Flexible and Dry Cleaning With Laser

Thomas Weingartz, 4JET Technologies GmbH
The 4JET Group is a leading supplier of integrated laser processing systems for surface processing.

The 4JET Group

- Established 01/2006: 4JET Technologies GmbH
  Laser Surface Cleaning and Modification
  Laser Tire Mold Cleaning Systems
  Laser Tire Marking Systems
  Target Industries: Tire, Automotive and others

- 4JET microtech GmbH & Co KG
  Laser Processing of Glass
  Laser Ablation of Thin Films
  Target Industries: PV, Technical Glass, Electronics

Key Figures

- >100 Staff
- > 30 Patents
- > 400 Machines installed
- Service in EU, USA, Asia
- 24/7 Hotline
- ISO 9001

Awards

- REIFEN Innovation Award 2016
- Deutschland Land der Ideen
- Deutscher Gründer Preis
- KFW-Unternehmenspreis Gründerchampions
1. **Common Cleaning Methods – A Short Summary**

2. **Cleaning with Laser – Why Does this Work?**

3. **Laser as an Innovative Approach Against Conventional Methods**
Which Parts Need to Be Cleaned?

- Derusting
- Degreasing
- Removal of Production Residues
- Paint Stripping
- Cleaning of Memorials / Buildings
Chemical / Electrical Methods

**Ultrasonic**
- Basically Stationary Units
- Frequencies from 20kHz to 400kHz

**Pros and Cons**

**Pros:**
- Comparatively Low Investment
- Can Clean Areas Where Other Methods Fail
- Not Abrasive

**Cons:**
- With Persistent Contamination Suitable for Finishing Only
- Prior to Ultrasonic Blast Cleaning Necessary
- Handling of Media
## Chemical / Mechanical

### Dry Ice

- Stationary and Mobile Units Available
- Dry Ice Pallets Are Accelerated to Almost Sound-Propagation Velocity and then Blasted onto the Contaminated Part

### Pros and Cons

<table>
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<th>Pros</th>
<th>Cons</th>
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<td>✓ Comparatively Low Investment</td>
<td>✓ Handling of Media</td>
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<td>✓ High Costs / Part</td>
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<td>✓ Inadequate Cleaning Results</td>
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<td>✓ High Energy Consumption</td>
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<td>✓ Very High Noise Emission</td>
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Common Cleaning Methods

Abrasive

Blasting

- Blast Cleaning
  - Sand
  - Glass Beads
  - Plastics
  - (Stainless) Steel
  - ...

- Stationary and Mobile Units
- Uses Compressed Air to Accelerate the Medium to High Velocities

Pros and Cons

Pros:
- Comparatively Low Investment
- Well Established > 50 Years

Cons:
- Handling of Media
- High Noise Emission
- Extensive Safety Needed for Mobile Units
- Low Reproducibility of Results
- Abrasive
What Happens during Laser Cleaning?

Cleaning with YAG-Laser – Simplified

- Contamination Absorbes the Laser Light
- Component Part Reflects the Laser Light
- Very Short Pulses (10-100ns) with Very High Energy
- Contamination Heats up and Chips Off
- Low Heat Input
- Residues Should Be Vacuumed
Innovative Cleaning with Laser

Cleaning Machines from 4JET Technologies

Stationary Solutions

- Use Laser Light for Cleaning
- 4JET Technologies Offers Machines for Cleaning
  - Tire Molds
  - Innerliner of the Tire
  - O-ring Seal Production Molds
  - ...
- Average Laser Power up to 1kW
- Flexible Machine Platform with PLC, HMI and Multi-Axis System

Pros and Cons

- **Pros:**
  - Contactless and Non Abrasive
  - Very Low Costs / Part
  - Excellent Cleaning Results
  - Automated Process
  - Very High Reproducibility of Results
  - No PPE Necessary
  - Low Noise Emissions
  - No Media

- **Cons:**
  - Purchasing Cost
  - Limited Flexibility
Contactless Cleaning Method - Laser

Mobile Device JETLASER
- Use Laser Light for Cleaning
- Ergonomical, Industrial-suited Design
- High Range of Available Laser Power Classes
  - 50W
  - 100W
  - 200W
  - 500W
  - 1000W
- Can Be Connected to an Industrial Robot

Pros and Cons

Pros:
- Contactless and Non Abrasive
- Very Low Costs / Part
- Good Cleaning Results
- Low Noise Emissions
- High Range of Parts to Clean Possible

Cons:
- Class 4 – device → Safety Measures Required
innovative cleaning with laser

Contactless Process - JETLASER

Mobile Device JETLASER
Visit Us at Our Booth

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