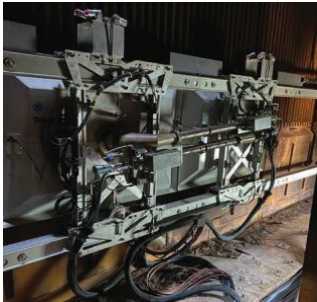




HRSG OFFLINE CLEANING

SAFE · EFFECTIVE · EFFICIENT



EPIC® Extraction Pressure Impulse Cleaner

The EPIC Extraction Pressure Impulse Cleaning process is revolutionizing HRSG Cleaning. This offline cleaning technology uses safe, effective and directly targeted pressure-wave impulse cleaning energy to remove deposits deep within and throughout tube modules. The patented cleaning technology systematically concentrates its affect solely and directly to the fouled tube sections, with no omnidirectional blasting impact to the surrounding area, nor mechanical fatigue to the tubes, expansion joints, SCR modules, baffles or superstructure components.

HOW IT WORKS

THE EPIC MOBILE CLEANING SYSTEM precisely mixes and combusts a combination of ethylene gas (C_2H_4) 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 shock waves directly deep into the modules, ultimately from both accessible upstream and downstream sides. The system creates and strategically focuses a sequential series of 120 (or more if needed, as determined by real-time monitoring such as on-board cameras) separate but compounded distinct shock wave impulses at a rate of 2 per second at each captive, fixed position. The rapid succession of shock waves effectively dislodges the 360-degree buildup and then further motivates the debris from the horizontal fins and structural surfaces to the lower header area as the equipment traverses the entire face of the tube bundles.



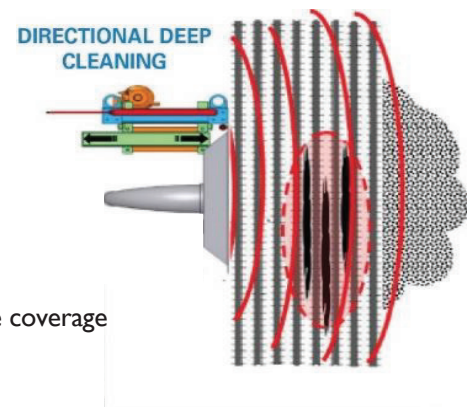
Before. Impacted deposits on finned tubes.



After. Finned tubes after EPIC cleaning.

BENEFITS

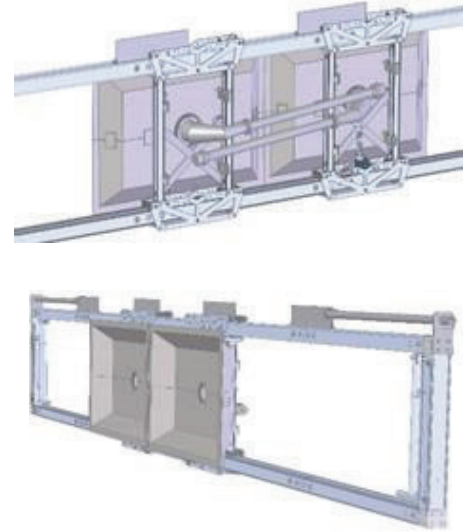
- Significantly reduced CT back pressure
- Optimizes heat rate efficiency
- Reduced confined space entry
- Eliminates scaffolding
- On-site, in-situ component assembly, typically ~2 hours/setup
- Targeted impulses create deep, penetrating & encompassing 360° cleaning
- No mechanical integrity damage to tubes, expansion joints, baffles, or other components
- No mechanical tube stretching or spreading required; pressure waves achieve 360-degree coverage
- Energy is directionally controlled and focused directly into and through the module harps
- Typically, considerably reduced outage duration compared to alternative methods
- Proven on-line cleaning technology for 15+ years supported by multiple US & International patents
- No need for regulatory permits or neighborhood pre-notification of disrupted blast or bursting events.



EPIC® and IMPULSE® are the property of PowerPlus Cleaning Systems, Inc. Thompson Industrial Services, with over 36 years of cleaning experience, proudly executes the EPIC® technology in the field.

IMPROVING HRSG PERFORMANCE + EFFICIENCY

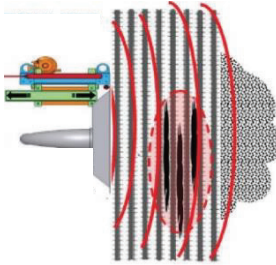
Over time, HRSG tubes and fins can become excessively fouled due to combustion-side deposit formation, most commonly with oxidation rust caused by dew point excursions, ABF, or ammonia salts transporting downstream of the SCR, especially in the LP economizer and/or preheater. Fouled tubes penalize plant performance in several ways, such as increasing the CT back-pressure and thus reducing power generation, decreasing heat rate by impeding optimum heat transfer, and resulting impact on fuel costs. Reduced heat transfer efficiency also reduces the net output of the steam turbine and increases exit stack temperature. HRSG cleaning is an effective way to restore lost performance although it is imperative to select the optimum cleaning methodology as well as technology to restore performance while evaluating 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 any of these secondary effects while utilizing the 15-year proven IMPULSE® pressure wave technology.



Borescope Inspection



Focused and Safe Directional Cleaning



Remote Control Station



WHY CHOOSE EPIC® OVER OTHER METHODS?

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 omnidirectional 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.

No Pre-Cleaning Work: No scaffolding or tube spreading is required, nor other modifications are necessary to gain access for cleaning. Exceptionally limited site support resources are needed.

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.

100% Turnkey: Thompson is the only company in the industry that can complete your entire HRSG cleaning without the need for you to necessarily make arrangements with another contractor. This includes cutting and replacing cable ports; removing and replacing sneak baffles (if even needed); vacuuming all dislodged debris; performing TCLP analysis; managing and completing the entire disposal process. In addition, our partnership with Clean Harbors allows us to offer other services during your outage, such as comprehensive valve inspection and repair; drone inspections, and many more.

ADDITIONAL SERVICES

LIFE CYCLE SERVICE SOLUTIONS

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

HYDROBLAST VACUUM + BIG PUMP

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

CHEMICAL CLEANING + FINFOAM®

- Custom-engineered chemical cleaning
- FINFOAM® air-cooled heat exchanger cleaning
- Automated tank cleaning and 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