Techniques to Improve Combustion Reliability at the Unit Level

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Five Key Techniques or Tools to Improve Combustion Reliability

- Operator Training
- Online maintenance
- Out-of-service maintenance
- Combustion monitoring
- Burner Management System
Operator Training

- Safety and Environmental
  - Excess $O_2$ (Stoichiometric operation)
  - Regulatory measured variables (NOx, CO)
  - Burner stability (Ignition and flame confirmation)

- Reliability
  - Flame shape / interaction

- Operation KPI
  - Excess $O_2$
  - Fuel pressure
  - Draft
  - Feed throughput
Operator Training

- Pro-active versus reactive maintenance
  - Change in fuels
  - Change in draft
  - Change in measurements
  - Consumables inventory

- Scheduled outage scope development
  - Capture “repeat offenders”
  - Consider known potential upcoming site operation changes
  - Always look to increase information, reliability and safety aspects
Online Maintenance

- Regular inspection / maintenance
  - Operator rounds outside / process monitoring inside
  - Address maintenance before it creates problems

- Regular review of recent changes and monitoring
  - PM schedule – is it adequate?
  - Repeat problems

- Safety practices and ergonomic projects

- Observation record for next outage
  - Turnaround list
  - Pre turnaround inspection by specialty provider

- Recommended parts inventory levels
Out-of-Service Maintenance

- Scope of work and expectations CLEARLY defined and agreed upon
  - Typically can not be done while heater is in operation
    - Burner tile
    - Heater refractory
    - Heater process tube
    - Monitoring instrumentation

- Planning meeting job walk
  - Important coordination for best chance at success

- Utility availability and distance
  - Don’t overlook the small things that can have major impact

- Onsite work versus local off site capabilities
  - Does it make sense to send burners off site to specialty provider
Combustion Monitoring

- Regular measurement and comparisons to benchmark
  - Excess O2 in radiant section (versus stack for regulatory compliance)
  - Combustibles or unburned hydrocarbons
  - Fuel pressure or flow
  - Fuel composition
  - Top of radiant section draft
  - Visual observation of flames / firebox

- Understand variation / deviation from “normal”
  - Is variation a trending movement or sudden change?
    - Plant upset?
    - Process condition change?
    - Fuel system fouling?
    - Draft control
Burner Management System

- Burner Management System (BMS)
  - Typically electronic with flame detection and purge permissive
  - No real steadfast regulations for process heaters
    - Typically user safety and loss prevention standard driven

- Pilot(s)
  - Manual
  - Electronic

- Flame detection
  - Flame rod
  - Infrared
  - Visual
Rewards

- Safe operation
- Lower cost of operation
  - Reduced fuel consumption and / or increased heater throughput
- Reduced unscheduled outages
  - Unplanned equal big $$$$$$
- Fewer reportable excursions
  - Process upsets – loss of product
  - Regulatory reporting / potential $$$$$$
- Emotional Aspects
Questions?

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