

ThyssenKrupp

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Counter-pressure casting at ThyssenKrupp Fahrzeugguss GmbH

Innovative process produces high-strength, lightweight auto components

Counter-pressure casting is an established casting process for the production of cast aluminum components of the highest quality. It is similar to conventional low-pressure casting but has been modified and optimized to allow cost-effective production of cast chassis components displaying outstanding mechanical properties. The main advantages of the process are:

- Controlled, low-turbulence mold filling from below to avoid inclusions, cold shuts and other casting defects
- Solidification under increased gas pressure to reduce structural defects

The process results in a considerably improved cast structure and therefore optimized component properties, which can be utilized to reduce weight. Counter-pressure casting is therefore ideal for highly stressed safety components, particularly in the chassis (wheel knuckles, steering knuckles, etc.) In addition to improved quality, a high level of automation and short cycle times, the counter-pressure process achieves a considerably higher material yield than conventional permanent mold casting. Thanks to an innovative, flexible mold concept, the process not only enables cost-effective volume production, but is also ideally suited for rapid prototyping.



Picture: Counter-pressure permanent mold casting facility at ThyssenKrupp Fahrzeugguss GmbH in Hildesheim, Germany.

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The first equipment of this kind in Europe was installed at the Hildesheim plant in 2002. After intensive trials in the pilot phase and the development of the first chassis components, the plant is now ready for volume production.

Improved component properties

Any type of defect can lead to premature failure of a component under mechanical load. In cast structures, gas and solidification porosity, as well as non-metallic inclusions, are the main factors affecting mechanical properties. The basis for improved component properties is a reduction in defects in counter-pressure cast structures. During mold filling the molten metal is continuously exposed to increased pressure, which suppresses the precipitation of gases, i.e. hydrogen. During solidification and the associated shrinkage of the metal, the pressure is maintained to prevent the formation of solidification porosity and cavities. This, in combination with flexible

mold cooling for controlled solidification of the cast component, results in high material yields. It is often possible to entirely do without the cycle-intensive casting system known in conventional permanent mold casting, consisting of runner and feeders. This makes yields of over 95% possible, which in turn reduces cleaning requirements and melting costs.

Simultaneous development

The potential of counter-pressure casting can only be fully realized if the improved mechanical properties and the casting process are taken into consideration when designing the component.

ThyssenKrupp Fahrzeugguss therefore offers this expertise as a comprehensive service of simultaneous technology development. We include the following in this:

- Material selection
- Component design and optimization
- Strength and stiffness analysis
- Vibration and resonance analysis
- Mold filling and solidification simulation
- Prototype and volume production.

Picture: Chart

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