

Cleaning of technical surfaces by the use of laser radiation

Clean-Lasersysteme GmbH

Herzogenrath/Aachen
Germany

web: www.cleanlaser.com

Mail: info@cleanlaser.com



Clean Lasersysteme GmbH

System Manufacturer:

Clean-Lasersysteme GmbH, Germany

- ❑ Founded 1997
- ❑ Location: Herzogenrath (near Cologne), Germany
- ❑ Certification: DIN EN ISO 9001:2000
- ❑ 2 owners (managing directors)
- ❑ Areas of service: manufacturing and developing of laser systems
- ❑ Construction of own building (Spring 2007) ~1250m² (~12000ft²)



Clean-Lasersysteme & Major Global Distributors



Clean-Lasersysteme & Global Distributors

US sales & service partner: adapt laser systems

- ❑ Location: Kansas City, Missouri/USA
- ❑ Full service & support center
- ❑ [http:// www.adapt-laser.com](http://www.adapt-laser.com)

adapt
laser systems



Asian sales & service partner: SAMAC Ltd.

- ❑ Location: Tokio, Japan
- ❑ Sales and service partner
- ❑ [http:// www.samac.co.jp](http://www.samac.co.jp)

Samac

価値あるマシンを世界から



UK sales & service partner: CIProcess

- ❑ Location: London
- ❑ Sales and service partner
- ❑ [http:// www.ciprocess.co.uk](http://www.ciprocess.co.uk)

CIProcess
at Cleanlaser.co.uk



Italy sales & service partner: In-Tech

- ❑ Location: Turin
- ❑ Sales and service partner
- ❑ <http://www.intech-srl.it/>

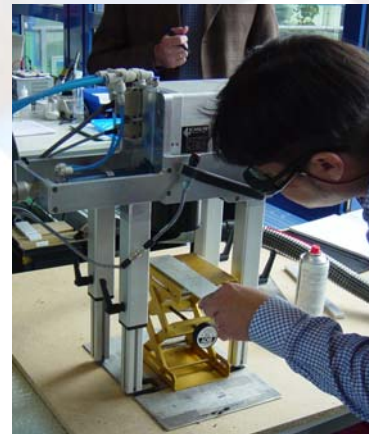
In-Tech
tecnologie industriali



Further sales partner in Ireland, Brasil, Netherlands, India

Our Areas of Service for You

Engineering & Application	Manufacturing	Service & Support
<ul style="list-style-type: none">• Feasibility studies• Process optimization• Technical design• Laser (system) development	<ul style="list-style-type: none">• Laser cleaning and de-coating systems• Laser machines• System integration	<ul style="list-style-type: none">• Assistance with proto-types and pre-serial production• Technical service• Instructional courses



References

Customers/users of the Clean Laser technology

 **AIRBUS**

 **EADS**



Samac
価値あるマシンを世界から




Audi

Honeywell

Fahrer

Eberle
AUGSBURG

BRAUN


Fraunhofer Institut
Lasertechnik

Weforma
Dämpfungstechnik GmbH

Continental
TEMIC

 **INOVAN**

 **Anteon**

SOEHNLE

 **NISSEI**

Bahlsen 

 **KRONE**

approx. 100 systems
sold world wide

 **clean**
LASERSYSTEME

www.cleanlaser.com

Functional Principles of Removing Coating Layers by Laser Radiation

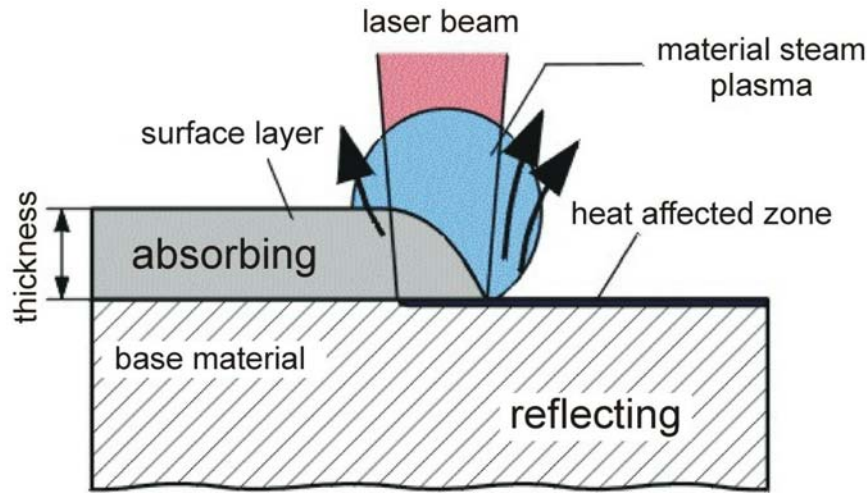


Photo: Fraunhofer ILT, Aachen

Ablation principle:

- ❑ Coating layer is removed by absorbing the focussed laser spot
- ❑ Very powerful but short laser pulses cause very little thermal influence on the base material
- ❑ Blank base material reflects laser radiation, ablation process stops
- ❑ Metals can not be damaged or melted with the “correct” laser parameter and by the use of the “best” wavelength

Two physical effects:

- ❑ Coating layer is vaporised (ablation by sublimation)
- ❑ Ablation by thermally induced pressure

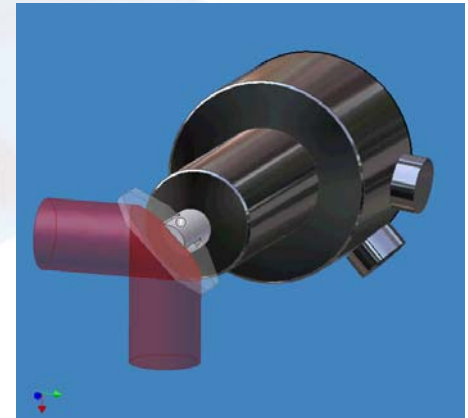
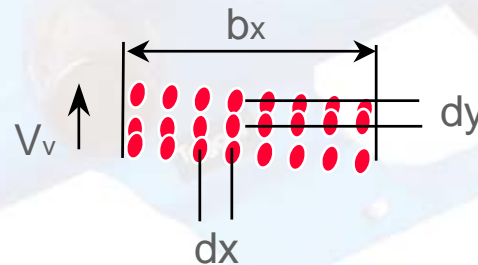
Advantage Clean Laser

Our patented ablation strategy – scan and move



- ❑ Up to 110,000 pulses per second
- ❑ Line-shaped beam deflection
- ❑ Adjustable scan parameters
- ❑ Very short impact times due to scanned laser-beam

Ablation strategy



Clean Laser Technology

Suitable for Different Speed Demands

Low Power

CL 20 / Backpack



Mid Power Laser

CL150 / CL300



High Power Laser

CL 500 / CL 1000



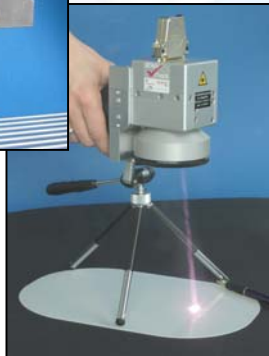
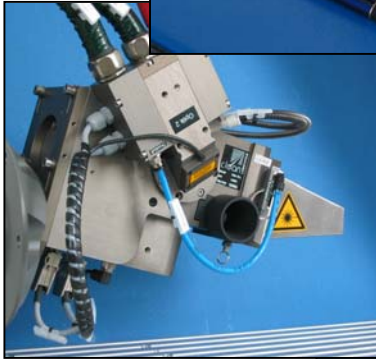
Peak Pulse Power: 5kW, 150kW, 240kW, 400kW

Mobile Laser Systems



- ❑ Average laser power (CW) from 20W up to 1000W
- ❑ Costs per hour
1 – 1,5 € per 100W
- ❑ Hand-held or robotic use
- ❑ No damaging of metallic surfaces
- ❑ Laser system for accurate cleaning of technical surfaces
- ❑ Laser class 4 product

Optics for Mobile Systems



- ❑ Optics for:
 - Manual or robot use
 - 1D or 2D
- ❑ Working Distance from 80 up to 250 mm
- ❑ Line size (1D) from 5 up to 70 mm
- ❑ Field size (2D) 100 x 100 mm²
- ❑ Laser class 4 product

CL 20 Q / Backpack



- ☐ Pulsed fiber laser
- ☐ Large operating distance up to 250 mm (10 in)
- ☐ CW laser power up to 20W
- ☐ Desktop or plug free (Backpack) version
- ☐ Several optics available - suitable for robot use
- ☐ No damaging of metallic surfaces
- ☐ With 2D optic excellent marking results (Backpack also)
- ☐ Laser class 4 product

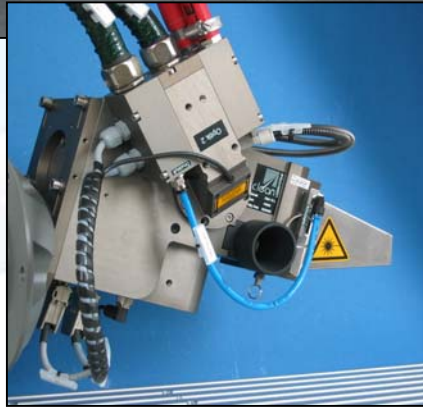
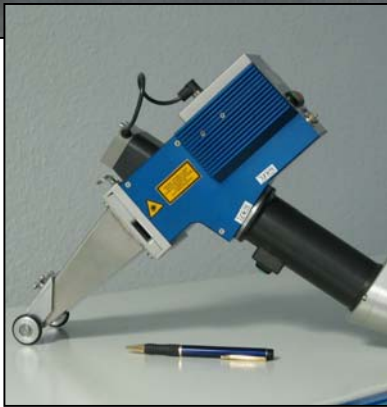
CL 150 – CL 300 Laser - Technical Details



Features and Options:

- ☐ Reliable diode pumped solid state laser (Nd:YAG)
- ☐ Integrated on-line resonator power meter for permanent quality-control
- ☐ Fieldbus (optional)
- ☐ CAN Bus, TCP/IP, RS 232
- ☐ Data Logging by external PC
- ☐ Easy user interface
- ☐ Telediagnostics (option available)
- ☐ Service interval: >3500hrs, or once a year

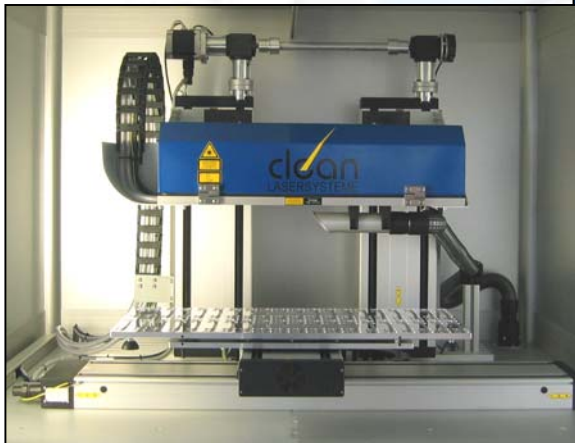
Mobile High Power Laser Series



- ☐ Up to 1000 W average power
- ☐ Air or water cooled version
- ☐ Available optics:
 - ☐ Stylus
 - ☐ OSH70L
 - ☐ OSA70L
- ☐ Industrial version for heavy duty applications
- ☐ Options available
- ☐ Class 4 Laser product

Nd:YAG Laser Workstation

Available Sources CL 20 / CL 150 / CL 300



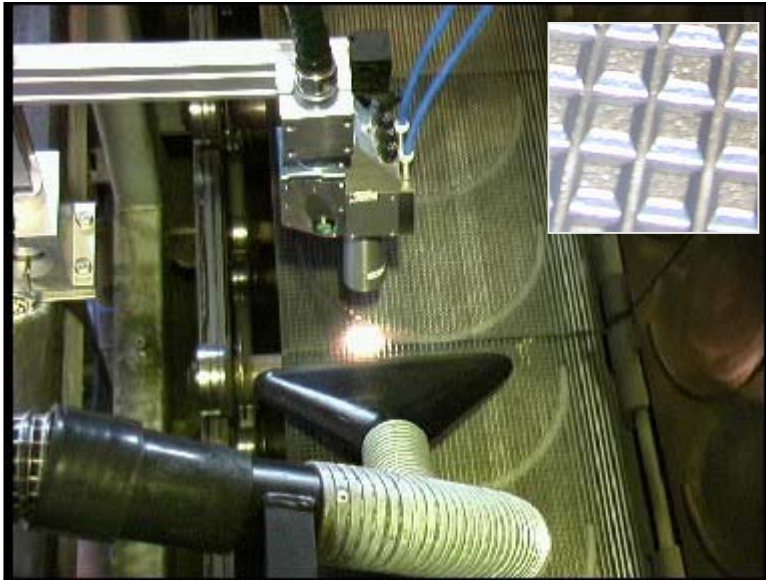
Technology:

- ☐ Flexible programming
- ☐ 2D high-speed beam-deflection for minimum thermal impact
- ☐ ultra efficient cleaning results
- ☐ no gas consumption & very low maintenance

Application-fields:

- ☐ Precise Paint-stripping
- ☐ Selective coating removal
- ☐ Partial cleaning

Laser – In-Line-Integration

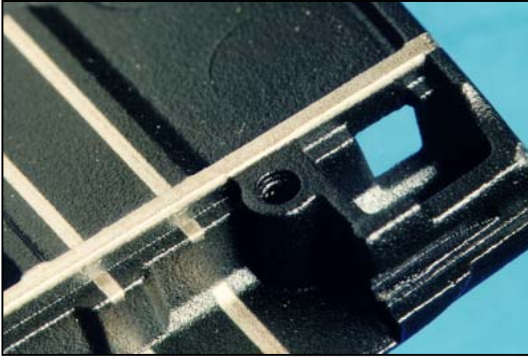


In-line Applications:
Baking
Pre-treatment
Brake pad cleaning



Selected Implementation Examples

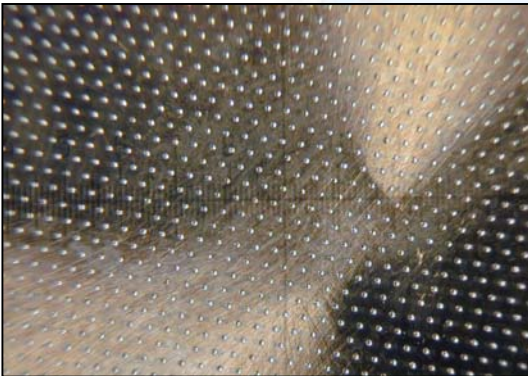
Paint stripping and de-coating



Pre-treatment for bonding or coating



Mold cleaning



Structuring



Marking

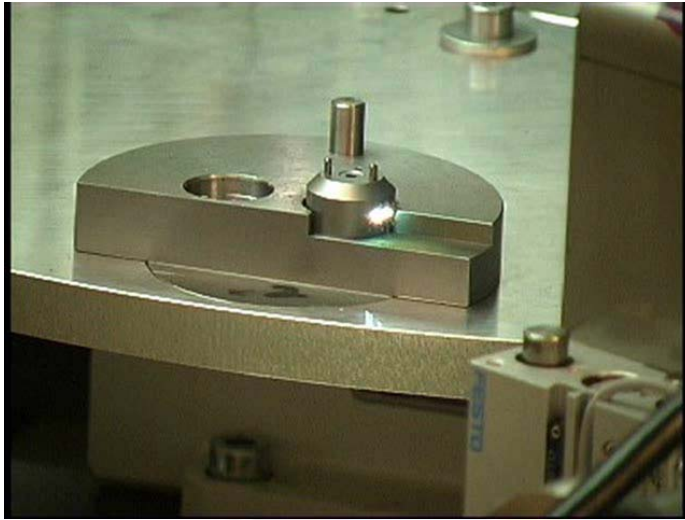


Cleaning and Restoration

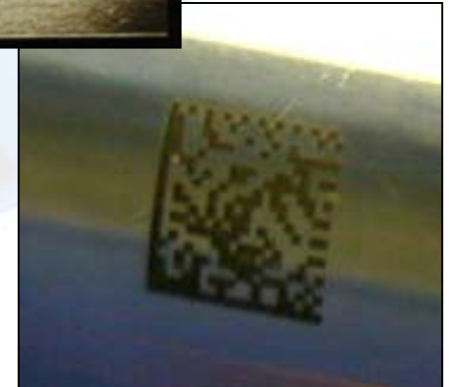


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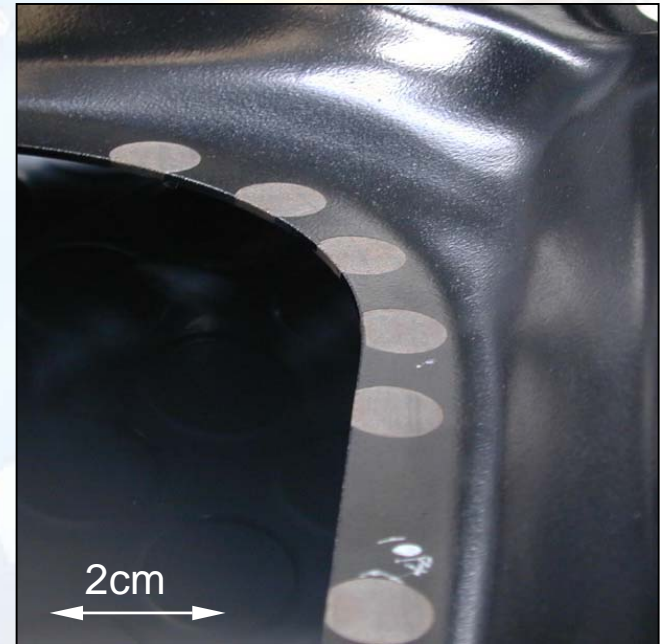
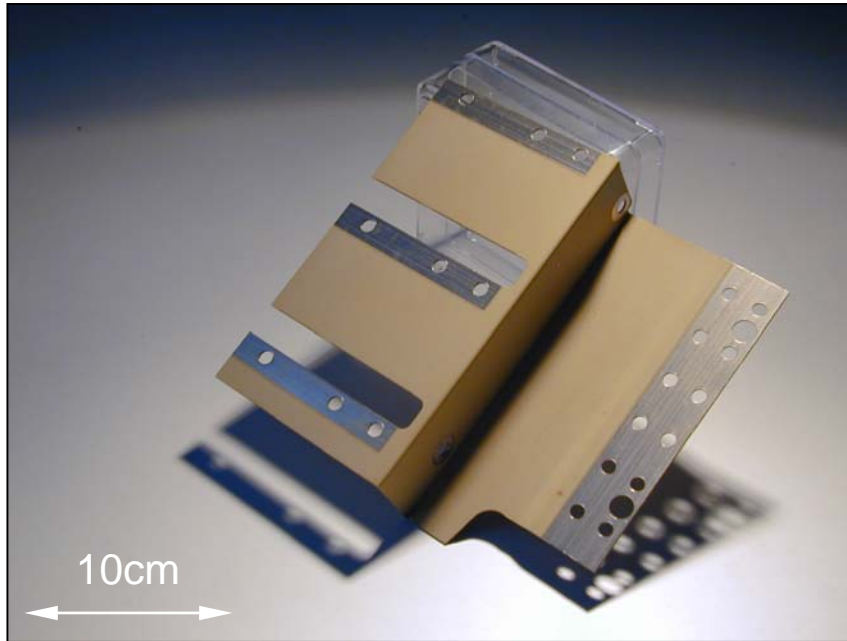
Laser Marking with Clean Lasersysteme



- ❑ Writing (OCR), HPGL, Barcode, Data Matrix Code, Grey scales picture (Bitmap)
- ❑ 300 DPI
- ❑ Several Materials (e.g. Wood, Plastic, Metal)



Precise Paint-Stripping from Metal



APPLICATION:

Production of electrical contact areas

ADVANTAGE:

Replacement of masking

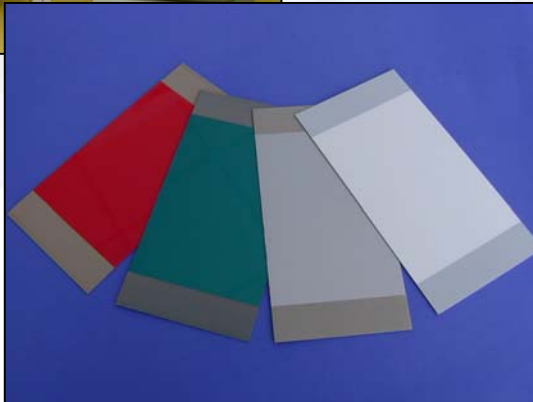
SAVINGS:

Up to 50 ct per area

Clean Laser Technology in Use at AIRBUS

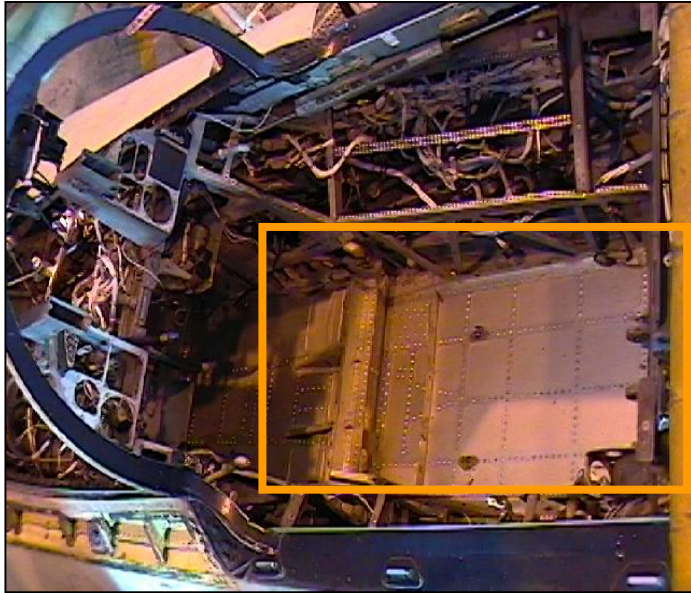


Workcell with workstation laser for serial production at AIRBUS



- ❑ Laser system for precise paint stripping application in production
- ❑ Manufacturer specified test-program successfully completed
- ❑ Result: no damage of metal ground material after de-coating
- ❑ Clean Laser equipment (workstation with workcell) is used for serial production
- ❑ Clean-Laser is ready for use in serial production! (Qualified process)

Paint-Stripping for Maintenance



APPLICATION: Damage free coating removal for maintenance and inspection

ADVANTAGE: „Zero-emission“, dry and flexible de-coating technology, no residues, no damage to surrounding areas

SAVINGS: Short set-up and de-coating time for smaller areas



Clean Laser Technology in Use at the U.S. Air Force



Evaluation trials at U.S. Air Force

Photo: SAIC

- ❑ US Air Force pollution prevention group
- ❑ Evaluation process for implementation of portable laser coating removal technology
- ❑ Testing of different ground materials and coatings
- ❑ Tests similar to SAE Standards
- ❑ Result: Clean Laser is the first and only system which is ready for manual paint stripping use!

Mold Cleaning with Laser Radiation

- ❑ Removal of residuals
- ❑ Economical cleaning of large segments with a beam width of up to 70mm
- ❑ Sensitive structures of aluminium and steel will not be damaged
- ❑ Cleaning speed with CL 500 Q of up to 0.1 m²/minute (depending on layer thickness)



Composite
production
Photo: EUROCOPTER



Composite Mold
Material after 100
treatments without dirt
layer (worst case test)

Photo: Clean-Laser

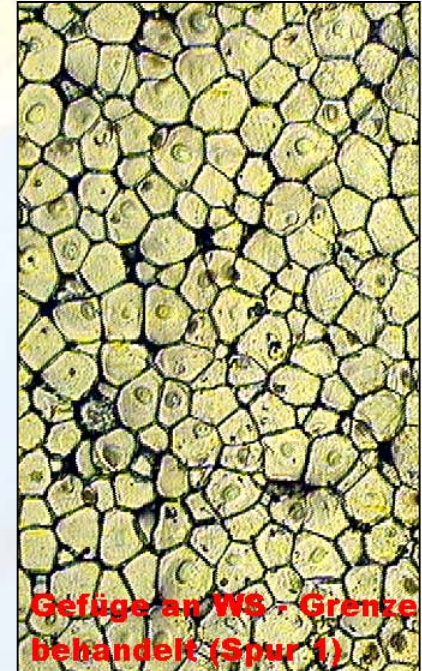


Parts Cleaning and De-coating

– No Damage to Metal Micro-Structure



Non-treated area,
uncoated



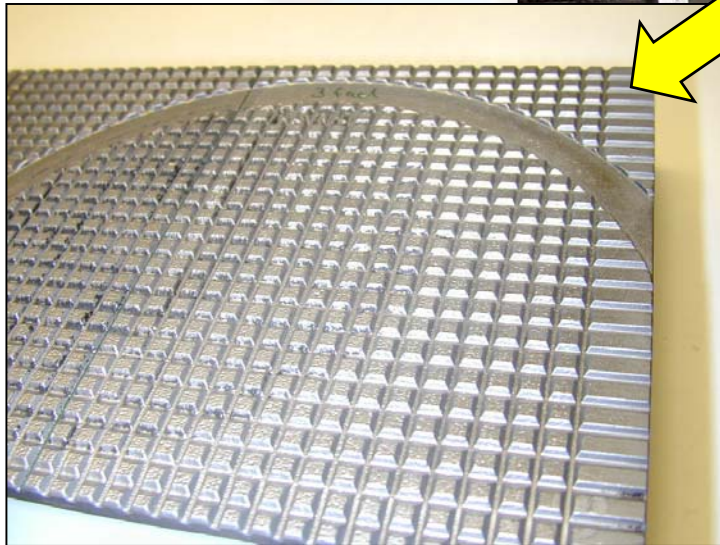
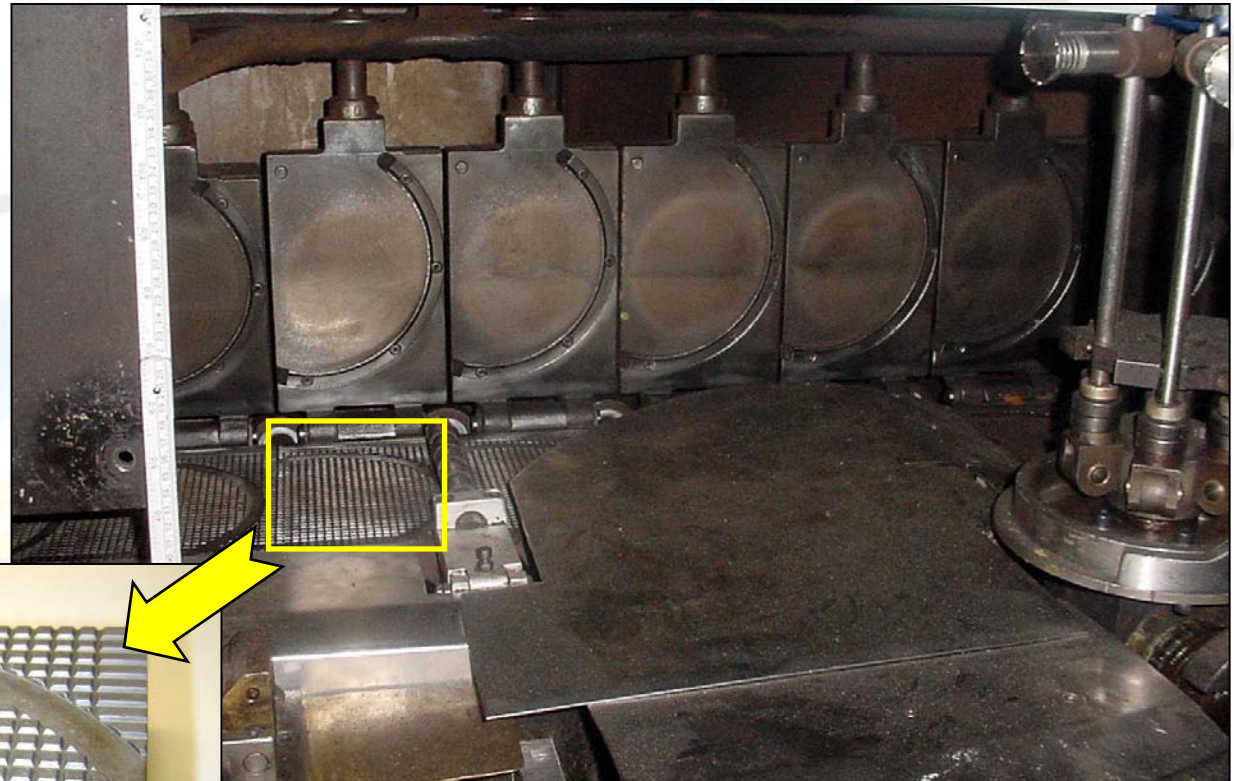
Laser de-coated
area

Photos: Lufthansa

- ❑ Manual laser de-coated aircraft part
- ❑ Proved no damage to basic material
- ❑ Laser: CL 120 Q with OSH 50L optics

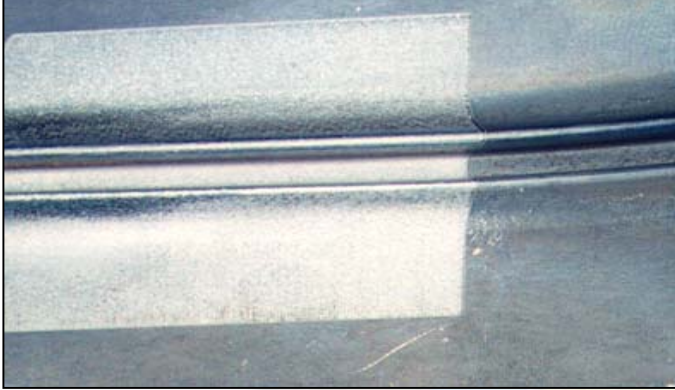
Automated In-Line Cleaning - Baking Industry -

- ❑ Cleaning speed up to 7cm²/s @CL120Q
- ❑ In-line cleaning possible

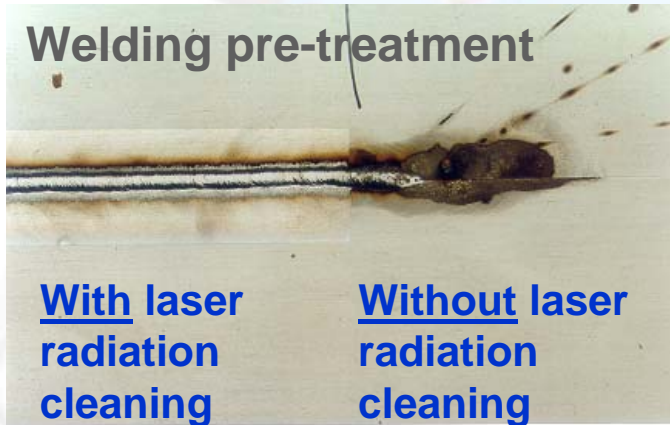


Pre-treatment for Adhesive Bonding or Welding

Adhesive bonding pre-treatment



Welding pre-treatment



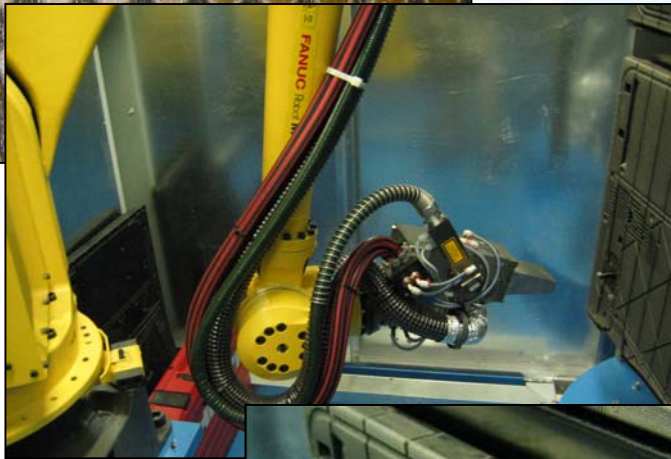
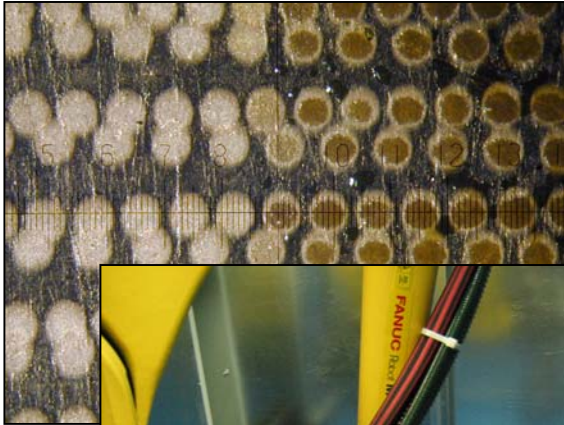
- ☐ Oxide and grease free surfaces for ideal joints
- ☐ Micro-roughness if desired
- ☐ Good long-term qualities
- ☐ Replaces wet chemical cleaning
- ☐ Speeds of up to about 30m² per hour (@500W)

AL-Welding Pre-treatment Clean-Lasertechnology at AUDI



- ❑ Treatment with CL 500 Q-Laser
- ❑ On-line Removal of oxidation and grease layers
- ❑ Constant surface quality
- ❑ Comparable to chemical cleaning results
- ❑ Local area cleaning with up to 13 ft/min (20mm line width)
- ❑ Status: in serial production for the new AUDI TT

Pre-Treatment of PUR for Adhesive Bonding



- ❑ Pre-treatment (cleaning) of PUR or other plastics
- ❑ „Adhesion points“ for best adhesion results AND maximum efficiency
- ❑ 3 shift working
- ❑ Special customer cleaning strategy
- ❑ Cleaning rates of up to $180\text{cm}^2/\text{s} = 65\text{m}^2/\text{hr}$

Advantages of the Clean Laser Technology

- ☐ Very good cleaning and de-coating results and speed
- ☐ Precise selective de-coating
- ☐ No damage to metal parts
- ☐ Very small Running Costs (0,30 - 5 € per hour)
- ☐ Total cost for CL500Q: ~20-30 ct minute
- ☐ Affordable invest
- ☐ No blasting material no chemicals
- ☐ No set up time
- ☐ Flexible use due to fiber optics
- ☐ No noise emission ("quiet" laser ablation)
- ☐ Easy integration
- ☐ Almost maintenance free technology

**Ablation with
Clean Lasers!**