# ECLIPSE BRIGHTFIRE™ BURNERS

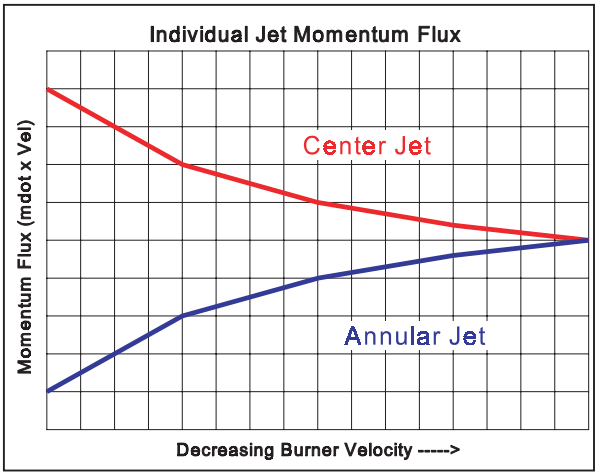
The Eclipse Brightfire™ burner is an adjustable low $NO_X$ air-fuel burner. Brightfire™ provides up to 35 percent lower $NO_X$ emissions and superior flame control compared to other burners. In addition, the Brightfire™ burner provides a wide turndown ratio and its sleek design will accommodate the tightest port constraints and provide years of trouble-free service.

### *Superior flame control*

The burner's low $NO_X$ emissions and superior flame control are accomplished through a combination of coaxial annular and central core flow streams. The momentum flux (mass flow rate x velocity) of the center jet is always dominant over the surrounding annular jet, except at the burner's minimum velocity setting, when the momentum flux are equal. The Brightfire's unique design varies the momentum flux of the individual jets by diverting gas flow from one jet to the other while changing the nozzle's total flow area. That is, as the center jet's momentum flux decreases, the annular jet's momentum flux increases. Figure 1 illustrates this behavior.

In practice, the dominant momentum flux of the center jet pulls the annular jet (through entrainment) into the center jet. At the burner's high velocity settings, this results in a more cohesive gas jet and the ability to achieve shorter flame lengths than an annular jet type burner alone.

At intermediate velocity settings, increasing amounts of fuel are diverted from the center jet to the annular flow stream. This occurs within the body of the burner. The annular flow field then acts as a buffer between the higher momentum center jet and the combustion air stream. The dominant center jet continues to entrain fuel from the annular jet prior to entraining combustion air. This delays mixing between fuel and combustion air which reduces $NO_X$ formation.




ECLIPSE®
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# Brightfire Burners

## Lower emissions, superior flame control, sleek design

At lower velocity settings, the momentum flux of both the center jet and annular jet is nearly equal. However, the outer boundary of the annular jet entrains relatively more combustion air than it does at higher velocity settings. Doing so creates a more intense outer combustion zone which encompasses the central fuel core. The encircling combustion zone coupled with low jet velocities promotes fuel cracking and further reduces NOx.

Figure 2 compares the relative NOx generation between an annular jet burner and the Brightfire™ burner as a function of the velocity setting. Typical furnace conditions should allow the burner to operate in the mid to low velocity settings to yield NOx reductions between 25 to 35 percent over annular type burners.

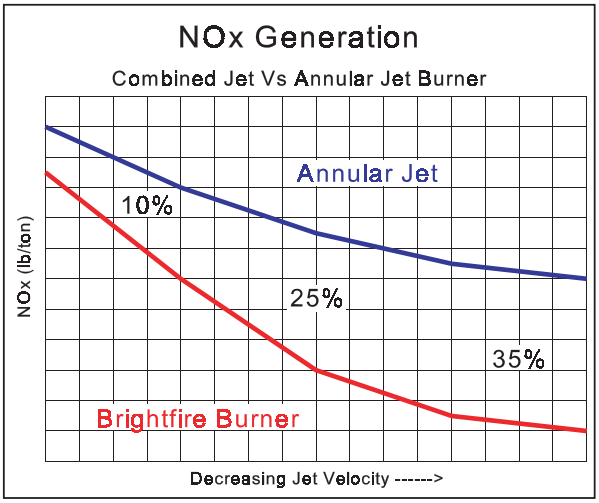


*Figure 2*

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