

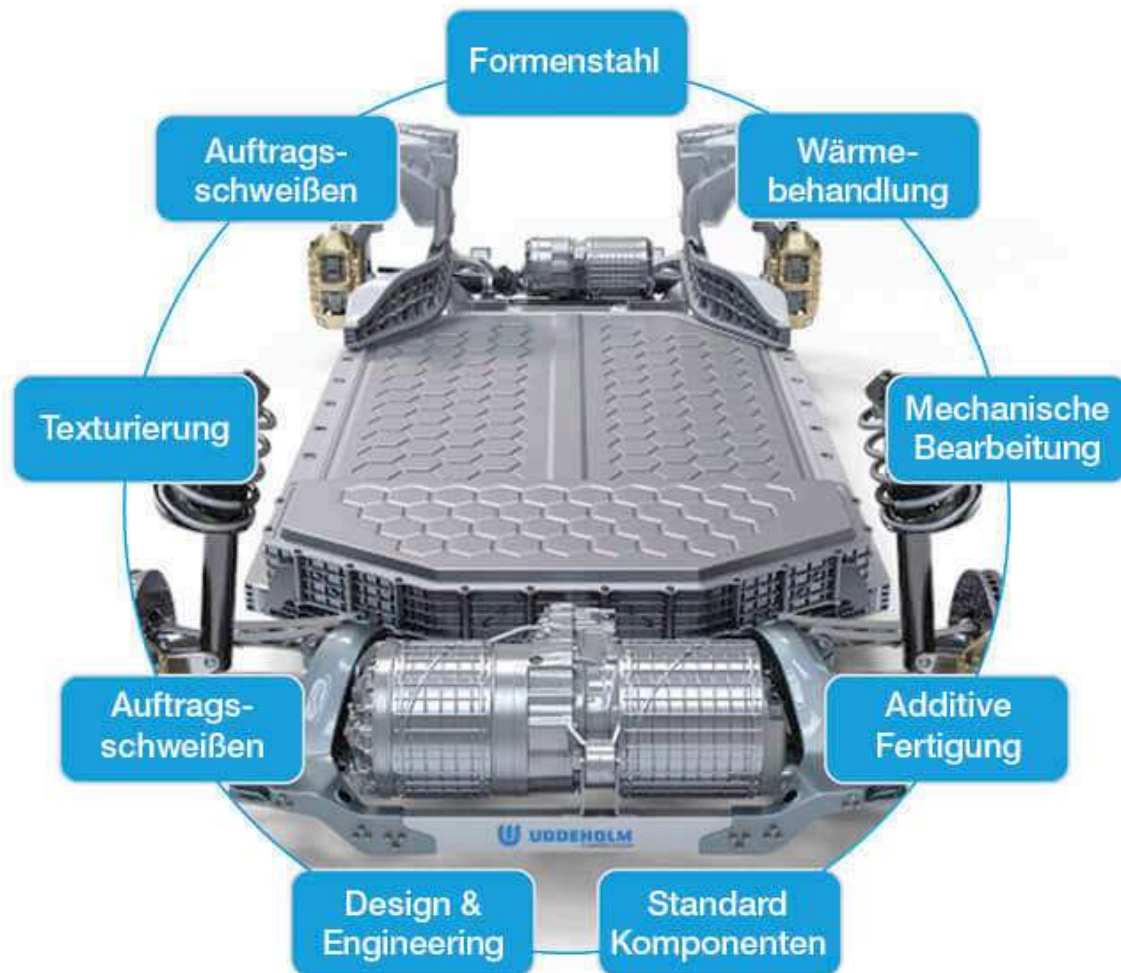


life of your die casting mold! **Our concern is much more comprehensive!**

OUR GOAL IS NOT SIMPLY TO EXTEND THE SERVICE LIFE OF YOUR DIE-CAST MOLD!

We have a much broader concern: to reduce the cost per cast part, and to do so in a holistic way. There are numerous cost factors in die casting, some of which can be influenced – such as scrap rate, cycle time and mould life – while others, such as the machine hourly rate and the cost of aluminium, are fixed. However, in many discussions with our customers, often only the mould service life is considered. However, as your reliable and competent partner in the foundry industry, we know that a comprehensive cost analysis is essential to effectively reduce the cost per cast part.

Uddeholm is known worldwide as a leading supplier of high-quality mould steel. But as part of the voestalpine Group, we offer you much more than that. Our comprehensive range of services has been specially tailored to the needs of die casters and includes products and services such as hot work tool steels and their heat treatment, surface treatments, mechanical processing, additive manufacturing, components for die casting such as venting systems and core pins, engineering, and the development of texturing technologies (see figure).



This comprehensive package of services allows us to influence many cost factors, including tooling costs and mold life, machine utilization rate, cycle time, scrap rate, mold maintenance and servicing costs, and rework and cleaning costs of cast aluminum parts. Furthermore, many of our conversations still focus exclusively on tool costs and mold life, but this leaves a lot of potential unaccounted for – in other words, undiscovered costs.

However, we want to ensure that you can fully benefit from our extensive know-how and range of services and thus effectively reduce your cost per cast part. We would like to present you with two examples of a holistic cost analysis, which illustrate how well thought-out choice of materials and innovative production methods enable efficient management:

**Example 1:
Reducing the cost of reworking a cast aluminium part by using the excellent premium hot-work steel Uddeholm Dievar.**

In this scenario, the expenses for post-processing ("hand plastering") of the aluminum part after casting were significantly higher than planned. The targeted service life of 100,000 aluminium parts was achieved, the total costs were too high at the end of the day. The forming inserts were made of hot-work steel 1.2343 ESU, which resulted in the following reworking costs for the aluminium parts:

- 0 – 25,000 parts ≥ €0 per part
- 25,001 – 37,000 parts ≥ €0.5 per part
- 37,001 – 100,000 parts ≥ €1.45 per part

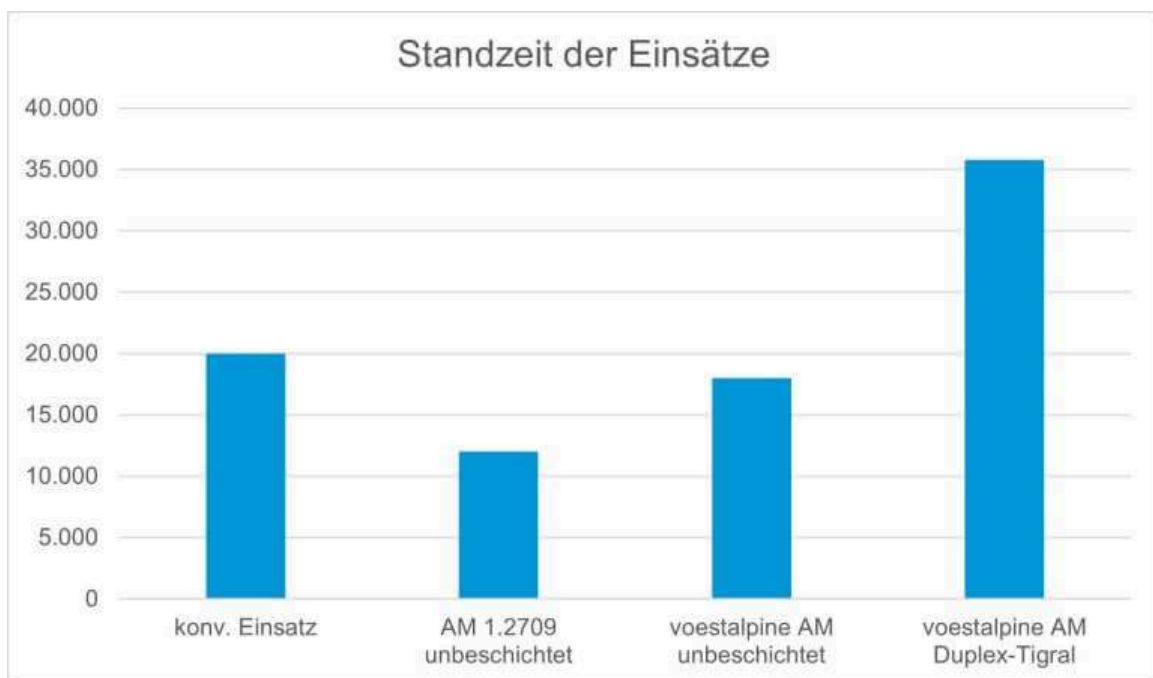
The average cost of "hand plastering" the die-cast parts from the mold with inserts made of 1.2343 ESU was approximately €0.97 per part. We have therefore made the next mould with inserts made of our premium hot-work steel Uddeholm Dievar. The die-casting mould has currently produced 26,000 parts and has no cracks and extremely low wear. In order to be able to estimate the cost advantage, we have assumed € 0.40 per part for the calculation of the average costs for the "hand plastering" of the die-cast parts from the Dievar mould until the end of the service life, although the costs will probably be lower. Possible longer service life of the mould and presumably lower maintenance costs were not included in the calculation. Nevertheless, the savings are considerable:

	Stakes from 1.2343 ESU	Operations from Uddeholm Dievar	Cost savings
Costs for the inserts (steel, hardening, machining)	20.360 €	€31,690	– €11,330
average cost of reworking the cast aluminum part	€0.9735/part	€0.40/part	
Total cost of reworking the cast aluminum part with a tool life of 100,000 shots	97.350 €	40.000 €	+ 57.350 €
Profit (based solely on "hand plastering")			46.020 €

**Example 2:
Cost analysis in the use of additively manufactured inserts**

Additively manufactured inserts are more expensive than those produced by machining processes. Nevertheless, AM deployments are becoming more common, as they are usually the most effective way to fix temperature problems in molds.

Customers who use AM inserts usually ask about improving tool life and saving cycle time in terms of cost aspects. What is clear is that these two factors enable significant cost savings that can quickly offset the additional costs of additively manufactured inserts. However, in many cases, a reduction in the scrap rate and a reduction in the maintenance and cleaning effort of the mold lead to even higher cost savings.



A more detailed presentation of the savings will be illustrated using a complex differential housing.

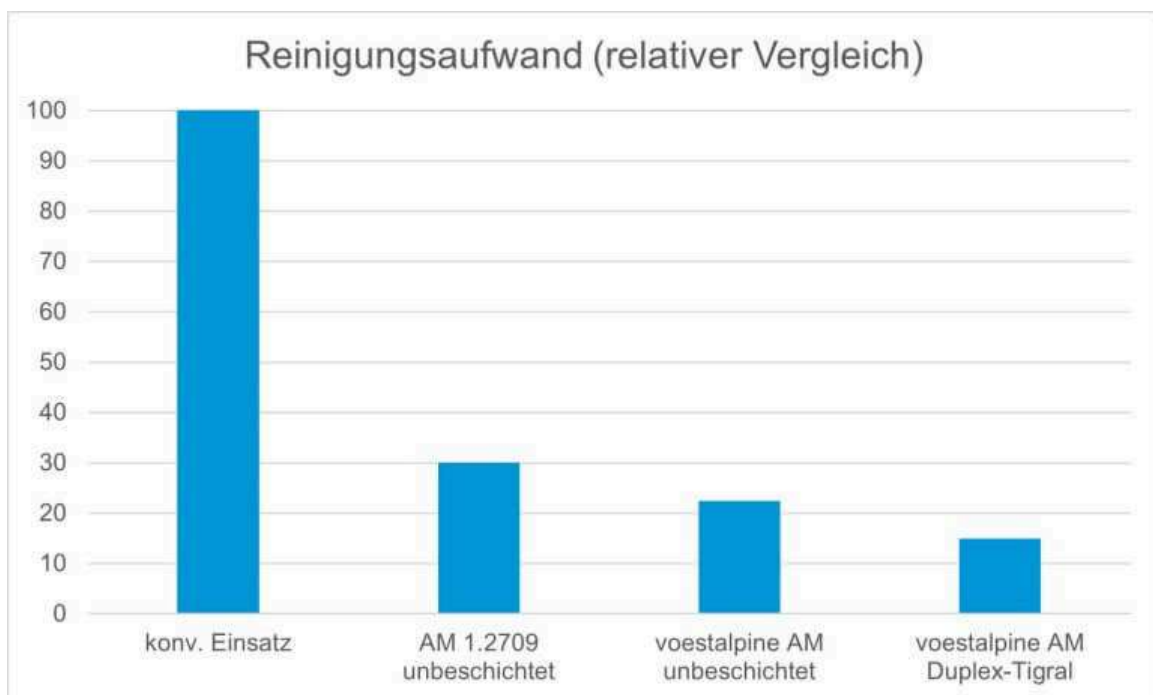
We have manufactured and tested various inserts:

1. A conventionally manufactured insert made of a premium hot-work steel.
2. An additively manufactured insert made of 1.2709, with a hardness of 47-49 HRC and without coating.
3. An additively manufactured insert made of voestalpine hot-work steel, with a hardness of 50-52 HRC and without coating.
4. An additively manufactured insert made of voestalpine hot-work steel with a hardness of 50-52 HRC and a coating with duplex Tigral from voestalpine eifeler.
5. The service life of the operations varied significantly, as the following graph shows. The shortest service life was provided by insert 2 of 1.2709, while the AM insert made of voestalpine hot-work steel with duplex Tigral coating (insert 4) exceeded the conventionally manufactured insert by more than 75%.

All additively manufactured inserts were able to **reduce the cycle time by 10 seconds from 125 to 115 seconds compared to** conventionally manufactured inserts. In addition, the reject rate could be significantly reduced due to the better temperature control of the AM inserts.

Whereas this was around 10% in conventional use, the two uncoated AM inserts achieved a reject rate of 6% and the coated voestalpine AM insert achieved a reject rate of only 5%.

The surface temperatures of the conventionally manufactured insert were very high, which led to **a high cleaning effort**. The optimisation of AM inserts has significantly reduced the cleaning effort. The chart below shows a relative comparison. Once again, the coated voestalpine AM insert performed best with **only 15% of the original cleaning effort**.



Result

We answered the question of whether the investment in the additively manufactured inserts was worthwhile with a calculation tool. We have compared three cases: the target (see values from the calculation), the current status, and the voestalpine solution.

The data for the cost comparison showed that the **greatest cost savings are achieved with an additively manufactured and PVD-coated insert made of AMPO W360:**

>> Compared to the uncoated conventionally manufactured insert, there was a **saving of €0.977 per part**, resulting in an **annual saving of €127,010** and a saving for the **entire**

project of €508,040. The additional costs per mission of €4,240 were amortized after 4,642 shots.

>> Compared to the uncoated AM insert from 1.2709, there was a **saving of €0.55 per part**, resulting in an **annual saving of €71,500** and a saving for the **entire project of €286,000**. The additional costs per mission of 1,400 € were amortized after 7,480 shots.

Uddeholm is the ideal partner for all die casters looking for high-quality mould steel products and tailor-made services.

We understand that investments must be carefully calculated and that all cost factors should be considered to ensure that

your investments are profitable. For this reason, we work closely with our customers to ensure that we understand their specific needs

and requirements and can provide them with the best possible solutions. Our experienced experts in the die casting process know all

the "cost traps

" and can help you make a smart decision when it comes to investing in our high-quality products and services.

So don't hesitate to contact us to learn more about how we can help you optimize your investment and improve your die casting processes.

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