Metals in shape.

# COMPETENCE IN ALUMINIUM AND MAGNESIUM HIGH PRESSURE DIE CASTING

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Source: //blog.mercedes-benz-passion.com/2010/02

**MAC GmbH | Consulting and Engineering | Switzerland | Germany**

# PROCESS OPTIMIZATION GEARBOX HOUSING ...

**…. for an automotive OEM Mg HPDC foundry**
**…. for a low pitting and oiltight gearbox housing**
**…. for an automatic transmission of a premium segment passenger car**

**Content:**

- Simulation of mould filling and solidification with optimisation of the ingate system for better flow, reduction of cold-flow, first injection stage, reduced adhesive points, avoidance of heat cracks and porosity.
- Execution of die casting technical calculations / determination of process parameters.
- HPDC conform design of the ingate system / reduction of pressurized area and yield improvement / rearrangement of overflow runners / determination of ingate cross sections.
- HPDC conform design of the gearbox housing / reduction of critical masses.
- Integration of die cast mold vents of passive and active design / project management for selection and procurement of venting equipment / coordination and supervision of installation and commissioning / supervision of casting process including vacuum process.

Source: //blog.mercedes-benz-passion.com

# PROCESS OPTIMIZATION GEARBOX HOUSING *...(2)*

**…. for an automotive OEM Mg HPDC foundry**
**…. for for low pitting and oiltight gearbox housing**
**…. for an automatic transmission of a premium segment passenger car**

Source: //blog.mercedes-benz-passion.com

**Content (continuation):**

- Sample manufacturing of castings / confirmation of die process parameters (1. phase «Parashot», 2. and 3. phase), documentation of casting process parameters including thermal parameters of die casting mold.
- Safeguarding part quality / X-ray samples incl. documentation.
- Warm marking of new die casting molds directly at the HPDC machine with documentation.
- Process optimizations at HPDC machines for the reduction of cycle time.
- Definition and introduction of X-ray specs / training of operators for product specific details.
- Project reviews with customers internal departments / reporting / preparation and work down of punch lists.

# PROCESS OPTIMIZATION GEARBOX HOUSING *...(3)*

**…. for an automotive OEM Mg HPDC foundry**
**…. for a low pitting and oiltight gearbox housing**
**…. for an automatic transmission of a premium segment passenger**

Source: Internet

**Requirements:**

- In-depth experience in all process steps along the HPDC process: From metal melting to trimming and mechanical machining.
- Extensive experience in mold filling and solidification simulations.
- Expert knowledge in the design of large HPDC parts with regard to die casting, trimming and post-processing.
- Excellent know-how of the design of ingate systems.
- Extensive experience with regard to heat balance of die casting moulds.
- Position of trust regarding the cooperation with the customer.
- Excellent communication skills with project management and shop floor operators.

# HPDC-CELL RETROFIT FOR NEW GEARBOX HOUSING ...

Source: Internet

**…. refurbishment of two complete HPDC-cells for the production of the new automatic transmission gearbox housing at an OEM foundry**

- Scheduling and coordination of suppliers for all refurbishment actions.
- Planning of vacuum process equipment for active ventilation of new dies.
- Verification of the scope of delivery with determination of gaps in scope.
- Processing of amendments of delivery contracts.
- Verification of interfaces between deliveries of suppliers and existing infrastructure.
- Check of charging notes against bill of works.
- Management and scheduling of acceptance tests.
- Punch list determination and follow-up of punch list actions.
- Check of documentation "as build“.
- Acceptance of new die casting mould and trimming die.
- Preparation of process description for production, verification and quality check.
- Management of the ramp-up to meet
  - scheduled availability of the HPDC cell,
  - cycle time of the process and
  - scrap rate.

# HPDC-CELL RETROFIT FOR NEW GEARBOX HOUSING *...(2)*

**…. refurbishment of two complete HPDC-cells for the production of the new automatic transmission gearbox housing at an OEM foundry**

Source: Internet

**Requirements:**

- Integration of the consultant into the foundry organization.
- Distinguished communication with purchasing, engineering and maintenance functions.
- Extensive knowledge along the process chain for aluminum HPDC parts.
- Automotive sector project management experience.
- Automotive requirements.
- Detailed knowledge processes with fully automated die casting cells.
- In depth knowledge of quality inspection and testing procedures .
- Handling of management reporting and progress reports.

# DIE CASTING CELL ALTERATION PLANNING ...

**…. for an automotive OEM aluminium and magnesium HPDC foundry**
**…. for low pitting and weldable die castings (automotive structural parts)**

**Content:**

- Specifications for different sections of the alteration projects: HPDC aluminium machine 01 and 02 and upgrade measures of HPDC magnesium machine 03.
- Project management with internal functions and suppliers / weekly project reviews / preparation and work down of punch lists.
- Consulting for vacuum venting systems / specifics availability, price, ease to maintain.
- Verification of the scope of delivery with determination of gaps in scope.
- Processing of amendments of delivery contracts.
- Management and scheduling of acceptance tests.
- Punch list determination and follow-up of punch list actions.
- Check of documentation "as build“.
- Management of construction site / work safety / order and cleanness.
- Preparation of process description for production, verification and quality check with 3-plate-HPDC moulds.

Source: Internet

# DIE CASTING CELL ALTERATION PLANNING *...(2)*

**…. for an automotive OEM aluminium and magnesium HPDC foundry**
**…. for low pitting and weldable die castings (automotive structural parts)**

Source: Internet

**Requirements:**

- Integration of the consultant into the foundry organization.
- Experience in consulting, planning, realization and project management of foundry projects.
- Distinguished communication with customers purchasing, engineering and maintenance functions.
- Extensive knowledge along the process chain for HPDC parts.
- Detailed knowledge of HPDC process in fully automated die casting cells.
- Automotive sector project management experience.
- Comprehension and problem solving capability.
- Excellent communication skills with project management, shop floor workers and suppliers.

# OPTIMIZATION OF STRUCTURAL ROOF PARTS ...

Source:
//blog.mercedes-benz-passion.com

**…. for a new folding roof of convertibles with structural capabilities**
**…. for a new premium segment passenger car**

**Content:**

- Simulation of mould filling and solidification with optimization of the ingate system, reduction of cold-flow, adhesive points, heat cracks.
- Redesign of castings suitable for the HPDC process / optimization of moulds and dies / reduction of porosity and shrinkage holes.
- Definition of sampling areas for tensile and bending specimens / assessment of tensile and bending test samples.
- Improvement of tensile strength and elongation.
- Batch monitoring during SOP, ramp-up and series production in 15 shift mode / crack and X-ray testing / safeguarding of parts quality.
- Process optimization / casting process parameter optimization.
- Trimming process optimization.
- Modification of parting line for reduction of deburring effort by > 50%.
- Preparation of deburring samples, formulation of work description and introduction on the shop floor.
- Formulation and introduction of X-ray specs / training for product specific details.
- Program for optimization of set-up time.

# OPTIMIZATION OF STRUCTURAL ROOF PARTS *...(2)*

Source: Daimler AG

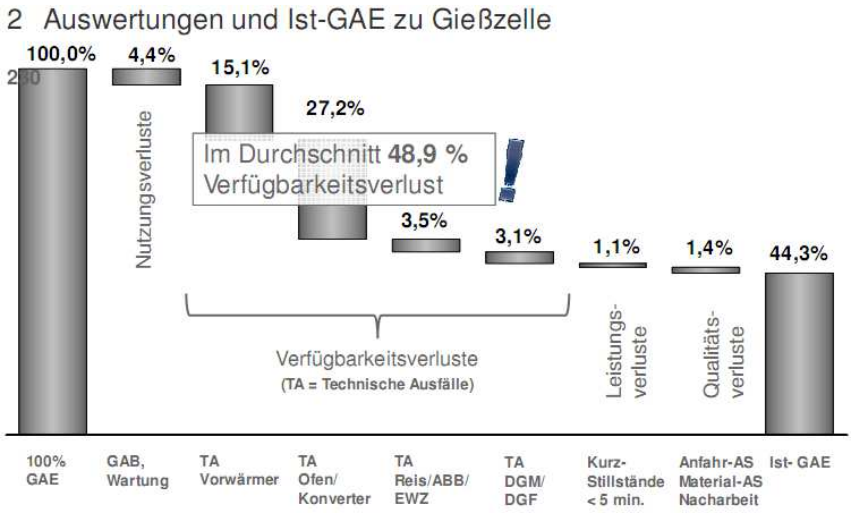
**…. for a new folding roof of convertibles with structural capabilities**
**…. for a new premium segment passenger car**

**Requirements:**

- Long term assignment on the shop floor within the customer's foundry.
- In-depth experience in all process steps from aluminium and magnesium melting to mechanical machining.
- Extensive experience in numeric mould filling and solidification simulations.
- Expert knowledge in the design of large aluminium and magnesium HPDC parts with regard to die casting, trimming and post-processing.
- Excellent know-how of design of ingate systems for aluminium and magnesium HPDC.
- Extensive experience with regard to heat balance of die casting moulds.
- Position of trust regarding the cooperation with the customer.
- Excellent communication skills with project management and shop floor operators.

# OEE-ANALYIS OF HPDC-CELLS ...

**…. for the determination of potential for additional output**
**…. definition and realization of output improvement activities**



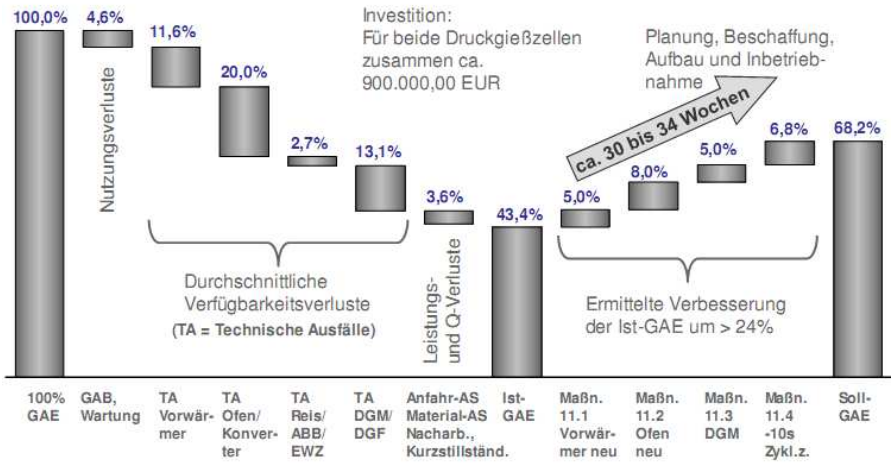

Source: MAC GmbH

- Logging of defects and disruptions of two HPDC-cells for gear-box housings over a three week period in 15-shift mode.
- Immediate root/cause analysis of defects and disruptions.
- Evaluation of defects and disruptions for detailed determination of the OEE.
- Pareto-analysis with regard to technical defects and disruptions.
- Formulation of a catalogue of recommendations and a priority program for activities.
- Investment appraisal for new melting equipment.
- Calculation of cost per piece and comparison of actual with expected results with the investment.
- Determination of financial key-figures of the investment.

# OEE-ANALYIS OF HPDC-CELLS *...(2)*

**…. for the determination of potential for output improvement**
**…. definition and realization of output improvement activities**

12 GAE-Wasserfall-Darstellung Soll-GAE für Gießzellen




Source: MAC GmbH

**Requirements:**

- Long term assignment on the shop floor within the customer's foundry.
- Knowledge in investment calculation tools.
- Flexibility to monitor morning, day and night shifts.
- Detailed know-how regarding HPDC-process
- Comprehension and problem solving capability.
- Excellent communication skills with project management and shop floor operators.

# PROJECT MANAGEMENT ZF RDU ...

Source: ae group AG / casted parts: ZF

**…. for the speed-up of the project phase of an aluminium die casting part for on-schedule initial sample inspection**

**Content:**

- Formulation of process sequence for rear axle drive-housing and housing cover manufactured by the HPDC process.
- Generation of functional requirements for production equipment for HPDC and fixtures for mechanical machining.
- Tender documents, tendering and comparison of quotes.
- Supplier supervision, execution of meetings with suppliers.
- Revision of existing process plans for mechanical machining.
- Determination of collisions issues between tools and fixtures.
- Coordination redesign of parts with customer.
- Supplier management for moulds and trimming dies / progress supervision / deadline monitoring.
- Coordination of the first-sample-inspection / planning of first-sample production runs in the foundry and in machining.
- Monitoring of first-sample-production.

# PROJECT MANAGEMENT ZF RDU *...(2)*

**…. for speed-up of the project phase of an aluminium die casting part for on-schedule initial sample inspection**

Source: ZF Achsgetriebe GmbH

**Requirements:**

- Integration of the consultant in the foundry organization.
- Extensive knowledge along the process chain for aluminium HPDC parts.
- Project management experience in the automotive sector.
- Automotive requirements.
- Detailed knowledge of HPDC process in fully automated die casting cells.
- Detailed knowledge of mechanical machining processes.
- Flexibility for the monitoring of first-sample-production in casting and machining.

# MICROSPRAY APPLICATION ...

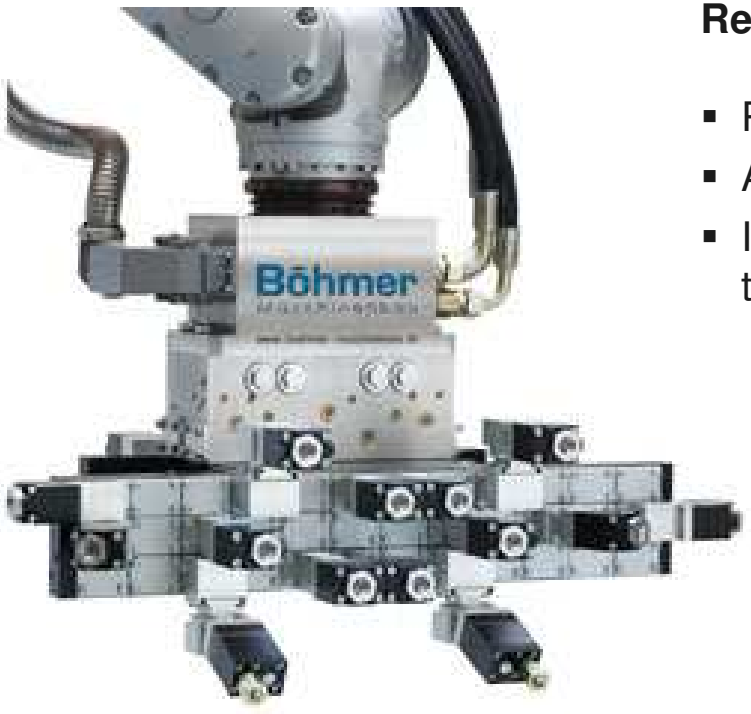
Source: Altea s.r.l.

Source: Altea s.r.l.

**…. implementation of an innovative and economical process**

- Die parting agent application on die casting mould with water-based lubricant or powder:
  - ✓ Reduction of costs for process water treatment and waste water disposal.
  - ✓ Reduced or no blowing for mould drying required (saves cycle time).
  - ✓ Largely reduced cleaning effort in die casting cell.
  - ✓ Very small quantities of die parting agent needed.
  - ✓ Reduction of cycle time.
- Increase of process temperature at cavity surface:
  - ✓ Longer lifetime of die casting moulds due to reduced temperature cycle load and improved penetration and lubrication effect.
  - ✓ Reduction of casting pressure and casting velocity.
  - ✓ Reduced load for the die casting mould and the die casting machine.
  - ✓ Improved part quality (surface and metallurgical structure).
- Improved availability of die casting cell.
- Excellent application for the production of thin-walled structural parts (automotive).

# MICROSPRAY APPLICATION *...(2)*



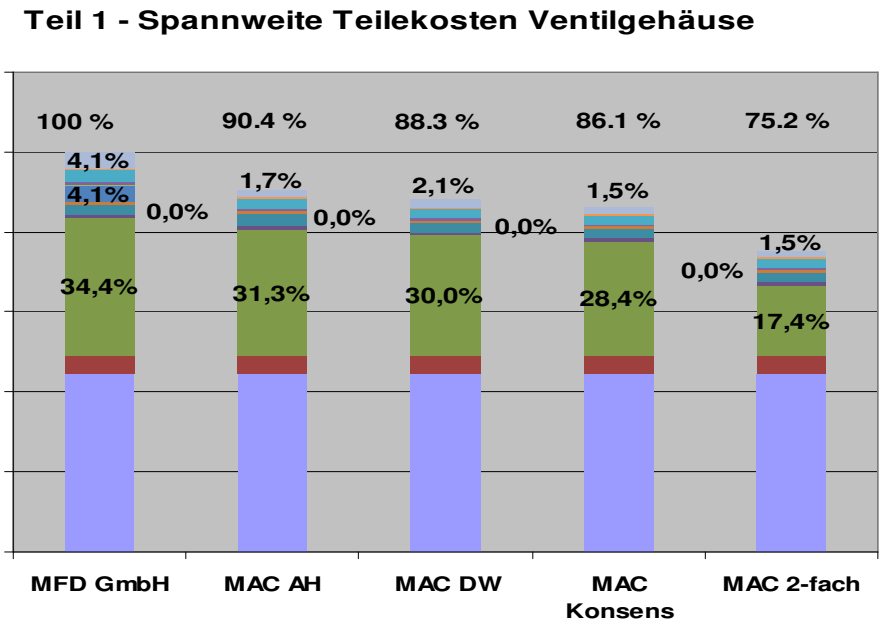

Source: Maschinenbau Böhmer GmbH

**…. implementation of an innovative and economical process**

**Requirements:**

- Principal decision to introduce these new technology.
- Acceptance of introduction in the foundry.
- Investment into equipment and a modified die casting mould (modified thermal balance):
  - Adaptation of the mould for increased heat transfer via internal heating and cooling channels.
  - Execution of additional form filling and solidification simulation based on the modified mould.
  - Modified or new spraying equipment with special nozzles or spray head to be exchanged with existing one.
  - If required integration of additional mould temperature regulation equipment.

# POTENTIAL ANALYSIS OF A HPDC OPERATION ...




Source: MAC GmbH

**Two basic approaches:**

**Direct via an audit - the classical approach**

- Actual situation is projected, supported by company data and compared with benchmarks/experience.
- Improvement potential is determined.

**Based on existing cost calculation**

- Cost calculations always cover an actual time span and are not dominated by momentary observations.
- Allow direct conclusions with regard to parts costs and operational results.
- Can be conducted with limited time spend by auditors in the operation.

# POTENZIAL ANALYSIS *...(2)*

**Schmelzkosten**

| Schmelzkosten | €/kg | Kommentar |
|---|---|---|
| Kalkulationswert Vollkosten | 0,254 | 90% des ausgewiesenen Vollkostensatzes |
| Grenzkosten | 0,1881 | |
| Vollkosten | 0,2824 | mit kalkulatorischen Kosten |
| Modifikationen | - - | |
| Vollkosten* | 0,2824 | |
| Potentiale | | |
| Abschreibungen | 0,003 | für Invest von ca. € 1,0 Mio. |
| Umlagen | 0,05 | auf Niveau Benchmark |
| Energiekosten | ? | zusätzlich bei Neuinvest. |
| Personalkosten | 0,04 | für 3 MA/Schicht |
| Summe | 0,093 | |
| nach Potential | 0,1894 | Reduktion um 33% |
| Benchmark | 0,187 | Vollkosten inkl. Zuschläge |

Source: MAC GmbH

**…. on the basis of existing management tools like pre- and post-calculation, cost accounting and P&L**

- By application of standardised parts calculation technical potentials are revealed.
- By comparison of hourly rates, overhead rates and other cost items with benchmark figures undesirable developments in cost structures will be detected.

**Requirements:**

- A well organised and established cost accounting.
- A pre- and post-calculation system which reflects the actual production.
- Reliable benchmarks which are really comparable.
- Excellent knowledge of cost accounting, pre- and post-calculation systems.
- Open mind set and trust of the management.

# CONTACT

**What can we do for you?**
**MAC is always available for questions regarding our area of expertise or for a discussion of a certain task.**

Souce: //blog.mercedes-benz-passion.com

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