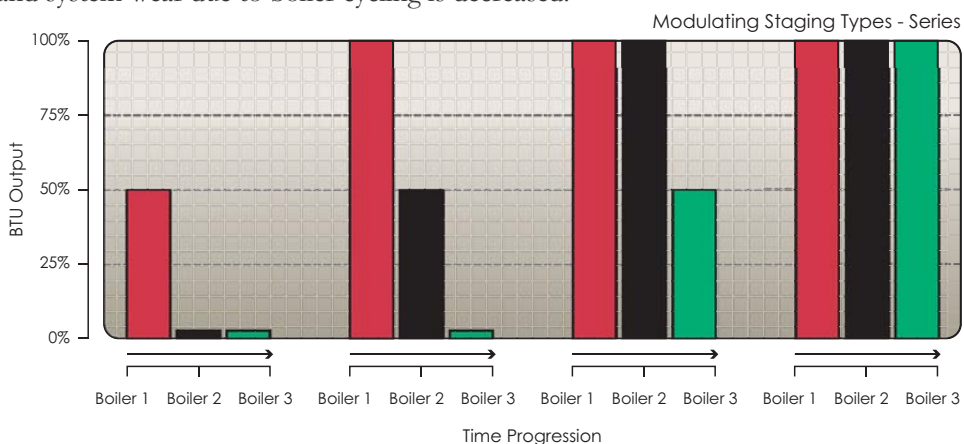


Series

The Series method of modulating boilers is based on a simple but effective algorithm. Underlying theory causes boiler 1 to fire when there is a load; modulating from the start percent (designated by the installer within the modulating options of the Control) to 100%. If the heat demand has not been satisfied at this point boiler 2 will then begin to modulate from the start percent to 100% (if required). This process will continue for each installed modulating boiler in the system to a maximum of five.

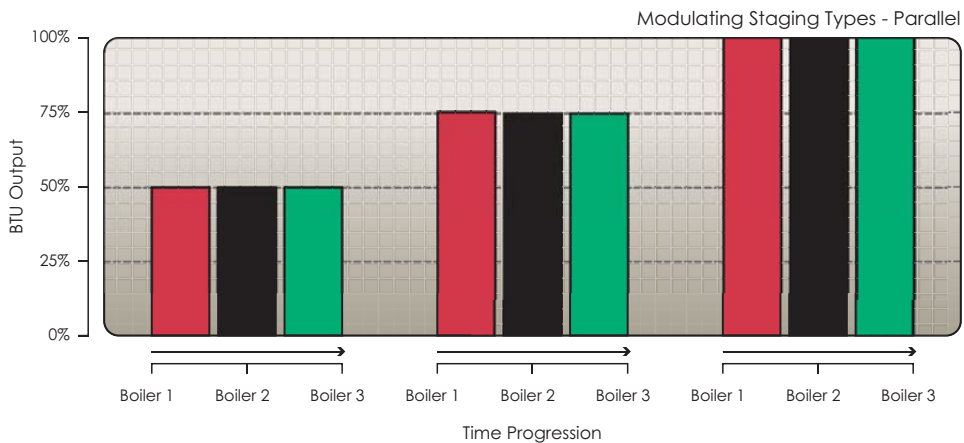
The process of modulating the boilers off works the same. When the last boiler in the system drops to the start percent it will then shut off that boiler. If the load continues to decrease then the Control will modulate down the second last boiler set up in the system. This will continue on until the lead boiler has dropped to the start percent. At this point the Control will allow the PID calculation to increase helping with boiler cycling. This will hold the lead boiler in the minimum fire (or start percent) position for longer, allowing the boiler to cycle less. As a result; system maintenance and system wear due to boiler cycling is decreased.



Parallel

The Parallel method of modulating boilers is the simplest of modulating algorithms. Underlying theory causes all of the installed boilers to simultaneously modulate from the start percent (designated by the installer within the modulating options of the Control) to 100% depending on the system load requirements. The maximum number of modulating boilers that the Control can handle is five.

The process of modulating the boilers off works in the same manner. When the load decreases, all of the boilers will modulate down until they are at the start percent. At this point, to help with boiler cycling, the Control will allow the PID calculation to increase. This will hold the lead boiler in the minimum fire position (or start percent) for longer allowing the modulating boiler to cycle less. As a result; system maintenance and system wear due to boiler cycling is decreased.



Progressive

Progressive modulation is a complex algorithm for very precise control over modulating devices. HBX Controls has optimized the process to work effectively for multiple modulating boilers. This modulation algorithm is a combination of series and parallel modulation with additional benefits.

Underlying theory causes the first boiler to modulate from the start percent (designated by the installer within the modulating options in of the Control) to 80% modulation. If the load still requires more heat then boiler 1 decreases to 40%, and boiler 2 increases from 0% to 40% (maintaining 80% output with 2 modulating boilers now on). As the load increases both modulating boiler 1 and modulating boiler 2 will increase to 80%. If there is still a higher load requirement, both boiler 1 and boiler 2 will decrease to 55% and modulating boiler 3 will increase from 0% to 55%. All 3 modulating boilers now take on approximately the same load as the 2 modulating boilers at 80%. This process will continue on until all boilers set up in the system are firing. When all the modulating boilers are firing and a load is still required, all 3 boilers will modulate to 100% simultaneously.

As load decreases the modulating boilers will simultaneously modulate down to the start percent. The lag boiler will shut down and remaining modulating boilers will increase their modulating to split the remaining load in percent. At this point to help with boiler cycling the Control will allow the PID calculation to increase. This will hold the lead boiler in the minimum fire position for longer allowing the modulating boiler to cycle less. As a result; system maintenance and system wear due to boiler cycling is decreased.

