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Commercial Tankless Water Heaters: O₂ Trim and Controls

Monday Morning Minutes | by Norm Hall, December 5, 2022

Gas fired water heaters remain the solution for most commercial water heater applications. Tankless gas fired water heaters are the choice of many engineers. Tankless controls regarding the air/fuel mixture can provide peace of mind benefits for the building owner and management. What are the technological advances in tankless water heaters you should consider in your specifications?



What is Oxygen or O₂ Trim?

Commercial water heaters are a key part of the building mechanical system. Today, most of these water heaters are condensing type, with or without storage. The proper oxygen and fuel blend is key to proper operation and maintaining the high published efficiency in the tankless water heaters. How does ASHRAE define “tankless”? Visit [Commercial Gas Fired Water Heater Types](#) for the definition.

The O₂ trim technology reduces the condensing to improve efficiency at all firing rates. Your specification should include water heater startup and commissioning by the factory authorized startup team. This team will set the burner for best efficiency during the

startup. It's relatively easy to set the proper oxygen delivery to the burner at design output and weather conditions of that day. A properly engineered system will deliver the right air/fuel mixture when the load is varying, and the weather is not perfect.

Too little oxygen and you have an unstable burn. The emissions rise, maintenance increases, and there may be nuisance flame losses. Many water heater systems may avoid this by providing too much oxygen which sacrifices efficiency. The properly designed O₂ trim system will adjust the speed of the blower in response to sensors to increase efficiency by 1% to 2%.

The O₂ trim option in water heaters is much more critical than many boilers. The water heaters always run in both summer and winter. The outdoor air temperature and humidity varies dramatically and that affects the oxygen volume.

Visit our previous blog, [Condensing Boilers – O2 Trim Should be Standard in Your Specification](#) for more information.

Correctly Engineered O₂ Trim System in Commercial Tankless Water Heaters



Air/fuel valve automatic adjustment or O₂ trim has been around in larger commercial and industrial boilers for a long time. The technology today should avoid the service intensive adjustments of years gone by.

The system should be engineered to avoid any mechanical linkage adjustments. It should also include a characterized rotating disk gas valve. Obviously in today's world the blower should be variable speed. The controls and O₂ trim should avoid cycling the burner on and off through a 20:1 turndown of the water heater design capacity to load.

Peace of Mind Water Heater Control for Efficiency

A great way to control the tankless water heater plant starts with the water heater temperature control. The control in the tankless models is much more critical than tank-type or storage water heaters. Changes in the load happen instantaneously and, in the tankless world, the controls must respond immediately. Feed-forward and feed-back sensors will assure a tight $\pm 4^{\circ}\text{F}$ control through the range of possible demand flow rates. The best solution will provide this tight temperature control coupled with an air fuel mixture modulation to keep the efficiency at peak and a wide 20:1 turndown range.

The second phase of control in the tankless water heater plant is the proper staging and de-staging of heaters. One example of proper water heater management is the PVI Edge® controller in the [PVI Centurion 2000](#) tankless water heater. The controller will operate multiple water heaters through the turndown range of each tankless heater. This will create the highest efficiency, virtually eliminate standby and cycling losses, extend the life of components, and provide the owner with comfortable instantaneous alerts and status.

Combining O2 Trim, Control, Proper Fit, and Long Life in a Tankless Water Heater



Here is an example of bringing all these benefits together in a single model.

The PVI Centurion® 2000 model fits easily through a standard door with its 28" width. It also will fit in most freight elevators to make installation in existing buildings possible.

The water heater has a generous 38.4 GPM (2304 GPH) capacity with a 100°F rise.

You can relax if pressure drop is a concern. This model has less than 3 feet or just over 1 PSIG of pressure drop at that 38.4 GPM flow rate.

Highest Quality in the Critical Heat Exchanger & Vessel

The PVI material choice remains the best in the Centurion. The down-fired heat exchanger and pressure vessel is designed and built with [AquaPLEX® duplex alloy stainless steel](#) to avoid pitting, crevice corrosion, and chloride stress corrosion cracking.

Peace of Mind Warranty Choices

The Centurion warranty options will fit any end user's needs. The installing plumbing contractor will also enjoy the peace of mind warranty.

Centurion	Industry Best Standard Warranty	Optional Extended Warranty
Pressure Vessel (Total Prorated)	15 years	-
Pressure Vessel 100% Coverage	8 years	10 or 15 years
Heat Exchanger (Total Prorated)	15 years	-
Heat Exchanger (100% Coverage)	8 years	10 or 15years
Parts	18 months	2 to 5 years
Controller	2 years	-
Labor Coverage	1 year	2 years

The standard warranty includes labor for the first year. The optional coverage can include up to 15 years on the major components and up to 5 years on other parts. The optional coverage will even include a second year of labor.

The Centurion tankless water heater is perfect for the client that is looking for a trouble-free, long-life solution in systems with a capacity need of 1,500,000 BTUH or greater. The O2 trim, controller, great turndown, long life, and warranty combines for a product the client will thank you for specifying. [Contact](#) the R. L. Deppmann sales engineering team for more information.