Effective On Load Cleanliness Control and Flue Gas Handling Techniques for HRSG Operation
HRSG Cleanliness Control
Gas Side Fouling

- Areas typically susceptible to heavy fouling:
  - Sudden change in tube spacing
  - Sudden change in flue gas velocity
  - Entrance of the GB Section finned tube sections
The Importance of Sootblowers

- When sootblowers fail to operate effectively, the results include:
  - Lost heat transfer and efficiency
  - Increased maintenance costs
  - Unscheduled outages
  - Inefficient operation
  - Lost revenue
Examples of Sootblower Arrangements

Mid Section

Gas Flow

Gas Flow

Flue Gas Leading Edge

SH

SH

GB

ECON
On Load Cleaning Devices

- US Retractable Sootblower
  
  ➔ Pros
  - Effective cleaning (cleaning radius up to 8 feet)
  - Low maintenance cost
  - Easy maintenance (more space and service openings)

  ➔ Cons
  - Need space outside of the boiler (roughly travel + 6’)

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On Load Cleaning Devices

US Retract

Galvanized Housing

Top Access For Easy Maintenance

NEMA 4X Junction Box

CFEIII Nozzle

Externally Adjustable Poppet Valve

SealPack System

Single Limit Switch

Electrical P-Chain
On Load Cleaning Devices

US Poppet Valve

- Locking Tab
- Seat
- Plug
- On-Line Pressure Adjustment
- Pressure Control Disk
- ANSI Flange

On Load Cleaning Devices
On Load Cleaning Devices

- D5E Rotary Sootblower

**Pros**
- Lower initial investment cost
- Minimal clearance requirement

**Cons**
- Light cleaning with moderate cleaning coverage
- Not too effective with dense tube spacing, finned tubes, and heavy fouling.
Dynamic Cleaning Optimization

- Execute required cleaning strategy
- Determine accumulation rate
- Determine required cleaning intensity
- Thermodynamic Model
- Flue Gas Draft Pressures
Dynamic Cleaning Optimization
Boiler Feedback

- Flue Gas Draft Pressure
- Flue Gas Temperature
- Steam/Water enthalpy, flow
Dynamic Cleaning Optimization

SMART Clean Processes

Identify critical sootblowers for increased frequency operation

Identify non-critical sootblowers for less frequent operation
HRSG Flue Gas Handling
AGH Product Locations: Gas-Fired Power Plant

- Diffusers, Transitions, and Ducting
- Diverters/Dampers
- Expansion Joints
- Exhaust Stacks
- Stack Dampers
- Silencers

GAS-FIRED STATION
Simple Cycle and Combined Cycle

Diffusers, Transitions, and Ducting
Diverters/Dampers
Expansion Joints
Exhaust Stacks
Stack Dampers
Silencers

BYPASS EXHAUST STACK
STACK DAMPER
EXPANSION JOINT
DIFFUSER
DIVERTER
BLANKING GUILLOTINE
HRSG (by Others)
TRANSITION
SILENCERS
Gas Turbine (by Others)