

“Extreme Cleaning Technologies”

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Today, I am going to present to you information about process technologies that can help you meet today's demanding RESET requirements.

We specialize in doing the dirty work. We have been pursuing unique cleaning capabilities for nearly 70 years for a wide variety of end uses. Our niche in the metal cleaning arena has always focused on the most difficult cleaning challenges.

To best sum up our technologies, we refer to them as...

EXTREME CLEANING TECHNOLOGIES



Extreme cleaning technologies are best suited for the most difficult and demanding cleaning challenges presented by both OEM and RESET operations.

These process technologies don't simply remove organics like carbon, oil, soot, coke, and paint – they are completely and efficiently destroyed in minutes and this represents dramatic time savings when compared to standard cleaning processes.

They react with the complex metal oxides that make stainless steels stainless and superalloys super. In short, these technologies are prime examples of unique chemistries that provide extreme results and benefits.



Here's a brief list of what this means to MRO and RESET activities:

—the process completely removes oils, soils, carbon, and coke deposits from engine components

—they condition and dissolve sulfidation and complex oxides from stainless steels, superalloys, titanium and refractory metals

—they remove and destroy virtually any type of organic coating, including Chemical Agent Resistant Coatings (CARC) and even fluorinated materials like Teflon®

Applications

Engine Component Cleaning

- removes carbon, coke, and soot deposits
- provides fast, thorough, and complete cleaning
- does not mask defects or flaws, e.g. hairline cracks
- produces inspection-ready components in as little as 30 minutes



The processing of used engine components after teardown is an ideal example of how one can collapse the timeline for cleaning.

After initial engine teardown and cursory precleaning, heads, blocks, crankshafts, camshafts and even turbocharger components are all candidates for processing.

Installations

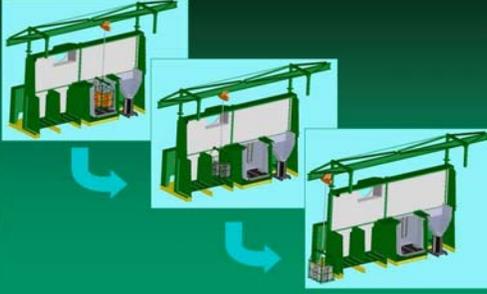
Ground-based Partners



Well accepted by these major diesel and turbine engine OEM's, the technology is ideal for simultaneously ramping up both production rates AND quality in the RESET arena.

Applications

Engine Component Cleaning



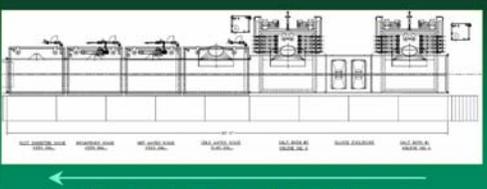
The equipment can range from a few tanks under a common hood to fully-automated multi-bath systems for repetitive high-production environments.

The equipment consists of a salt bath at 700° F, adjacent rinse tanks including both cold and hot water, and a byproduct or sludge dumping station. The work is indexed first through the molten salt and then rinsed in water. An optional brightening station and final rinse are often included under the ventilated hood enclosure.

Total process time is component dependent, but usually ranges from 30 – 120 minutes from start to inspection. This compares very favorably to 8 – 12 hours for simple thermal cleaning processes, not including their required post-cleaning operations such as ash removal and/or shot blasting.

Process Lines

Depot-Class Rebuild System



large scale engine component cleaning line
(work travel right to left)

To the left is a schematic of a large depot class process line for used cleaning engine components. It consists of two molten salt baths, hot and cold water rinses, a brightening station and a final rust preventative dip.

Completely automated, the system is serviced by a loop monorail system with multiple work handling hoists. Specific parts are processed according to the recipe-driven automated handling system.

After processing, the cleaned components travel to adjacent inspection cells prior to re-machining and final reset.

Applications

Engine Contamination

examples of retained shot after bake & blast cleaning which are eliminated by Extreme Cleaning

Here is an example of retained shot in an aluminum component that was taken out of service – the potential for it breaking free and contaminating lubricants or destroying bearing or other mechanical surfaces is obvious.

By eliminating the need for mechanical cleaning operations, the risk of re-introducing harmful contaminants to a freshly-cleaned part is eliminated.

Applications

Turbo Bearing Housing Cleaning

turbo bearing housings without and grease

in molten salt bath cleaning

ready for inspection

Another example of extreme cleaning technologies is the cleaning of used turbocharger components.

Originally processed by thermal cleaning and a secondary blast operation, the housings had an unacceptable field failure rate due to cracked castings going back into service; the blasting operation peened over the cracks so they were not visible during inspection. A secondary problem was retained shot in critical passages, which was then picked up by fluids passing through these contaminated areas.

A simple sequence of molten salt, water rinses, and a neutralizer / brightener completes the processing and eliminates this potential issue.

Applications

Block & Head Cleaning

before (above) and after (right) salt bath cleaning and post-processing

Capable of reacting with both organic and select inorganic contaminants, one process can efficiently remove paints, oils, soils, and carbon along with helping to make metallic oxides and scales more amenable to downstream processing.

This sequence demonstrates the thoroughness of cleaning, contrasting the parts after the stages of initial teardown, salt cleaning, water rinsing, and brightening.

From one piece to dozens at a time. In as little as 30 minutes.

Applications

Alloy Cleaning & Renewal

cleans titanium blades of lubes, scales, and oxides during both initial manufacturing and overhaul

Some of the most difficult cleaning operations are the removal of the tenacious and resistant service scales formed on titanium, stainless steels, and superalloys.

These are readily conditioned in the process to render them more easily removed in downstream process stages.

Applications

Alloy Cleaning & Renewal

- descales stainless, titanium and superalloys
- conditions service scale and sulfidation
- removes plasma & flame sprayed coatings
- removes graphite, moly disulfide, boron nitride, etc



The process addresses four specific cleaning areas:

- (1) It descales stainless, titanium and superalloys: during component-level manufacturing and fabrication while components undergo MRO operations
example – titanium helicopter rotor components
- (2) It conditions service scale and sulfidation from products such as: combustion cans, blades, buckets and vanes, along with misc. hot section components
- (3) It removes plasma / flame sprayed coatings such as: tungsten carbide / chromium carbide and prepares surfaces for recoating and renewal
- (4) It removes graphite, moly disulfide, boron nitride and all common forming forging lubricants

Installations

Aerospace Partners



These companies are process users for jet engines, blades, and buckets, flame spray coatings removal, paint removal and other aerospace related OEM and RESET operations.

Applications

Chemical Agent Resistant Coating (CARC) Removal



The fast and thorough stripping of CARC via molten salt is a prime example of the efficiencies of these extreme processes.

This light, tight oxide formed during stripping can be seen as the brilliant blue tint in this photo.

A mild acid dip or conventional paint pretreatment quickly restores the original base metal lustre.

No mechanical post-treatment is required prior to refinishing.

Results

Extreme Cleaning Results



Improved cleanliness, reduced process times, increased reliability and performance, and decreased manpower are not mutually exclusive attributes. Extreme cleaning technologies can provide all of these benefits to MRO / RESET.

For coatings removal, engine or turbine overhaul, or other difficult cleaning applications, these robust methods can provide tangible and valuable improvements in work flow and production flexibility.

Extreme cleaning technologies are more than capable processes to meet today's most demanding RESET challenges.