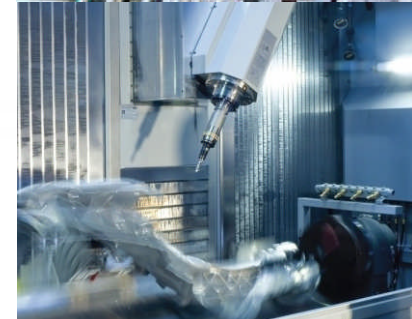
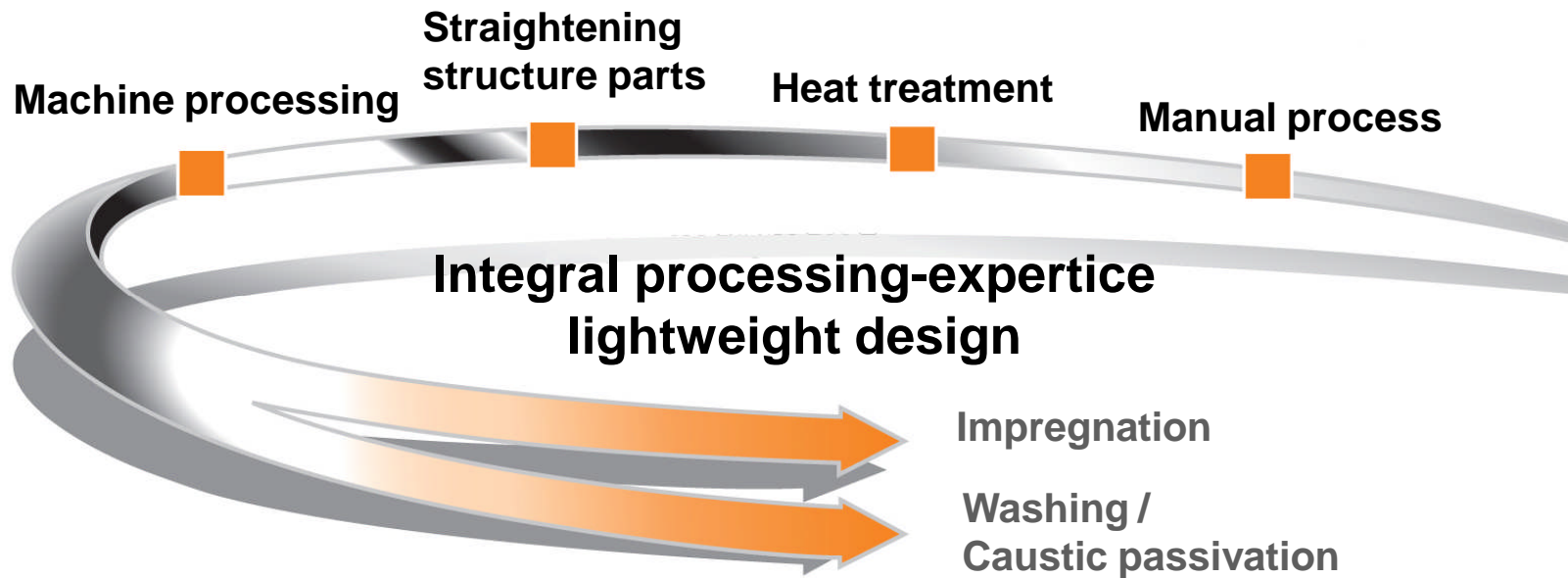


Roadshow 2012

Complete process chain after casting for Aluminium lightweight design

Dr. Lars Martin, Dipl.-Ing. Gerhard Niebuhr, Dipl.-Ing. Christian Wex



Locations of Finoba Automotive GmbH

Location Hertingshausen
plant I 6.500 m² shopfloor Area



Location Kassel

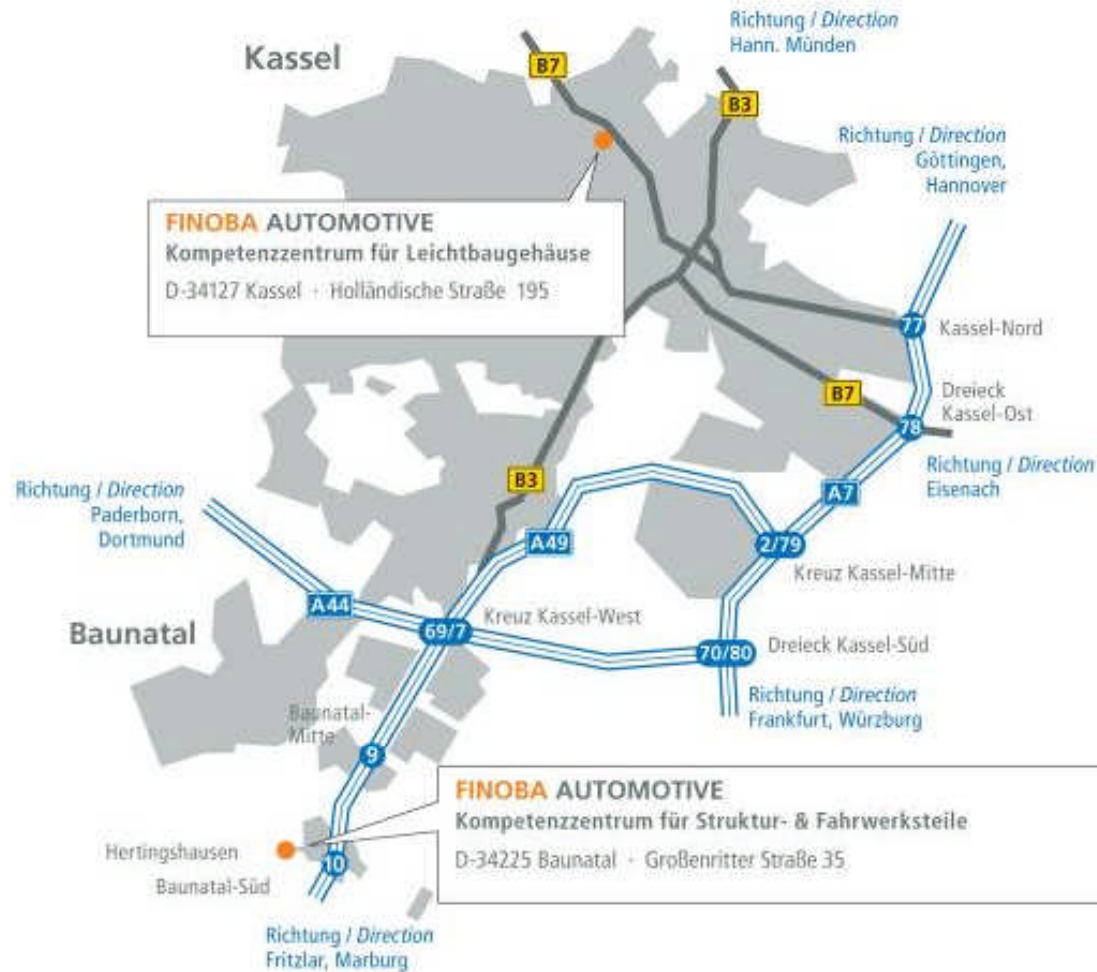
plant II

5.000 m² shopfloor Area

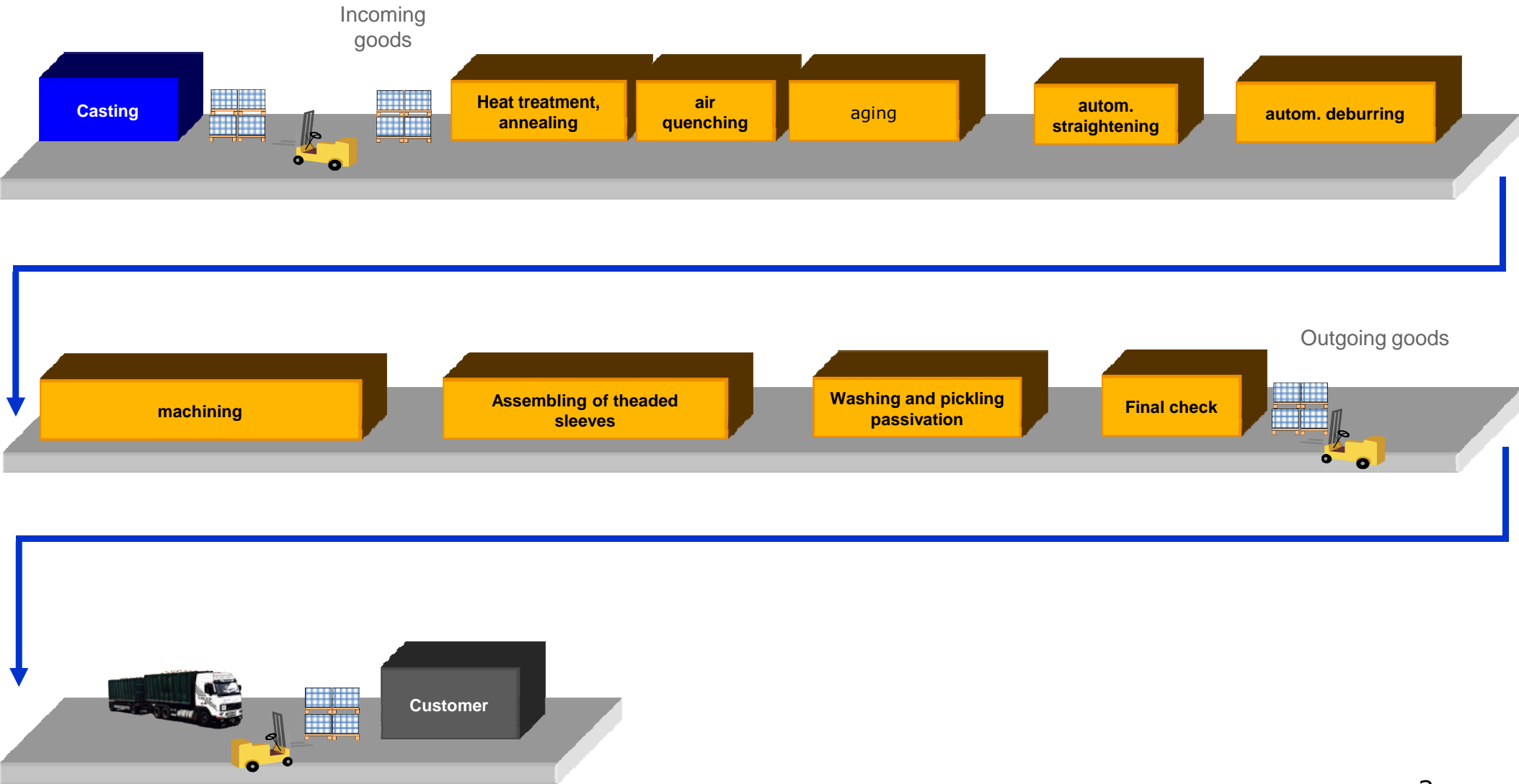


Location Kassel

plant III 2.000 m² shopfloor Area



Private owned company with 360 Employees and 22 Mio. € sales volume



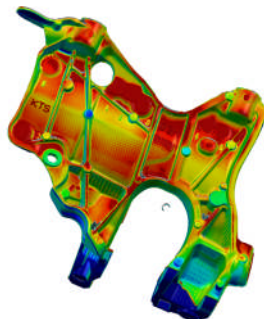
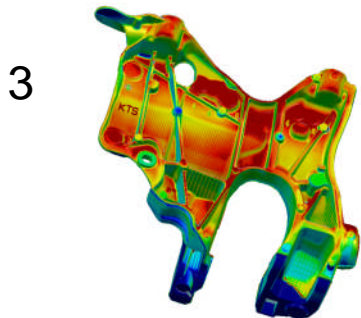
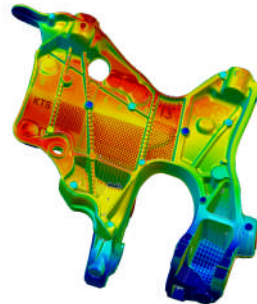
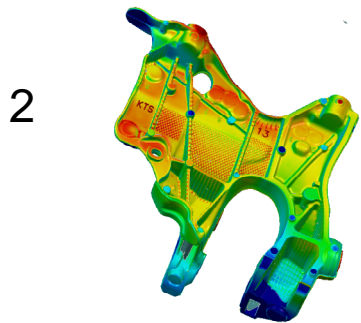
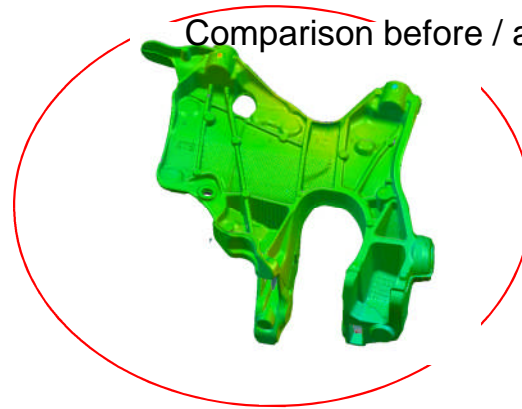
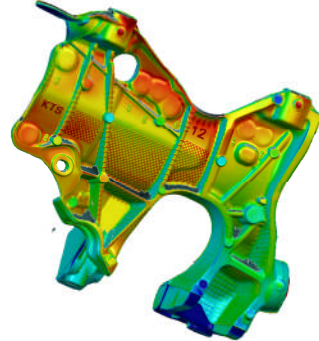
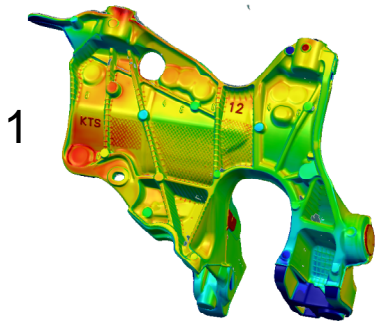
We treat parts

Examples: shape deviation by optically visualisation

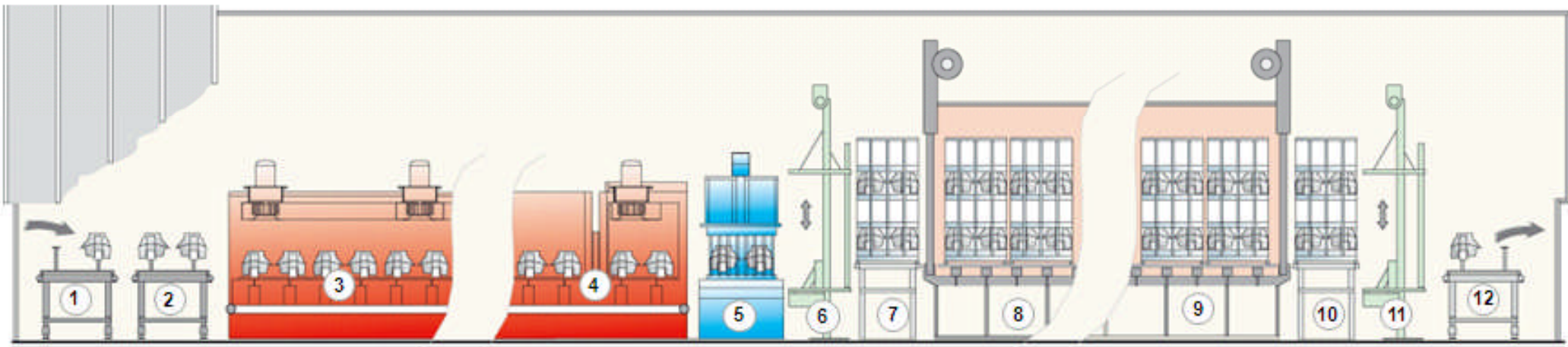
before heat treatment

after heat treatment

Comparison before / after heat treatment



Process of Heat treatment



1. placement

2. cache unit

3. heating-up

4. solution heat treatment

5. rapid cooling

6. elevator

7. stock removal frame

8. heating-up

9. stock removal glow

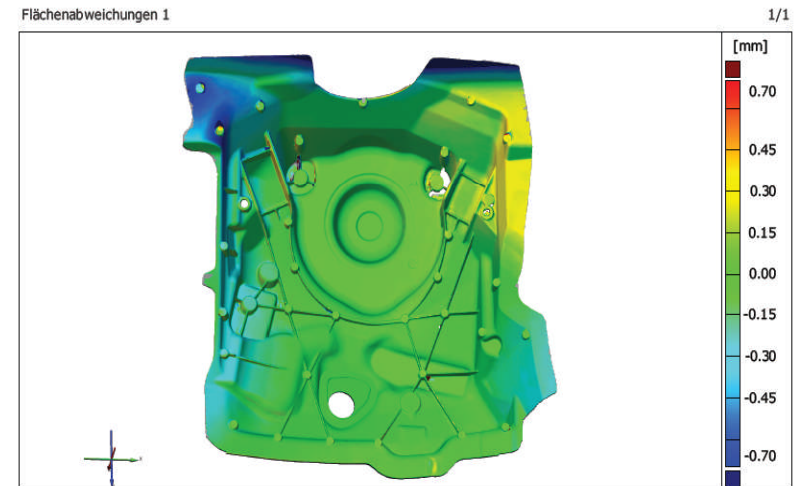
10. destacking

11. cooling section with cache

12. taking and transfer

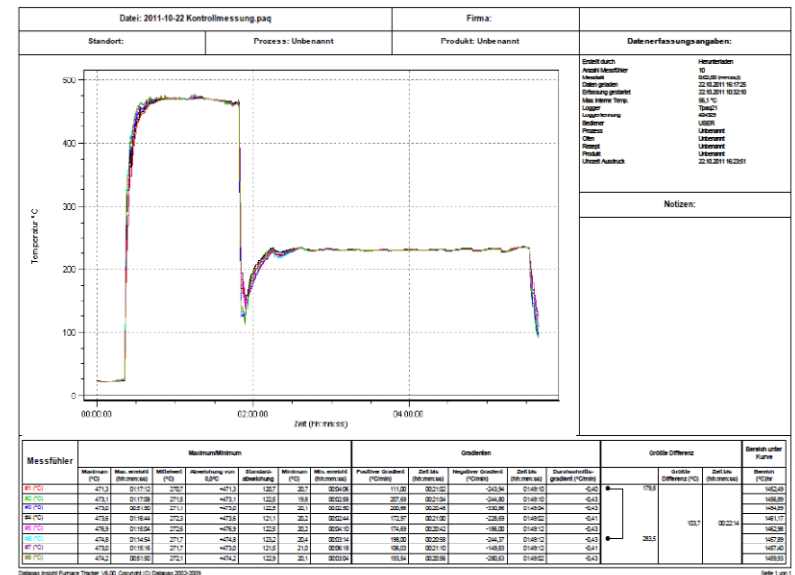
Solution annealing (heat treatment)

- ➔ the best practice position in the heat treatment frame will impact all successor proceses of semi finished parts.
- ➔ Positioning evaluation needs to be done correctly. This will essentially influence post processing and costs of straightening.
- ➔ The evaluation of the test is realized with e.g. GOM-measuring



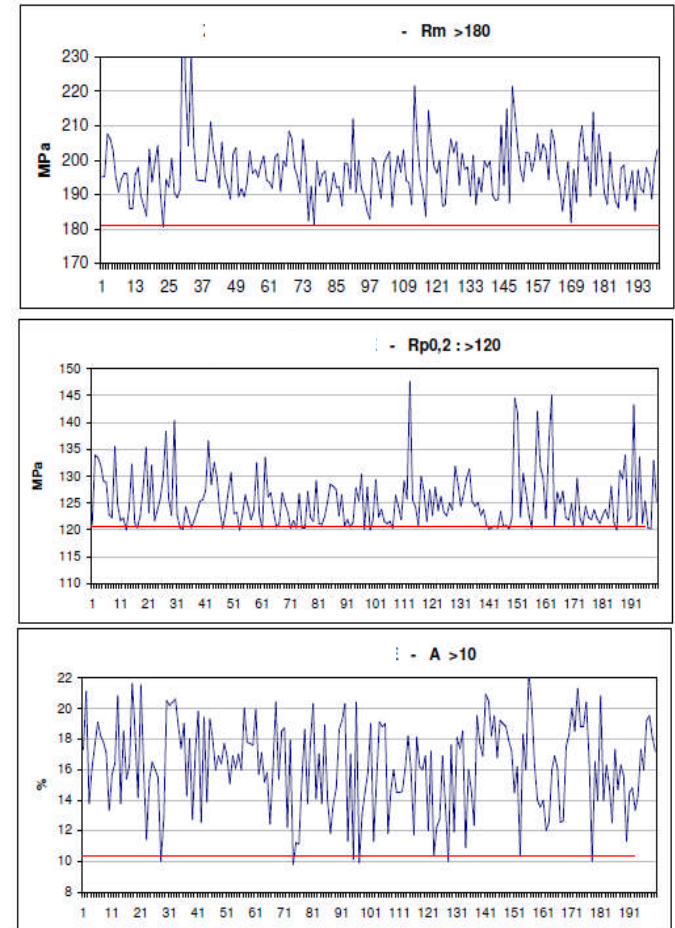
Air quenching

- ➔ Incoming air flow above the parts
- ➔ Oszillation of base frame under the airquench
- ➔ Cooling rate and incoming air flow must be aligned with the temperature of less than 200° C, duration within 15 sec



Mechanical properties of die cast parts

- ➔ Consideration of peak results while tensile strength evaluation
- ➔ Influence of microporosity
- ➔ Best practise is to generate test samples direct out of the construction part
- ➔ Test samples out of the initial filling piece may lead into wrong results
- ➔ Test procedures need to be confirmed between customer and supplier



Range of mechanical properties (e.g. AISi10Mg Mn)

$R_{p0,2} > 110 - 150$ MPa

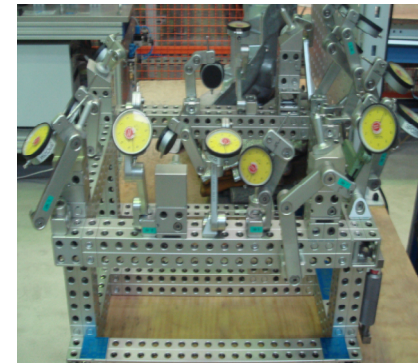
$R_m > 160 - 210$ MPa

$A_5 > 10 - 15\%$

Straightening of structural parts

- The calibration of the construction parts will be habitually done by manually operations. Workflow will following blister removal and checking the shape in gauges with interferences.
- the efforts / costs for the project starts are even higher due to small batch sizes and missing experience of straightening
- within serial production the straightening is more experienced and could potentially decrease costs

- within integrated or automatically supply chain, automatically straightening is possible (depending on volume, amounts of car sets)



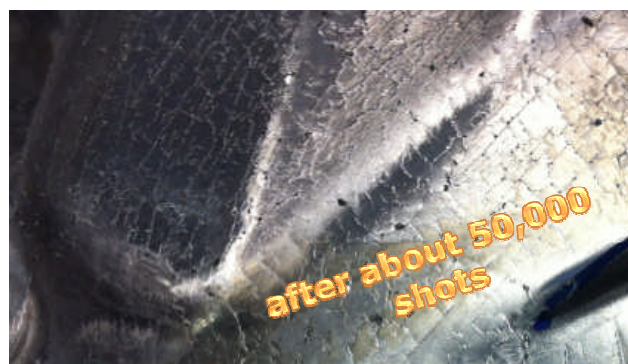
Processing by hand for lightweight design

- ➔ functional and contact surfaces have to be assessed in detail at the preparatory stage in collaboration with the foundry as well as with the vehicle assembly
- ➔ heat checking with increasing service life is costly because the surface deteriorates
- ➔ grinding costs increase with increasing service life of the die
- ➔ with manual grinding, the effort involved can be up to about 8 minutes per part
- ➔ this time can be reduced by using robot cells but even so grinding costs can still account for about 20% of the added value after casting

Manual cleaning of structural parts:



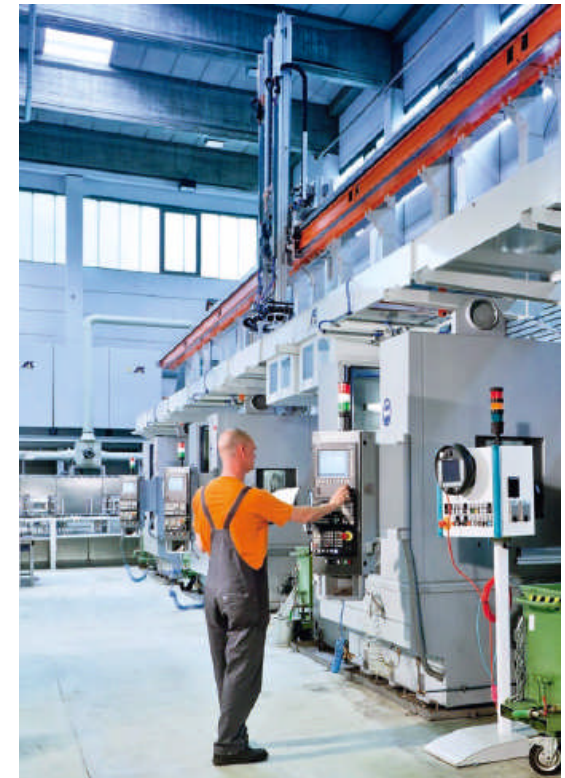
Automatic cleaning of structural parts:



We treat parts

Locating points for next die:

- ➔ coordination is needed between die-making and machining
- ➔ follow-on dies always have to be designed to be dimensionally identical otherwise there will be a cost driver in the form of unnecessary setting-up times between dies
- ➔ the interface (locating points) between the raw parts and the parts to be machined has to be determined and designed in advance
- ➔ these locating points have to be consistent for all processing steps: straightening after heat treatment / machining / final gauging.
- ➔ the locating points have to be included in the drawing – ideally at the development stage.



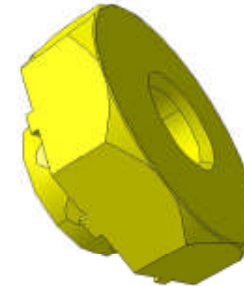
Application of Helicoil threaded inserts

- Helicoils can be inserted manually or automatically
- processing using robots is difficult (FINOBA has automated this process and optimized it for serial production)
- with coated Helicoils, the surface coating can result in assembly problems because the coating thickness is not always uniform
- if possible, alternatives should be considered at the design stage e.g. rivet nuts or self-clinching nuts that are easier to automate (see alternatives below)

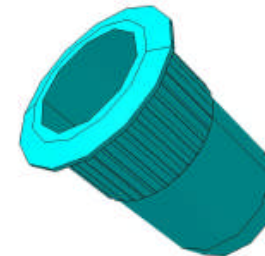


Alternatives to Helicoil threaded inserts:

→ Clinch-nuts



→ Rivet Nut



→ Ensats[®]-inserts



Ensats[®]

Assembling of Helicoil and potential failures:

➔ Threat is not fully apperend at first gang

➔ *sufficient material necessary*



➔ Bolt is not capable removeable.

➔ *sufficient material necessary*



FINOBA has installed several bath of 10m³

- ➔ flexibility for small and bigger construction parts is given
- ➔ bath fluid can be used several times (less worn out)
- ➔ best fluid stream around the parts
- ➔ trademark fluid Alodine 2040 / Henkel in usage

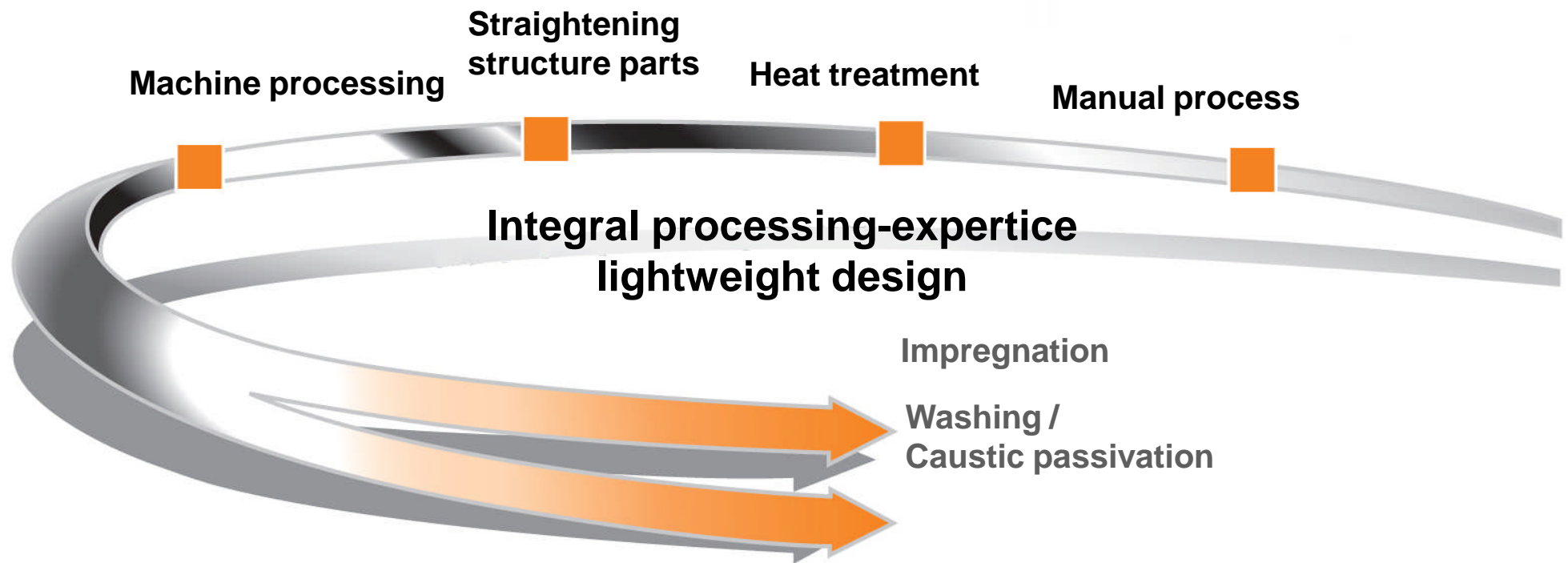
Entfetten ▪ Beizpassivieren

Assembling of Helicoil threaded inserts



YOUR advantage:

- One face to your aims
- Reducing of ppm-rate through continuous control of processes (due to DIN/ISO 16949)
- No logistical additional expenses – all out of one hand



Thanks for your attention!

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We treat parts