Integrated Test & Measurement (ITM)

**Industrial Monitoring**
- 18+ years of experience developing and installing boiler monitoring solutions

**Testing Services**
- In-Vehicle testing, data acquisition, condition monitoring, and product validation.

**Structural Testing/Analysis**
- Design validation, condition monitoring, consulting services
Sootblower Fouling Detection (SFD) Monitoring Technology by ITM

US Patent US9927231B2

Sootblower Fouling Detection (SFD) by ITM

Boiler

Process Optimization
Personnel Safety
Maintenance and Reliability

Sootblower

Sootblower Fouling Detection (SFD)

Process Optimization
– Fouling/Slagging along the path of a Sootblower
– Overall Boiler Fouling/Slagging
– SFD based Sootblower Optimization Strategy

Predictive Maintenance and Safety
– Mechanical Health of your Sootblower
– Sootblower Steam Quality (Flow, Condensate, etc.)
– Packing Leaks / Sootblower Safety
– Developing a data driven Sootblower Maintenance Strategy
SFD Dynamics

- The SFD technology measures the Force/Response Energy Transfer between the sootblower jet and the boiler heat exchanger surfaces.
- The two most influential variables are boiler fouling and sootblower steam quality.

Vibration Sensors

US Patent US9927231B2

SFD Operational Benefits

- Determine location of fouling
- Increase overall boiler efficiency
- Mitigate risk of plugging the boiler
- Decrease tube erosion
- Reduce tube failures due to sootblowing
- Optimize steam consumption
Questions the SFD Addresses

- Where is my fouling and slag building up in my boiler?
- Which sootblowers should I be running to remove slag buildup?
- Is my sootblower working correctly?
- Do I need to schedule service on a sootblower?
- My maintenance crew serviced a sootblower, did they fix it?
- How can I prioritize my sootblower maintenance?
- Is my control valve working correctly?
- Which sootblowers have potential safety concerns due to packing leaks?
- Am I getting good steam flow?
- Do I have a condensate problem?
- What order can I run my sootblowers to minimize condensate in supply steam?
- Is my buildup localized or spread out along the sootblower path?
- Is my poppet valve leaking?
- Is my poppet valve stuck open?
- Is my poppet valve stuck closed?

SFD Fouling Detection Plate Test Validation
SFD – Cleaning Optimization

SFD Sootblower Fouling Percent Above Threshold (PAT)

Sootblower Operation

Period of increased fouling

2 weeks
SFD Sootblower Fouling (PAT)

• The Percent Above Threshold (PAT) is an indication of fouling along the path of the sootblower.
• The PAT is reported every time a sootblower operates.
• The PAT is used to calculate the Fouling Index (FI), which is used to prioritize sootblower operations. PI Tag naming convention: UFL.[AssetName]_SFD_PAT_SB[#]

Fouling Index (FI)

• The Fouling Index (FI) is calculated based on the PAT.
• FI = -2 : Disable SFD for that Sootblower - Maintenance required.
• FI = -1 : Disable SFD for that Sootblower
• FI = 0 : Decrease operations level 2
• FI = 1 : Decrease operations level 1
• FI = 2 : No change in sootblower operation count
• FI = 3 : Increase in operations level 1
• FI = 4 : Increase in operations level 2
• The FI is used by the sootblower control system to set the operating priority of the sootblowers. PI Tag naming convention: UFL.[AssetName]_SFD_FI_SB[#]
Overall Fouling Indicator (OFI)

- The Overall Fouling Indicator (OFI) is a measure of fouling on the boiler areas stimulated by a specific sootblower.
- An increase in OFI indicates an increase in the fouling rate.
- A decrease in OFI indicates a decrease in the fouling rate.
- A significant increase or spike in OFI over a short period of time is a sign that the sootblower is running at a reduced flow rate.
- The PI Tag naming convention: UFL.[AssetName]_SFD_OFI_SB[#]

SFD Safety and Maintenance Benefits

- Effective maintenance tool to alert operators of mechanical issues with:
  - Packing leaks
  - Wall rollers
  - Carriage rollers and tracks
  - Poppet valves
  - Supply steam issues
Mechanical Fault Indicator (MFI)

- The Mechanical Fault Indicator (MFI) is an indication of the sootblowers mechanical condition (e.g. condition of gears, racks, rollers, wheels).
- The MFI is reported every time a sootblower operates.
- PI Tag naming convention: UFL.[AssetName]_SFD_MFI_SB[\#]

Mechanical Fault Indicator (MFI) Practical Example

- Track section replaced
- Track, pinion, and carriage rollers replaced
- 6 weeks
Sootblower Steam Flow Indicator (SFI)

- The Sootblower Steam Flow Indicator (SFI) is an indication of sootblowers steam flow.
- The Packing Leak Alarm (PKLA) identifies steam leaks at the sootblower packing.
- The SFI and PKLA are reported every time a sootblower operates.
- The PKLA goes high when the SFI > threshold.
- PI Tag naming convention:
  UFL.[AssetName]_SFD_SFI_SB[#]
  UFL.[AssetName]_SFD_PKLA_SB[#]

Low Flow Alarm (LFA)

- The Low Flow Alarm (LFA) goes high when the SFI < threshold.
- The LFA identifies issues with sootblower poppet values and the supply steam header control value.
- The LFA is reported every time a sootblower operates.
- PI Tag naming convention:
  UFL.[AssetName]_SFD_LFA_SB[#]
SFD Predictive Maintenance Benefits

- Reduction in maintenance costs
- Reduction in labor costs by increasing efficiency of employee time
- Reduction in major sootblower failures
- Reduced downtime for repairs
- Increased service life of parts
- Verification of repairs
- Improve safety around sootblowers

Potential Savings

- **Safety**: Packing leaks, sootblower lance stuck in boiler, tube erosion, lance failure.
- **Maintenance**: As with other assets at your mill a predictive maintenance strategy will increase uptime of the sootblower and reduce your maintenance cost.
- **Operation**: Potential steam savings of 1-4% MCR. 1-3 year ROI on steam savings alone.
Comments

• An SFD based sootblower optimization strategy adjusts sootblower priorities around your established sequencing baseline
• A healthy sootblower is an effective sootblower

Next Steps

• Contact ITM
• Onsite visits and boiler audits
• Potential temporary pilot installation
• How can we help?
Questions/Comments

• Any questions or comments?

Contact Info

Integrated Test & Measurement (ITM)
227 Water Street, Suite 300
Milford, OH 45150

T: 844.837.8797 ext. 0
info@ittestsystem.com

http://wwwittestsystem.com