

## INOV8 BURNER TECHNOLOGY

Several patentable features have been included in the **INOV8** Waste Oil Burner design to deal with the carbon precipitation and gassing-off problems as follows:

- A recirculation system is provided to maintain high levels of heat transfer (velocities over three feet per second) as the oil is heated to prevent the occurrence of the nucleate boiling and graphite precipitation.
- The recirculation system has automatic venting allowing the released gases to escape and to maintain steady oil flow to the nozzle.
- The recirculation system in combination with an automatic vapor eliminator provides a unique feature in that the oil pump becomes self-priming. In fact, the charged recirculation loop causes the burner pump to act like a vacuum pump with very low-pressure capabilities. Most codes require locating the furnace (unit heater) eight feet off the floor.
- With all competitive units, it is necessary to use either a remote floor mounted pump or involve rigorous priming. The self-contained oil pump on the burner housing is adequate for most applications.
- A filter is included in the recirculation loop immediately after the heater circuitry to entrap any small particles before the oil enters the passage leading to the nozzle. Competitive units do not have such a practical method to filter all oil between the heating system and the fine aperture oil nozzle. The general solution has been to sacrifice good atomization by using a large aperture nozzle.
- The recirculation loop system pumps hot oil so that viscosity variations are minimized to maintain uniform firing rates over wide oil conditions.
- The recirculation system uses a built-in relief valve of the pump to a desirable advantage. The flow rate through the valve is ten times greater than what is encountered in the firing rate of the burner making pressure regulation much more manageable.
- A pneumatic/mechanical device moves a needle through the combustion gun to the aperture of the oil nozzle. This needle will prevent nozzle drip at shut down, will maintain an open orifice for consistent firing, and will ignite immediately since oil does not drain out of the final delivery circuit.

The fact that other manufacturers of waste oil furnaces use the less expensive residential combustion controller is not justification for its use here, particularly when personnel and/or property would be placed in peril. There have been many cases where buildings have been destroyed by fire initiated by explosions of waste oil furnaces. The design of this waste oil furnace includes a number of innovative concepts directed specifically to safety and reliability, and yet, this manufacturer is convinced that a more sophisticated primary combustion control is absolutely necessary.

The **INOV8** burner uses an industrial rated primary safety control at a cost ten times greater than the aforementioned residential control. It is an industrially rated control qualified to monitor combustion equipment as large as 2.5 million BTUH. The primary safety control features the following programmed sequence:

1. An oil temperature interlock to prevent firing of cold oil.
2. An air pressure interlock to prevent oil delivery without proof of atomizing air.

3. A **90** second purge to insure venting of explosive vapors prior to each start sequence insures there is no residual fire before introducing new oil
4. Start mode consists of a **ten second trial-for-ignition** period.
5. Automatic sequence from start-mode to run-mode upon flame detection.
6. A **three second** timing to terminate oil delivery if a flame outage occurs during run mode.
7. **One** attempt to re-establish flame, but only then, after repeating steps 1, 2, 3 and 4 above.
8. If flame is not detected within the **ten second trial-for-ignition** period, the unit reverts to a full safety shutdown wherein power is terminated to the combustion motor (oil pump) and the oil heater. After safety shutdown occurs as indicated by a red light, manual reset is required.
9. Termination of spark ignition after flame established to lengthen the life of the ignition transformer and the electrodes.

The primary safety control uses an ultra-violet flame detector. The ultra-violet detector is not sensitive to daylight or artificial light, as is the case with the cadmium cell detector, previously mentioned. The ultra-violet sensor will "see" and respond to the flicker of a match or candle at a distance of four feet, but will not "see" a strong artificial light at any distance. This feature alone will prevent dangerous situations from occurring. One of the more appealing aspects of the burner is the serviceability. The heart of the burner is the "Slide-Out Fire Control Module". It is designed for ease of servicing and should it need replacing a new Module can be replaced within five minutes. This Module includes all of the operating controls; temperature sensors, electric pre-heater and the needle actuator, which could be subject to field failure. Replacing of this unit would not require highly qualified technicians.