WinCast®
The Tool for all Casting Cases
Fast, Precise and Easy to Handle

RWP GmbH | Gesellschaft beratender Ingenieure für Berechnung und rechnergestützte Simulation mbH

www.rwp-simtec.de
Content

- Sand Casting 1
- High-Pressure-Die-Casting 2
- Low Pressure 3
- Investment Casting 4
- Continuous Casting 5
- Heat Treatment 6
- Stress/Distortion/Life Time 7
- Evaluation of the Mechanical Properties for a Complex Thin Walled Aluminium Casting 8
Sand Casting

- The total gating and riser system, filter and core are part of the model.

- New precise physical data for exothermic materials are available.

- Graphite expansion and precise defect prediction are typical requirements.

- Validation with experiments is the basic for good simulation results.
High-Pressure-Die-Casting

The simulation of solidification is the base for the prediction of porosities, residual stress and deformation.

Several cycles are calculated to draw near the steady state.
Low Pressure

- process optimization
- mechanical properties
- cooling calculation
- defect calculation
- pressure - time input
- dendrite arm spacing

FEM Modell

Defects

Solidification

Appearance of defects
The investment casting process can be handled by WinCast® with more and more complex parameter.

Precise geometry with a lot of details is the reason for real success.

Optimized gating and riser systems lead to a minimal deformed part. Temperature, solidification, stress and deformation simulation are performed to reach the optimum.
Continuous Casting

The thermal and mechanical equations are coupled. Thus the material flow and the shrinkage of the billet can be determined as well as the gap formation and gap dependent heat transfer.

- primary and secondary cooling
- material and heat transport
- pull (and push) conditions
- contact between strand and graphite chill
- contact between graphite and chopper chill
- heat transport within cooling lines

Horizontal Casting  Vertical Casting

Chill breathing
Heat Treatment

The changing residual stresses while Heat Treatment can be calculated in order to optimize the oven curve and to reduce the deformation.

**Oven Curve Heat Treatment**

**Time Step 1**

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>0</td>
</tr>
<tr>
<td>800</td>
<td>100.000</td>
</tr>
<tr>
<td>600</td>
<td>200.000</td>
</tr>
<tr>
<td>400</td>
<td>300.000</td>
</tr>
<tr>
<td>200</td>
<td>400.00</td>
</tr>
<tr>
<td>0</td>
<td>500.000</td>
</tr>
<tr>
<td>1000</td>
<td>600.000</td>
</tr>
</tbody>
</table>

**Temperatures Time Step 1**

**Stresses Time Step 1**

**Time Step 2**

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>0</td>
</tr>
<tr>
<td>500</td>
<td>100.000</td>
</tr>
<tr>
<td>0</td>
<td>200.000</td>
</tr>
<tr>
<td>500</td>
<td>300.000</td>
</tr>
<tr>
<td>0</td>
<td>400.00</td>
</tr>
<tr>
<td>500</td>
<td>500.000</td>
</tr>
<tr>
<td>1000</td>
<td>600.000</td>
</tr>
</tbody>
</table>

**Temperatures Time Step 2**

**Stresses Time Step 2**
Stress/Distortion/Life Time

High differences in temperature during a high pressure die casting cycle and enormous pressure peaks are reasons for local cracking in the die and reduce the life time a lot.

- **Temperature**
- **Pressure**
- **Deformation**

![Graph showing principal stress vs. time and load cycles](image)
Evaluation of the Mechanical Properties for a Complex Thin Walled Aluminium Casting

FEM Geometry

Filling and Solidification

Distribution of the local Mechanical Properties

Validation

Comparison Real Tensile Test vs Simulation

MPa

Measurement

WinCast

1 3 5 7 9 11 13 15 17 19 21 23

www.rwp-simtec.de
RWP is your Partner in the foundry area and developer of the Software package WinCast®. RWP acts worldwide via representations in Europe, Asia and America. Since 1984 experience out of consultancy, R&D are respected by the software development. One of the leading products, WinCast®, is the complete software tool that can be used to analyze and solve not only common problems.

WinCast® calculates based on one FE-Mesh: Mold-Filling, Solidification, Residual Stress, Shrinkage, Deformation, mechanical properties, life cycle prediction, micro structure, impact, strenght.

**Developed for:**
- Sand Casting
- High Pressure Die Casting
- Investment Casting
- Die Casting
- Low Pressure
- Centrifugal Casting
- Continuous Casting
- Welding
- Heat Treatment
- Special Processes

**We offer:**
- Software
- Software Development
- Consulting
- R&D
- Training / Seminar