



Boiler Optimization

CIBO

Energy and Environment Focus Group

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What is Boiler Optimization?

- Process of matching boiler output with plant objectives
 - Environmental
 - Energy requirements
 - Cost
 - Other – response, operator involvement
 - Compromise
- Plant must evaluate and establish objective before embarking on optimization program
- Size doesn't matter?!?!?

How?

Tuning and System Design Evaluation

What is Tuning?

- Optimization of system based on plant objective statement
- Establish boundaries of optimization
- Site visit
- Pre-tuning planning
- Develop written tuning plan
- Execute tuning
 - Mechanical
 - Instrumentation
 - Controls
 - Document

Typical Tuning Approach

● Mechanical

- Inspect/repair primary air system to ensure in working condition
 - Fluidized bed – fluidizing nozzles
 - Stoker – grate openings
 - Pulverized coal – coal pipe air flows
- Inspect/repair secondary air ports to ensure in working condition
- Inspect/repair all dampers/drives, expansion joints, etc. to ensure in working condition
- Inspect/repair fuel system to ensure in working condition and providing proper sizing and flow distribution

Typical Tuning Approach

- Instrumentation

- Inspect/repair all air and fuel flow measuring devices
- Calibrate all air and fuel flow measuring devices
- Identify and repeat for all other critical instrumentation
- Document tuning settings

Typical Tuning Approach

- Testing & analysis of combustion with existing equipment
 - Furnace O₂ & CO measurement profiles
 - Computer Fluid Dynamics (CFD) review (can be performed prior to on-site work)
 - Determine optimum settings of existing air and fuel systems

Typical Tuning Approach

- Optimize combustion process
 - Implement tuning plan
 - Adjust air & fuel distributions based on results of testing or CFD analysis
 - Maintain emission limits for applicable regulated pollutants (NO_x, CO, SO₂, Hg, HCl, dioxins/furans, etc.)
 - Optional (larger units) – HVT & process testing
 - Furnace and/or duct traverses
 - Fuel testing
 - Ash testing
 - Document

Typical Tuning Approach

- Controls Tuning

- Review for proper air and fuel control logic
- Set control tuning parameters (gain, etc.) to maintain optimum operation
 - Base load and load ramp tuning
 - Controls algorithms to aid in optimization
- Document

Typical Tuning Approach

- Tuning Report

- Prior to site departure, preliminary report detailing optimized air and fuel system settings by load
- Final report will tell complete story of effort including objectives, data, settings, and recommendations for enhancement

Typical Tuning Approach

- Recommended modifications
 - Air or fuel system alterations may be recommended to produce lower emissions than is available with existing equipment
 - Advanced over-fire air
 - Fuel sizing or flow distribution changes
 - Additional instrumentation

System Design Evaluation

- Concurrent with tuning study
- Holistic evaluation of systems for best practices
- Can include review of system design, operating and maintenance procedures, etc.:
 - Plant energy (H&M balance, pinch analysis, existing heat recovery)
 - Feedwater system
 - Fan system
 - Fuel system
- Recommendations to optimize systems in synergy with boiler (issued with final report)