Low Pressure Die Casting
— a process which pays off

Low Pressure Casting Compared to Gravity Casting

Compared to gravity casting, low pressure casting offers following advantages: In low pressure casting, the metal within the furnace is pressed through the riser tube into the mould by pressure which works on the metal surface (picture 1). This form of mould filling is the most important difference to gravity and stirle casting. The process of mould filling proceeds absolutely controlled. This results in a low-turbulence or even turbulence-free mould filling. The metal within the furnace is in a closed vessel under protected atmosphere. As a result, the melting absorbs less hydrogen and other impurities and the formation of oxide films is reduced. This is the basis for good melting quality. Unlike in gravity casting, the metal surface is not continuously interrupted by re-dosing in low pressure as the melting is removed through the riser tube under pressure which means that costs for cleaning, trimming and melting-down can be reduced significantly. Costs for cleaning are mainly personnel costs, especially for jobbing with foundries with small quantities for which automat-

eed cleaning or press punching is not profitable at all. Considering increasing energy costs, which means EURO / kg melting, each kilogram of unnecessary melting should be avoided. Example (picture 2): Producing 10,000 parts / year and saving 9 kg / part of cycle material saves 90,000 kg aluminium / year (plus approx. 7% melting loss = 96,300 kg). Based on melting costs of 0.35 EURO / kg on average, this means a reduction of costs from 33,705 EURO / year. Considering these advantages, the higher investment in the machine concept is amortised and profitable within a short time due to above mentioned reasons. Compared to other casting processes, low pressure casting is more than just an alternative.

In summary, gravity casting has definitely still its merit and is surely the more economic process for certain parts. Even if the machine invest is higher at first, low pressure casting is also interesting for jobbing foundries due to the casting quality that can be achieved as well as the savings regarding cycle material and costs for cleaning.

Considering above mentioned explanations, the higher investment pays off very soon and low pressure casting is the more profitable process compared to gravity casting. Nevertheless, it is often not possible to choose between low pressure and gravity casting as only low pressure comes into question due to defined quality requirements. A lot of foundries offer low pressure casting also as an alternative to their actual production proc-

to enlarge their product range.

One of the major advantages of low pressure casting is the smaller gating system compared to gravity casting. Feeders are normally not necessary (head feeders only in the minority of cases) which reduces the cycle material. In low pressure casting, cycle material is 5 % to 20 % of cast-

weight whereas in gravity casting it can be up to 100 %. Less gating material also means that costs for cleaning, trimming and melting-down can be reduced significantly. Costs for cleaning are mainly personnel costs, especially for jobbing with foundries with small quantities for which automat-
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Table 1: Mechanical properties of a wheel carrier made of Al Si 7Mg (0.3) T6 cast in low pressure casting after different heat treatments (AlSi7Mg)T6 – 7.3 % Mass percentage Si; 0.19 % Fe; 0.017 % Cu; 0.005 % Mn; 0.33 % Mg; 0.005 % Zn; 0.002 % Mn; 0.12 % Ti; 0.003 % Al

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Age hardening 160 °C/5 h</th>
<th>Age hardening 160 °C/12 h</th>
<th>Age hardening 175 °C/5 h</th>
<th>Aging 80/12 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 % Yield strength R p0,2</td>
<td>285</td>
<td>240</td>
<td>267</td>
<td>208</td>
</tr>
<tr>
<td>Tensile strength R m</td>
<td>380</td>
<td>282</td>
<td>304</td>
<td>345</td>
</tr>
<tr>
<td>Elongation after fracture A 5</td>
<td>6,3</td>
<td>18,5</td>
<td>5,6</td>
<td>10,0</td>
</tr>
</tbody>
</table>

Further factors for successful low pressure cast-

ing are cooling/cold casting, core casting concepts, moulds/mould concepts, melting preparation/ quality and reproducible machine processes. KURTZ has a long and varied experience in all these fields and can offer a wide range of poss-

ibilities.

Results and Valuation

The data shown in table 1 have been investigat-

ed on a wheel carrier produced in low pressure casting. The trials were made with different heat treatments to check the effects on the mechan-

ical properties. Two days for casting trials had to be sufficient for KURTZ to cast the part in low pressure casting successfully. The part produced by low pressure casting has passed the pulsat-

ing fatigue test promptly. Contrast to it was not achieved with counter pressure casting. Picture 3 shows a test certificate indicating the strength of a transmission suspension manu-

factured in low pressure casting. The data were investigated by flat bar tension specimen with a cross section of 4 x 10 mm (thus the most unfa-

vourable test bar). With investigations of the strength of coupling plates for trucks (table 2) produced in low pressure casting the main attention was paid to the expansion to be achieved.

The lateral parts of the casting were bent by 45 °C without breaking. As a conclusion it can be said that the casting quality achieved in low pressure casting can be compared to counter pres-

sure casting. The efficiency is a considerable ad-

vantage of low pressure die casting thanks to the lower investment costs and the somewhat higherst costs arising with counter pressure casting.

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Picture 2: Test certificate of a transmission suspen-

sion made in low pressure casting (flat bar tension specimen, wall thicknesses 4 x 12 mm, weight per piece 2,1 to 3,8 kg)

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