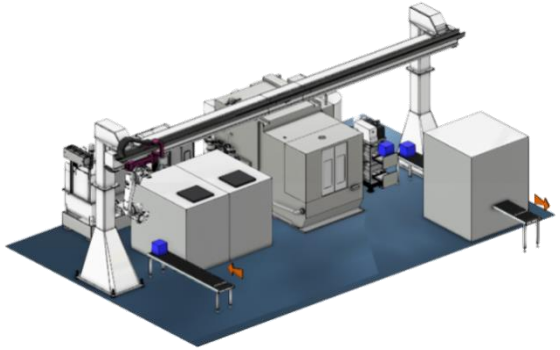
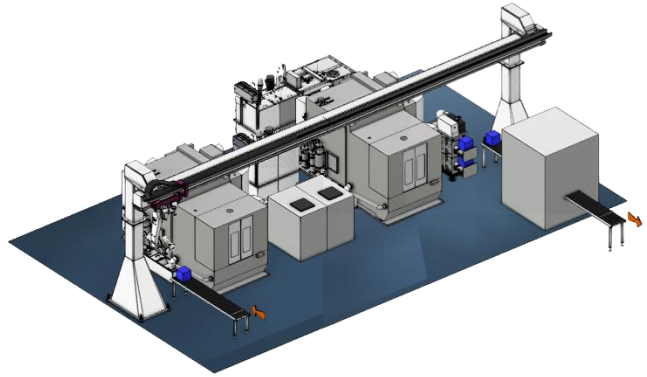


# Piller Entgrattechnik GmbH

## HIGH PRESSURE TECHNOLOGY - DEBURRING AND CLEANING WITH HIGH PRESSURE



# Piller Entgrattechnik GmbH – The Deburring Company

## HQ: Ditzingen - Germany

- Founded in 1995
- 3.000 sqm manufacturing space
- 1.000 sqm deburring – parts cleaning center
- R&D laboratory
- Customer Competency Center
- After Sales Service
- 100 employees

## International

- Piller Gépézeti Kft. (Ungarn)
- Sales partners Int. (USA, Kanada, China, Mexiko, …)
- Sales partners EU (Spanien, Italien, Frankreich, …)

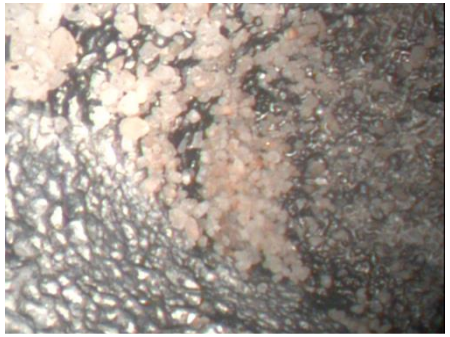
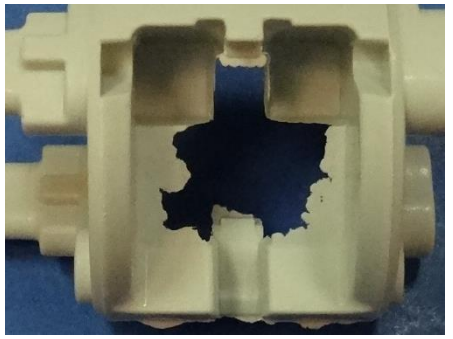
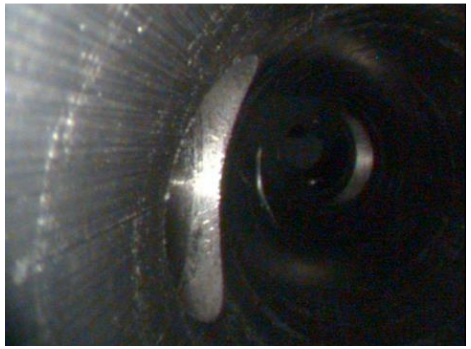
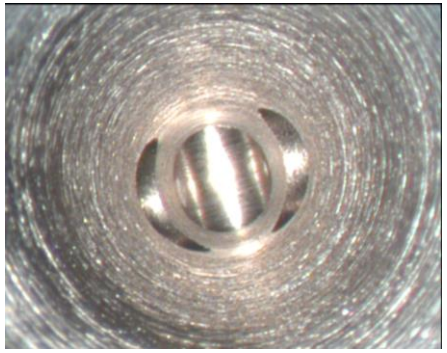
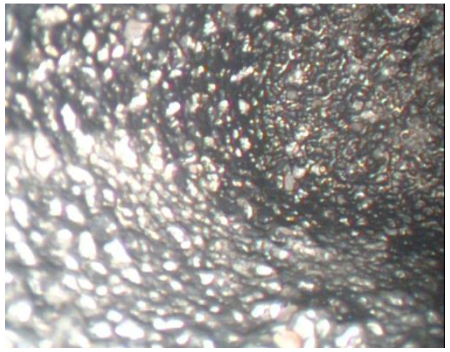
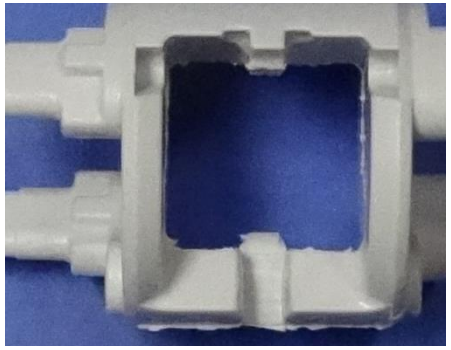
## Management

- Rouven Haag, GM CTO
- Rolf Nick, GM CSO

# International Markets

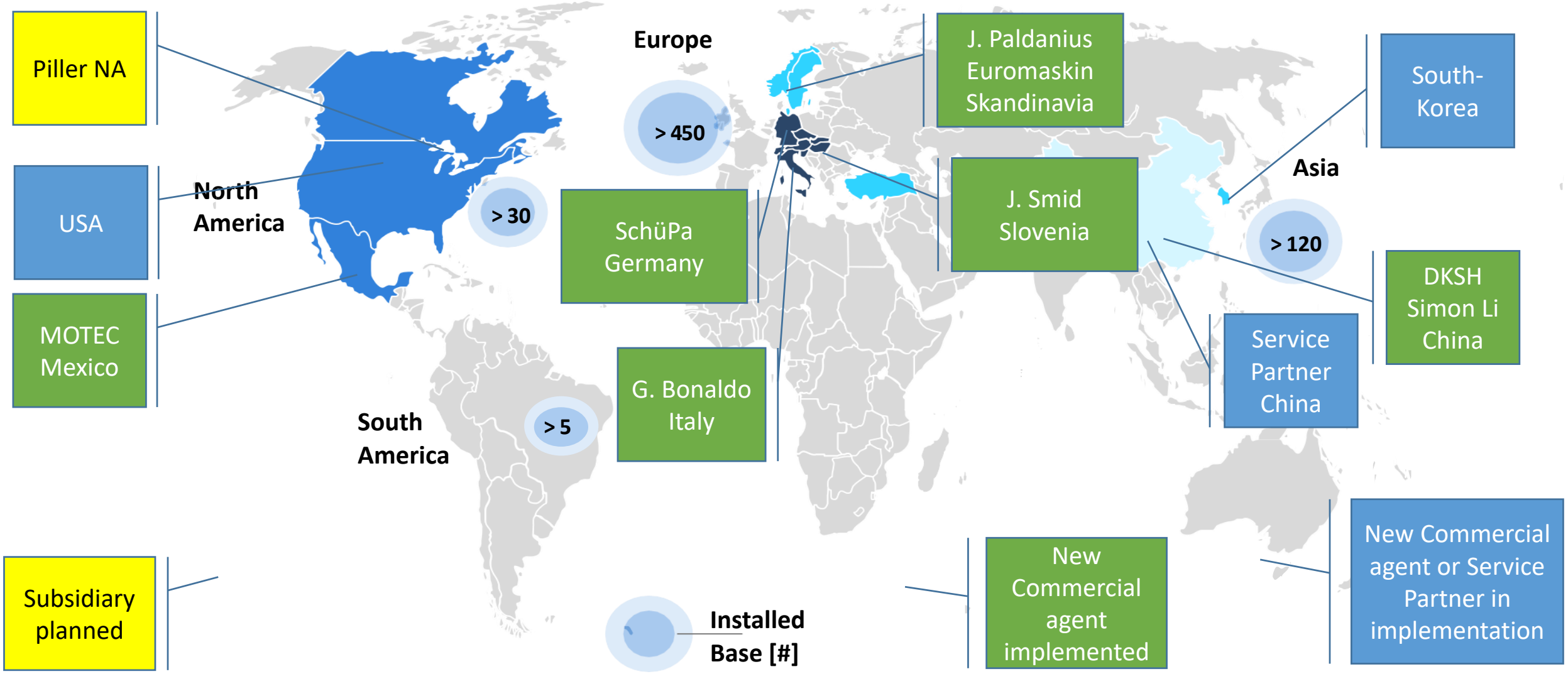



# Typical applications: High pressure deburring - and cleaning

| | burrs | chips | sand residuals | burrs at the parting line |
|---|---|---|---|---|
| **before** |  |  |  |  |
| **after** |  |  |  |  |

# Long-standing business relationships with many well-known customers

# International Lineup – Installed Bases

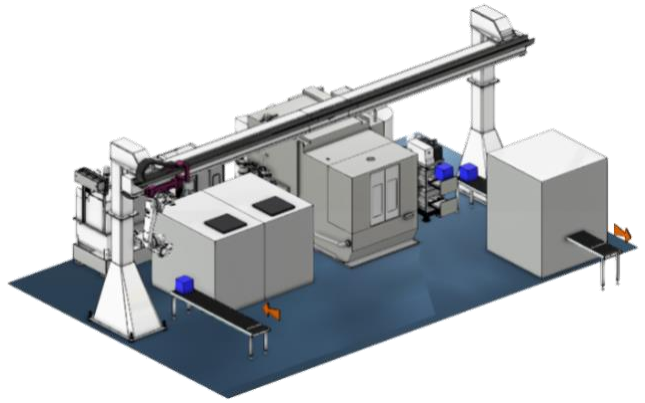


# The unique Piller approach and product strategy

**CNC High Pressure Deburring with highest precision and velocity**

combined with our

**proprietary innovative CNC Cleaning Approach**



| Quantities/variant flexability | Pre-cleaning | Ultrasonic work piece conditioning | HP-Deburring/-Fine-cleaning Flushing/Pre-drying | Drying | |
|---|---|---|---|---|---|
| Quantities low to high at maximum flexibility | Model:<br>- Single chamber<br>- Double chamber<br>- Pass through system | Model:<br>- Single chamber<br>- Double chamber | Model:<br>- VJ III Clean (low pressure only)<br>- VJ III (high pressure only)<br>- VJ III HD Clean<br>- VJ III Plus (2 CNC-axis systems) | Model:<br>- Single chamber<br>- Double chamber<br>- Drawer type<br>- Double drawer type | Model:<br>- Pass through system |
| Criteria | high chip- or oil defilement | highest residual dirt requirements | | Can be replaced by blowing off if necessary | |

based on our

**new modular Piller System Concept**

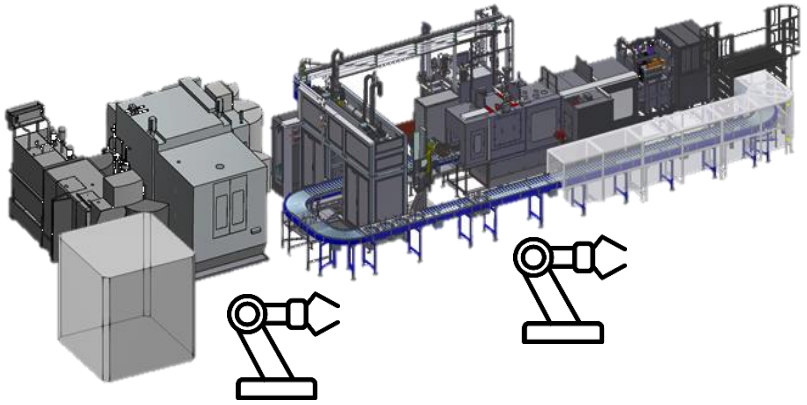
delivers

**highly competitive results at lowest TCO**

# State of the art: Overall process projects require complex, interlinked large-scale systems. New approaches in cleaning technology are desirable!

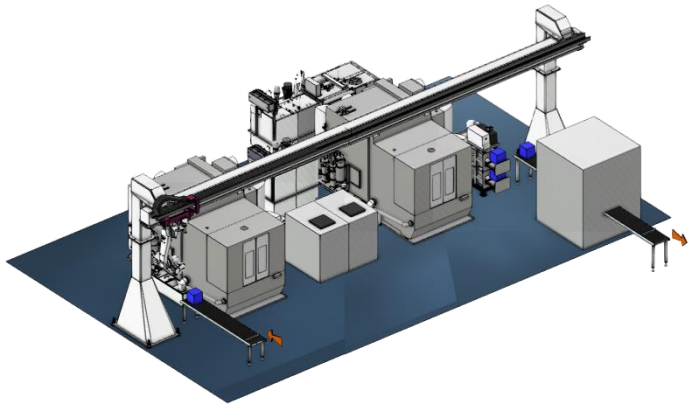
Pre-cleaning | HP-deburring | Fine-cleaning | Rinsing | Blow-off | Vacuum-drying

***Conventional Piller lines***



Combination of
- Piller HP-CNC machining center
- Project specific conveyor systems
- Special solutions

***New modular Piller line***



Combination of:
- units from Piller`s modular system
- Extensive adaptation options for specific customer requirements

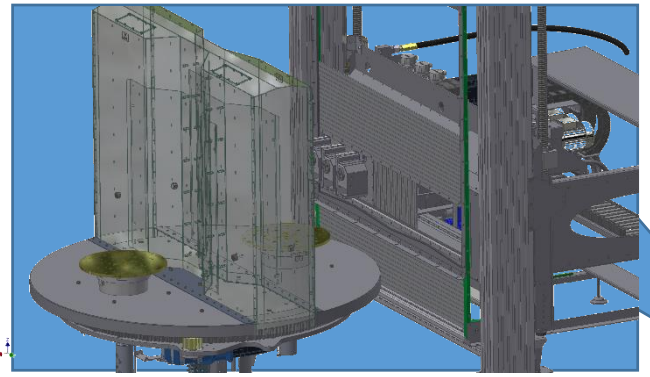
**Customer`s advantages**

- Reduced investment
- Output increase
- Reduced energy consumption
- Reduction of foot print
- Reduced control / automation installation
- High-flexibility of the complete system
  - High variety of variants possible
  - High reuseability
- TCO-reduction due to our modular system
  - Mature and durable technology
  - Ease of spare parts supply
  - High reuseability
  - Reduced amount of training

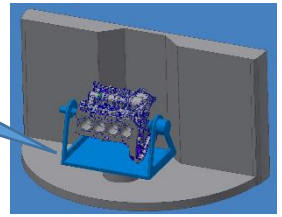
# The redesigned VJ III machining center offers maximum velocity, flexibility, precision and efficiency for process management and the basis for HP Fine-cleaning

Pre-cleaning | CNC HP-deburring | Fine-cleaning | Rinsing | Blow-off | Vacuum-drying

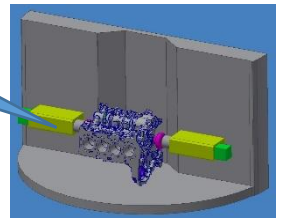
***New VJ III HD Clean***



Crankcase Alt I
- B-Axis
- Fixture pivoting



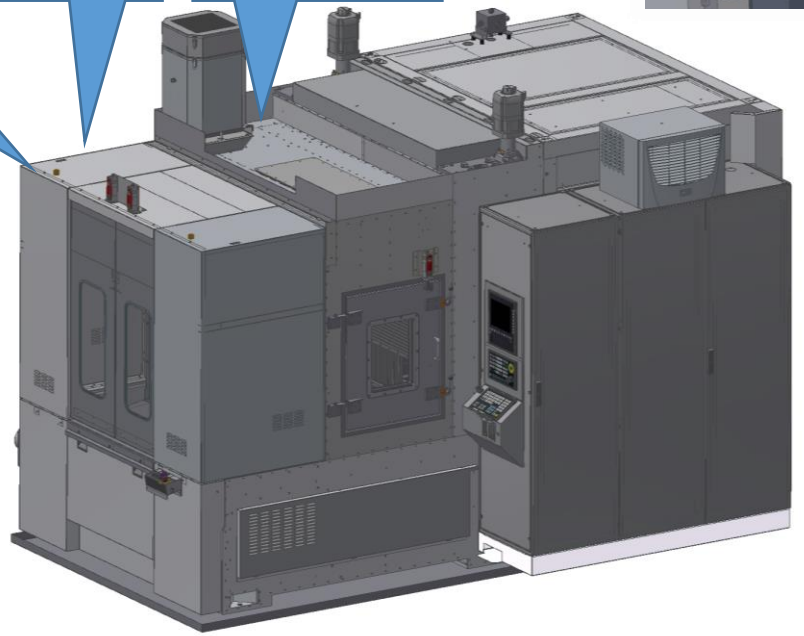
Crankcase Alt II
- A-Axis



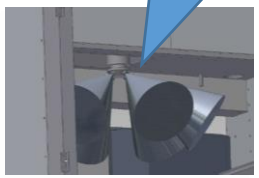
**Process integration (2nd work chamber)**
- ✓ CNC controlled (B-axis)
- ✓ Integration of rinsing & pre-drying
- ✓ Optimized 2nd media loop

2nd work-chamber

HP work-chamber



Optional chamber rinsing



**Maximized tacttime utilization for HP**
- ✓ tripple Z-axis system
- ✓ Loading parall. to HP main time
- ✓ HP Deburring
- ✓ HP Fine-cleaning

**Carry over minimization**
- ✓ Spinning on B-axis
- ✓ Sloping down swivel table

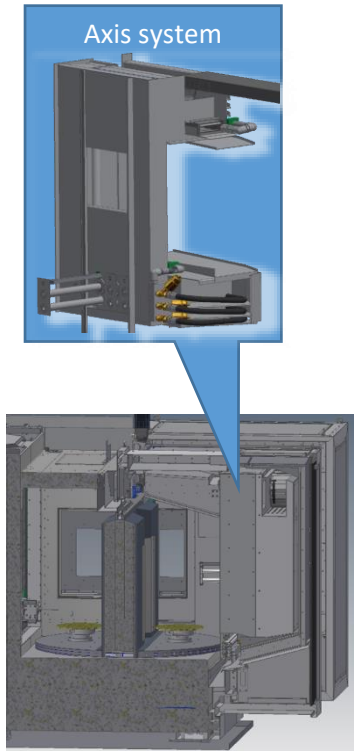
**Recontimination minimization**
- ✓ Chamber design
- ✓ Optional chamber cleaning

**Efficient pre-drying**
- ✓ Spinning on B-axis
- ✓ CNC impulse blowing

# The VJ III Plus complements the product family with maximum process freedom, the VJ III double-spindle machine with an even higher output

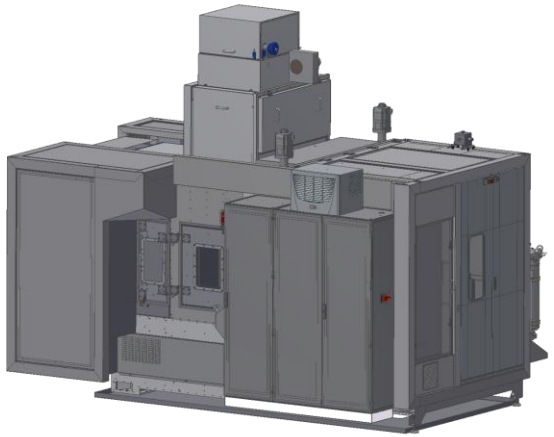
Pre-cleaning | CNC HP-deburring | Fine-cleaning | Rinsing | Blow-off | Vacuum-drying

## *New VJ III Plus*




**Maximum degree of process freedom**

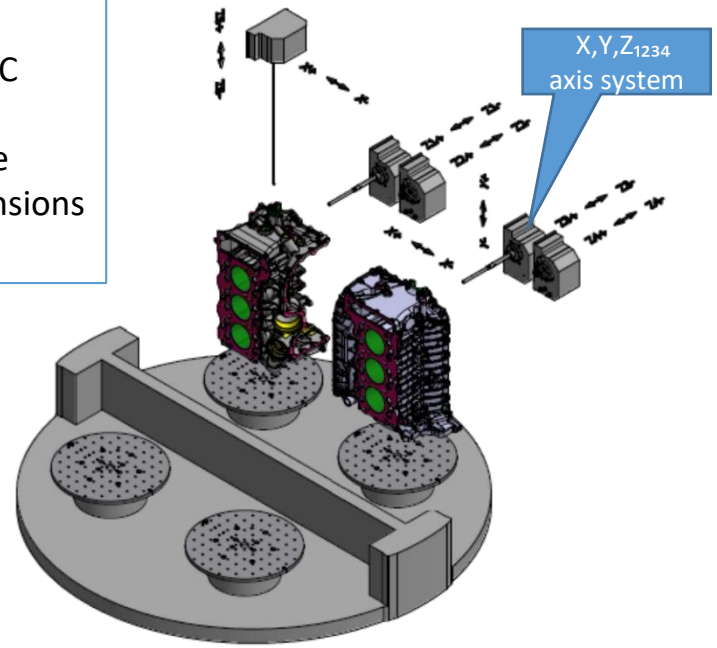
- ✓ Processing with max. precision in 2nd work chamber
- ✓ Complete drying by blow-off possible
- ✓ Blow-off predrying high complexity parts
- ✓ Integration of additional processes possible



## *New VJ III DS (Doppelspindel)*

**Maximum Output**

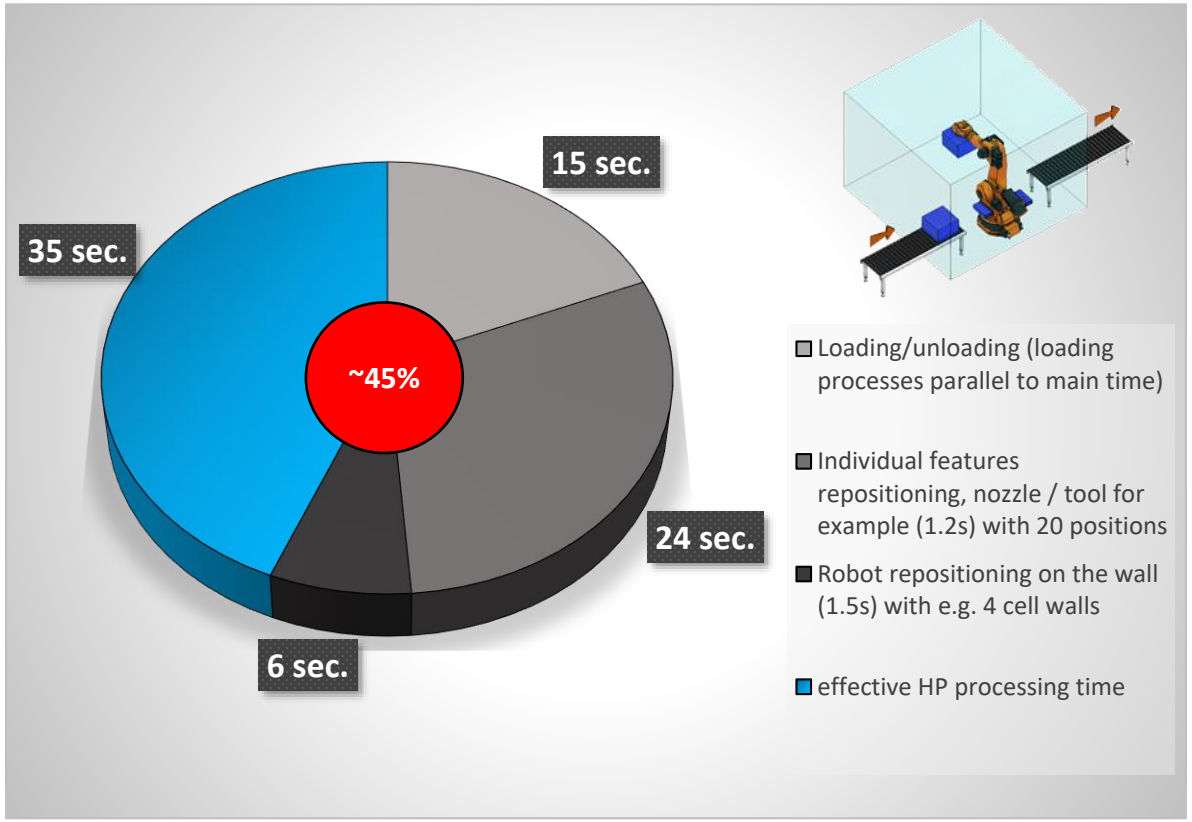
- ✓ Doubled process- or halved main time
- – Reduced number of CNC operated tools
- – 2x Z-axis per work piece
- – Max. work piece dimensions reduced



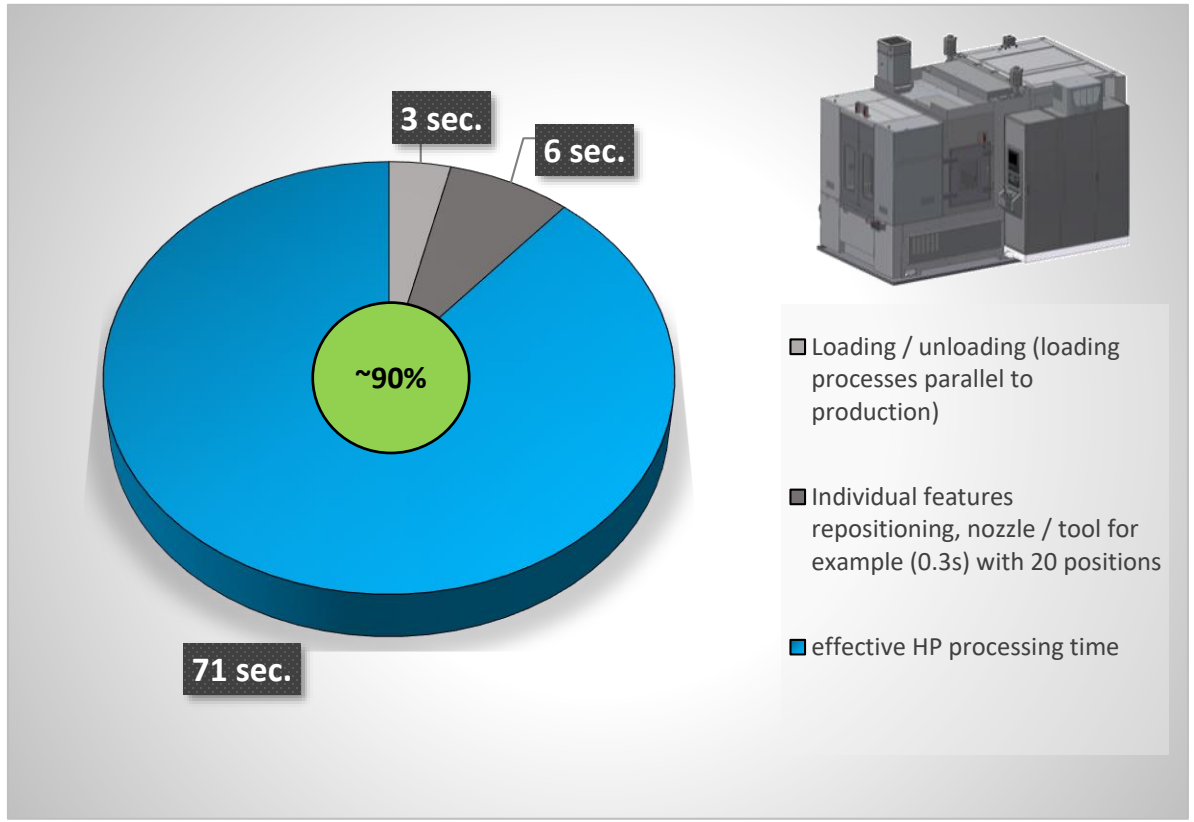
# Concept comparison - cycle time HP process (80s line cycle)
# The CNC concept and the change of parts parallel to main time create advantages

## HP Simulation: work piece with 20 features, 4 water tools in use

***HP robot cell***



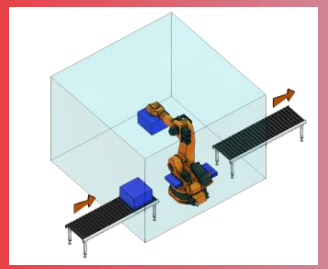

***PILLER VectorJet III HD***

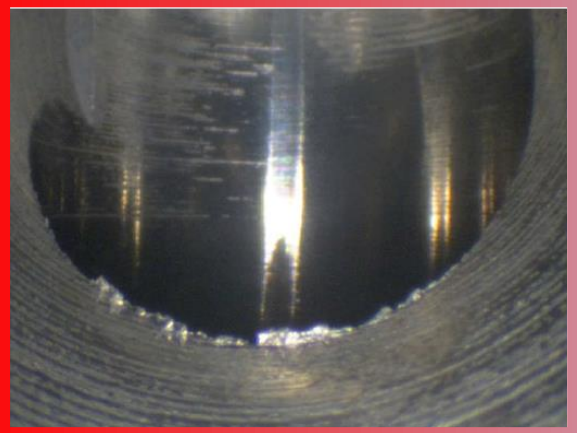


# Concept comparison – Piller CNC concept specific advantages in precision, flexibility and velocity of HP process allow for best deburring results

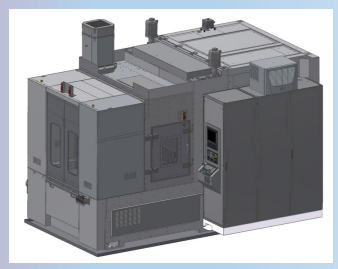
## Typical Deburring Results – intersecting bores

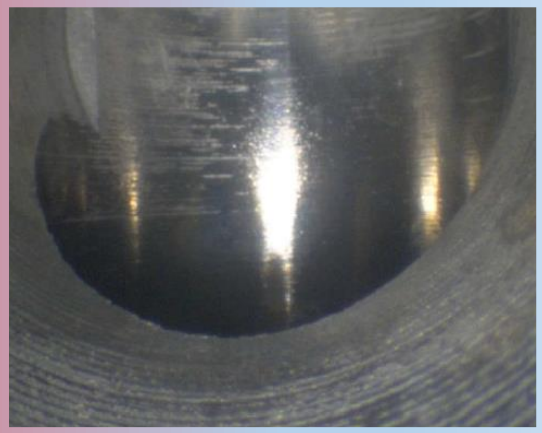
**HP robot cell**





**PILLER VJ III**





## Piller Advantages:

**Piller core competence**
**hp tool/process development**
- ✓ Distance tool to part
- ✓ Angle of water jet
- ✓ Pressure of water jet
- ✓ Volume of water jet

**Higher effective HP Process time**
- ✓ Lower feed rate
- ✓ Rotating lance vs. Full jet nozzle

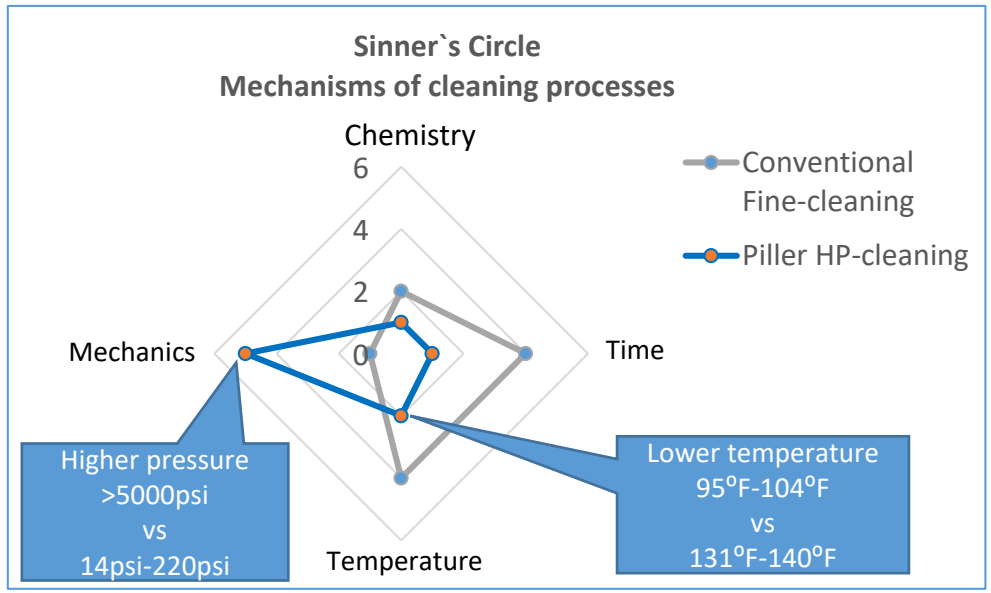
**Higher CNC precision**
- ✓ Dive into smaller bores
- ✓ Rotating lance

**Piller Tripple Z-Axis System**
- ✓ The right tool for each situation
- ✓ 0.3 sec. change over time

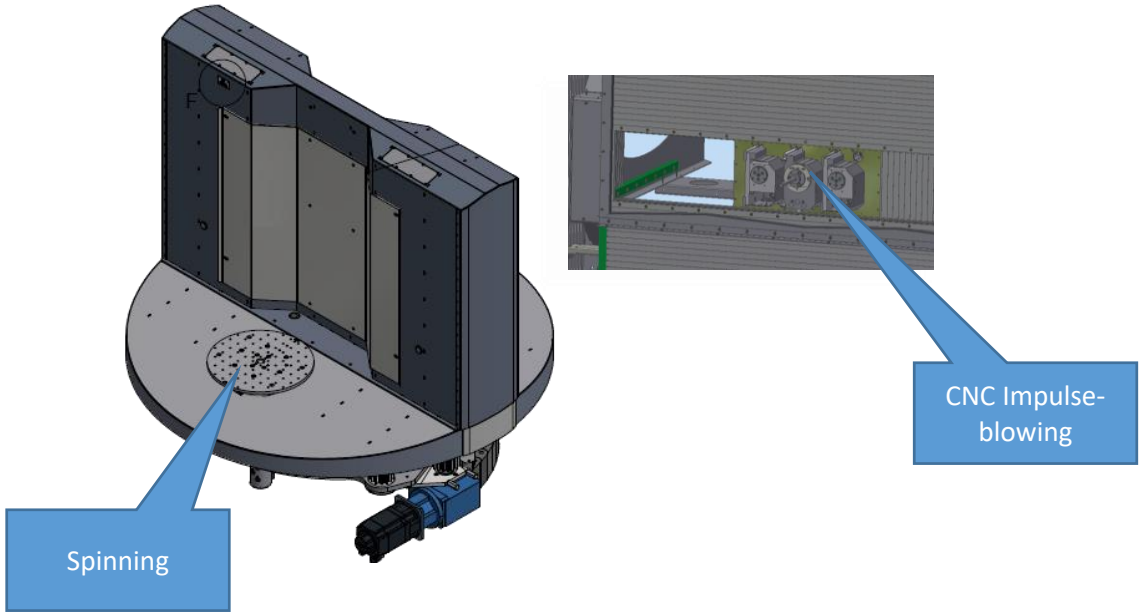
# The Piller CNC concept enables new approaches in cleaning technology. Efficient kinetic energy replaces high temperature in the cleaning and drying process

| | | | | | |
|---|---|---|---|---|---|
| Pre-cleaning | CNC HP-deburring | Fine-cleaning | Rinsing | Blow-off | Vacuum-drying |
| Pre-cleaning | CNC HP-deburring<br>CNC HP-cleaning | CNC<br>Rinsing | Impulse-blowing<br>Spinning | Vacuum-drying | |

## Unique Piller fine cleaning approach




## Pre Drying in a VJIII CNC Machine Center

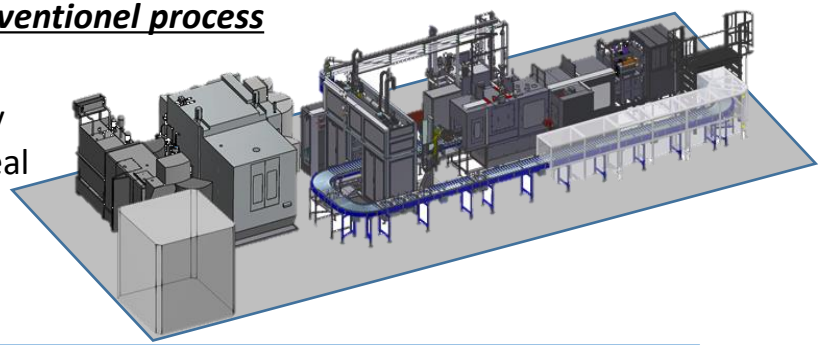


# Demanding specification: component conditioning with ultrasound (patent pending) prior to HP-cleaning improves cleanliness results by a whole class

Pre-cleaning Brushing → **Ultrasonic work piece conditioning** → HP-deburring HP-cleaning → CNC-Rinsing → Pre-drying → Vacuum drying

***Initial situation – conventionel process***

- Line tact of 130s
- Results are barely achieved with ideal maintenance



**Particle quantity in membran filter**

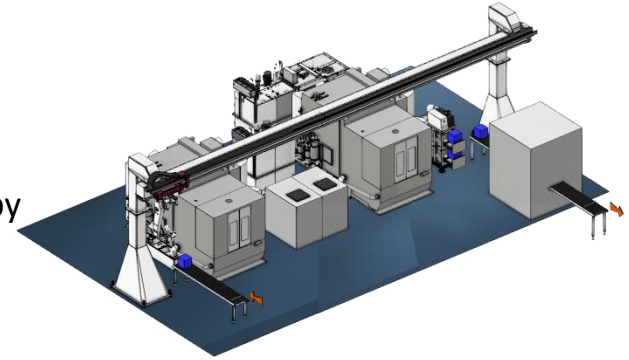
| Particle size (mm) | Code | Total | Metallic | Non-metallic |
|---|---|---|---|---|
| >1000 | K | 1 | 1 | 0 |
| 600 - 1000 | J | 1 | 0 | 1 |
| 400 - 600 | I | 10 | 7 | 3 |
| 200 - 400 | H | 73 | 41 | 32 |
| 150 - 200 | G | 180 | 99 | 81 |
| 100 - 150 | F | 667 | 323 | 344 |

Exceeder neccessary:

- 1 particle in the range of 1000 µm – 1500µm
- 2 particle in the range of 600 µm – 1000µm
- (surface of castings)

***Modular Piller Line***

- Line tact of 80s
- Ultrasonic work piece conditioning improves results by a whole class



**Particle quantity in membran filter**

| Particle size (mm) | Code | Total | Metallic | Non-metallic |
|---|---|---|---|---|
| >1000 | K | 0 | 0 | 0 |
| 600 - 1000 | J | 0 | 0 | 0 |
| 400 - 600 | I | 2 | 0 | 2 |
| 200 - 400 | H | 24 | 4 | 20 |
| 150 - 200 | G | 67 | 12 | 55 |
| 100 - 150 | F | 157 | 50 | 107 |

Specification can be met:

- Exceeders should commit to 400 µm – 600µm range
- A precise analysis of the work piece initial state and an optimized overall process is necessary

# Concept comparison - overall energy consumption is vastly reduced by the Piller HP fine-cleaning and CNC pre drying approach, keeping process temperature at approx. 100°F

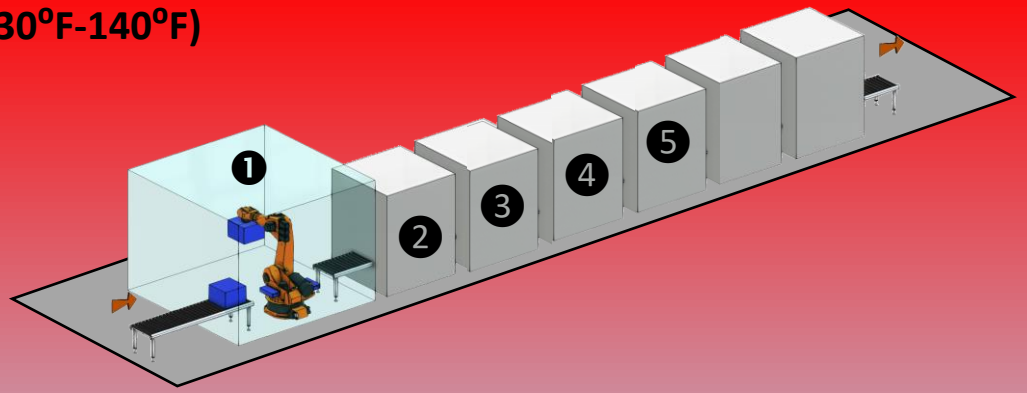
***Energy consumption - major drivers***

200%

**Part Cooling**
- Active cooling to ambient temperature

**Auxiliary heating of tank**
- Compensate 6%-8% evaporation rate
- Compensate heat capacity of parts

**Conventional fine cleaning (130°F-140°F)**
1. Pre wash & HP deburring
2. Fine-cleaning
3. Rinsing
4. Vacuum drying
5. Active cooling tunnel



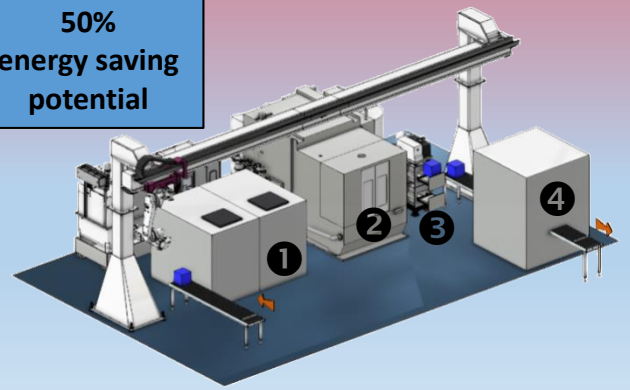

100%

**HP Process**

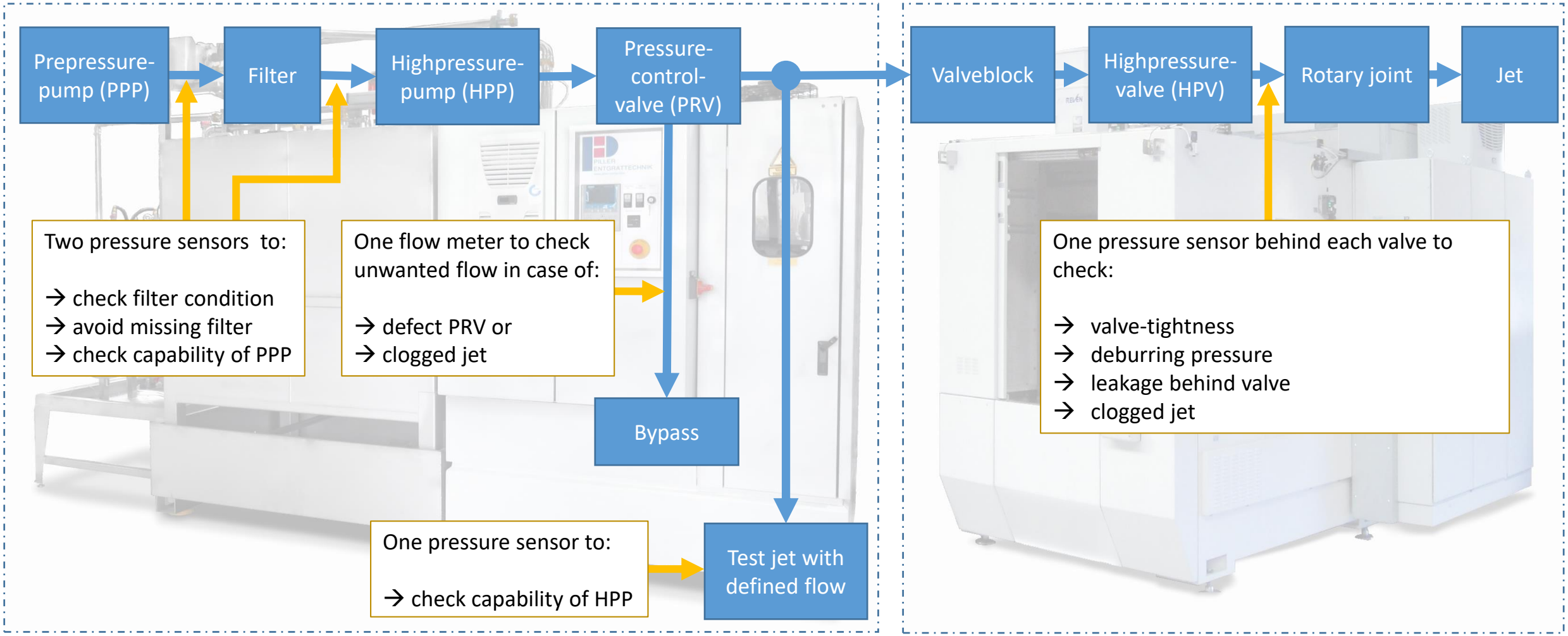
**Piller Concept (95°F-104°F)**
1. Pre wash (ambient temperature)
2. HP deburring, fine-cleaning, rinsing
3. Vacuum drying
4. Passive tempering tunnel

**Piller wasteheat recovery**
- Compensate <1% evaporation rate
- Compensate heat capacity of parts

**50% energy saving potential**



# Process reliability




pressure unit

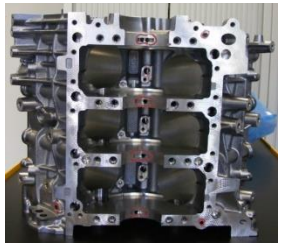
work unit

# The longtime customer satisfaction and service life of our Piller machine line up is demonstrated by the timespan of running projects and our shop floor for contract deburring services

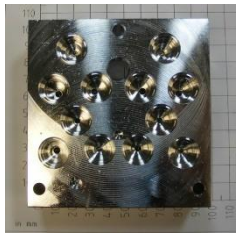
## Examples of OEM longtime projects - three-shift operation (24/7)

Main brake cylinder
WSA 10
since 1999

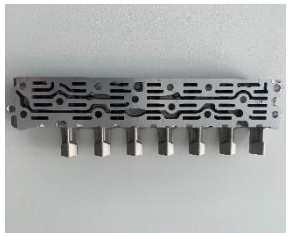
Motor block
VectorJetIII
since 2005



ABS valve block
RoboJet
since 2004



Valve plate gear
RoboJet Twin
since 2011



## Machines used for our contract deburring services

| Typ and # | in use since | Runtime 24/7 |
|---|---|---|
| 2 x VectorJet II | 2000 | x |
| VectorJet II | 2001 | x |
| VectorJet II | 2002 | x |
| MulitJet | 2003 | x |
| MulitJet | 2004 | x |
| VectorJet III | 2009 | x |
| VectorJet II | 2013 | x |
| VectorJet III | 2016 | x |

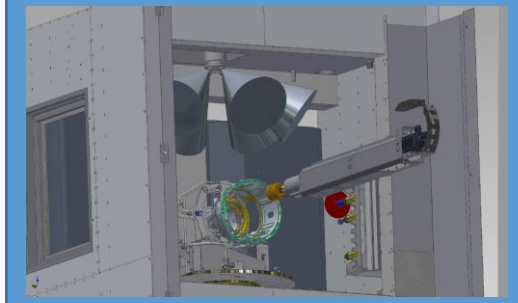
**Over 90% of our equipment delivered since the company was founded is still in operation - Key factors**

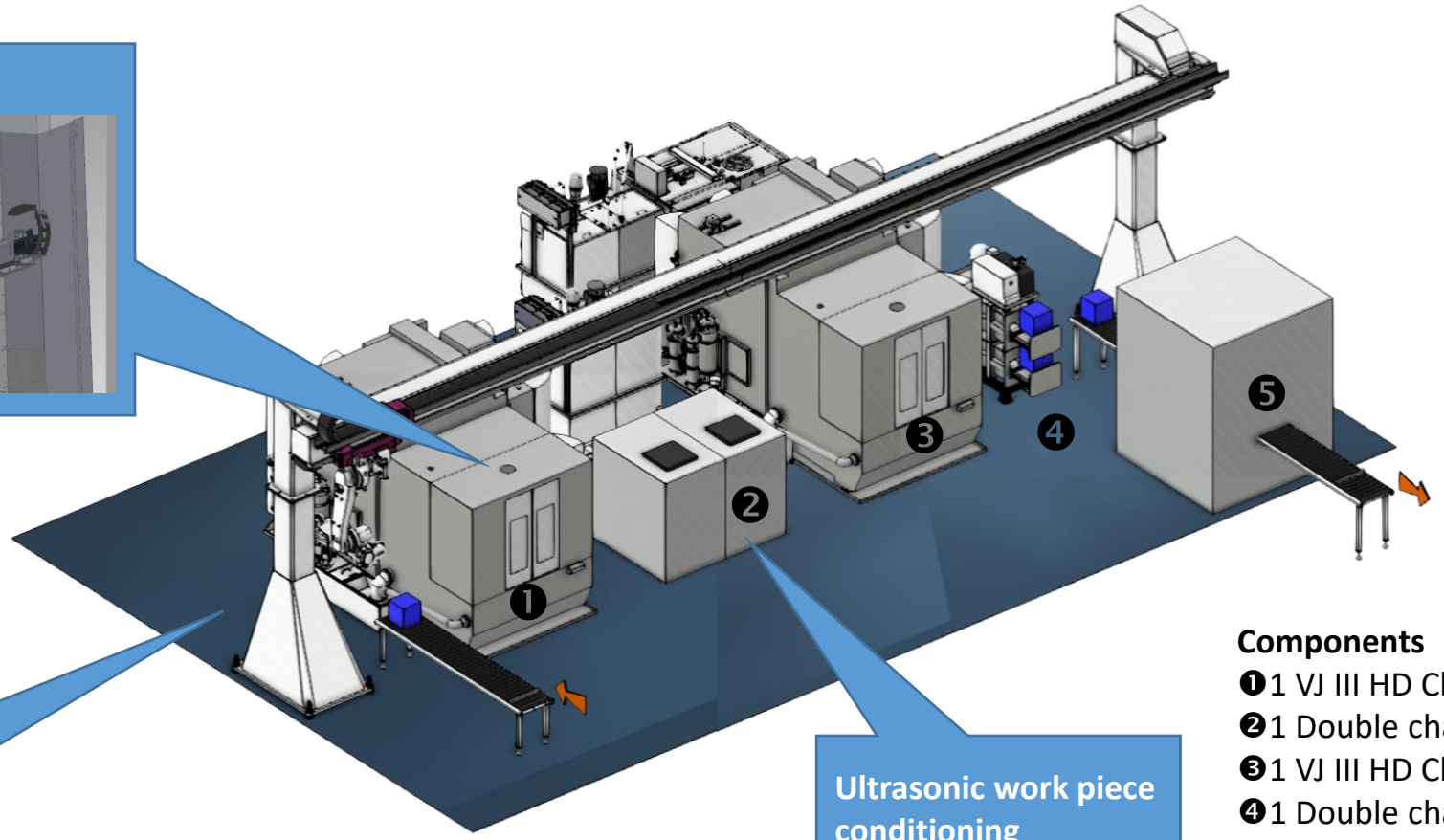
- Machine design for long service life and best in class results
- A high level of service and training that we provide for our customers
- Machine versatility for reuse scenarios

# Example configuration of modular system for a gear housing

Pre-cleaning Brushing → Ultrasonic work piece conditioning → HP-deburring HP-cleaning → CNC-Rinsing → Pre-drying → Vacuum drying

**CNC Brushing**





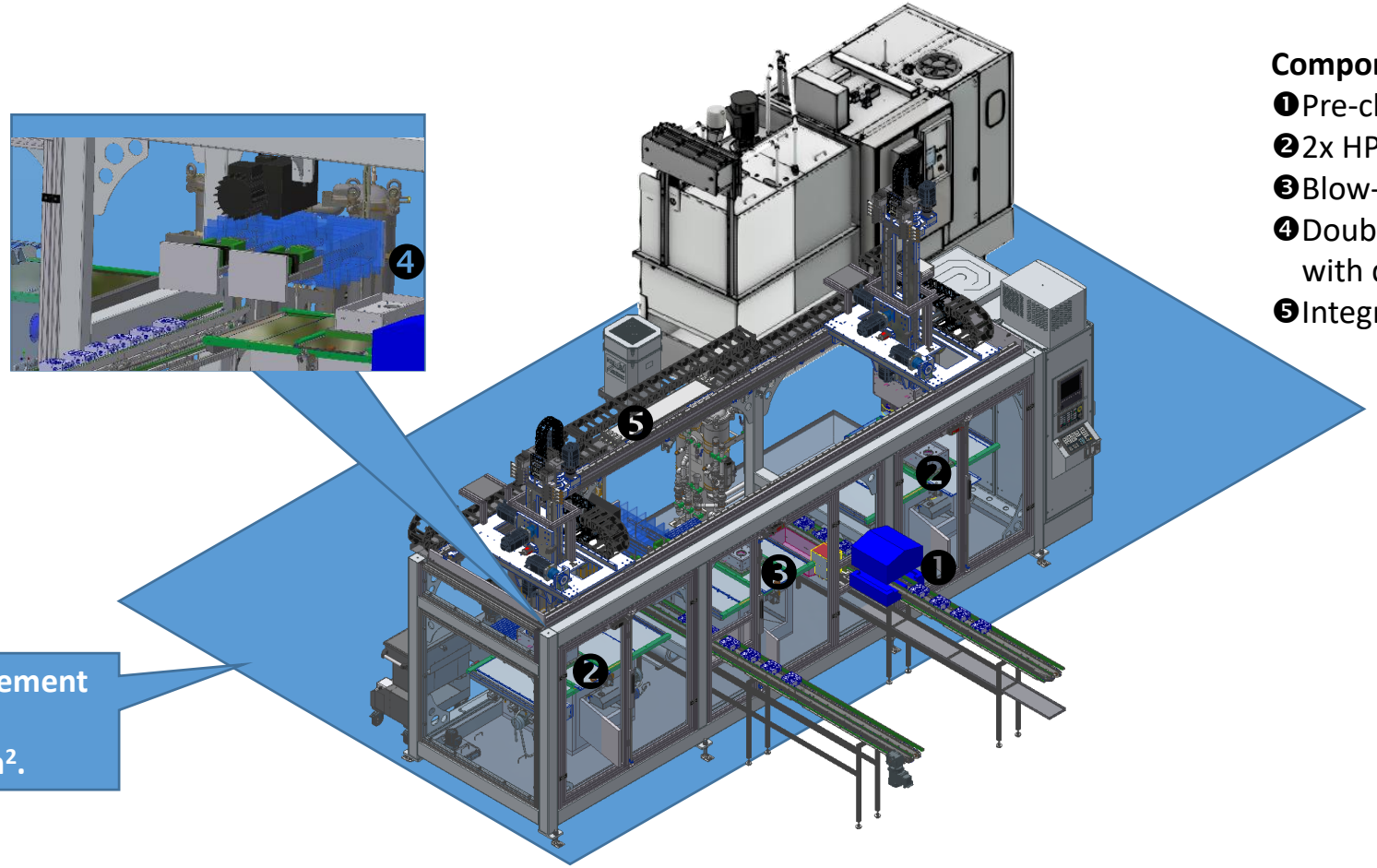

**Space requirements**
**16m x 7m**
**approx. 120 sqm**

**Ultrasonic work piece conditioning**

**Components**
❶1 VJ III HD Clean + Brush package
❷1 Double chamber Ultrasonic unit
❸1 VJ III HD Clean
❹1 Double chamber vacuum dryer
❺1 Tempering section (passive)

# Example configuration of modular system for next generation braking systems

Pre-cleaning | HP-deburring HP-cleaning | CNC-Rinsing | Pre-drying | Vacuum-drying




**Components**

❶Pre-cleaning unit (bell type)
❷2x HP- & Rinsing work chambers
❸Blow-off chamber
❹Double chamber vacuum dryer with drawer
❺Integrated automation

**Space requirement 8m x 8m approx. 64 m².**

# The advantages of Piller`s CNC HP-deburring- and cleaning process for all customer`s demands

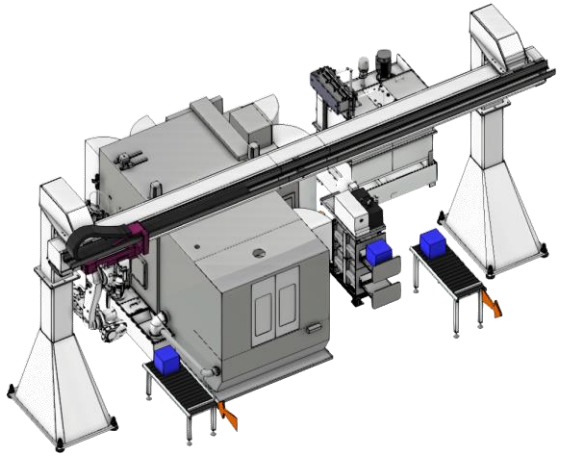
Pre-cleaning | HP-deburring | Fine-cleaning | DI-water rinsing | Pre-drying | Vacuum-drying

## Best-in-class cycle times

- CNC axes with high positioning feed
- VJ III: due to 3x Z-axis tool change 0,3s
- VJ III: due to swivel table parts exchange 2,5s
- MJ: rotary indexing system
- RJ Twin: double chamber principle, parts exchange <0,1s (switchover time of chambers)

## Lowest TCO-cost

- Low temperature HP-cleaning concept
- CNC pre-drying: spinning & Impulse blowing
- Pressure drop  optimized media routing
- Longlife components
- Low space requirement
- Cost-optimal service: Accessability and robust design
- Own developed HP-valves: low-wear und regenerable



## Full process integration

- Plus Family: pre-washing, high-pressure, fine-washing, DI-water rinsing, vacuum-drying
- HP-prozess remains decisive for the cycle time
- All advanteges of Piller`s CNC concept are provided in the overall process chain

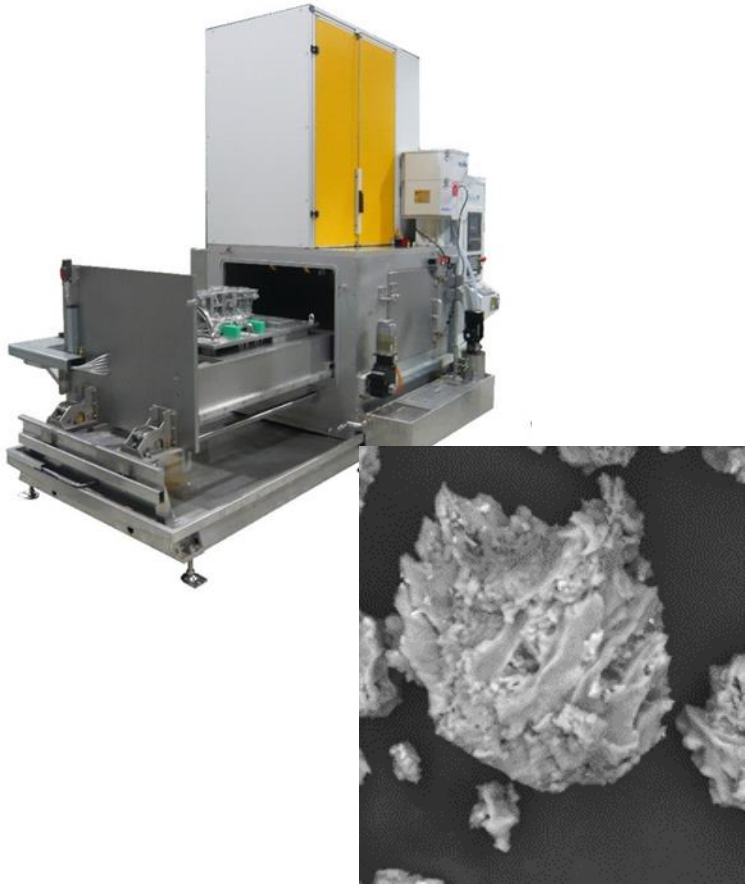
## Advantages due to flexibility

- Six side operations available by using a 5-axis approach in one clamping position
- Quickly convertible (also avail. in automated set-ups)
- Very economical even with small batches
- High reconfigurability
- Standard CNC-programming  instead of complexe teaching

## Highest available process quality

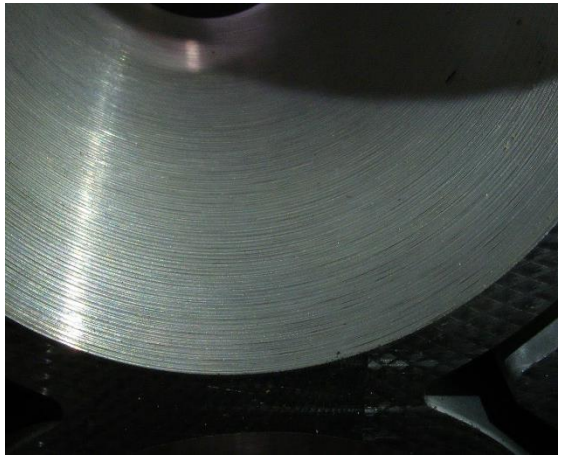
- CNC HP-deburring, -cleaning and CNC pre-drying
- Own experience as user: 24/7 inhouse subcontracting
- Optimized filter cascade unit
- Top notch pump technology and own developed HP-valves with very low pressure drop
- Self cleaning small chambers to avoid  re-contamination
- Carry-over optimized (spinning)
- Ergonomic and intuitive operation
- Highest level of work safety

# We develop machine concepts und innovative processes for new application



µ sized particles are removed out of the metall surface structure. The conditioned coarse and inhomogen surface is ideally suited for hard coating surface treatmentents.

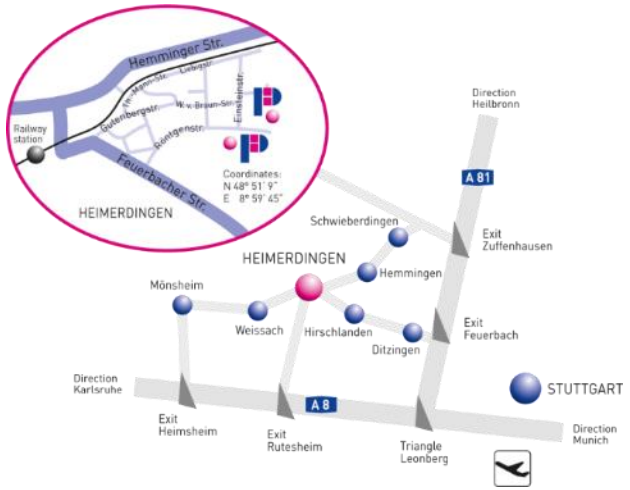
Pre high pressure treatment
Machined surface



Post Piller high pressure treatment
Ready for hard coating

Competition
pre treatment

# How to find us

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**Thank you for your time**
**and your interest!**