



FITNESS-TO-OPERATE PROGRAM

Properly Maintain Sootblowers

Clyde Industries is committed to deliver a high quality Fitness-to-Operate (FTO) program to help our customers properly maintain their sootblowers in the most cost effective way.

Sootblowers can pose a significant threat of injury and costly damage to surrounding equipment if they are not adequately maintained or if critical issues are not being addressed early. All accidents are preventable but the challenge is to do it in a systematic and cost-effective way. This challenge is real, especially when the sootblowers are aging and there are multiple different types of sootblowers to maintain.

Aging equipment, which requires more attention, when coupled with lack of capacity of trained maintenance personnel can often force us to run the sootblower-to-failure. This maintenance practice is generally unsafe and counter to the recommended operating procedure but unfortunately, is not uncommon.

Clyde Industries's FTO program offers three levels of maintenance focus.

Level 1: Basic Maintenance & Emergency Handling – is where we want to strengthen first as it is the important foundation for an efficient implementation of the next two levels. In this first level, the program offers:

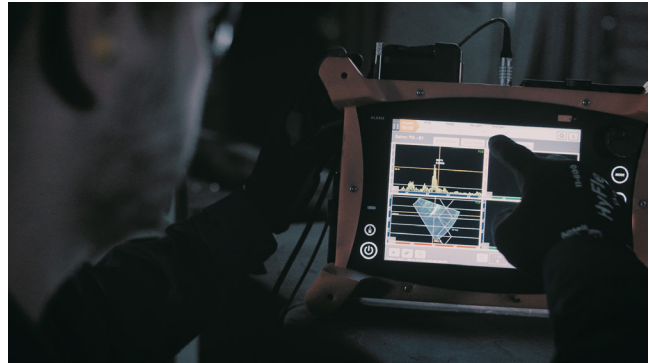
- **Training:** Hands on basic maintenance & emergency handling training for the maintenance team.
- **Sensor Technology:** Utilize Clyde Industries's proprietary sensor technology to monitor the health of the sootblowers and send alert to assist the maintenance team to detect and resolve problems early and avoid costly repairs.
- **Remote Support:** The maintenance team would have access to Clyde Industries engineering resources via phone or online support to help them troubleshoot difficult problems or simply just for asking any technical questions.
- **Critical Spare Parts:** Guaranteed expedited Order-to-Delivery time for critical parts.

FITNESS-TO-OPERATE PROGRAM

Level 2: Safety & Reliability – The Clyde Industries FTO team will schedule sootblower safety and reliability inspections. Frequency of the walkdown depends on the severity of the sootblower health condition. The inspection includes:

- **Non-Destructive-Test (NDT):** Perform NDT in the field on lance/feed tubes using state of the art NDT equipment such as a Phased Array Ultrasonic Testing (PAUT) to examine the weld integrity and Ultrasonic Thickness Measurement to detect potential corrosion / thinning in the tube.
- **Alignment Inspection:** Sootblower misalignment stress occurs when the lance tube is not fully aligned with the sootblower travel path, causing the lance and feed tubes to experience abnormal loading. This abnormal loading can result in premature lance and feed tubes fatigue failure. If not identified and fixed, the fatigue failure can cause the tube breaking off completely and exposing those in the area to heavy steam flow. The lance tube may also launch inside the boiler like a projectile and damage the boiler tubes.
- **Presence of Corrosive Boiler Flue Gas in the Lance & Feed tubes:** The lance tube may also be susceptible to corrosion (especially in the weld joint between the stainless steel and high strength alloy steel) if the scavenging air system is not in good operating condition. It will allow hostile boiler flue gas to enter the lance tube, causing tube corrosion.

The customer will receive a detail report about the safety & reliability of their sootblowers, along with the recommended corrective & preventive actions. Once approved by the customer, Clyde Industries FTO team will perform the corrective and preventive actions.



Level 3: Complexity & Maintenance Cost Reduction – Semiannually, Clyde Industries FTO team will provide sootblower audit with a goal to identify cost saving and complexity reduction opportunities. Part standardization is one of the key element to reduce the complexity of the sootblower maintenance program. It is not uncommon to have multiple types of sootblower parts that serve the same purpose and can be unified to reduce maintenance complexity and cost. The customer will receive semiannual complexity & maintenance cost reduction opportunity report and its costs & benefits analysis.