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Advanced Technology for Industrial Maintenance Applications

Heat Induction Coating Removal & Laser Ablation

Uses Only Electromagnetic Energy & Focused Light

New Sustainable Solution

Mitigates EH&S Risks, Saves Time, Reduces Costs

Timothy Niemeier
Vice President
Best-Tec Abatement, Inc.

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Structural Steel Preservation Challenges

Lead Paint Abatement - Corrosion Control Process Improvements, Environmental, Health & Safety Concerns …

- Deferred Maintenance Issues
- Replacement for Abrasive Media Blasting Needed
- Prevent Dangerous Airborne
- Eliminate – Hazardous Dust Containment, Noise, Mixed Waste

Goals: Maintain vs. Repair, Save Time & Reduce Costs

Protect People & The Planet!

Dumping Hazardous Grit-Blasting Waste

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New Coating Removal & Surface Prep Solution

- No abrasive media, no chemicals, no water
- No hazardous mixed waste to dispose
- No clean-up
- No dust containment needed
- No base metal removed – non-abrasive
- Immediately paint treated surfaces
- Extremely precise
- Safe to use near operating equipment, controls, other personnel
- Very low carbon emissions
- Does not pollute air, water or soil

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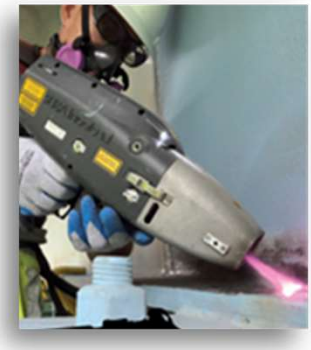
The Most Advanced Corrosion Control Technology Available Today

Induction Coating Removal (ICR) And Laser Ablation (LA)

"ICRALA"

Metal Cleaning

LA effectively removes coating residues, lead primers, & non-visible contaminates, ***thoroughly cleans the metal surface***



Laser Cleaned Metal

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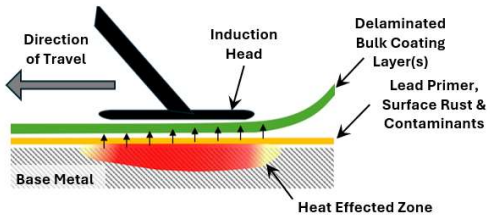
Heat Induction Coating Removal

How it Works

- Base metal is internally heated by high frequency electric currents created from a magnetic field emitted by the induction head.
- *Instantly* heats metal to 160-200°C (320-390°F) causing coatings up to 25mm (1.0 in.) thick to de-bond for easy removal by scraping-off in flakes or strips.



ICR Does Not Remove:

Lead primers, rust, other contaminants

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Heat Induction Coating Removal

How it Works

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Heat Induction Coating Removal

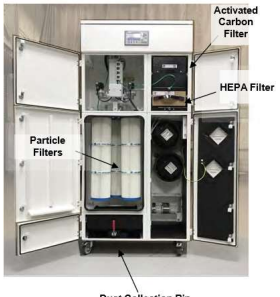
How it Works

Induction Unit

Chiller

Generator
480V, 3-ph

Fume Extractor
Filter Unit



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Induction Coating Removal

Applications

- Safe removal of lead & asbestos containing coatings w/o creating hazardous mixed waste
- Removes non-hazardous coatings, including high performance fusion bonded coatings, liners & wraps from ferrous metal substrates
- *Rapid removal* - ***very*** thick coatings & liners up to **25 mm (1 in.) DFT**

Heat Induction Coating Removal Rate: up to **28 m²/hr. (300 ft²/hr.)**

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Induction Coating Removal

Limitations

- Only works on steel substrates ≤ 9.5 mm (0.375 in.) thick
- Does not remove lead primers, rust, or other surface contaminants from base metal
- Requires a secondary substrate cleaning method before painting or welding … ***That's Perfect for Laser Cleaning!***

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Pulsed Laser Ablation – How it Works

Laser Type: Q-switched, nano-second pulsed, solid-state, diode-pumped, fiber optic beam delivery w/integrated / interlocked fume extraction & filtration

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Portable Laser Ablation

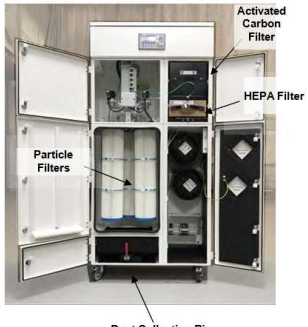
Laser Source

Generator
480V, 3-ph

How it Works

Fiber Optic
Beam Delivery

Laser Optic



Fume Extractor
Filter Unit

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Laser Ablation Applications

- De-coat / clean hard access areas
- Safely clean precision machined surfaces, ferrous & non-ferrous metal substrates, de-paint welds for NDT/NDI
- Remove coatings, rust, hydrocarbons, chlorides in one step
- Remove lead & asbestos containing paint
- Radiological DECON
- De-coat & clean items not possible with other methods
- Works near others, operating equipment & controls
- Ideal for removing thin residues & contaminants

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Laser Ablation Limitations

- Line-of-sight process - shadowing
- Focused laser beam - works within range of focus
- Can't vaporize inorganic materials / coatings
- Process rates varies based on coating thickness & color

LA coating removal rate @0.09 m^2 (1 ft^2) min. per 51µ (2mils) DFT

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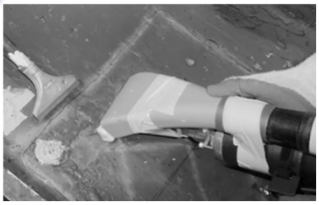
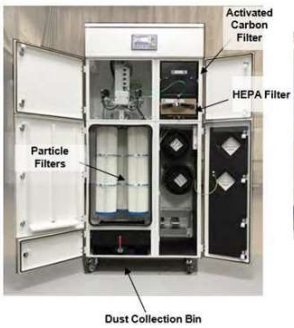
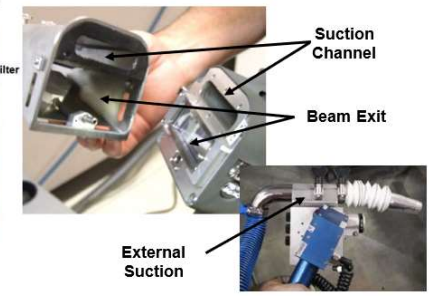
Fume Extraction & Filtration
Essential Process Control for EH&S

Technology incorporates point-source fume extraction & filtration, essential for maintaining safety & environmental compliance by preventing the release of potentially hazardous airborne.







Uses powerful vacuum & multistage filtering - scrubs extracted air of process vapors & residues.
Fume extractor is interlocked so ICR / LA will only operate with fume extractor on & functioning correctly.

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Safety

Laser Safety

- Laser Safety Officer
- Formal / Qualified Laser Operator Training Mandatory – 2 Days: Consists of Classroom & Hands-On
- Hazard Controls – Administrative (SOP), Technical, PPE: Laser Safety Eyewear, Half Mask Respirator
- Laser Controlled Area (LCA) & Signage

Induction Safety

Personnel with pacemakers restricted within 10 feet of the induction head

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Safety

Approved for Use …

Onboard Navy Ships

Inside Nuclear Power Plants

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Equipment as Delivered

100kW Generator

Equipment Container w/Laser System, Induction Unit, Fume Extractor

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Virginia Dept. of Transportation

Conclusions After 8 Years of Study

ICRALA vs. Traditional Abrasive Media Blasting …

- **Safely & effectively removes hazardous coatings**
- **Quickly removes bulk coatings & cleans the base metal**
- **Equivalent adhesion to grit blasting w/significantly reduced surface area**
- **Mitigates risk of lead exposures, no mixed waste, minimal clean-up**
- **Safe for treating steel & bolts**
- **Eliminates need for costly dust containment, very low process noise**

New option - Save time & expense, complete zone & spot repairs early - sustainable process improvement for corrosion control to mitigate EH&S risks

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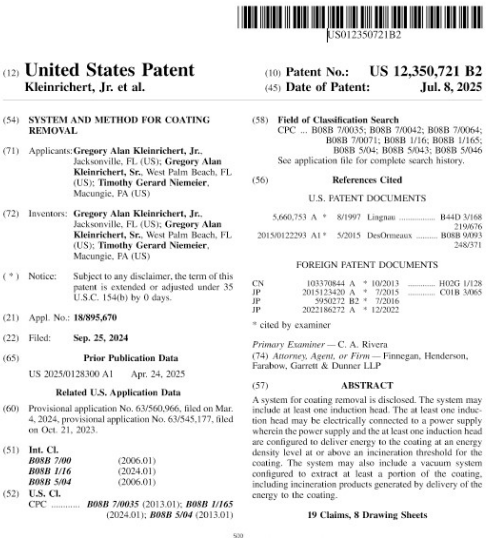
Latest Innovation

U.S. Patent Granted July 2025 – AMPP 2025 Innovation of the Year Award



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(12) **United States Patent**
Kleinrichert, Jr. et al.

(10) **Patent No.: US 12,350,721 B2**
(45) **Date of Patent: Jul. 8, 2025**

(54) **SYSTEM AND METHOD FOR COATING REMOVAL**

(71) Applicants: **Gregory Alan Kleinrichert, Jr.**, Jacksonville, FL (US); **Gregory Alan Kleinrichert, Sr.**, West Palm Beach, FL (US); **Timothy Gerard Niemeier**, Macungie, PA (US)

(72) Inventors: **Gregory Alan Kleinrichert, Jr.**, Jacksonville, FL (US); **Gregory Alan Kleinrichert, Sr.**, West Palm Beach, FL (US); **Timothy Gerard Niemeier**, Macungie, PA (US)

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(51) **Int. Cl.**
B08B 7/00 (2006.01)
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CPC ***B08B 7/0035*** (2013.01); ***B08B 1/165*** (2024.01); ***B08B 5/04*** (2013.01)

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See application file for complete search history.

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Primary Examiner — C. A. Rivera
(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow, Garrett & Dunner LLP

(57) **ABSTRACT**

A system for coating removal is disclosed. The system may include at least one induction head. The at least one induction head may be electrically connected to a power supply wherein the power supply and the at least one induction head are configured to deliver energy to the coating at an energy density level at or above an incineration threshold for the coating. The system may also include a vacuum system configured to extract at least a portion of the coating, including incineration products generated by delivery of the energy to the coating.

19 Claims, 8 Drawing Sheets

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Takeaway…

Induction Coating Removal

+ Laser Ablation = *ICRALA*

New Technology Solution

Tested & Approved

Hazardous Coating Removal

Super Clean Surface Ready for Re-Coating

Green Technology

Responds to EH&S Concerns

New Standard for Sustainability

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