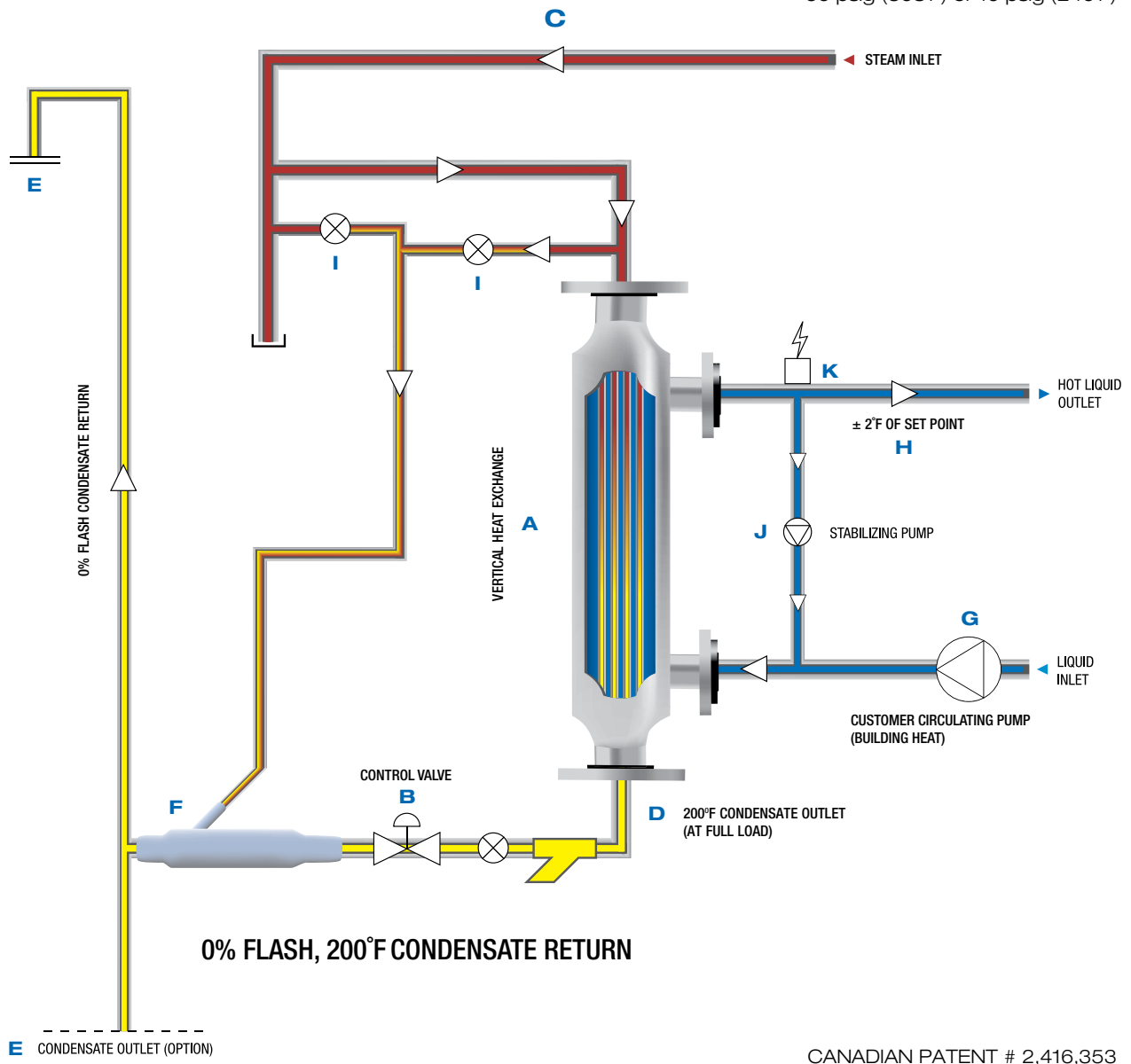
### With Maxi-Therm's patented design, however, we resolved these issues

1. No pressure reducing station on the steam side « **C** » and no safety relief valve(s) to the roof are required. In fact, we recommend using high-pressure steam (even over 170 psig and we always size the heat exchanger to subcool condensate to 200°F « **D** ». Plus, our heat exchanger uses more sensible heat, for greater performance and efficiency. Simply, our technology always uses  $\pm 1000$  btu/lb. of total heat of steam, either at 10 psig or 125 psig steam pressure.
2. We have achieved stability of heated liquid outlet set point temperature for building heat « **H** ». In fact, we are the first to guarantee  $\pm 2^\circ\text{F}$  of set point temperature, even when variable speed drives are used on the circulating pump « **G** ».
3. Stabilizing pump « **J** » pre-heats incoming liquid and creates additional turbulence in heat exchanger « **A** », averaging temperature towards sensor « **K** ». Therefore the purpose of the stabilization circuit is to stabilize the fluid temperature across the heat exchanger circuit.
4. No condensate pumping substation needed to lift condensate « **E** ».
5. Condensate Mixer « **F** » enables high pressure steam traps « **I** » to discharge directly in the flooded return line « **E** » without creating any water hammer.

# Hot water generation

## Steam to liquid

175 psig (378°F), 125 psig (353°F)  
60 psig (308°F) or 10 psig (240°F)



CANADIAN PATENT # 2,416,353

US PATENT # 6,857,467 - B2

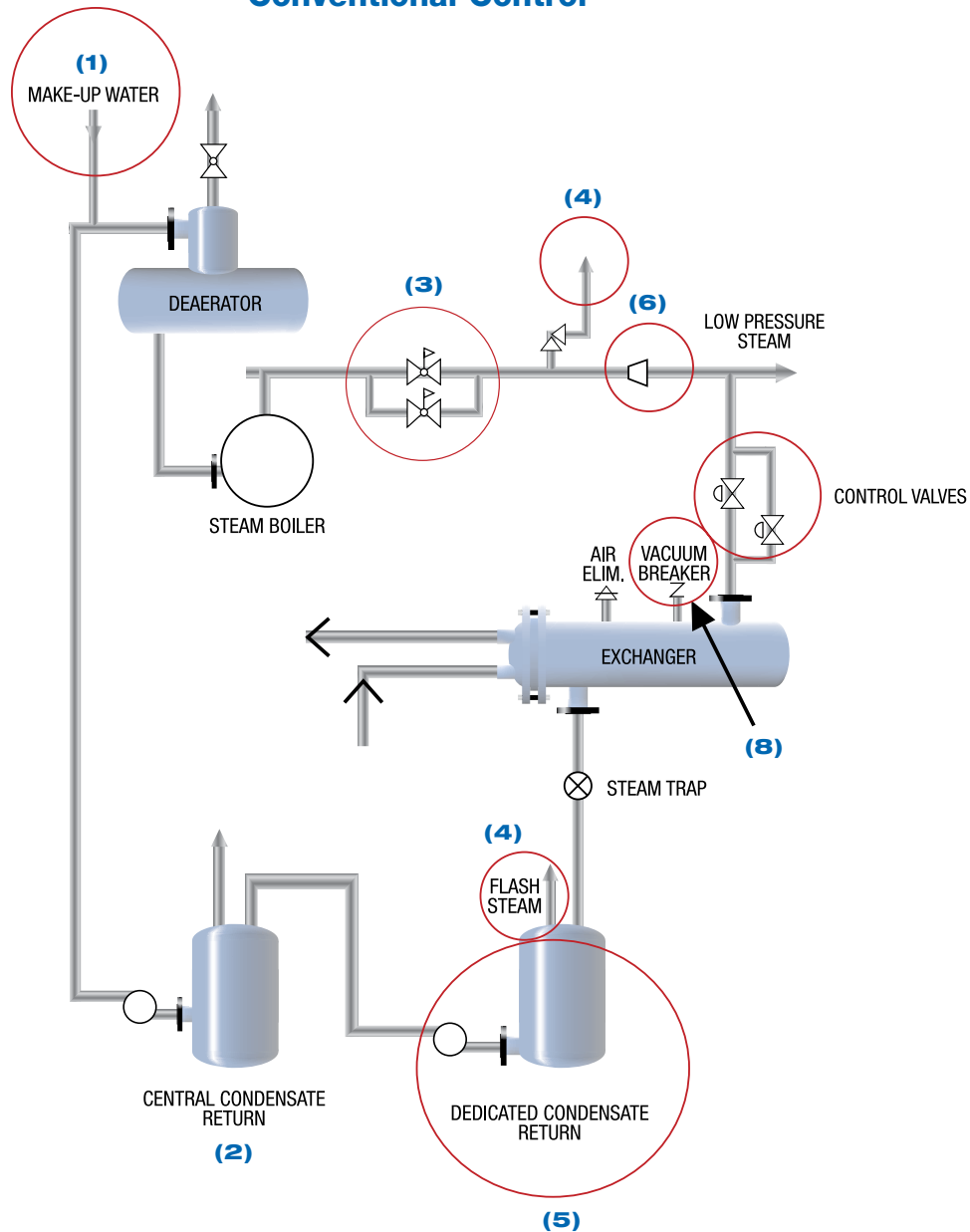
"Honorable Mention" by  
ASHRAE-AHR-Expo 2005 / Orlando, Florida

First Prize For Product Design Technology 2002 A.Q.M.E. Canada.

# Hot water generation

## Steam to liquid

### Conventional Control



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#### (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 blowdown.

#### (2) CONDENSATE PUMPS LAST LONGER

Condensate that is "too hot" causes pump cavitation and seal leaks.

#### (3) NO STEAM PRV STATION

The Maxi-Therm can use high, medium or low pressure steam directly.

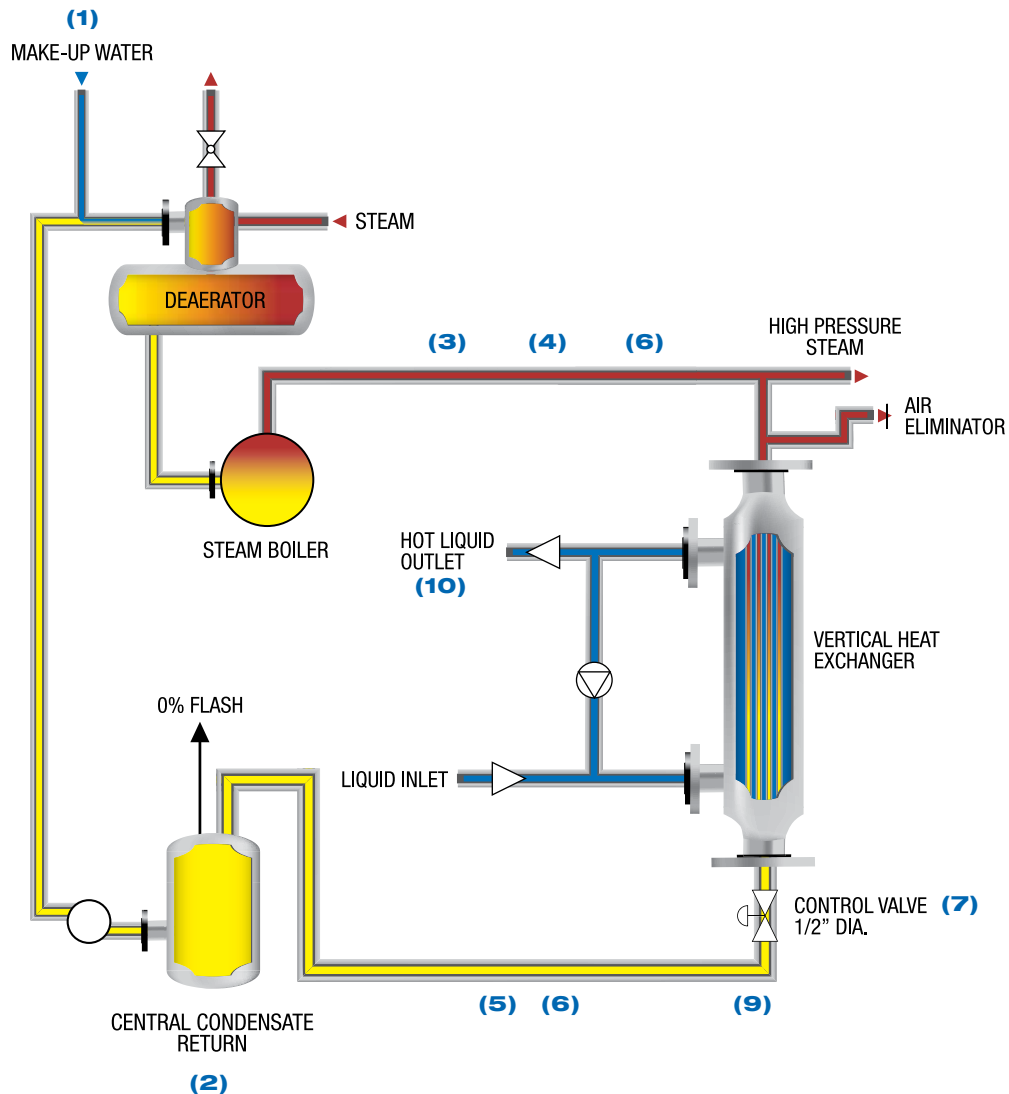
#### (4) NO STEAM SAFETY RELIEF TO ROOF

Many times the vent piping is the most expensive part of the entire system. Maxi-Therm can eliminate the need for both the pressure relief and condensate receiver vent.

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## Maxi-Therm Control



### (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 Maxi-Therm runs at constant pressure and a vacuum breaker is not needed. Independent site testing demonstrated seven times less corrosion rate.

### (9) 0% FLASH 5.4% TO 20% ENERGY SAVING AND GREENHOUSE GAS REDUCTION

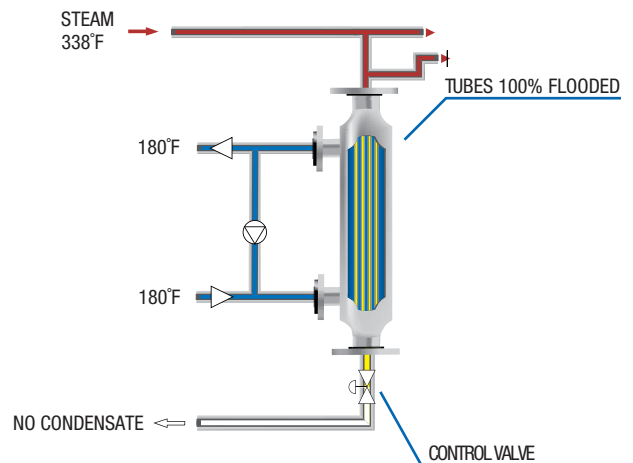
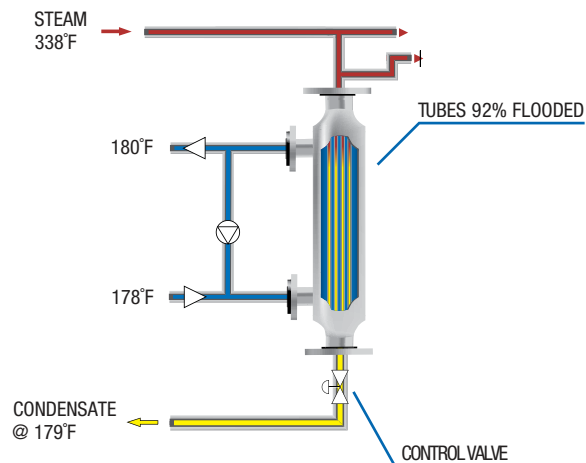
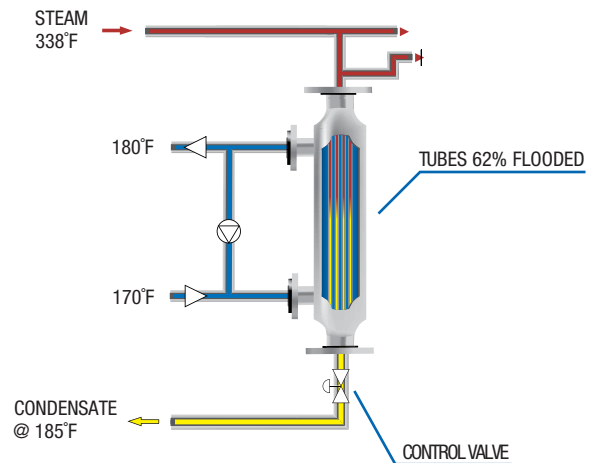
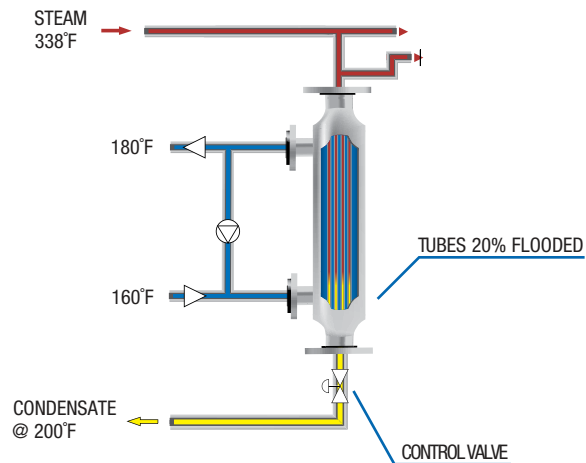
### (10) STABILITY OF SET POINT TEMPERATURE $\pm 2^{\circ}\text{F}$

# Hot water generation

## Steam to liquid

### Sequence of operation

Steam in the tubes at 100 psig



### MC system operation example

Temperature is controlled by modulating the condensate (MC) not throttling the steam. A building heat system with constant 100 psi steam at 338°F. At full load 20°F rise, water enters at 160°F and leaves at 180°F. As entering water temperature rises, the amount of surface exposed to steam is reduced. Condensate is cooled to 200°F or less by entering water, eliminating flash steam. 5.4% to 20% energy savings. No steam PRV station, no safety relief to roof, no pumping sub-station.

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## Manufacturing facilities and service technicians in the United States & Canada

- Custom fabrication per ASME Section VIII DIV #1, U-UM-R stamp.
- Quality control assurance program CSA B51, ANSI B 31.1, B 31.3, B 31.5.
- National board ISO 9001-2000.
- Over 250 units installed from 10 usgpm to 2750 usgpm in HOSPITALS, UNIVERSITIES and institutions.



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