Thermal Integration Ltd. Patent Application

Pump speed control for hot water heat exchanger, based on flow response

Unique Principle:

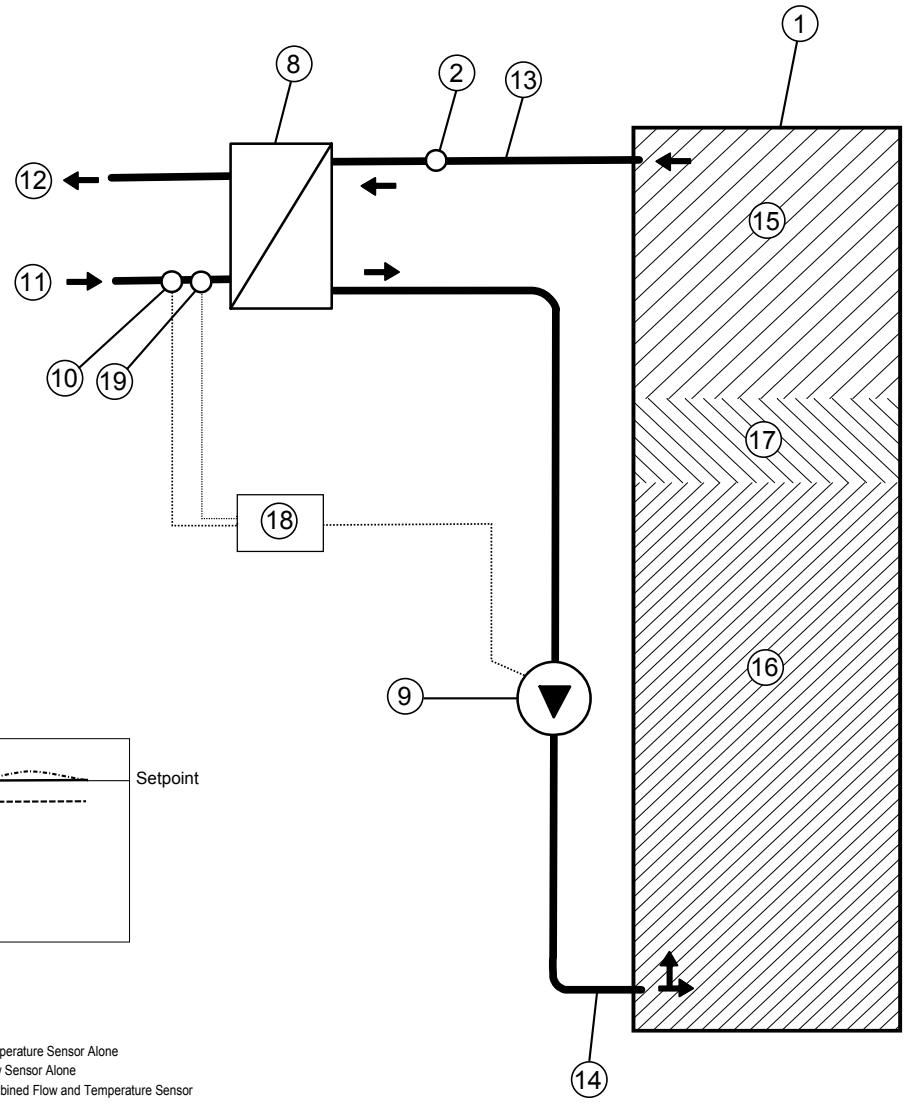
The use of flow sensor to provide proportional pump speed control to a domestic hot water heat exchanger to provide instant response to changes in flow to taps and overcome the time delays and inaccuracies resulting from modulating pump speed in response to sensed output temperature.

The system is completely predictive, setting circulation pump speed in response to system inputs rather than adjusting the pump speed in response to measured output temperatures. Inputs are fed into a software function within the controls that pre-determines the most suitable pump speed. The most suitable pump speed is calculated in part to keep the output temperaure within usable temperature limits, typically 50C to 60C. Other factors that will affect the pump speed are the hot storage temperature and incoming cold water temperature. Should the hot storage temperature be relatively low then the target temperature range for calculations is reduced accordingly to prevent excessive pump circulation speeds.

Operation:

When a hot water tap fed from pipe (12) is opened, the flow of water to taps is detected by flow sensor (10), which in turn switches on the pump (9) to deliver hot stored water (15) via pipe (13) into the heat exchanger (8). The temperature of the delivered hot stored water is measured by sensor (2), and is used in the calculation to determine a suitable pump speed. A temperature sensor (19) may be used to detect the temperature of the incoming cold water to allow the calculated pump speed to account for variations in the incoming water temperature.

The heat is exchanged into the incoming cold water (11) through the heat exchanger to provide the heated domestic water (12). The flow rate of stored water through the heat exchanger (8) is modulated in proportion to the sensed flow rate to taps at (10) to ensure that the temperature of water delivered to taps (12) is within a target range. When the flow rate to taps (12) changes, the flow sensor provides an instantaneous signal to the controls (18) which in turn calculate and set the required pump speed (9).



Graph detailing advantages of flow control over temperature control.

