



RILEY POWER INC.

Low NO_x Controlled Combustion Venturi (CCV®) Burners for All Wall-fired Boilers Firing Pulverized Coal

OVERVIEW

The first generation Low NO_x CCV® Burner was introduced in the early 1990's by Riley Power Inc. (RPI), a Babcock Power Inc. Company, to respond to the market demand to meet lower NO_x emissions. The original CCV® burner was designed for all wall-fired applications firing pulverized coal, including front, rear, opposed, and cell-fired arrangements. This design was subsequently followed by the Dual Air Zone (DAZ) CCV® burner that offered separate air flow control and improved levels of NO_x reduction. Upgrades in both designs have been incorporated to provide improved mechanical reliability and performance.

FEATURES / BENEFITS

Service-proven design

- Nearly 2000 units sold for over 150 utility and industrial boilers generating from 20 to 1,300 MW per unit.

Patented venturi coal nozzle assembly included with every CCV® burner

- Concentrates the coal to the center providing a rich mixture which is then divided into smaller individual streams.
- Produces a less turbulent, slower mixing flame, providing more gradual coal/air mixing, and lower NO_x.
- Excellent flame length and shape control.

Low overall pressure drop

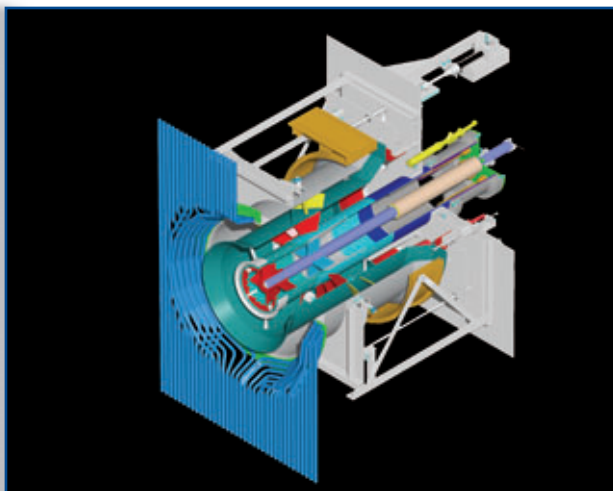
- Minimizes losses through the burner to 3.5 - 4.0" wg.
- Lower operating cost.

CCV® DAZ burner incorporates two (2) separate air zones

- Improves the ability to stage the air surrounding the primary combustion zone.
- Allows for independent control of secondary and tertiary air zones providing better NO_x control, often eliminating the need for OFA.
- Independent burner air flow measurement probes are available.

Superior Mechanical Reliability

- Register swirl vanes and operating mechanism designed for many years of reliable mechanical operation.



CCV® BURNER DESIGN



CCV® BURNER COMPONENTS



RILEY POWER INC.

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- Burner air flow shroud incorporates specially machined edges to shed fly ash for years of trouble-free operation.
- Many burners have been in operation for over 10 years without mechanical binding issues.

Flame Stabilizer Ring (FSR) included in all new CCV® or retrofit burners

- Enhances flame attachment.
- Further reduces NO_x emissions.
- Maintains or reduces fly ash UBC/LOI.
- Reduces slagging at burner front and lower furnace walls.

For most retrofit applications, burners plug into existing burner openings without modifying pressure parts

- Easier and less costly retrofit (material, labor and time off-line).

Extensive experience retrofitting cell fired arrangements

- Nearly 8,000 MW of cell-fired utility units have been successfully retrofitted by RPI with no pressure part replacement, no OFA, and no burner respacing.

Wear protection options available for CCV® coal nozzles

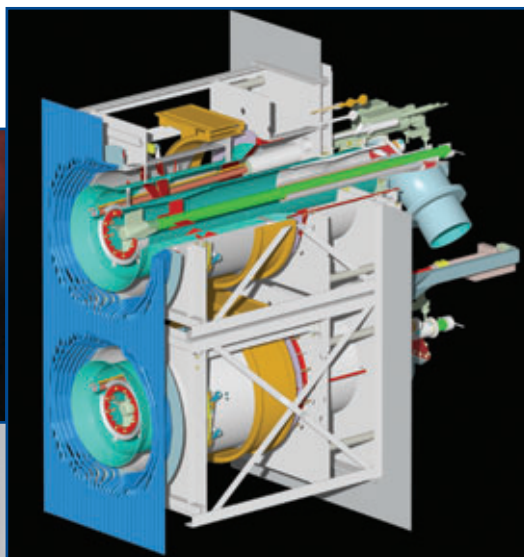
- Provides extended life.
- Cast coal spreaders – cast Riloy 74; protective tungsten carbide coating (Riloy 76) can also be added to leading edges.
- Alumina ceramic protective sleeve for spreader support tube.
- Ceramic lined coal head.
- Single piece stainless steel venturi with Conforma® Clad protective coating.
- Ceramic lined coal nozzle.

In-house CFD modeling capability

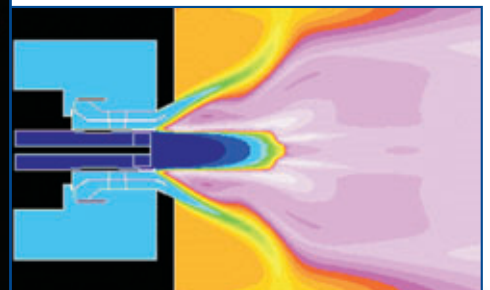
- Predict burner settings necessary to achieve optimum burner aerodynamics for low NO_x emissions and low UBC.
- Optimize design of FSR.
- Furnace modeling.
- Analyze furnace gas temperature, CO and O₂ profiles which will result from low NO_x retrofit.
- Design boundary air system for protecting waterwalls from corrosion, if needed.
- Minimize time and cost required to tune burners during commissioning.



TYPICAL CCV® BURNER FLAME



CCV® CELL BURNER



CFD MODELING