



HRSG Off-line Cleaning

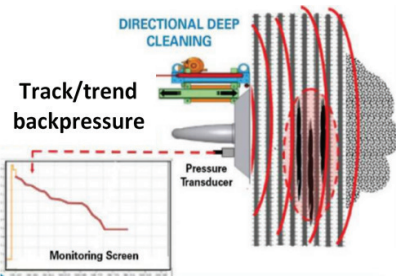
Documented Results of the EPIC HRSG Cleaning Technology

EPIC® - Extraction Pressure Impulse Cleaner

The EPIC HRSG cleaning system has proven to be effective, safe and economical. This off-line cleaning technology uses directly targeted pressurewave impulse cleaning energy to dislodge and remove deposits deep within and throughout dense tube modules.

The patented cleaning procedure that is employed systematically concentrates its affect just to the fouled tube sections, with no omnidirectional, secondary blasting impact to the surrounding area, nor mechanical fatigue to the tubes, expansion joints, seals or superstructure components.

EPIC utilizes rapidly repetitive shock waves at Mach 5 speeds that create a high amplitude particle displacement to resonate and dislodge deposits. The high number of successive pressure waves effectively fracture, displace and ultimately dislodge and remove the deposits.



Rapidly Repeated Focused Shockwaves

Remotely controlled, fully automated, and safely contained, detonations created inside of a high-pressure combustion tube directionally focuses highly effective, rapidly-repeated shockwaves into and through the module.

Before and After Borescope Images



Impacted deposits on finned tubes



Finned tubes after EPIC cleaning

Documented EPIC Results

Station Location	# of HSRGs	Results
Florida	1 (5 of 8 faces cleaned)	CT reduction of 4.1 iwc (within 1.3 iwc of design guarantee although only 5 of 8 faces cleaned) that equated to a 1,081-hour (41 day) payback based on full load output. MW increase was 6.14 MW (3.5%) with 4.6% CT fuel efficiency improvement resulting in a heat rate improvement of 500 BTU/KW-hr. Stack temperature increased 1.6 degrees F. Companion HRSG subsequently scheduled for EPIC cleaning as well but for all 8 faces/4 modules.
South Carolina	2 (8 of 8 faces cleaned on both)	CT average reduction of 3.72 iwc (within 0.82 iwc of design). Heat rate improvement averaged 68.5 BTU/KW-hr. MW increase averaged 1.27 MW each with average 0.74% CT fuel efficiency improvement. 36 tons of debris removed. Presuming running both CTs for 7800 hours per year, based on an average price of \$32 per MW, that would generate an additional 19,500 MW-hrs./year, which would equate to an additional \$624k the first year.
Arizona	2 (5 of 8 faces cleaned on both)	CT reduction of 2.4 iwc (within 2.5 iwc of design guarantee but only 5 of 8 faces cleaned). Heat rate improvement averaged 140 BTU/KW-hr. MW and averaged 1.76 MW each with an average 1.15%/CT fuel efficiency improvement. Presuming running both CTs for 7800 hours per year, based on an average price of \$32 per MW, that would equate to an additional \$875k the first year.