

# Case Report

## Car Steering Knuckle



**Hirschvogel  
Tech Solutions**



**Success in additive manufacturing  
based on continuous process chains**

Innovative solutions with  
3D printing at Hirschvogel  
Tech Solutions

## COMPANY PROFILE

# Hirschvogel Automotive Group

As a global automotive supplier with around 5,300 employees in nine plants on three continents, the Hirschvogel Automotive Group develops, produces and sells high-strength parts for the automotive industry, among others.



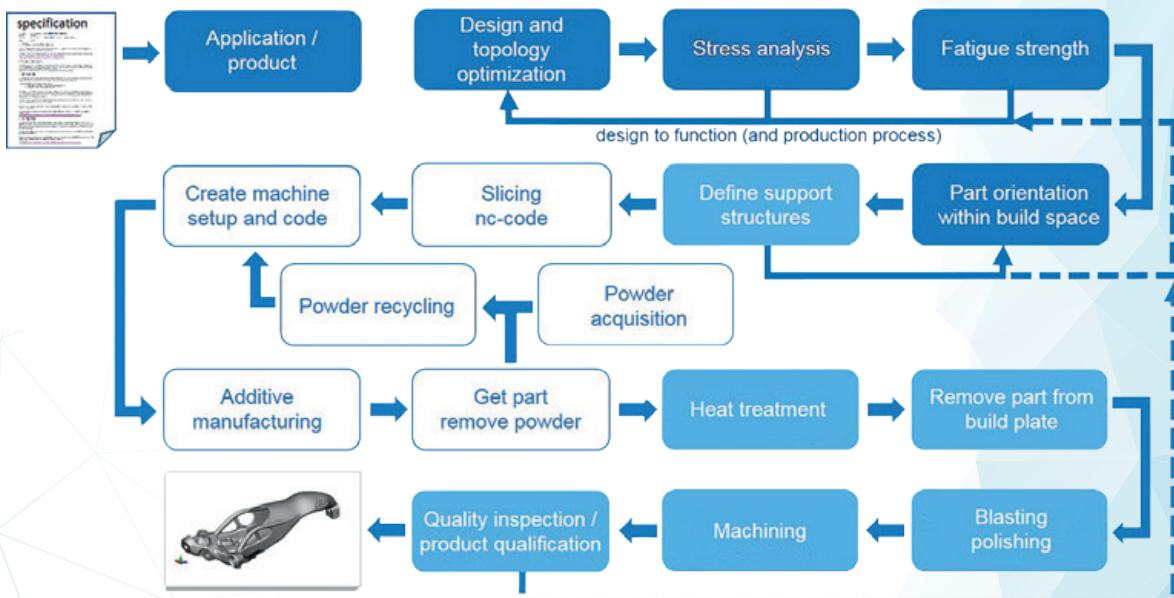
The vision of the company is to achieve continuous improvement and to provide expert answers to the host of new questions arising from ever more stringent requirements. A corresponding level of commitment and passion goes into each and every product. As a creative development partner, the Hirschvogel Automotive Group can draw on its development know-how to make an active contribution to achieving the technical and economic goals of its customers.

## Hirschvogel Tech Solutions

As a brand of the Hirschvogel Automotive Group, Hirschvogel Tech Solutions is available to you as a competent service provider for part development and additive manufacturing. Through the combination of the three service components – part development, additive manufacturing and materials/failure analysis – the company supports its customers with an optimum know-how package for developing innovative products and high-strength components. Hirschvogel Tech Solutions is thus an innovation partner and solution provider in many application areas that extend far beyond forging and the automotive industry.

## CURRENT SITUATION / CHALLENGES

Development work at Hirschvogel Tech Solutions is always carried out based on an integrated approach, with a focus on the entire process chain. In this way, innovative and technically sophisticated solutions are commercially viable.

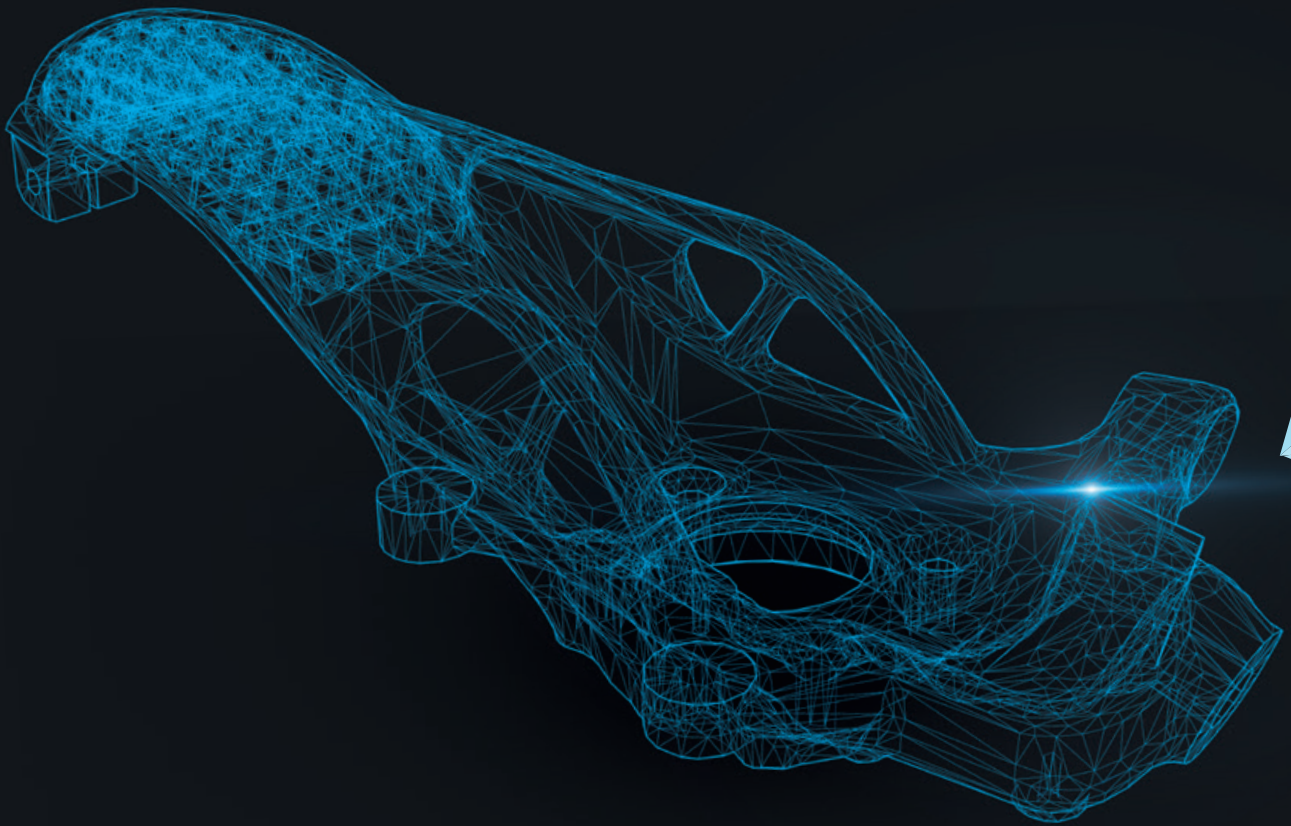


Designation:

**CAR STEERING  
KNUCKLE**

Industry:

**AUTOMOTIVE**



Produced on:

**SLM® 500 QUAD**

Material:

**AlSi10Mg**

To gain maximum benefit from attractive solutions and additive manufacturing, it is productive to make use of methods taken from bionics, drawing on structures developed by nature over millions of years and applying them to the areas of engineering and technology.

## SLM® SOLUTION

# Steering Knuckle Development

This approach was adopted, for instance, on a steering knuckle, where it was possible to achieve a weight saving of 40 % in the neck area compared to the conventional forged part. All the requirements demanded of the part were fulfilled, taking into account the given assembly space. To do this, specially developed methods and specifically adapted CAx systems were used. Part design was carried out with a view to later production, allowing the part to be manufactured without the many additional internal support structures that would otherwise be required.

Initially, a number of part variants was developed based on solutions from nature. These variants were then assessed before selecting those which were best able to fulfil the given boundary conditions. This was then verified by appropriate calculations.

The skillful positioning of the part, which is almost 600 mm in length, means that it can be produced easily on an SLM®500. It was also possible to produce the part with few support structures, and to completely do without internal ones. This resulted in low post-processing effort.

Tests carried out on tensile and notched bar specimens, which were built in the same process, showed results that matched the forecast values.

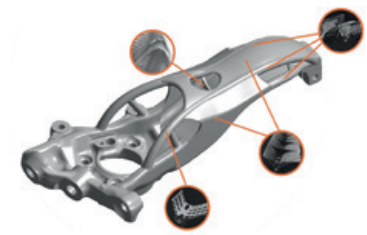


Fig. 1:  
Selection/assessment of design approaches



Fig. 2:  
Part structure with load-adapted supports

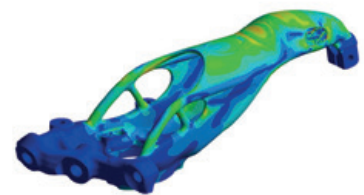


Fig. 3:  
FEM calculation

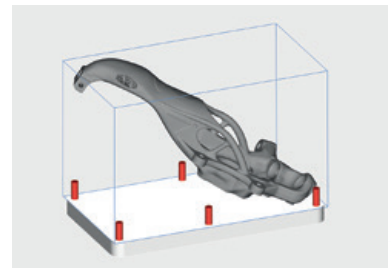


Fig. 4:  
Part production

## SUMMARY

# Car Steering Knuckle

- Global automotive supplier with longstanding experience in serial production
- Part development is based on an integrated approach and takes into account the entire additive manufacturing process chain
- High level of development expertise in lightweighting as well as in the application of designs based on bionics
- Material savings of 40 % compared to the conventional forged part
- Production requiring few support structures leads to reduced post-processing effort

### Selection of the part spectrum of Hirschvogel Tech Solutions



**Fig. 5:**  
Tong with a structure that is adapted to the production process and loads



**Fig. 6:**  
Spray nozzles



**Fig. 7:**  
Tool with internal cooling



**Fig. 8:**  
Housing

## About SLM Solutions

The Lübeck-based SLM Solutions Group AG is a leading provider of metal-based additive manufacturing technology. SLM Solutions focuses on the development, assembly and sale of machines and integrated system solutions in the field of selective laser melting.

SLM® technology offers diverse options in the metal-based additive manufacturing of parts, such as a new design and geometric freedom, lightweight construction through the reduction of metal part weight, significant advantages in terms of production speed and the manufacturing of internal undercut parts in low quantities.

Our products are utilized globally by customers from the most varied sectors, particularly in the aerospace, automotive, tooling, energy and healthcare industries, as well as in research and education.

They particularly value the following advantages of our technology partnership:

- Highest **productivity** using patented multi-laser technology
- Highest material density and **part quality** through our innovative gas stream management
- Completely closed **powder management** in an inert gas atmosphere
- Cutting-edge process monitoring using various **quality control modules**
- Multilingual open **software architecture** with customer adaptability
- Ultracompact **modular design**
- Long-term and **confidential customer relationships**
- **A technological leader and pioneer** in metal-based additive manufacturing with decades of market experience

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