Covanta
Low NOx Technology

WTERT Conference
October 2008
Covanta Low-NOx Technology

Announced in March 2007
New, cost-effective technology that changes how we look at NOx

- Able to meet Federal requirements without SNCR
- With SNCR able to achieve previously unachievable NOx levels
Why Focus on NO\textsubscript{x}?

- Criteria pollutant, acid gas, ozone precursor
- Contributes to acid rain and SMOG
- Non-attainment areas require LAER and off-sets
  - Impacts development of new EfW plants
- Only emission EfW industry is not significantly below MACT

WE NEED TO DO BETTER
EfW NO$_x$ Control

- Uncontrolled NO$_x$ in EfW mass-burn units typically in 300 ppm range
- SNCR typically controls NO$_x$ to 150-200 ppm
  - MACT standard for large EfW = 205 ppm
  - NH$_3$ slip increases with lower NO$_x$
- Flue Gas Recycle with SNCR further reduces NO$_x$ to $\sim$ 100 ppm (new Covanta unit at Lee)
- SCR used in Europe – but high cost & energy
- **GOAL:** SIGNIFICANTLY LOWER NO$_x$ WITHOUT HIGH COST OF SCR
Covanta Low NOx Technology

Very Low NOx – VLN™

Low NOx – LN™

- Developed in cooperation with our partners Martin GmbH
- Both patent pending
Covanta VLN™

- Internal circulation gas used as tertiary gas
- Air distribution based on MSW HHV and boiler fouling
- Integrated SNCR and combustion control
- Reduced total air flow – lower excess O2
- Increased boiler efficiency and energy recovery
- Best for new units
Covanta LN™

- Simplification on VLN™ for retrofit applications
- No internal circulation gas
- Total air flow unchanged – minimal impact on boiler performance
- Remainder of plant unaffected
- Comparable performance to VLN™
- Best for retrofit applications
Where it All Started

- 325 TPD Mass Burn Martin Grate
- Low NOx installed in April 2006
- Extended testing in both LN™ and VLN™ modes
Low NOx Performance

- Over 2 years of operation
- Without SNCR NOx reduced ~ 50%
  - NOx = 130 – 180 ppm
  - Meets current MACT w/o SNCR
- Covanta LN™ with SNCR:
  - NOx = 70 - 90 ppm (function of boiler)
  - NH3 slip < 10 ppm
- Covanta VLN™ with SNCR:
  - NOx < 60 ppm
  - NH3 slip < 10 ppm
VLN™ Extended Performance

January 2007 - May 2008

60 ppm NOx  50 ppm NOx

NOx  NH3 Flow  NH3 Slip
Design / Operating Considerations

- Increased furnace temperature
- Reduced furnace gas velocity
  - Reduced particulate carry-over
- SNCR design & integration of combustion and SNCR control
- Tertiary nozzle design to ensure complete mixing
  - CFD modeling
Other Operating LN™ Systems

- **Hempstead, NY (1 unit)**
  - 900 TPD DBA roller grate and boiler
  - Start-up in December 2006

- **Hennepin, MN (2 units)**
  - 600 TPD W&E grate and boiler
  - Start-up in August 2007 and March 2008

- **Haverhill, MA (2 units)**
  - 825 TPD Martin grate and boiler
  - Start-up in October 2007 and April 2008

- **Essex, NJ (1 unit)**
  - 900 TPD DBA roller grate and boiler
  - Start-up in May 2008
Conclusions

• Covanta Low NOx technologies have been commercially demonstrated
  – Years of operating experience in multiple plants

• LN™ System for Retrofit Applications
  – 60 – 90 ppm NOx with SNCR
  – Six installations operating
  – More installations planned

• VLN™ System for New Units
  – 60 ppm NOx with SNCR
  – < 10 ppm NH3 slip

• FURTHER NOx REDUCTIONS TO COME