Topic:

Robotic, CNC, and Chamber washers designed to meet the new demands of Surface Preparation and Cleaning for Automotive, EV, Battery and Complex Casting Products

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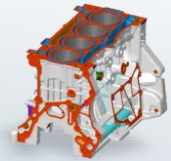
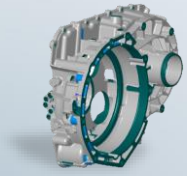
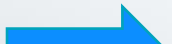
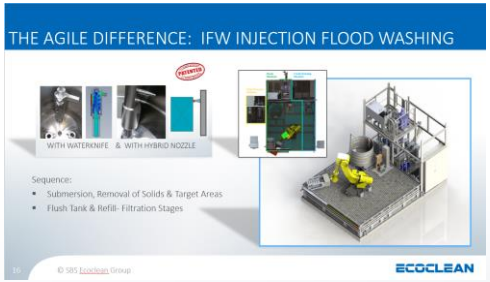
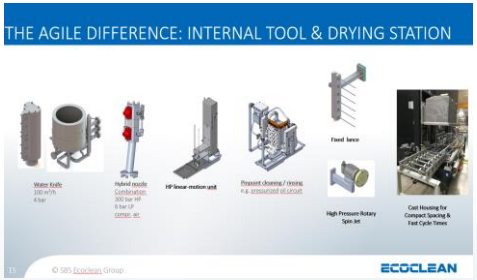
CHANGING WORLD
PRISMATIC PART CLEANING MACHINE PATHS





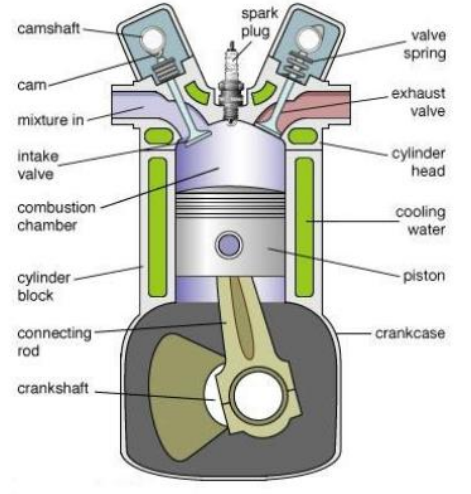






CHANGING WORLD
E-MOBILITY

Internal Combustion Engine (ICE) Components that need Cleaning



Components that need cleaning

1. Cylinder Block
2. Cylinder Head
3. Crankcase
4. Piston
5. Piston Pin
6. Piston Rings
7. Connecting Rod
8. Crankshaft
9. Valves and Valve Mechanisms
10. Flywheel
11. Camshaft
12. Transmission housing
13. Transmission – internal components

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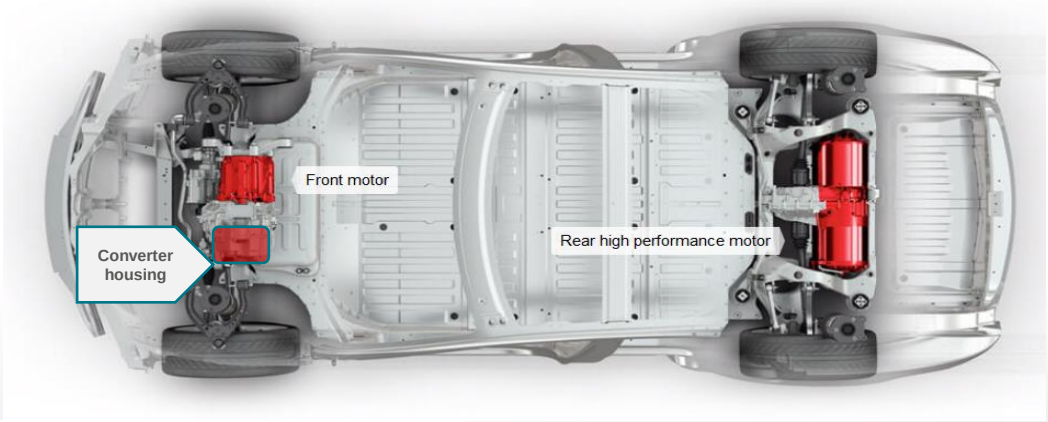
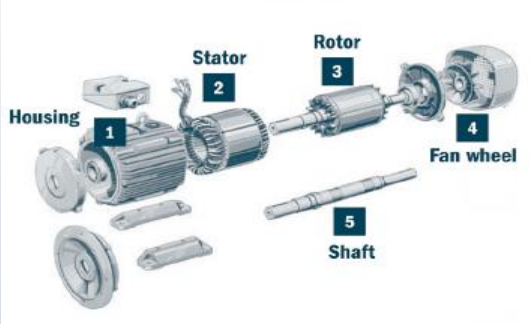
CHANGING WORLD
E-MOBILITY

Battery Electric Vehicle (BEV) -





Components that need cleaning

1. Electric Motor Housing
2. Rotors
3. Stators
4. Shafts
5. Torque Converter Housing
6. Internal converter parts (gears)
7. Transmission housing
8. Transmission – internal components

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Overview

SUPPLIERS PARTNERSHIP FOR THE ENVIRONMENT

HONDA

Industrial Parts Cleaning & Surface Processing

ECOCLEAN

technology that inspires

Surface Cleaning/Washer Technology: at Honda Meeting Water, Energy & Air Sustainability Goals (ZW,ZL, LLC)

- **Basic Introduction of Our Company & Technology**
- **Close collaboration with Honda Process and Program Engineers**
- **Flexible "Agile" Technology**
  - **Energy Reduction Items**
  - **Water Reduction Items**
  - **Variety of Filtration and Media Options**
  - **Ventilation and Airflow Designs**
  - **Space & Footprint Savings (Facility Impact)**
  - **Modular and Re-deployable Configurations (Capital Impact)**

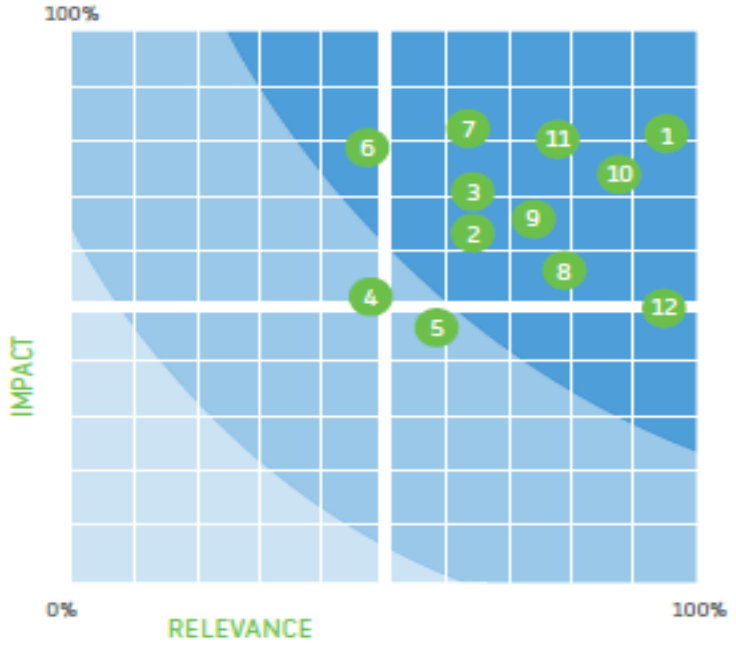
ENGAGEMENT WITH PROCESS ENGINEERS AND FOR OPTIMIZATION

Understanding & Embracing Sustainability Drivers

Relevance matrix

1. Energy efficiency
2. Climate change and emissions strategy
3. Environmental management
4. Water management
5. Responsibility on materials
6. Responsible criteria for product development
7. Labor practices
8. Health and safety
9. Relations with NGO's and regulatory agencies
10. Relations with clients and suppliers
11. Relations with shareholders
12. Wealth distribution

LOW RELEVANCE | MEDIUM RELEVANCE | HIGH RELEVANCE



Performance Results

Part Contamination Level Incoming $f/_{of}$ $V/_{Weight, Size, Count}$

Part Cleanliness Result $\sum$ = **Part Geometry** (shape, configuration and passages),

Fluid Chemistry (Type, Temperature, Concentration, Cleanliness, Surface Exposure),

Filtration (incoming streams, each stage of part exposure, tool wear, media type (nominal or absolute), number of stages),

Hydrodynamics (Pressure, Force, Motion, Velocity, Density and Temperature),

Processing (conveying, fixturing, drying (air, heat, vacuum), protection (external environment)

Surface Cleaning/Washer Technology: at Honda Meeting Water, Energy & Air Sustainability Goals (ZW, ZL, LLC)

- **Flexible "Agile" Technology**
  - **Energy Reduction Items**
  - **Water Reduction Items**
  - **Variety of Filtration and Media Options**
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Industrial Parts Cleaning & Surface Processing

ECOCLEAN
technology that inspires

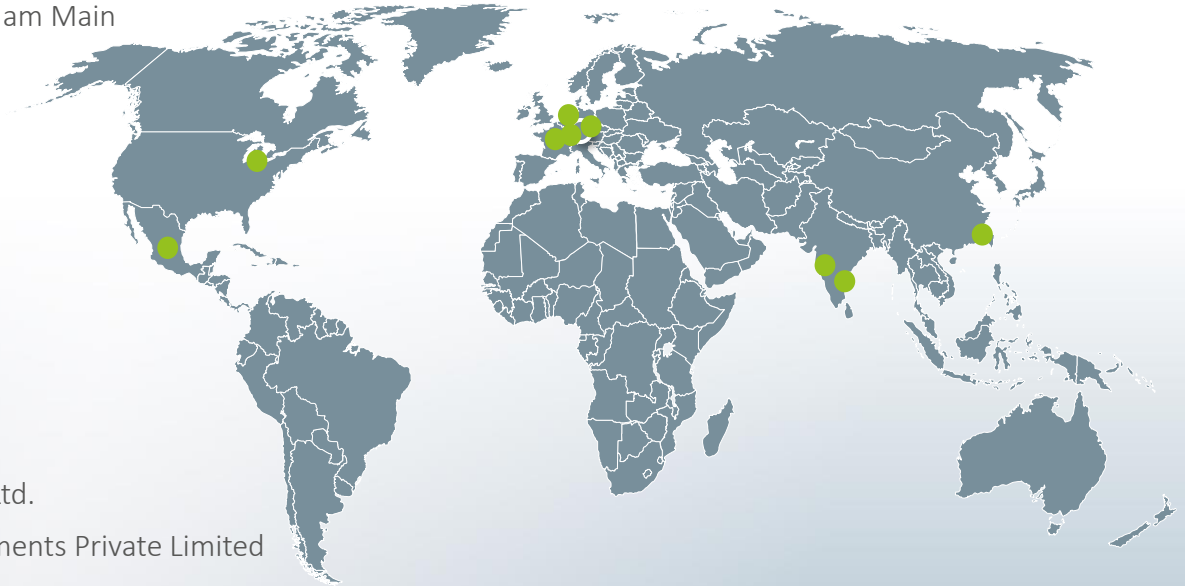
SBS ECOCLEAN GROUP CORPORATE STRUCTURE

Parent Company:

- SBS Ecoclean GmbH, Headquarter Frankfurt am Main

Subsidiaries Companies:

- Germany: Ecoclean GmbH
- France: Cleaning France S.A.S
- Czech: ECOCLEAN spol. s.r.o
- Swiss: UCM AG
- United Kingdom: Ecoclean UK
- United States: Ecoclean Inc.
- Mexico: SBS ECOCLEAN MÉXICO, S.A. DE C.V.
- China: Ecoclean Machinery (Shanghai) Co., Ltd.
- India (Chennai): Mhitraa Engineering Equipments Private Limited



SBS ECOCLEAN GROUP CORPORATE STRUCTURE

NAFTA

Europe

Asia

ECOCLEAN'S APPROACH TO A CHANGING WORLD

Laser

Mech Deburr
Welding Cells
Automation

Booster

NDT
Vision
Coating

Basic Automation/Partner

Marking

NDT

Impreg
Build

Passivation

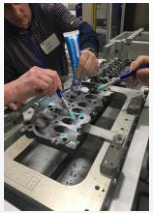
Velox

Service

Retool

- Robot Programing
- Site Mapping
- Audit Reviews
- Ancillary Equipment
- Spares/Inventory
- 1Hr Person

Portfolio Solutions, Tool Kit Items, Basic Integration, Consultive Support, Site Optimization



Consultive: R&D, Lab Testing, Global Project Activities, Specification Development

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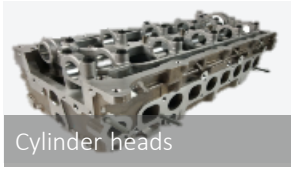
CHANGING WORLD
TYPES OF APPICATIONS

Cleaning and Surface Preparation


Cylinder heads


Turbochargers, turbines, compressors

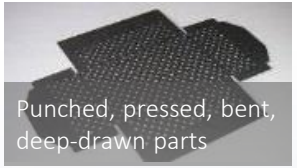

Mass-produced parts (turning, milling...)

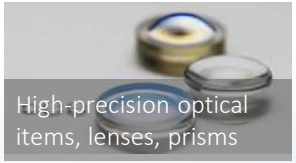

Medical devices, implants, needles

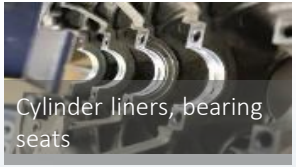

Car bodies, coating frames

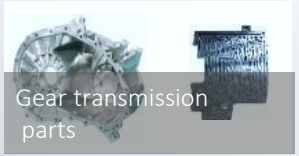

Crankcases


Diesel injection systems, pumps


Punched, pressed, bent, deep-drawn parts


High-precision optical items, lenses, prisms


Cylinder liners, bearing seats


Gear transmission parts

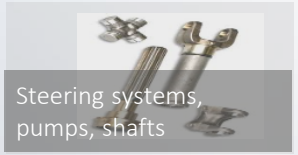

Brake systems, ABS pumps


Non-metallic parts


Precision mechanics, watches, sensors


Turbine parts, medical equipment components


Crankshafts


Steering systems, pumps, shafts


Aircraft and military components


Pre-coat cleaning


Plastic parts, precision-finished surfaces

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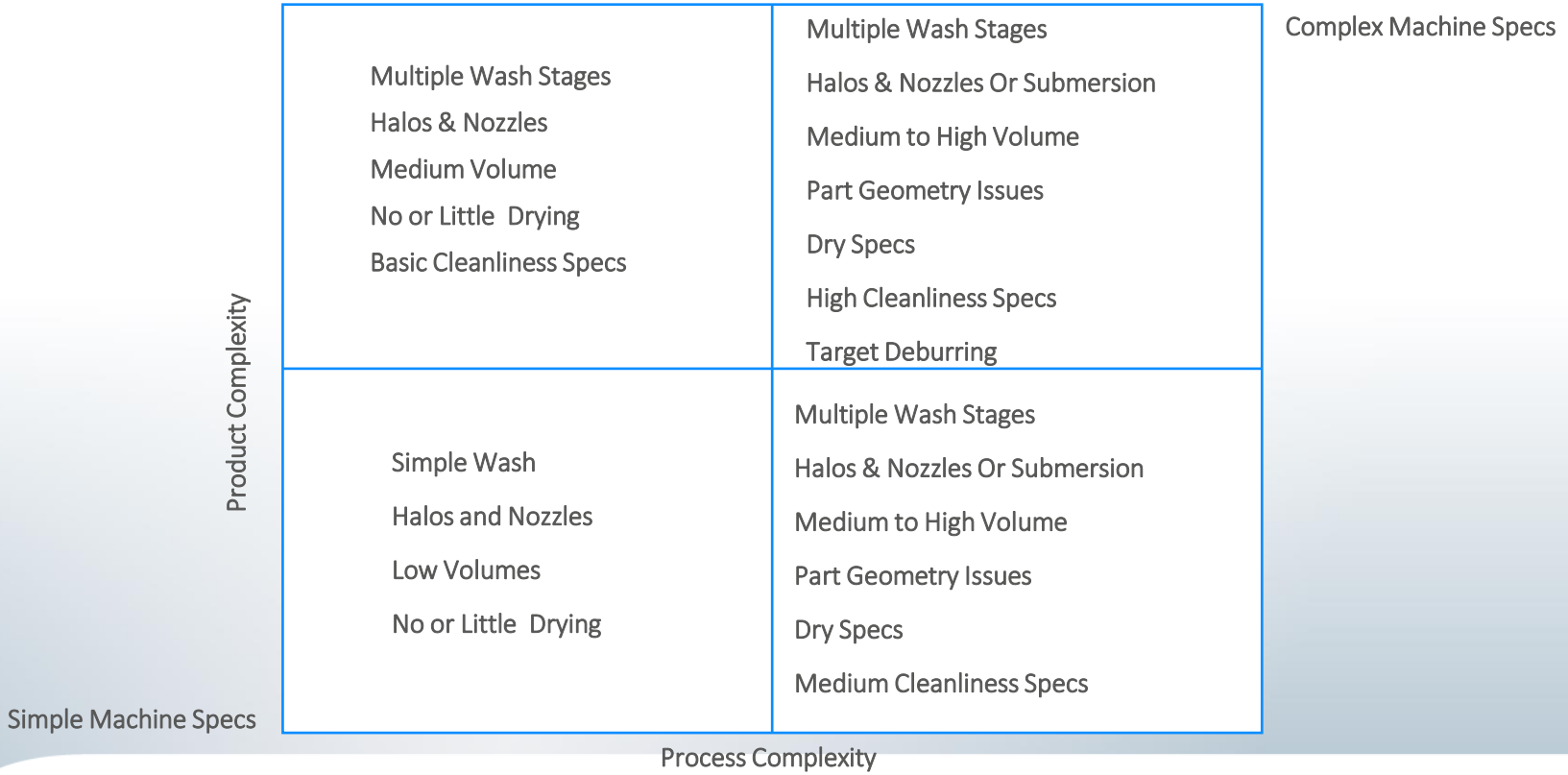
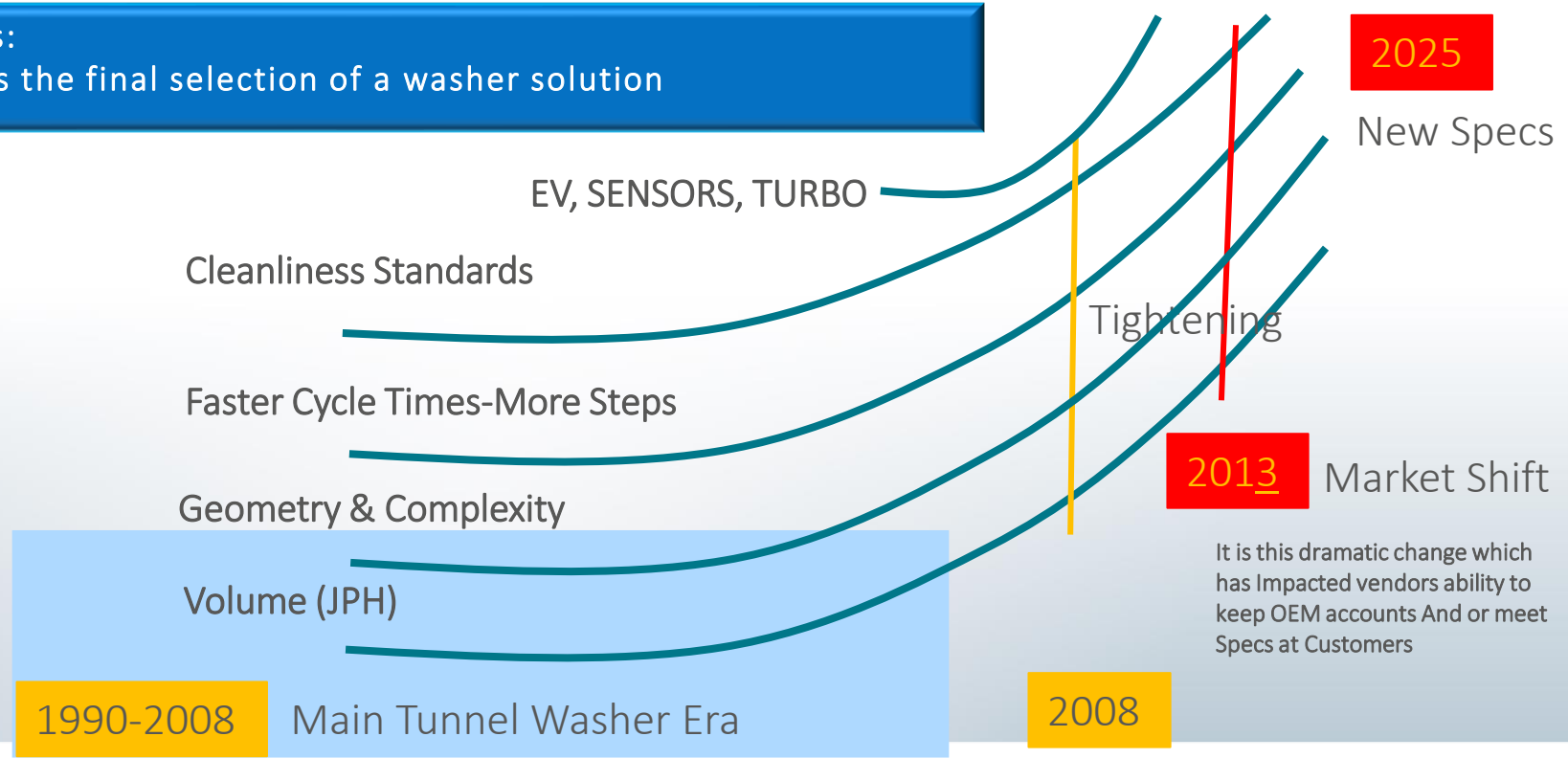
SHIFTING OF PART COMPLEXITY, MATERIALS, MARKET NICHES



CHANGING WORLD
TIGHTER CLEANING REQUIREMENTS

The Variables:
What impacts the final selection of a washer solution



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CHANGING WORLD
TIGHTER CLEANING REQUIREMENTS

Process and Cleaning Objectives

Process definition and selection of the machine technology according to the requirement and complete process chain (before and after).

CLEANING TECHNOLOGIES
CLEANING CHEMISTRY OPTIONS

Cleaning Chemistry

- Aqueous cleaning media
- Non-halogenated hydrocarbons
- Modified alcohols
- Chlorinated hydrocarbons
  - Or AIR

CLEANING TECHNOLOGIES
ECOCLEAN PRODUCT PORTFOLIO

Powertrain Components | EV, HPO, MED OPTICS | Structural Components

Robotic



CNC Style


Precision

EcoCAir

Aqueous Chamber






Steam

Rotary

Vacuum Solvent


Transfer


Belt

Dry Cleaning

MRO

ECOCLEAN

CLEANING TECHNOLOGIES
AQUEOUS OR WATER BASED TECHNOLOGY

Washer types

Single chamber

Single chamber, Rotary or

Carousel Type

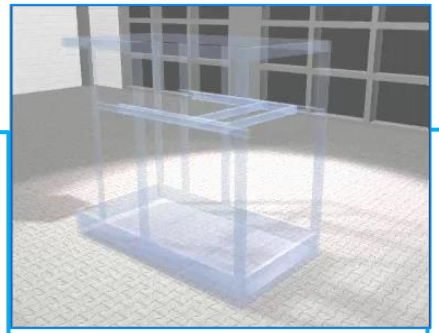
Belt washers

Multi tank

CLEANING TECHNOLOGIES
SINGLE OR MULTI-CHAMBER DESIGNS

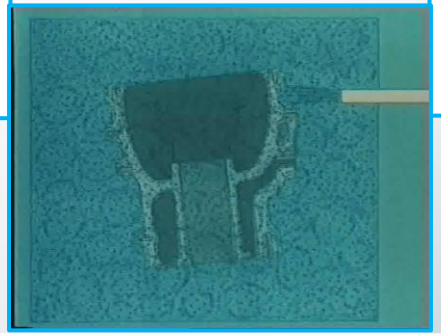
Cleaning

- **Flow washing:** The workpiece is flushed with a flow of the cleaning medium
- **Spray cleaning:** A spray jet of 10 bar pressure is directed directly at the workpiece
- **Injection flood washing:** The working chamber is flooded with cleaning medium. Turbulent flows are generated by a high-pressure pump via special nozzle systems. The resulting flow movements ensure that the product is thoroughly cleaned both externally and in hidden recesses and cavities



Process Overview and

Part Flow and Target View



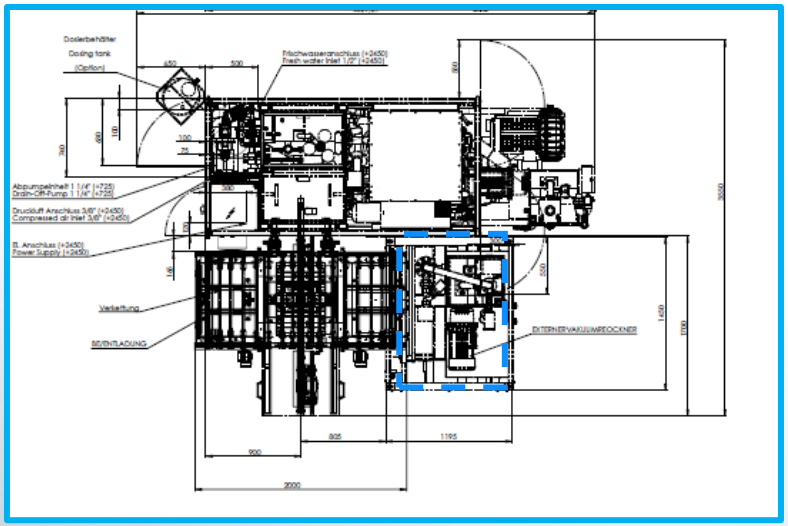
Drying

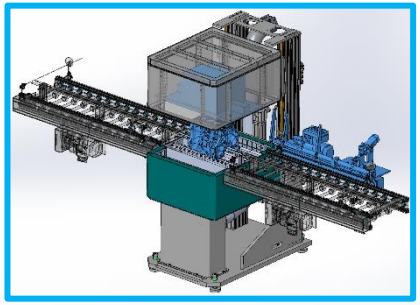
- **High-speed blow drying:** A flow of compressed air generated by a powerful compressor is played over the charge. Workpieces are effectively dried due to the kinetic energy of this airflow. On workpieces of simple geometry, this may be enough to achieve complete drying
- **Vacuum drying:** Ensures 100 % drying, even with complex shaped workpieces

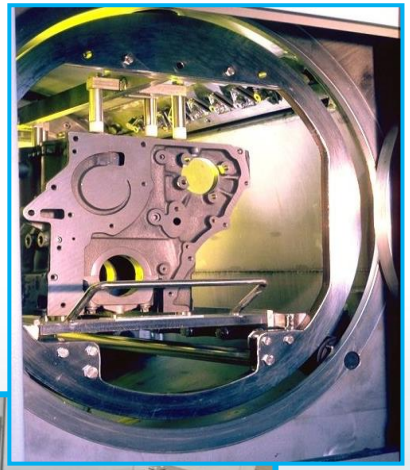
CLEANING TECHNOLOGIES
SINGLE OR MULTI-CHAMBER DESIGNS

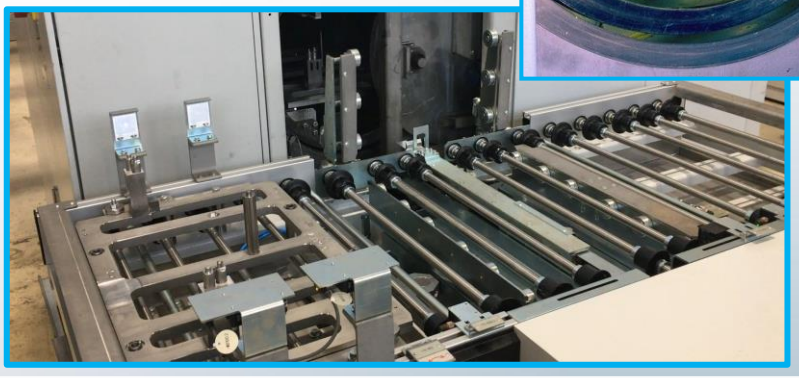
CLEANING TECHNOLOGIES
LAYOUT OR LOADING OPTIONS

Indexing and Shuttle Design with Stand Alone Vacuum Dry Option





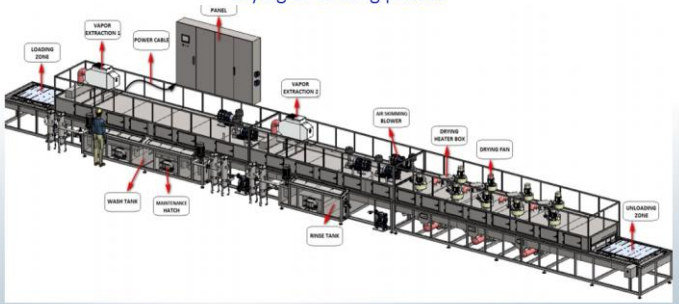




CLEANING TECHNOLOGIES
BELT OR TUNNEL CLEANING DESIGNS

EcoCBelt Washer –Complex Geometry Tray-Housings-Components

Larger machines are required for large parts, and multiple stages including blow off, drying or cooling phases



CLEANING TECHNOLOGIES
CHAMBER, ROTARY, CAROUSEL TYPES

CLEANING TECHNOLOGIES
TRANSFER MACHINE DESIGNS

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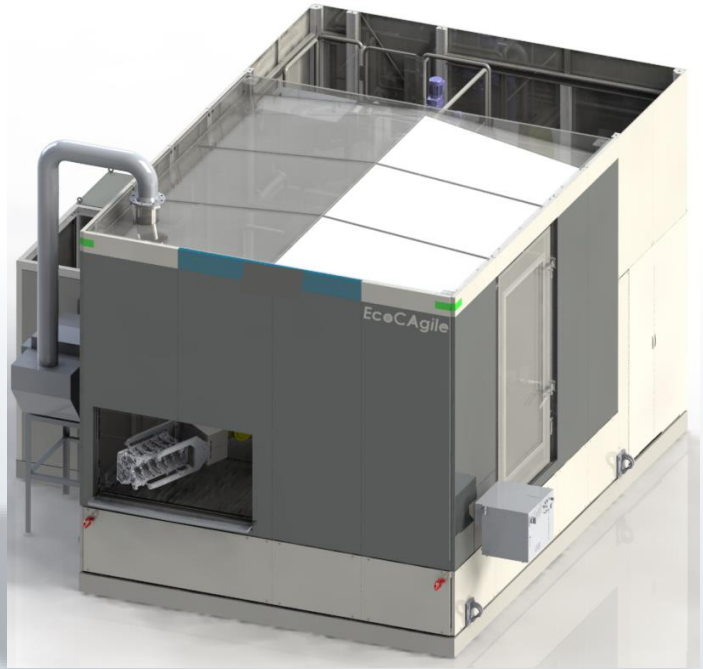
ECO ROBOTICS – A CLASS OF IT'S OWN

We combined proven designs with innovation



- Functional and transparent machine design available in 2 different sizes
- State-of-the-art process technology to achieve best in class cleanliness results
- Modular load / unload concept to achieve cycle times down to 30 seconds
- Soundlevel less than 75 dB(A)
- Modular design for incremental investment
- Easy to maintain
- Ecoclean service network in the NAFTA Region
- Post (Casting/Cubing), Intermediate and Final Washer Designs

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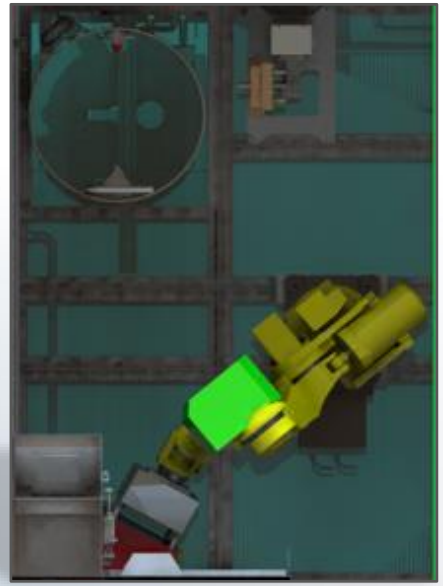
ECOCAGILE – A CLASS OF IT'S OWN

Integration of standard robot suppliers



FANUC
R-2000iC/210

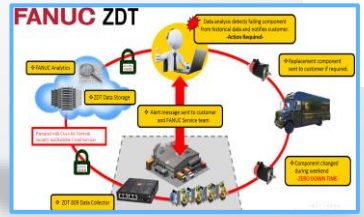
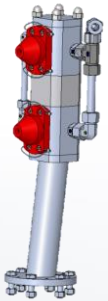


ABB
IRB 6640

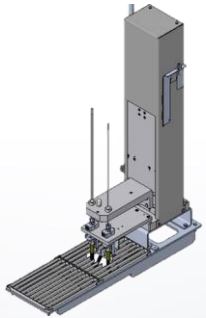
KUKA
KR210-2
Foundry

THE AGILE DIFFERENCE: INTERNAL TOOL OPTIONS

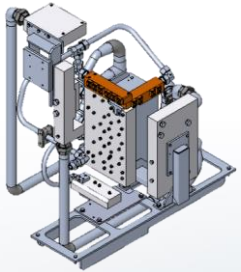
Water Knife
100 m³/h
4 bar



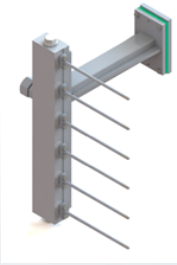
Hybrid nozzle
Combination
300 bar HP
6 bar LP
compr. air



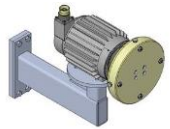
HP linear-motion unit



Pinpoint cleaning / rinsing
e.g. pressurized oil circuit



Fixed lance



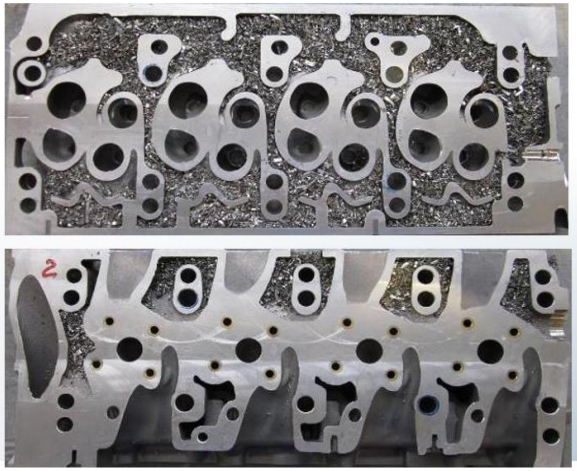
High Pressure Rotary
Spin Jet

HYBRID NOZZLE- TARGET CLEANING & DEBURR

Example of Test Trial Results

CHIP REMOVAL FROM WATER PASSAGES

20 g of aluminium chips



Trial execution

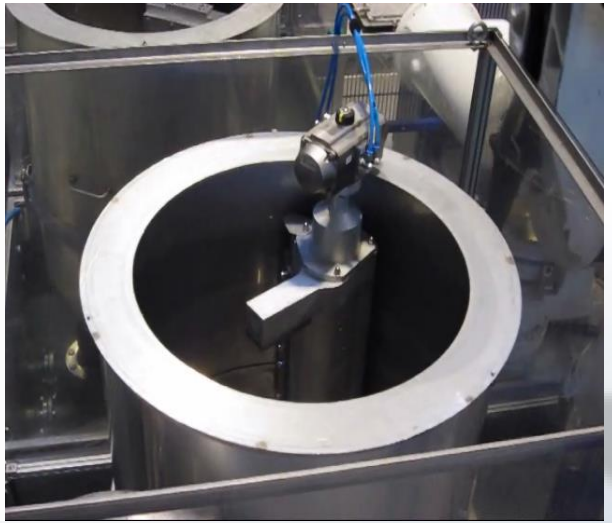
2 hybrid nozzles operating in parallel
high-pressure (300 bar) +
low-pressure (10 bar)
submerged
Process time: 4.6 sec.
Result: chip-free

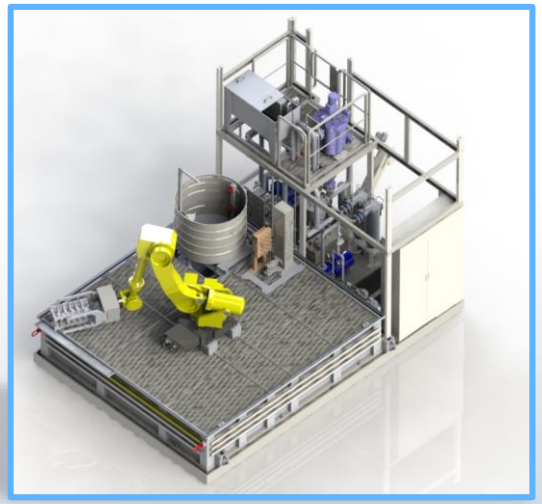
Video

CLEANING TECHNOLOGIES
ECOCFLEX AND AGILE ROBOTIC DESIGNS

- Single parts cleaning for parts with complex geometry
- Parts movement possible
- Specific cleaning
- All treatment methods possible
- Very high flexibility
- Lower throughput than transfer machine
- Cleaning process integrated in production line

CLEANING TECHNOLOGIES
THE AGILE DIFFERENCE: IFW INJECTION FLOOD WASHING

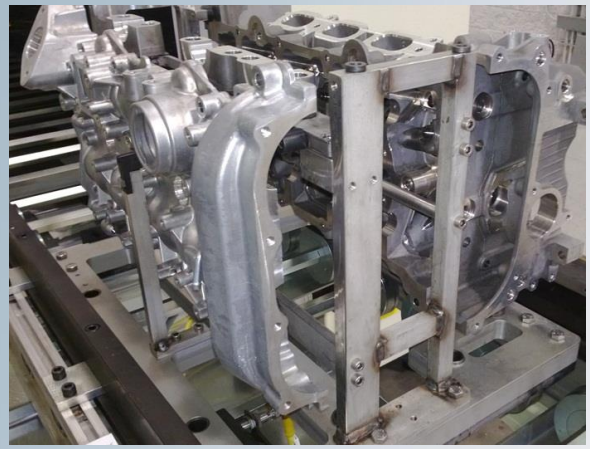


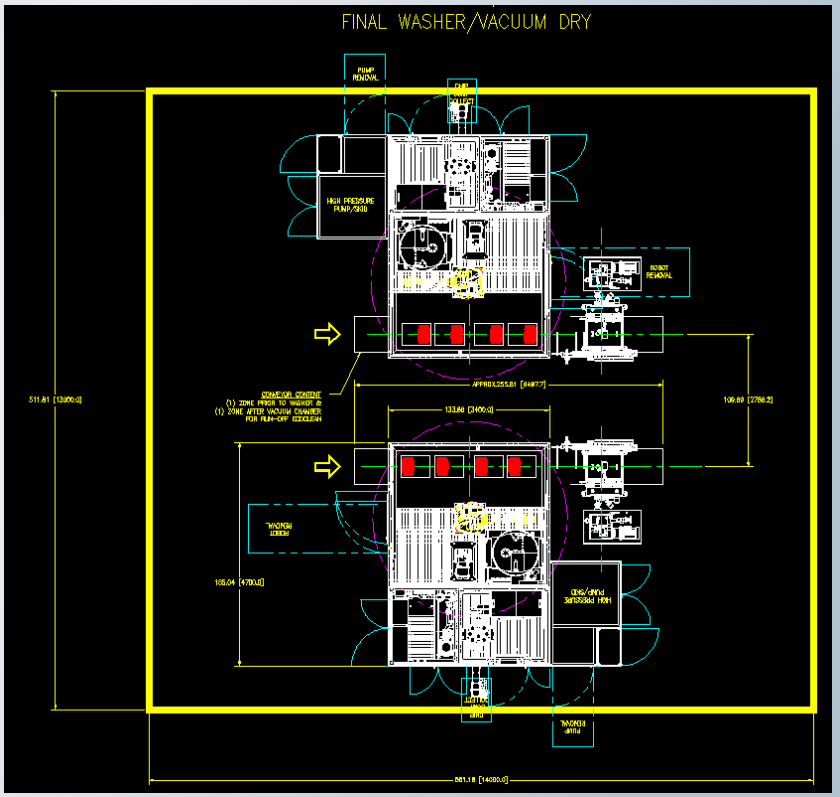


ALTERNATE: INTEGRATED PALLET WASH/STAGES

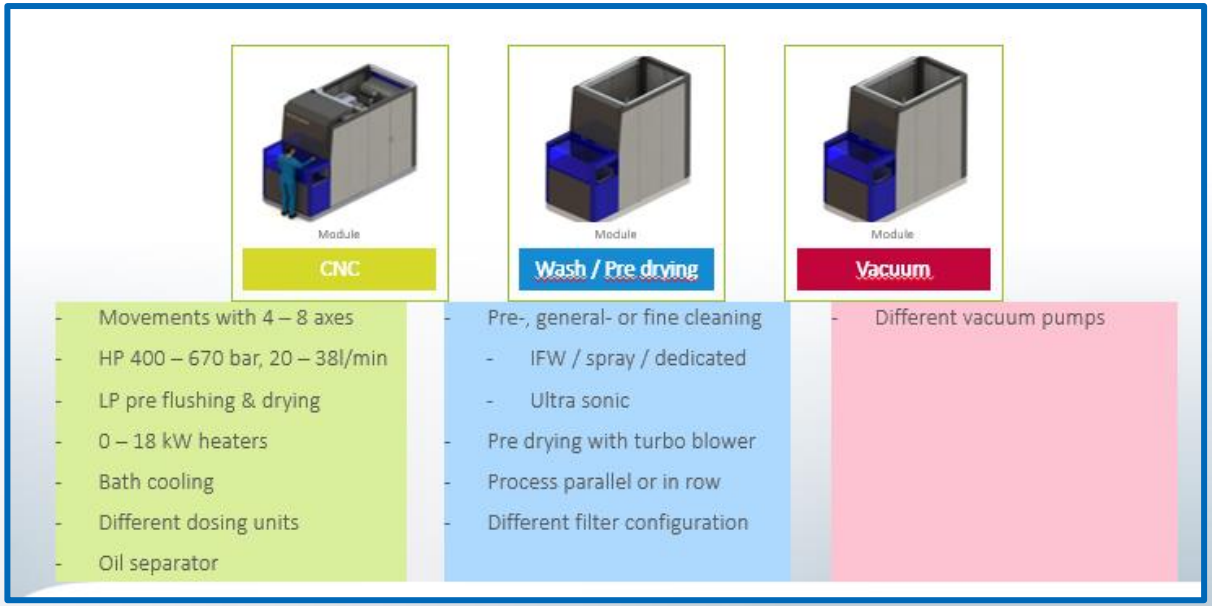
Pallet/carrier cleaning process

Project Activity- Head Project…Fast Cycle, Complex Areas





CLEANING TECHNOLOGIES
IN LINE DEBURR-MULTI STAGE HIGH SPEED DESIGNS



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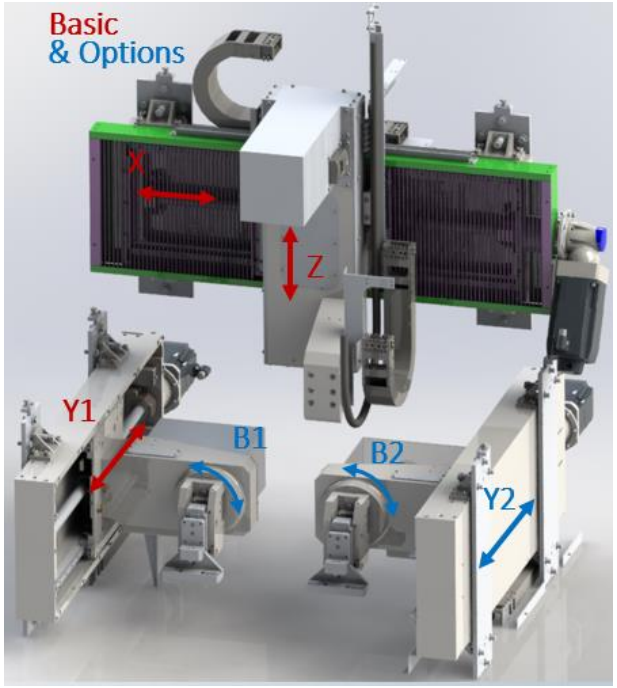
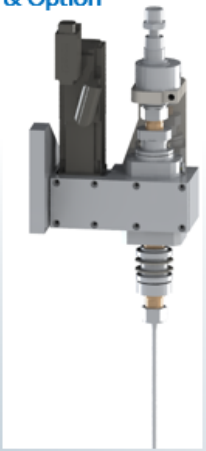
CLEANING TECHNOLOGIES
VELOX OVERVIEW



Basic & Option



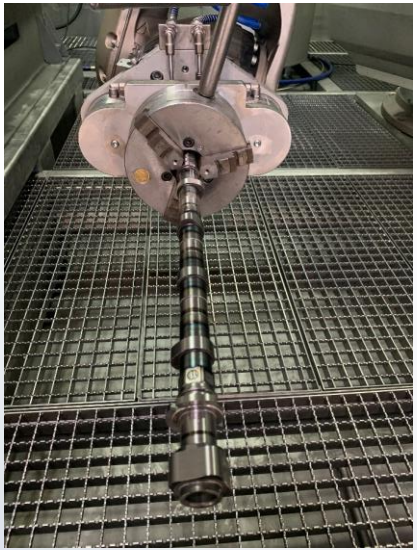
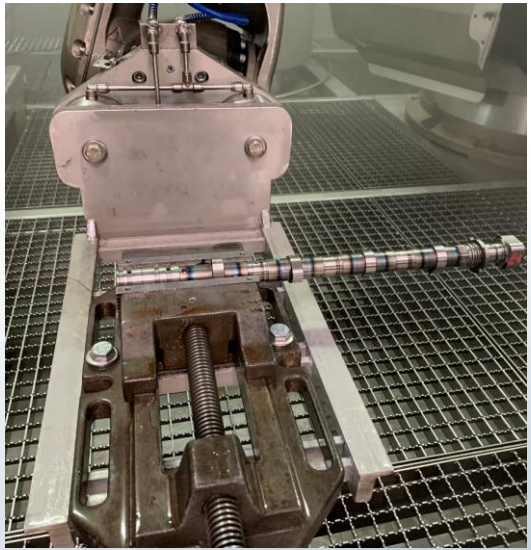
Standard spindle:

- Can be exactly adjusted between 0° - 360°
- Rotation up to 2.000 rpm
- Easy tool exchange with 1 nut
- p < 1.000 bar (standard), 3.000 bar possible

HP revolver:

- Faster tool to tool time (< 1,5 s)
- V = 40 l/min, p < 800 bar
- Fast tool exchange with 1 nut
- 4 tools

Part handling

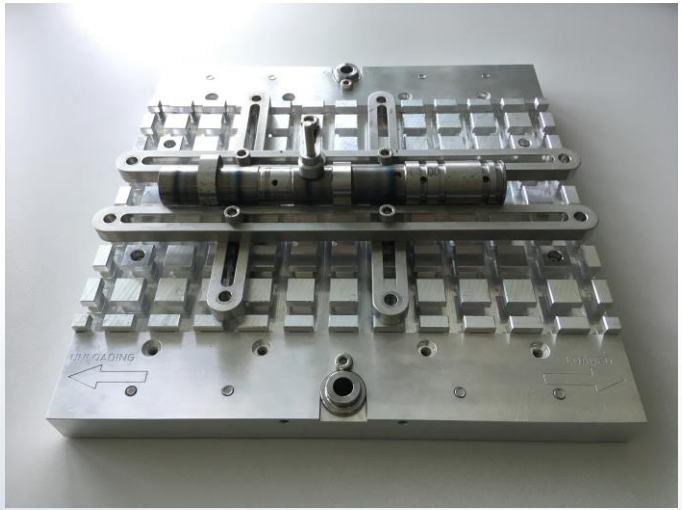
Gripping for treatment of deep blind hole and outer surface	Gripping for treatment of blind holes around center of the shaft at the opposite side
	

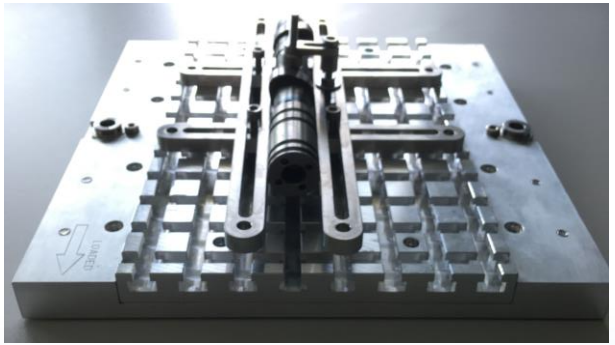
Part view

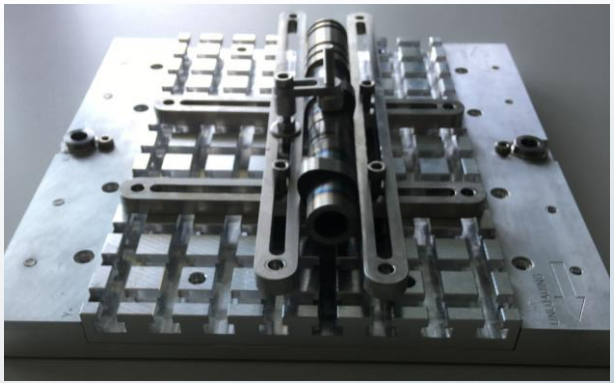
Deep blind hole
Last intersection at 320 mm

4 blind holes arranged around the cam shaft center

Trial pallet



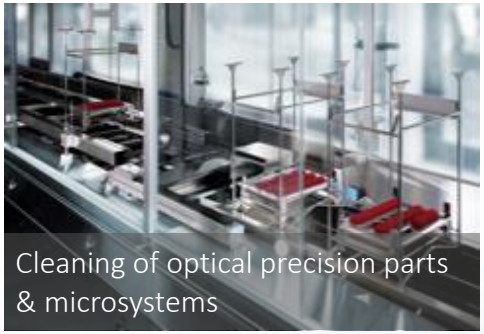




Video EcoCvelox with cut in half part

CLEANING TECHNOLOGIES
FINE CLEANING- UCM AG

- Designed for cleaning process in clean room
- (smooth) part movement possible
- All treatment modes possible
- Cleaning process integrated in production line



Cleaning of optical precision parts & microsystems

Cleaning of mechanical precision parts

Cleaning of medical components

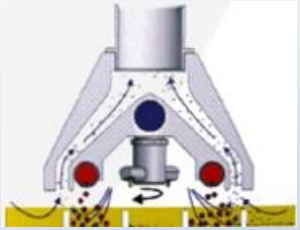
Cleaning before PVD/CVD coating

CLEANING INDUSTRIAL
FINE CLEANING- UCM AG

UCM develops and markets products, systems and service solutions for fine and ultra-fine (<1 Micron) cleaning processes with aqueous multi-stage ultrasonic cleaning lines

CHANGING WORLD
TYPE OF SOLUTION A FUNCTION OF THE CONTAMINATION

Powder	Cutting of substrate	Surface finishing	Cleaning	Heat Treatment
Vacuum Vibration Air blowing (Powder recovery)	Sawing off support structures	Blasting Vibratory Finishing Coating	Dry or wet	Tempering Annealing



Evtl. unter Schutzgas

CHANGING WORLD
SELECTIVE CLEANING - ECOCAIR

EcoCair Cleaning of complex 3D printed parts

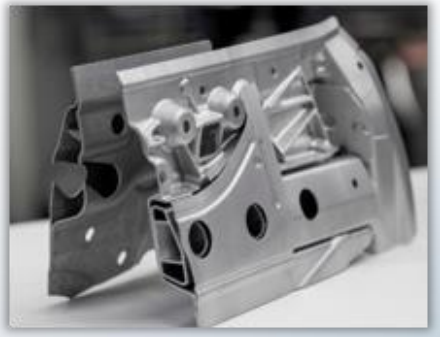
3D-printed parts:

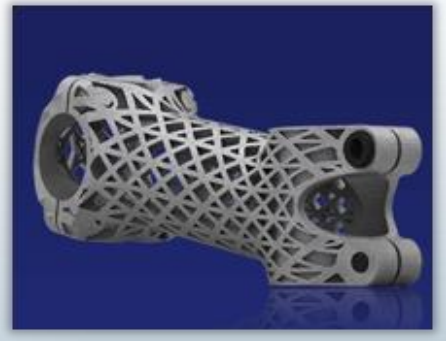
Cleaning of complex 3D printed parts

Dry cleaning required to avoid stacking of wet powder inside hollow spaces – powder recovery

Cleanliness requirement: max. particle < 75 µm

Subsequent wet cleaning as single part or in batches required





CHANGING WORLD
SELECTIVE CLEANING - ECOCAIR

EcoCair Cleaning of assembled E-Motors

E-Motors for E-Bikes:

Cleaning of assembled E-Motor prior to close sealing cap

Cleanliness requirement: max particle size < 500 µm

Cycle time 7,6 sec (twin pitch)

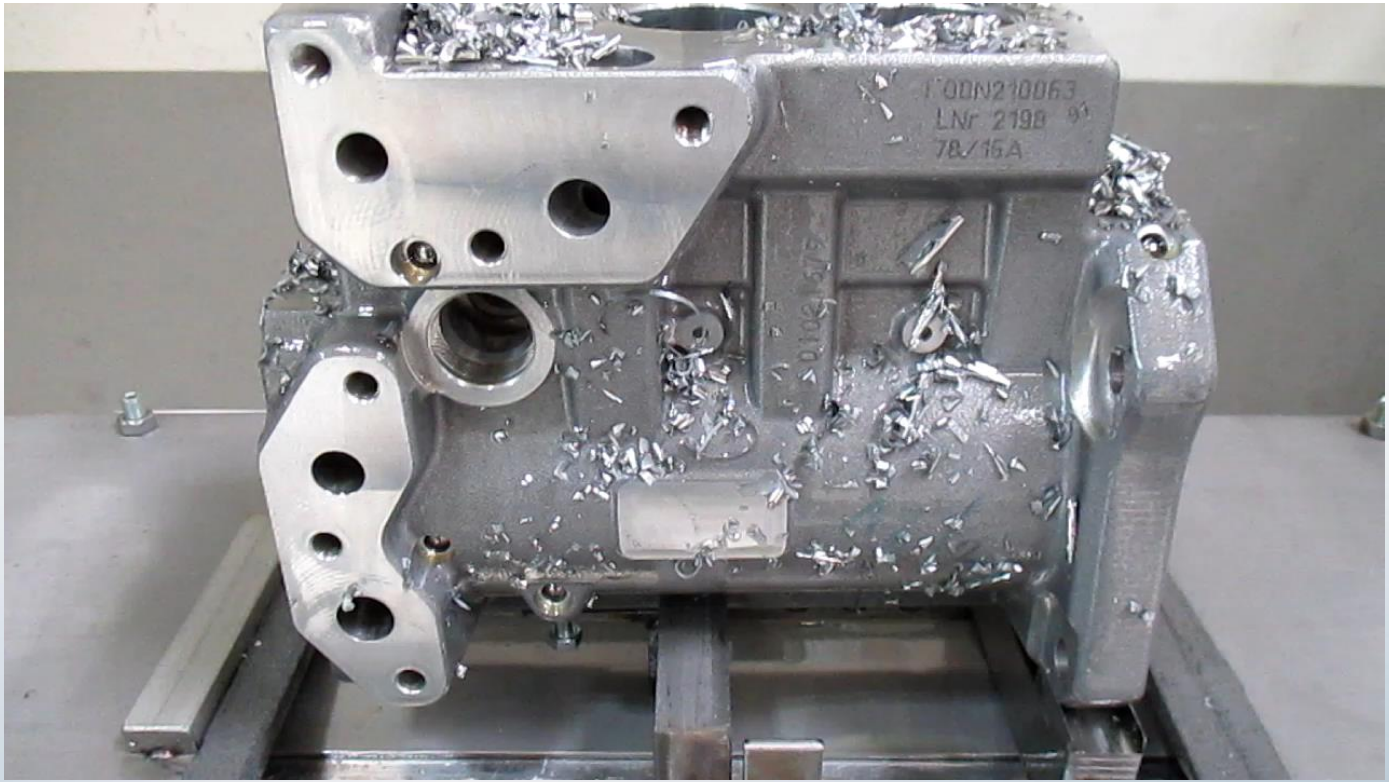
ANCILLARY EXAMPLES- VACUUM CHAMBER PART DRYING

EcoCvac

Advantages

- Short process time of 1.5 – 3.0 sec
- Lower maintenance cost due to the fact that the process chamber cleans itself during each cycle
- Higher process stability
- High availability
- Low risk of recontamination because of guided extraction of chips and coolant
- Separation of chips and liquid contamination
- No aerosol contaminated exhaust air
- approx. 50 % more energy efficient than compressed air cleaning at equal investment costs

ANCILLARY EXAMPLES- ECOCVAC CHIP REMOVAL

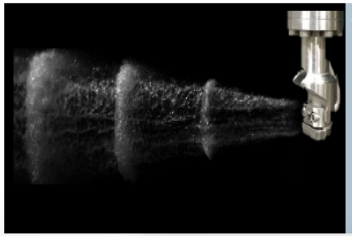


CHANGING WORLD
PART TREATMENT AND ACTIVATING

Technologies and Processes

Activation prior to thermal coating and de-coating by means of medium-pressure water

- Unique surface topography provides very good adhesion of protective coatings
- Energy consumption reduced by 50%
- Process medium (water) is run in a closed circuit
- No masking of parts required



Technological Features

-Pulsating medium pressure, water jetting technology (up to 850 bar add on ultrasonic)-

- Roughening from 1 µm up to several mm
- Highest adhesive pull strenght
- Wide range of substrate materials
- Closed loop of process fluid
- No abrasives in process media

PulseBoreCenter with EcoCbooster

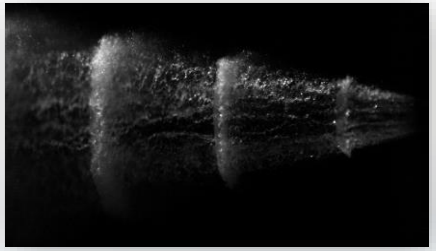
ECOCLEAN

CHANGING WORLD
SELECTIVE CLEANING - ECOCBOOSTER

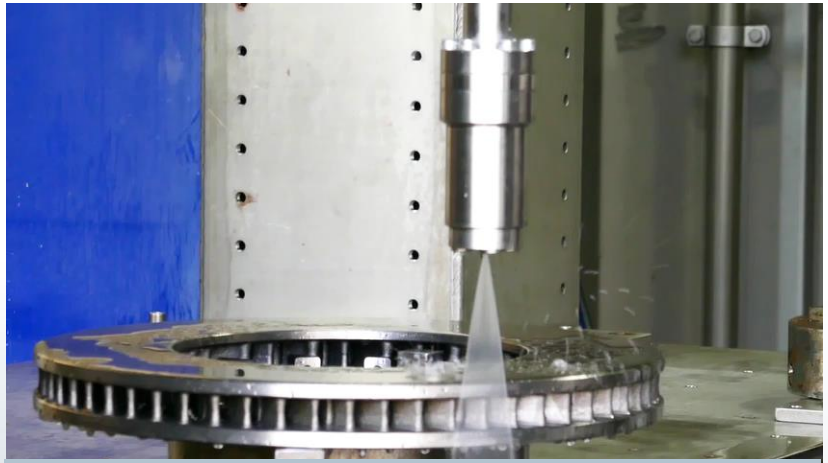
Weld cleaning prior to cathodic dip painting (CDP) – Substitute for ceramic blasting
Roughening surfaces of aluminium structural parts before adhesive bonding

Weld seam after cleaning

20,000 pulses per sec



CHANGING WORLD
SELECTIVE CLEANING - ECOCBOOSTER

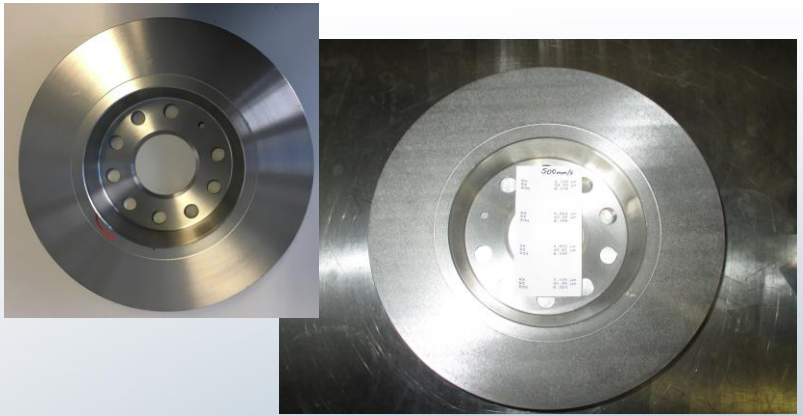


Surface activating of brake discs prior to coating

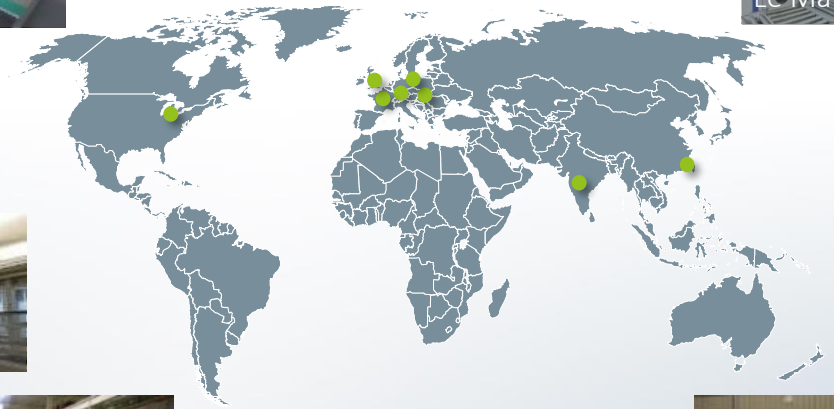
Electrically powered vehicles require brake rotors with superior anticorrosion properties. Cutting ambient levels of fine particulates requires less brake rotor wear.
→ Coating of brake rotors

Brake discs: roughening of surfaces prior to coating of brake discs

Brake discs: elimination of oxide in substrate of casted brake discs prior to coating (corrosion protection)



SBS ECOCLEAN GROUP TECHNOLOGY CENTERS



SBS ECOCLEAN GROUP
NORTH AMERICAN TEST LAB

ECOCLEAN

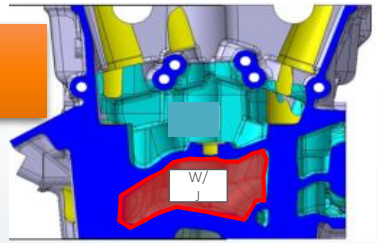
ECOCAGILE TEST CELL- (VALIDATION) SOUTHFIELD MICHIGAN

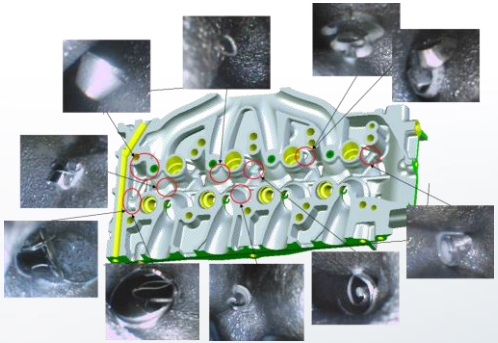
EXAMPLES OF TEST RESULTS

Water Jacket Effectiveness

Cylinder Head Water Jackets are top area for Chip Remains

Internal Location:
Limited access for flushing





Complex Geometry:
Many chip traps

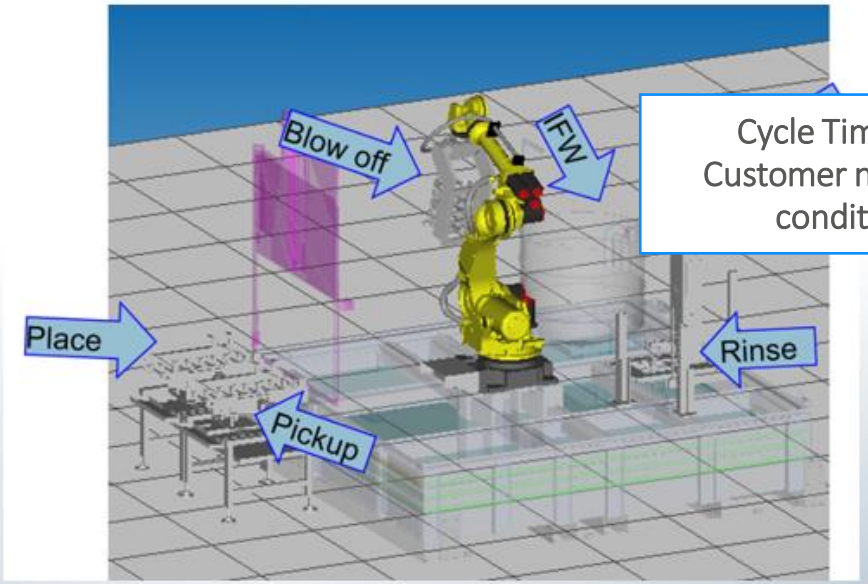
Sand Cast:
High Static Friction

Deep Cavities:
Difficult to flush

ECOCLEAN

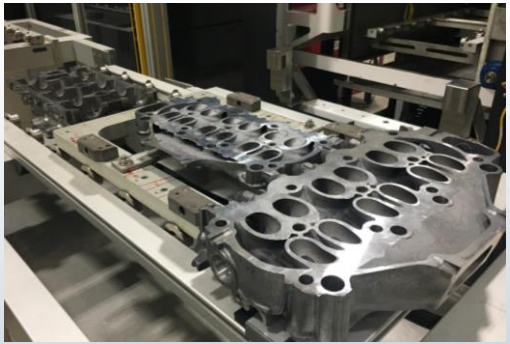
Lab Machine Configuration

Washer Layout



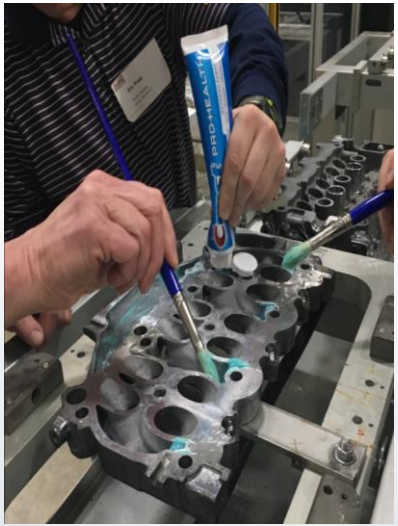
Cycle Times Per Customer notes and conditions

Cross Cut Sections before Assembly

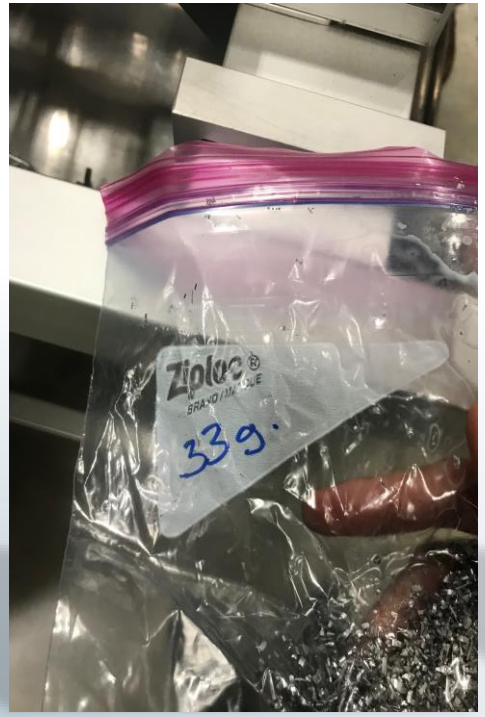


Test Methodology

Customer Supplied Chips and Types	Toothpaste Tests (Types Matter)	Re-assembly And mounting	Visual and Lab Testing



33g loading to various part trials…before and after…IFW and Nozzle tests only



Tooth paste loading to various part and surface trials…before and after…
IFW and Nozzle tests only

33g loading larger machining chips to various part trials…before and after…IFW and Nozzle tests only

250g loading larger machining chips to various part trials…before and after…IFW and Nozzle tests only Cam Cap Removed- worse case loading levels

THANK YOU PRIORATIZING YOUR TIME TODAY AND FOR YOUR PARTICIPATION!

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technology that inspires