FOR BAKING INDUSTRY

Clean-Lasersysteme GmbH
Edwin Büchter  CEO/President
Herzogenrath-Aachen, Germany
www.cleanlaser.com
buechter@cleanlaser.com
CONTENT OF THIS PRESENTATION

- Clean-Lasersysteme GmbH - Introduction
- Current Technology Overview
- Functional principle and laser parameter
- Basic Integration and automation requirements
- Application Examples
- Latest developments
- Running costs /costs of ownership
Clean-Lasersysteme GmbH OVERVIEW INTRODUCTION

- Founded 1997
- Location: Herzogenrath (near Cologne), Germany
- Optical production in **white room** environment
- Own laser **systems** development department
- Own laser **process** development department
- 2 owners (acting as CEO’s)
- Approx. 200 devices & systems in field
- Turnover 2009: 3.2 M€ (+10%), Expected 2010: (+25%) -> ~4.0 M€
- ~30 employees, 40% engineers and PhD’s

WE PROVIDE SOLUTIONS
OUR AREAS OF SERVICE FOR YOU

WE PROVIDE SOLUTIONS

ENGINEERING & APPLICATION
- Feasibility studies
- Technical design
- Laser (system) development
- Laser process development

MANUFACTURING
- Laser cleaning and de-coating systems
- System integration
- Corresponding automation technology

SERVICE & SUPPORT
- Assistance with proto-types and pre-serial production
- Instructional courses
- Worldwide technical service
FUNCTIONAL PRINCIPLES OF REMOVING COATING LAYERS

BY LASER RADIATION

ABLATION PRINCIPLE

- Coating layer is removed by absorbing the focused 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
- Metal can not be damaged or destroyed while using the “correct” laser parameter and wavelength
- Higher Intensity can lead to modifications on Metal if required

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

ABLATION PRINCIPLE
• Up to 50,000 very short pulses per second
• Line-shaped beam deflection
• Very short impact times due to scanned laser-beam
• Exclusive licensed Patent Pending for manual decoating with scanned beam

Courtesy AUDI AG
INTENSITY DETERMINED BY FOCAL DIAMETER AND PULSE-POWER

THE OPTICAL SYSTEM & FREQUENCY

High intensity and low depth of sharpness

High depth of sharpness and reduced intensity

\[ I = \frac{P}{A} \]
BEAM HOMOGENIZATION BY FIBRE CABLE – Beam shaping

- Laser source emits “gaussian“ beam profile
- cleanLASER fiber-cable homogenizes the laser beam
- Constant intensity within the complete focal area
- De-coating/cleaning of sensitive parts possible
- Undamaged substrate
DEFOCUSSING TEST (ON A REAL MOULD)

PARAMETER OVERVIEW

- CL 500
- high beam Quality M²~20
- Optics OSA 70
- Removal of release agent
- Movement in y-direction 300mm
- Movement in z-direction 60mm
- Excellent cleaning results in a z-range of: +/-10mm
- Sufficient cleaning results in a z-range of: +/-25 mm
- Suitable range for efficient automation and handheld use with compact optics
cleanLASER TECHNOLOGIE

SUITABLE SYSTEMS FOR DIFFERENT SPEED DEMANDS

MOBILE LASER FOR FLEXIBLE USE

LOW POWER
Backpack / CL 20 / CL 50

MID POWER LASER
CL 150 / CL 300 / CL 500

HIGH POWER LASER
CL 1000

WORKSTATIONS & SYSTEMS FOR AUTOMATED USE
FEATUES AND OPTIONS

- Pulsed laser
- Large operating distance up to 250 mm
- CW laser power up to 20W
- Desktop or plug free (Backpack) version
- Several optics available - suitable for robot use
- Water cooled optics for high temperature enviroment available
- With 2D optic excellent marking results (Backpack also)
- Laser class 4 product
FEATURES AND OPTIONS

- Reliable diode pumped solid state laser (Nd:YAG)
- Integrated on-line resonator power meter for permanent quality-control
- Field bus (optional)
- Telediagnostic & Data Logging/remote access (optional)
- Simplified user interface
- Available with beamswitch e.g. for manual and automated cleaning with one laser unit
OUR LASER OPTICS FOR CLEANING

EXAMPLES – SOLUTIONS FOR (ALMOST) EVERY APPLICATION

Automated Optics
- OSA 20
- OSA 70
- Stylus

2D Optics (manual or automated use)
- Stamp 10
- Stamp 14

Handheld Optics
- Stylus
- OSH 20
- OSH50
- OSH80
CUSTOMIZED LASER MACHINE

“MOULD WIPER” FOR MOBILE IN-LINE CLEANING

FINAL CONCEPT:
• 80 watts short pulse unit
• Top located automation system
• Gun style automation system
• Fiber coupled laser unit
• Fully air cooled system
• Integrated suction hose/channel system for attachment of an external suction unit
CUSTOMIZED LASER MACHINE

DEVELOPMENT PHASE – CONCEPTIONAL DESIGN EXAMPLE

CONCEPT:
- 3 Axis Gantry
- Complete design by cleanLASER
- CIP
- Hot Moulds
CUSTOMIZED LASER MACHINE

DEVELOPMENT PHASE – PROGRAMMING AND INTERFACE EXAMPLE

Software and Control:
- PC based control and programming
- Touch screen
- Graphics based visualisation
cleanLASER APPLICATION IMPRESSIONS
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
Current Status: More then 15 units in use (mainly US armed forces)
AL-WELDING PRE-TREATMENT WITH CLEAN LASER TECHNOLOGY

AL- BASED CARS

- Treatment with CL500 / CL300 Laser
- Removal of oxidation and grease layers
- Pre-treatment for electric beam- and laser welding of Al 6016 sheet metal
- Constant surface quality
- Comparable to chemical cleaning results
- Local area cleaning with up to 4m/min
- Status: in serial production at AUDI for TT and Q5 models
COMPOSITE MOLD CLEANING

- In use at several Aircraft makers!

- Work piece after 100 treatments (500 W) without any dirt layer – no abrasion

- Aluminium

- Removal of process residuals
- Economical cleaning of large segments with a beam width of up to 100mm and more
- Sensitive structures of aluminium, invar and steel will not be damaged
- Homogeneous cleaning results
- Cleaning speed of more than 15 m²/hr (depending on layer thickness and laser power)
AUTOMATED IN-LINE CLEANING

BAKING INDUSTRY

Cleaning speed up to 10cm²/s @CL150
In-line cleaning possible
AUTOMATED IN-LINE CLEANING

FUNCTION AND TECHNOLOGY - BASED ON CL 150 LASER UNIT

Two axis gantry (y-z) (manual or automated)
Line-by-line cleaning (manual or automated)
CIP applicable
AUTOMATED IN-LINE CLEANING BAKING MOLD USING CL 20

IN INDUSTRIAL USE SINCE 2007

Record: 5.8 Million cones within 15 days (24/7) means >4 cones per second in average
Using a mirror for deflection
Simulating the access situation
CLEANING OF LIMITED SPACES

TECHNICAL CONCEPT TO SOLUTION
CLEANING OF LIMITED SPACES

THE FINAL CLASS 1 SYSTEM
COST & ADVANTAGES OF THE CLEANLASER TECHNOLOGY

• Cleans with the power of focused light
• Flexible use due to fiber optics / Easy integration & automation
• (Almost) maintenance free technology
• High repeatability, sensitive cleaning technology
• Special advantages on Aluminium

ECONOMICAL EFFECTS
• Very small operating Costs
  0.5-5€/hr (CL20/CL1000)
• Low costs of ownership due to reliable new diode pumped laser technology
• Affordable Investment/short payback period
• No process downtime

ECOLOMICAL EFFECTS
• No blasting material no chemicals
• No noise emission ("quiet" laser-ablation)
• No waste at all except of the ablation residues

CleanLASER turn down the production costs!
MERCI BIEN!
THANK YOU!
DANKE!