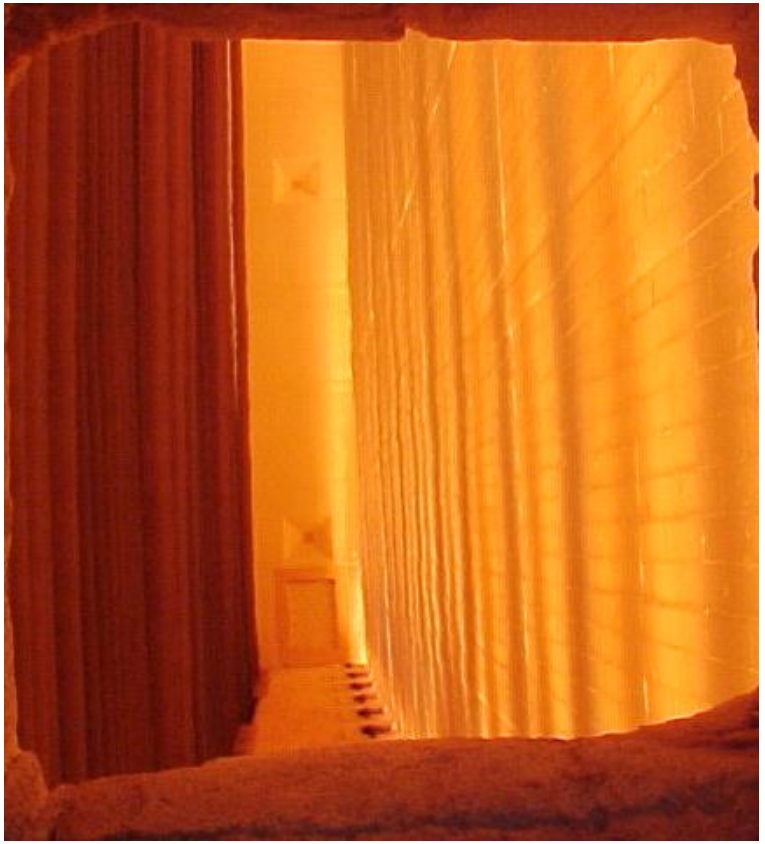
EEPC Ethylene Seminar

24-26 October 2012, Barcelona (Spain)

Flame Interaction and Rollover Solutions in Ethylene Cracking Furnaces

Statement of Problem

- **Cracking furnace must be retrofitted with new hearth burners to meet lower NO_x requirements (150 mg/Nm3)**
- **Tight burner spacing**
- **Flame rollover is not acceptable**

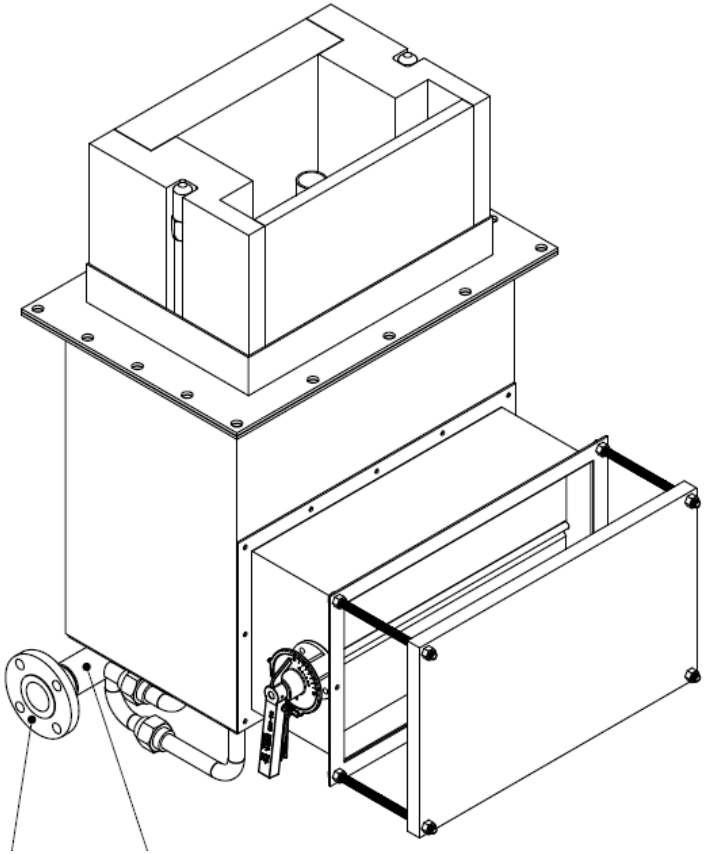


Application Description

- **2 Furnaces, 24 floor burners each, double fired**
- **RFG ~10% H_2 by volume**
- **Average firebox temperature: 1250°C**
- **Firebox dimensions: 10.21 x 2.8 x 9.93 m**
- **Induced draft**

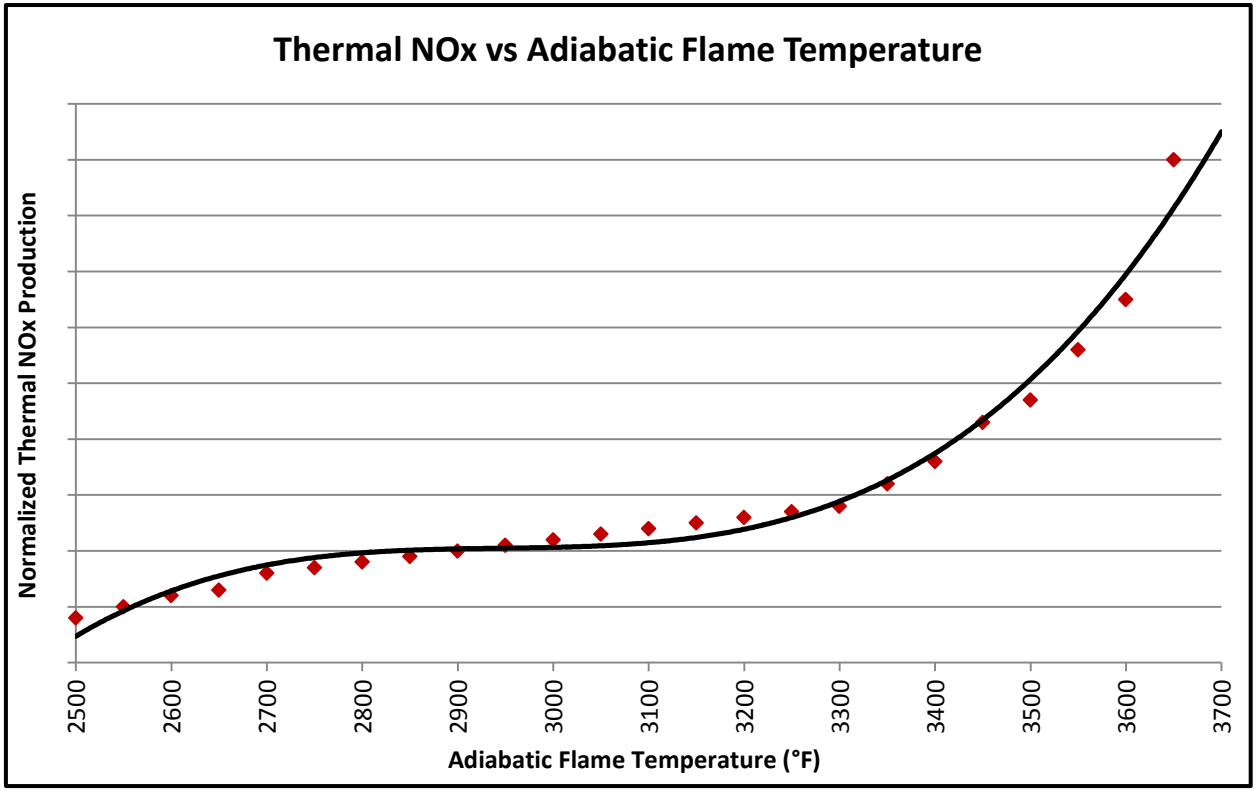
Technology Employed

- **Zeeco "Enhanced-Jet" Ultra Low NO_x Burner**
- **Secondary tips inspirate inert flue gas into flame**
- **Capable of sub 100 mg/NM^3 NO_x emissions**



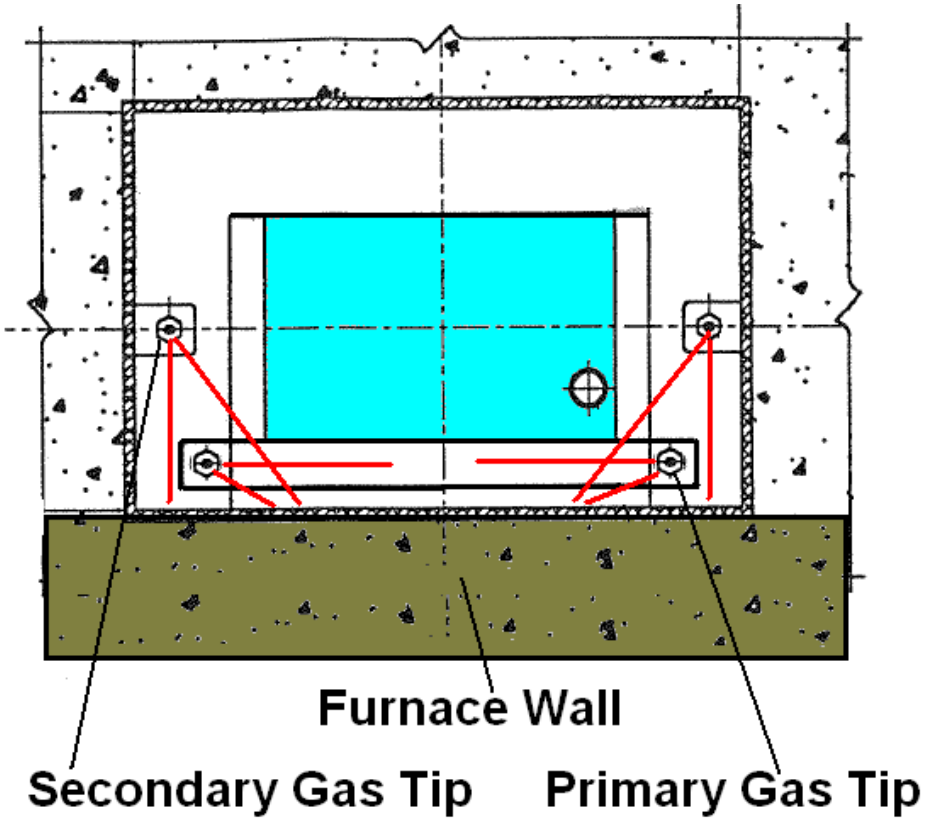
Reducing NOx

Thermal NO_X is the primary contributor to total NO_X.



Burner Design

- **Secondary tips fire into flue gas, inspirating flue gas into the flame**
- **Primary gas tips provide "fuel staging" and allow for tuning of heat flux profile**

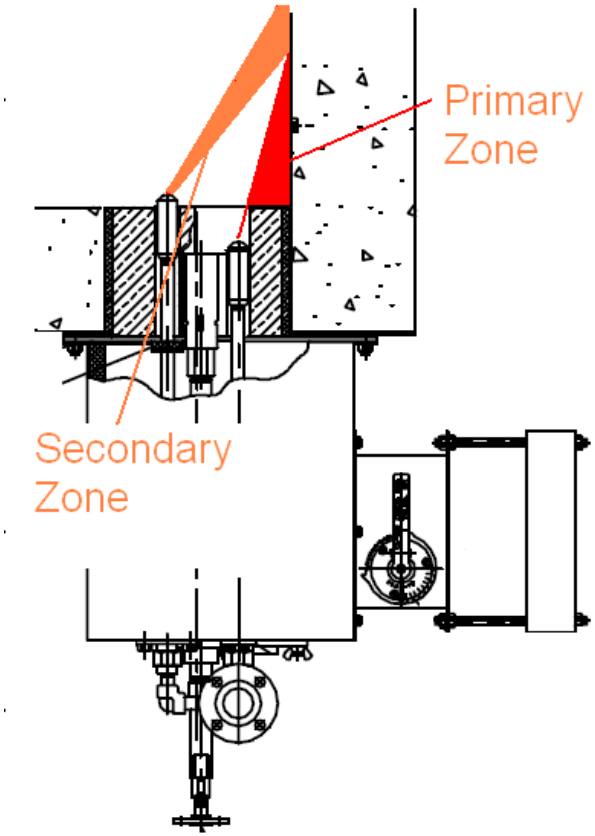


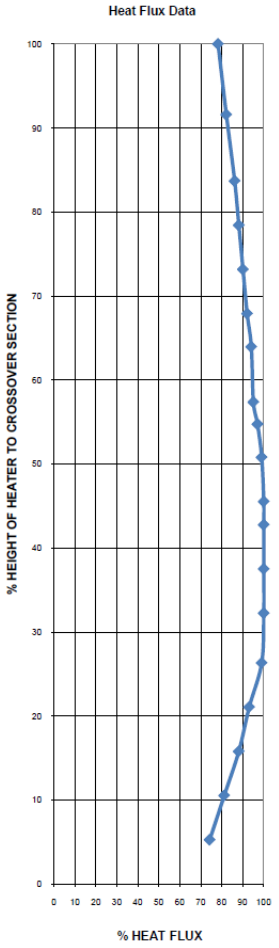
No Flame Rollover

- **Inherent furnace currents tend to pull gasses towards tubes around 4 m above floor**
- **Fuel gas never crosses air stream so fuel gas is always between air and wall and cannot roll over**

Heat Flux Profile

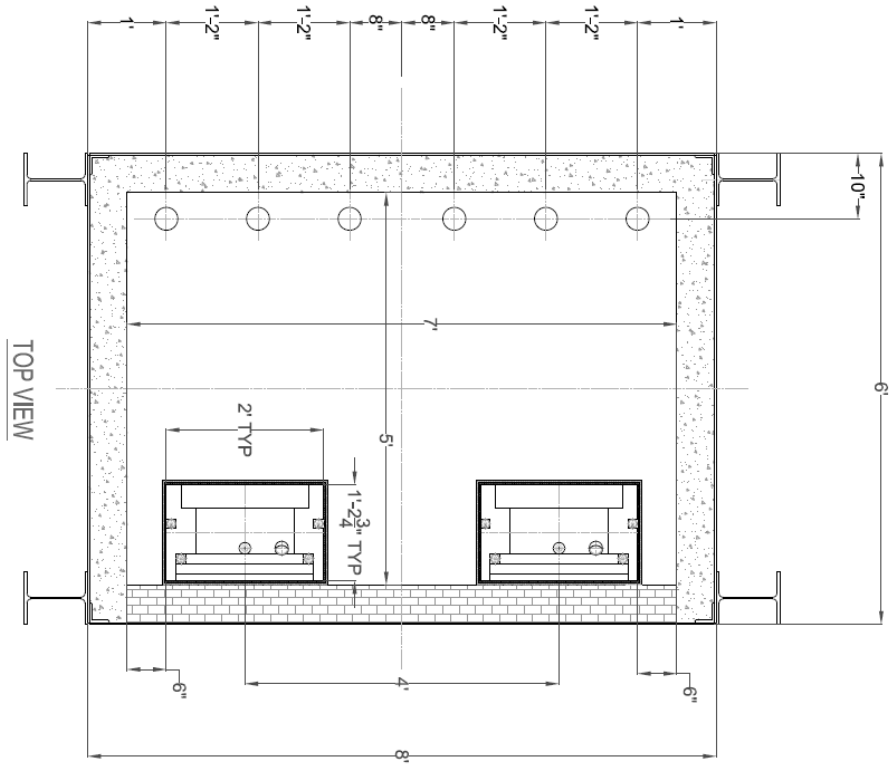
Heat flux profile can be “tuned”





Enhanced Jet Data

- **39 PPMV (79 mg/NM³) NO_x**
- **Corrected to 3% O_2**
- **1275°C Firebox**
- **1065°C Floor Temp.**



Enhanced Jet Video