

Measuring Ammonia from SCR or SNCR Systems

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Comparison of NH₃ measurement methods

Table 1. Technologies for Continuous Measurement From Ammonia

Technique	Advantages	Disadvantages	Well Suited For
NOx differential	<ul style="list-style-type: none"> • Experience & familiarity with method • Cost 	<ul style="list-style-type: none"> • Measures a surrogate • Sensitivity for high NOx situations can be poor 	<ul style="list-style-type: none"> • Low NOx (gas turbines or gas boilers)
UV photometry	<ul style="list-style-type: none"> • Experience & familiarity with method 	<ul style="list-style-type: none"> • Strong Interference from SO₂ 	<ul style="list-style-type: none"> • Natural Gas applications, or other low SO₂
TDL (IR)	<ul style="list-style-type: none"> • Relatively interference free (except for water) • Solid-state • In-Situ - no sample handling required • Sensitivity 	<ul style="list-style-type: none"> • Moderate moisture interference must be properly addressed • Alignment needs to be maintained • High particulate loading may require shortening of path length 	<ul style="list-style-type: none"> • All applications, especially coal
IR (multicomponent)	<ul style="list-style-type: none"> • Multiple species 	<ul style="list-style-type: none"> • Tends to be Expensive 	<ul style="list-style-type: none"> • All applications

The above are general statements that reflect the author's overall impression based upon his close familiarity with NOx reduction technology and ammonia monitoring technology. This is not intended to be a complete list. However, it is a list of the most important approaches in the author's opinion. In some cases companies may claim to have addressed certain disadvantages. The author neither disputes nor confirms their claims.

Optimization after SNCR Vendor Startup

- SNCR Vendor met contract obligations, but . . .
- Crane needed lower NH_3 slip than vendor could provide while achieving same NO_x at outlet
- ATP worked with owner to develop instrumentation and controls to better operate SNCR for low slip

A difficult application

- Use of TDL on CP Crane Coal Fired Units
 - 20 foot wide ducts, with lots of flexing
 - Built special mount to maintain alignment, and has never required realignment since installation in 2008
- SNCR used for NOx control and permanent TDL installation
- Optimized controls to reduce slip during transients

Optimization Results

Ammonia Slip (ppm) versus load (MWg)

Figure 11b. Unit 1 average daily ammonia slip v avg load in MWg

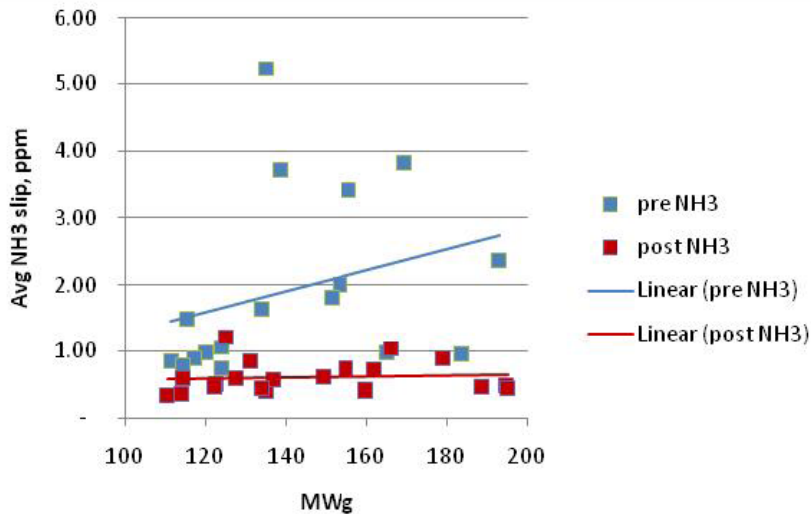
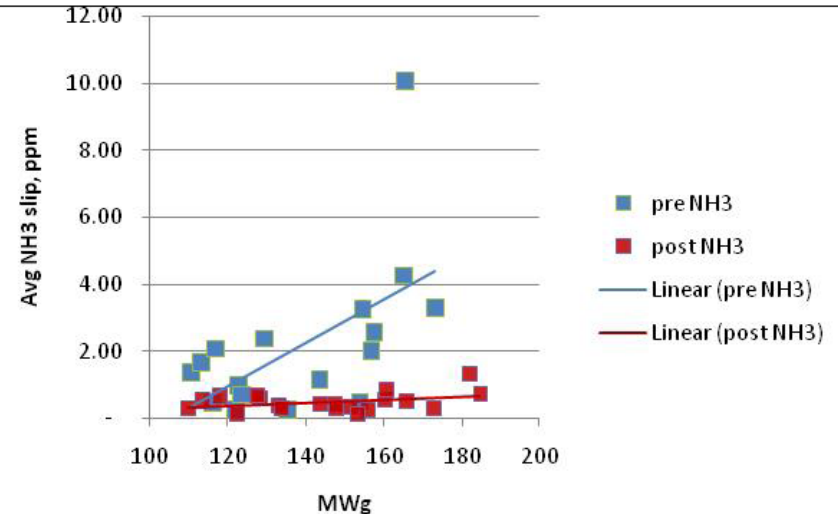


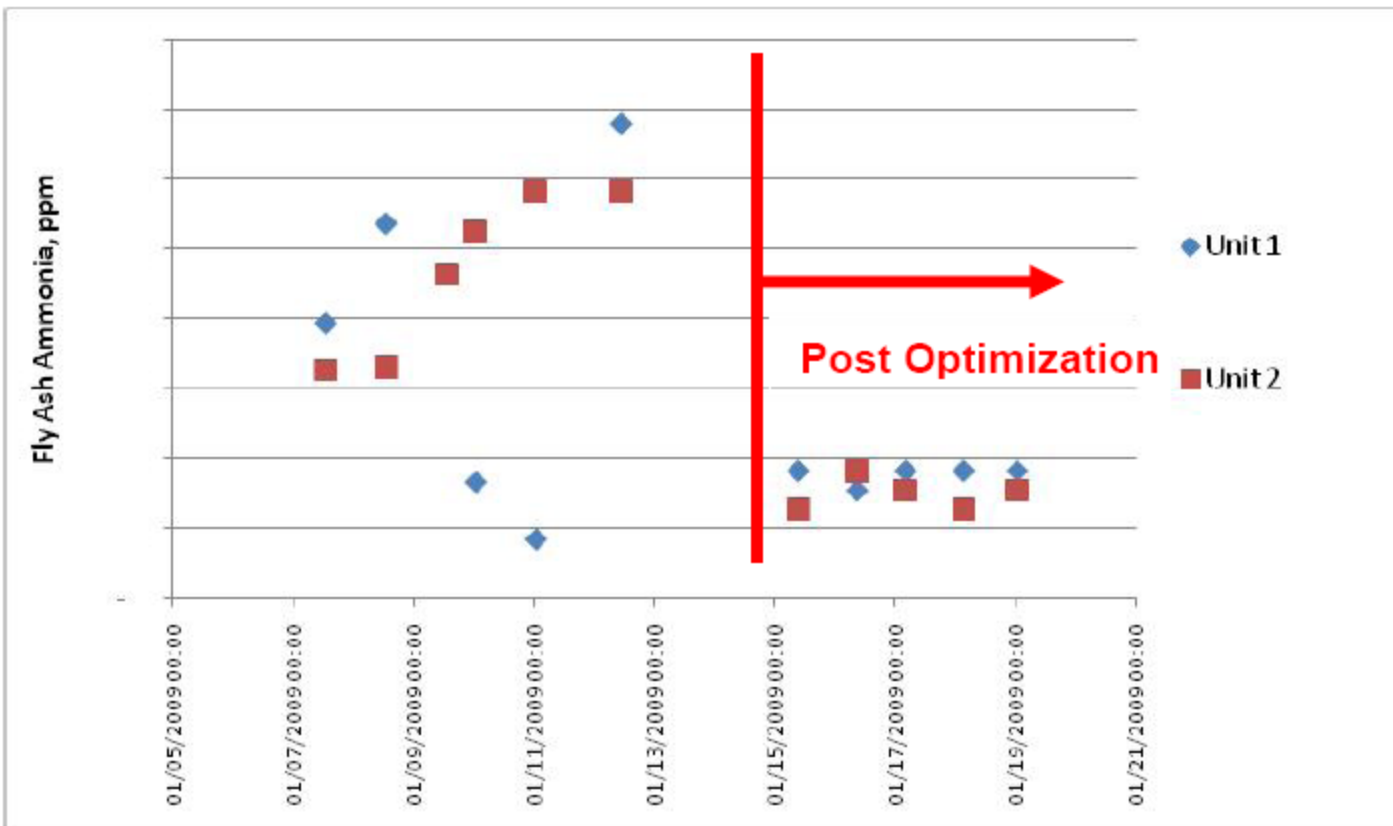
Figure 12b. Unit 2 average daily ammonia slip v avg load in MWg



Optimization Results

Fly Ash Ammonia (mg/kg) v time

Figure 13. Ammonia in Fly ash (mg/kg)



Optimization Results

Reagent (gal/MW hr) v load (MWg)

Figure 11a. Unit 1 daily avg urea consumption in gal/MW hr versus avg load in MWg

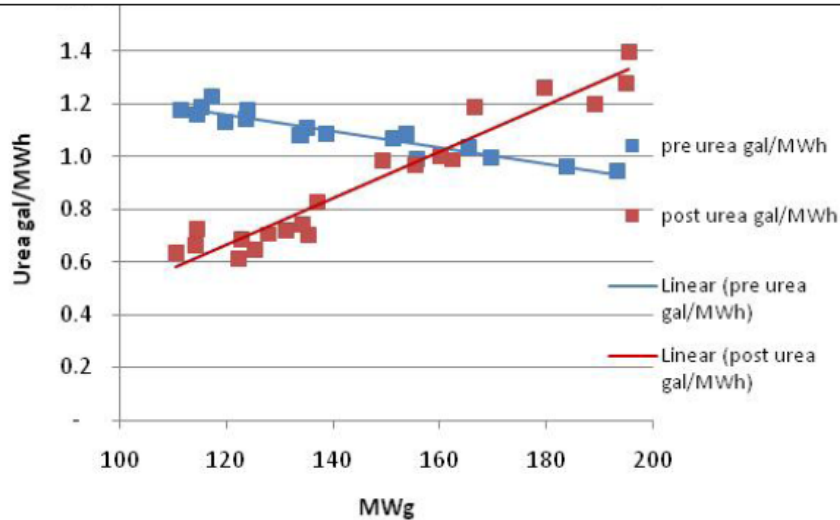
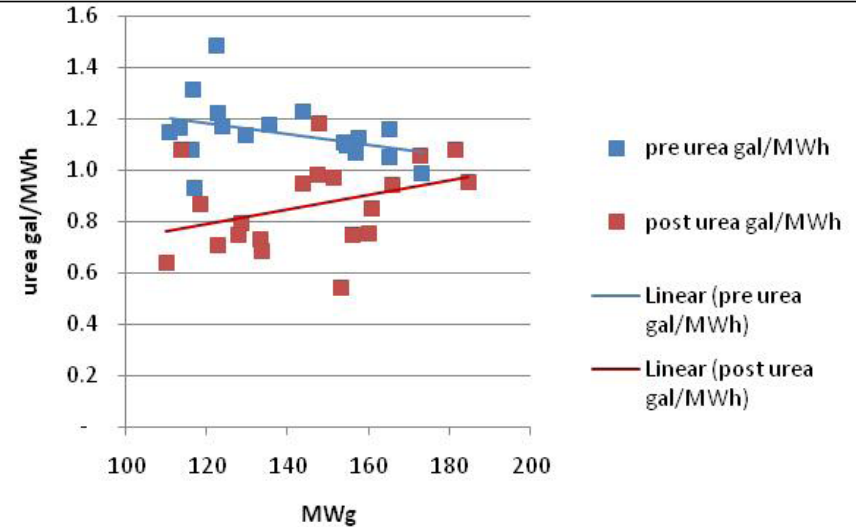


Figure 12a. Unit 2 daily avg urea consumption in gal/MW hr versus avg. load in MWg



Conclusions – TDL Ammonia

- TDL instruments are extremely useful for optimizing/monitoring SNCR or SCR systems on coal or gas applications
 - Fast response to changes
- Mounting Device has worked very well at maintaining alignment and allowing cleaning of TDL optics
- TDL technology is not “plug and play” – integration needs to be done right

Conclusions

- Many more options available for natural gas than for coal
 - No SO_2 or SO_3
 - No particulate matter

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