

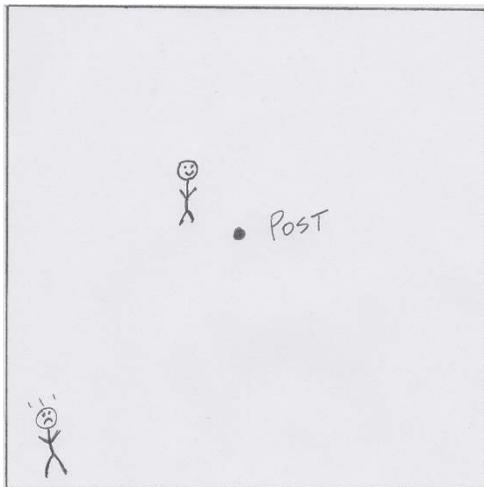
## JB Tech Talk No. 11: The Fine Print About Programming a Boiler Controller

A friend of mine who worked for a large wholesaler had sold a modulating-condensing boiler demo unit to a mutual friend who is a plumber, and it was short cycling badly. I was asked to look at it to see if I could get it to straighten up and fly right. I went over that evening to check it out. And have a beer.

The boiler was connected to a radiant garage slab and was oversized for the load. But it still should not have been short cycling the way it was.

There were many variables that could be adjusted in the controller, including the expected boiler operating differential temperature ( $\Delta T$ ). We set the minimum/maximum firing rates as low as we could to compensate for the oversizing and the  $\Delta T$  to 20 °F. It did not cure the problem.

I was stumped, so I took the boiler manual home and went right through it to see if there was something we were missing. And I found it in the fine print. The boiler controller was adding 10 °F to whatever was entered for the  $\Delta T$  value.



One of the best explanations I've heard for proportional (modulating) control is to imagine you are in a large field and there's a post in the middle of it. (See work of art to the left.) If you are standing in a far corner of the field and are told to go to the post, you will start running hard to get there and will likely blow right past it before you realize you must slow down and go back. If you are close to the post when you get the command, you'll saunter over because you don't have far to go.

By adding 10 °F to the operating  $\Delta T$ , the controller was allowing the actual temperature to get farther away from the setpoint (post). When the controller energized the burner, it would go through its ignition sequence and the water temperature would drop a bit more before the burner fired. With the water temperature now being a long way from the setpoint (the 'post') the controller would drive the burner like a rented mule to get to setpoint, then overshoot and shut the burner off. The fluid temperature would then drop, and it would go through the same sequence again.

I phoned my plumber friend and asked him to change the  $\Delta T$  setting to 10 °F and see if that helped. It did, and even though the boiler was still too big it calmed down enough to make it liveable.

By the way, the artwork is copyrighted.