

Excess Air Discussion

Combustion is simple chemistry. It takes a fixed ratio of oxygen molecules (from air) to complete the combustion of a given amount of fuel. Mixing air and fuel molecules together is just one of the processes that a fuel burner has to accomplish but it is major one for fuel economy and safety!

There is quite a difference in performance between a \$500 Commercial mixer and a hand-held whisk – if you are making a milk shake.

There is quite a difference in performance of some fuel burners compared to others when it comes to mixing fuel and air.

But is it important?

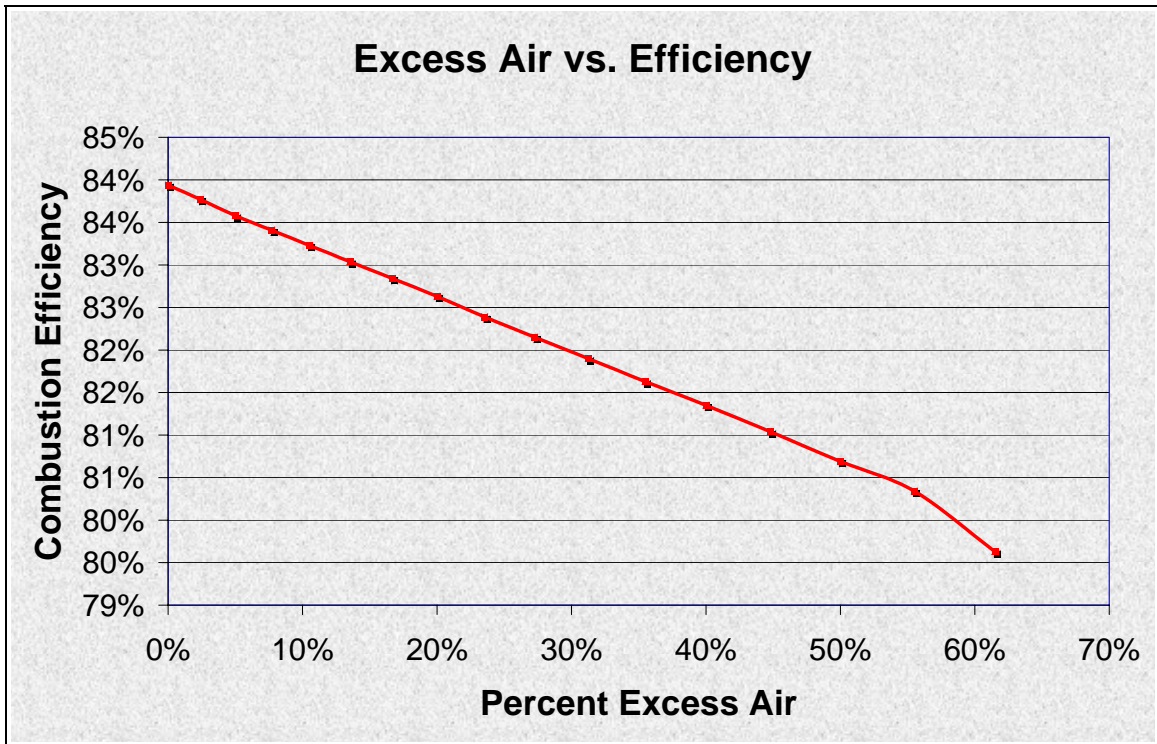
If the goal is safety, then yes it is VERY important. If the mixing of air and fuel is not perfect then there will be partially unburned fuel in the form of carbon dioxide (CO). Carbon dioxide is dangerous. Therefore a burner that has a less efficient mixing head design will require a good deal more air flowing across it to provide more oxygen than a burner with a more efficient mixing head.

It is like the Commercial mixer compared to a hand-held whisk: The Commercial mixer needs less water to dissolve sugar crystals than a whisk does.

Adding more air than is necessary is adding what we call “excess air.” While a small amount is necessary to assure that there is a safe amount, excess air is wasteful. Excess air cools the flame which means that the temperature difference between the combustion gasses and the water in a boiler is decreased. Therefore the boiler becomes less efficient.

While there are lots of theoretical and mathematical things that we could show, we went to an actual boiler and tested. We changed the air damper settings on a burner to change the amount of excess air and then measured the combustion efficiency using an electronic testing device. The results show a dramatic reduction in boiler efficiency with increased levels of excess air. Higher excess air translates to higher fuel bills

The burner we used has a VERY efficient mixing head so that we could safely burn the fuel with no excess air and still have low conversion of fuel to carbon monoxide. Following is a chart that shows how excess air robs dollar bills from your pocket.



It doesn't matter what the type or the brand was in regard to the affect of excessive excess air. The tests were done on a boiler that has a cataloged efficiency. The cataloged efficiency is a very relative thing, isn't it? The type of burner used will greatly affect the actual boiler efficiency and the amount of dollars spent on fuel.