HOT WATER RESET SCHEDULE FOR HYDRONIC SYSTEMS

Henry Manczyk, CPE, CEM, Director of Facilities Management, Monroe County, New York

Among the many factors that HVAC system designers and operators consider in selecting appropriate boilers or boiler improvements for building heating systems are optimal boiler size for the required building heating load, capital and life cycle costs, equipment efficiency, etc. There are various additional measures that can further enhance the performance of the system. One is the installation of a hot water reset controller.

Normally, boiler systems heat water to a pre-determined and steady high temperature without regard to outside conditions. It is anticipated that during severe cold outside temperatures, discharge water temperatures must be sufficiently high so as to compensate for actual heat loss. But, the presetting of relatively high water temperature, while satisfying an extreme load on colder days, may waste energy on milder days.

The installation of a "hot water reset system controller" can reduce heat costs by up to 10% - 15% and have a payback of 1-3 years. Benefits derived from such an installation will include:

- Increased boiler efficiency
- Reduced heat loss through pipes
- Elimination of boiler overheating
- Shutting down of a boiler when it is not needed
- Longer boiler life cycle due to reduced wear and tear

There are different methods to controlling hot-water temperature at a desired level. One is to install a hot water reset system controller to control the boiler directly. The other is to install a controller to manage a mixing control valve on the hydronic loop, so the water temperature in the system can be reset through a mixing valve rather than the boiler. The advantage of this method is that the boiler temperature remains constant, not lower than 160º F, thus avoiding condensation and potential of thermal shock problems.

Basically, when the outdoor temperature is 2º F, the hot water will maintain 177.5º F; when the outdoor temperature reaches 42º F, the hot water will linearly go to 128.4º F.

The reset controller can provide you with three schedules:

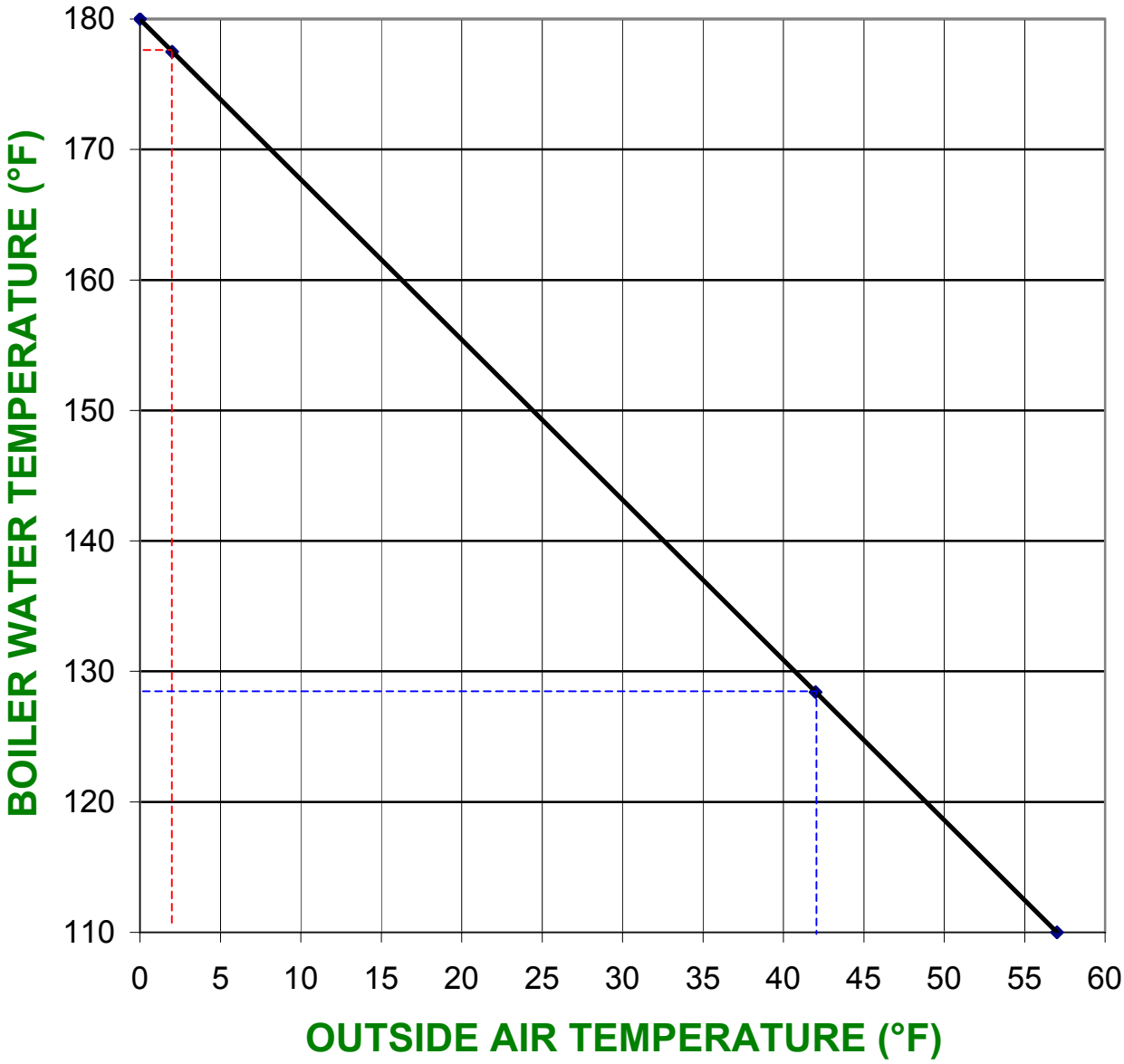
- Morning warm up
- Occupied hours
- Non-occupied hours

Your schedules, of course, will vary based on the type of system and local climatic conditions.

Posting the temperature curve chart of the hot water reset schedule in the boiler room allows the operator to verify that the hydronic system is operating at a temperature appropriate to the outdoor temperature.

The principle of a hot-water reset temperature schedule has proven itself in terms of cost efficiency and environmental conditions. It deserves consideration.

HOT WATER RESET SCHEDULE



(°F)	2	7	12	17	22	27	32	37	42	47	52	57
(hours)	23	72	172	247	402	625	928	745	566	503	439	364

BIN HOURS [SEPT. 1 TO APR. 30]

from Niagara Falls, NY Climatological Data

CALCULATION FOR HOT WATER RESET SCHEDULE

Slope of a straight line

$$\frac{\Delta Y}{\Delta X} = M$$

M = Slope

$\Delta Y = Y_2 - Y_1 = 180° - 110° = 70°$

$\Delta X = X_2 - X_1 = 0° - 57° = -57°$

$$M = \frac{70}{-57} = -1.228$$

To calculate the hot water discharge temperature at any outdoor air temperature.

$\Delta Y = M\Delta X$

$Y_2 - Y_1 = M (X_2 - X_1)$

$Y_1 = Y_2 + MX_2 + MX_1$

$= 180 - (-1.228 \times 0) + (-1.228 \times X_1)$

$= 180 + 0 - 1.228 X_1$

$Y_1 = 180 - 1.228 X_1$

Y_1 = New discharge temperature

X_1 = Outside temperature

Example 1: 2° Outside Temperature

$Y = 180 - (1.228 \times 2)$

$= 177.5$ °F

Example 2: 42° Outside Temperature

$Y = 180 - (1.228 \times 42)$

$= 128.4$ °F

Reference:

Hot Water Reset and Boiler Cutout Control, Madison Gas & Electric Company web page http://www.mge.com/business/saving/boilers.htm