



Sequencing Options Mean New Levels of Building Efficiency

Lochinvar's Intelli-Fin boiler is changing the way engineers, architects, and building managers look at total building efficiency. The first boiler with LonWorks® capability, Intelli-Fin offers a thermal efficiency rating as high as 97%, and can enhance overall building efficiency through the use of new control and management technologies.

Boiler sequencing is an effective way to improve efficiency, reduce maintenance, and enhance the longevity of a hydronic system. The advent of new control technologies allows more options for managing boiler operation and for system design. Intelli-Fin takes full advantage of these capabilities, expanding the choices for effective sequencing strategies.

Intelli-Fin boilers and water heaters give system designers "conventional" sequencing options such as first on/last off and first on/first off. These are offered in the standard sequencing package with the Intelli-Fin. However, Intelli-Fin also provides an entirely new series of sequencing choices as options — capabilities that have a direct impact on efficiency gains.

Run Time Equalization

Sequencing setups such as first on/first off and first on/last off can simplify maintenance scheduling and allow minor gains in system efficiency. However, with intelligent controls in place there are new options that come into play.

One is run-time equalization. Each Intelli-Fin boiler monitors its total run-time via a digital control. By utilizing the run-time equalization sequencer, each unit can be set to cycle on and off so all units operate for approximately the same total hours. The sequencer looks at total run hours of each unit, then picks the unit with the least total hours to come on first. During this selection, the sequencer pays no attention to the physical boiler number sequence, only to building load and total unit run-time. This logic allows unit run-times to be kept within 24 hours of each other. So unlike some sequencing options, which actually place additional stress and wear on one unit in a system, this approach allows the system to achieve a much greater balance and improve equipment life.

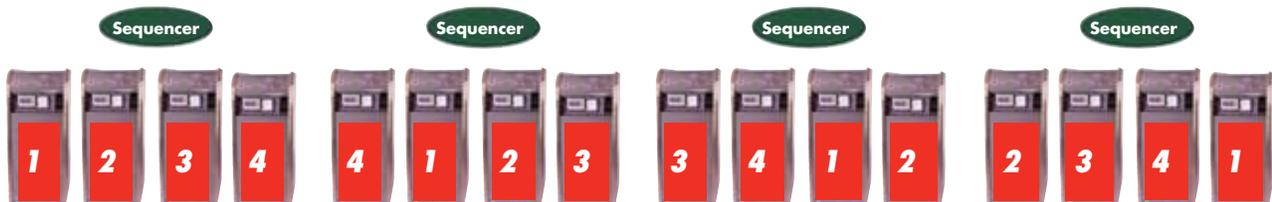
Efficiency Optimization

But there's another approach with even more promise. It's called efficiency optimization.

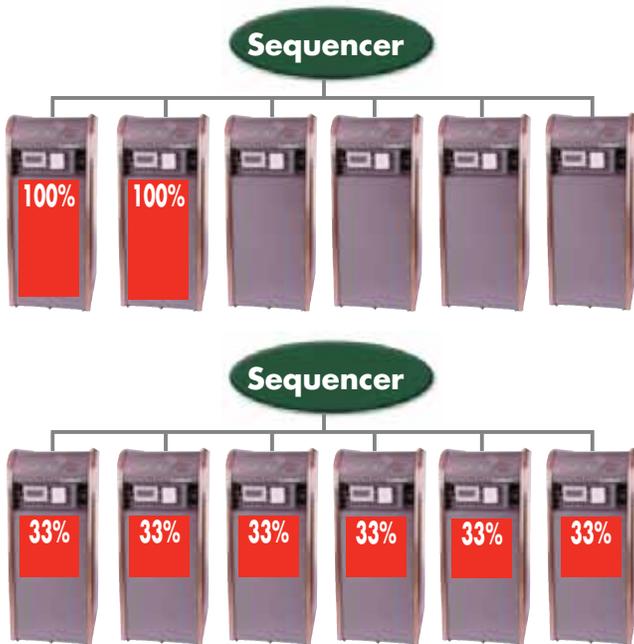
A typical multiple boiler sequencer energizes one unit until the system demand is satisfied or until system temperature begins to drop and additional units are energized. While this firing sequence takes place, no consideration is given to boiler firing rate or system efficiency, meaning the sequence is dependent solely on building demand. Therefore, when one unit can produce the required Btu/hr to satisfy demand, only one unit is energized.

However, Lochinvar's intelligent sequencer takes advantage of the increased efficiency at the reduced firing rates that Intelli-Fin offers. The Intelli-Fin is capable of a maximum thermal efficiency of up to 97%. In a sequencing system, it is now possible to allow multiple units to operate at this maximum efficiency level a majority of the time. Efficiency optimization sequencing matches building demand by energizing the optimum number of boilers and controlling their firing rate. This selection and control allows the boilers to operate at their most efficient output.

When multiple boilers can operate more efficiently than a single unit at full fire, the sequencer alters the firing rate and energizes additional boilers. Each boiler will be using a portion of its total capacity, and generating a total Btu/hr output that may be possible by utilizing fewer units. However, the enhanced efficiency of the sequencing operation (particularly when combined with maintenance advantages) can make a significant contribution to overall building efficiency.



Run Time Equalization allows multiple units to operate approximately the same number of hours by changing the firing sequence. This simplifies maintenance and reduces wear.



Efficiency Optimization Sequencing allows multiple boilers to operate more efficiently than one or two units. Since Intelli-Fin is up to 97% efficient at 33% firing, using all six in the series saves money.

For example, the control system detects the total heat load needed for morning warm-up. The system then looks at the number of boilers available and selects the optimum firing rate for the units that it puts into operation. If the system has six boilers with capacities of two million Btu/hr each, and the heat load is four million Btu/hr, two boilers could satisfy the load firing at 100% of rated output.

At full firing, the Intelli-Fin's thermal efficiency is approximately 93%. To increase system efficiency, the controls will use efficiency optimization sequencing to fire all six boilers at 33% of rated output—which allows each unit to operate at a maximum thermal efficiency of 97%.

By using efficiency optimization sequencing, the overall efficiency of the boiler system is increased from 93% to 97%, and each unit is fired at a rate well below its maximum, which reduces wear and tear on the system.

So Intelli-Fin's new sequencing options can enhance efficiency and provide ways to make the boiler system operate longer with less maintenance.

STANDARD SEQUENCING PACKAGES PART NO.

Water Heater	SMP3000
Boiler	SMP3001
Boiler w/Outdoor Air Reset	SMP3002

OPTIONAL EQUIPMENT:

- Command Display
- Remote Mounting Base for Command Display

Standard Package Includes:

- First On/First Off with Lead Lag
- First On/Last Off

CUSTOM SEQUENCING PACKAGES PART NO.

Water Heater	SMP3003
Boiler	SMP3004
Boiler w/Outdoor Air Reset	SMP3005
Remote Monitoring	SMP3006
Local Monitoring	SMP3007

Custom Package Includes:

- First On/First Off with Lead Lag
- First On/Last Off
- Efficiency Optimization
- Efficiency Optimization with Run-Time Equalization

Smarter Controls, More Options

To take advantage of LonWorks® capabilities, Lochinvar developed a new control system and monitor that allows multiple boilers to be managed from a single Command Display electronic module. The system can be accessed on site or remotely by PC.

The Command Display features backlit LCD readouts, showing eight lines and up to 40 characters per line. A 10-key keypad makes for easy menu selection, and allows for multiple layers of information to be displayed. The Command Display can be mounted on any of the units, on a wall in the mechanical room, or in an office within the facility. A single Command Display is capable of managing the functions of up to 16 individual units



when networked using the LonWorks daisy chain wiring arrangement. In addition, the same Command Display can also manage the sequencing functions of a multiple boiler system, providing total control from a single source.

Up to 21 points are visible from the display screen, including:

1. Calculated Setpoint - Setpoint as adjusted by outdoor air reset
2. Setpoint Temperature
3. Return/Inlet Temperature
4. Supply/Outlet Temperature
5. Temperature Rise
6. Status - current mode or fault condition
7. Outdoor Air Lock Out - maximum outdoor air temperature requiring heat
8. Outdoor Air Max - warmest outdoor air temperature where reset function begins
9. Outdoor Air Minimum - coldest outdoor air temperature where boiler reaches maximum reset temperature
10. Outdoor Air Temperature - outdoor air temperature display
11. Maximum Setpoint - maximum water temperature
12. Minimum Setpoint - minimum water temperature
13. Total Run Time – in cumulative hours
14. Sequencing Type - for multiple boilers
15. Percent Burner Input – between 25% to 100%
16. Auxiliary Relay - on/off status of auxiliary function (i.e. air louvers)
17. Percent Bypass - % bypass is open (0% to 100%)
18. Bypass Temperature
19. Operating Sensor - indicates location of operating sensor in either the inlet or outlet
20. Heater Pump - on/off status of internal pump
21. Heater I. D. - identifies unit as a boiler or water heater



Lochinvar Corporation • 300 Maddox Simpson Pkwy • Lebanon, TN 37090 • 615-889-8900 / Fax: 615-547-1000
www.Lochinvar.com