

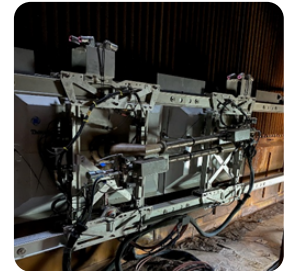


HRSG Off-line Cleaning



EPIC® - Extraction Pressure Impulse Cleaner

The EPIC Extraction Pressure Impulse Cleaner is revolutionizing HRSG Cleaning. This off-line cleaning technology uses safe, effective and directly targeted pressure-wave impulse cleaning energy to remove deposits deep within and throughout tube bundles. The patented cleaning procedure that is employed systematically concentrates its affect just to the fouled tube sections, with no omni-directional blasting impact to the surrounding area, nor mechanical fatigue to the tubes, expansion joints, SCR modules, or superstructure components.



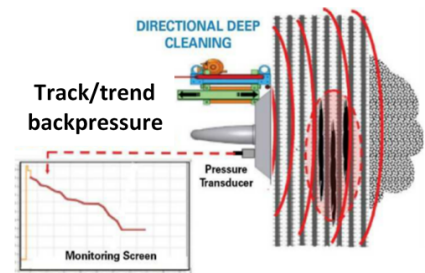
How it Works

The EPIC Mobile Cleaning System precisely mixes and combusts a combination of ethylene gas (C₂H₄) and compressed air, which is all safely contained within a patented 2” high-pressure combustion tube, generating repetitive detonations at Mach 5 speed, delivering pulsating, penetrating high pressure shockwaves directly deep into the modules, ultimately from both accessible upstream and downstream sides. The system creates and closely focuses a sequential series of 120 (or more if needed, as determined by monitoring our cameras) separate but compounded distinct shockwave impulses at a rate of 2 per second at each captive, fixed position. The rapid succession of shockwaves effectively dislodges the 360-degree buildup and then further motivates the debris from the finned tubes to the lower header area as the equipment traverses the entire face of the tube bundles.



Benefits

- Significantly reduced CT back pressure
- Optimizes efficiency
- Reduced confined space entry
- Eliminates scaffolding
- On site assembly
- Targeted impulses create deep, penetrating + encompassing 360° cleaning
- No mechanical integrity damage to tubes, SCR, or other structure
- No mechanical tube stretching or spreading required
- Energy is directionally controlled through the tube bundle
- Typically reduced outage time compared to alternative methods
- Proven on-line cleaning technology for 15+ years supported by multiple US patents
- No need for regulatory permits or neighborhood prenotification of disrupted blast or bursting events



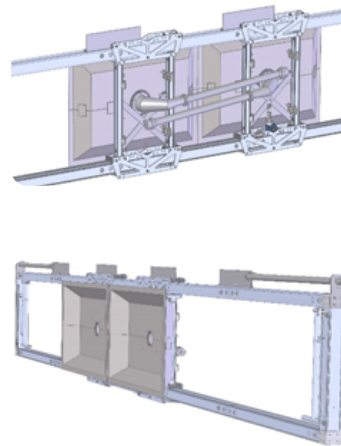
"Even after removing over 18 tons of debris, there was only a brief "puff" out the stack upon startup"

EPIC® and IMPULSE® are the property of PowerPlus Cleaning Systems, Inc. Thompson Industrial Services, with over 35 years of cleaning experience, proudly executes the EPIC technology in the field.



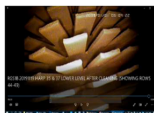
Improving HRSG Performance + Efficiency

Over time, finned tubes in HRSGs can become excessively fouled due to combustion-side deposit formation, most commonly with rust caused by dew point, ABF or ammonia salts transporting downstream of the SCR as well as off-line condensation, especially at the LP economizer cold end. Fouled HRSG tubes penalize plant performance in several ways such as decreasing heat rate by reducing the heat transfer, increasing back pressure of the gas turbine and resultant fuel costs. Reduced heat transfer efficiency also reduces the net output of the steam turbine and increases exit stack temperature. This results in extra cost and lost revenue from restrictive MW output and/or reduction in steam generation. HRSG cleaning is an effective way to restore lost performance thereby increasing the net power output. However, extreme caution choosing the HRSG cleaning methodology should be employed to consider the potential long term secondary mechanical effects on the tube integrity, welds, superstructure and duct work impact of the method selected. The EPIC cleaning system, with safe, targeted, isolated and controlled cleaning pressure will not subject the HRSG to these secondary effects.



Why EPIC® Over Other Methods

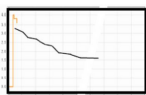
Borescope Inspection



Safe for Your Entire Unit

EPIC's impulses are highly targeted through the tube bundle and do not cause any damage to the mechanical integrity of the tubes. Plus, there is no violent shock or omni-directional blast impact to the HRSG structure. In addition, the tubes will never be stretched or spread and the process has several fail-safe safety features.

Track/Trend Backpressure



No Pre-Cleaning Work

No scaffolding or tube spreading is required, or other modifications are necessary (or minimal if any) to gain access for cleaning. Exceptionally limited site support resources are needed.

Vibrators Under Headers



Reduced Cleaning Time

Utilizing the advanced EPIC technology, with remote positioning and activation of the IMPULSE cleaning equipment with real time video monitoring of the cleaning in action, results in reduced overall outage duration as well as confined space exposure compared to several other methods. The service can also be complemented by the post-cleaning removal of the considerable dislodged debris by incorporating Thompson's own vacuuming equipment and personnel, rather than orchestrating additional arrangements with yet another contractor for the turnkey HRSG cleaning project.

Remote Control Station



Additional Services:

LIFECYCLE SERVICE SOLUTIONS

- Construction phase cleaning support
- Pre-commissioning cleaning
- Daily maintenance support
- Outages/Shutdowns/TARs
- Decommissioning

HYDROBLAST VACUUM + BIG PUMP

- Automated hydroblasting 12K-40K PSI
- High volume hydroblasting (30x traditional volume)
- Wet, dry, sludge vacuuming
- Pneumatic + hydro-vacuum excavation

CHEMICAL CLEANING + FINFOAM®

- Custom-engineered chemical cleaning
- FINFOAM® air-cooled heat exchanger cleaning
- Automated Tank cleaning + Vapor phase degassing/pipe cleaning

SPECIALTY + CUSTOM SOLUTIONS

- Dry ice blasting
- Combustible dust remediation
- Industrial drone inspections
- Coatings + liner removal
- Sponge media abrasive blasting
- HRSGs with EPIC™ technology

