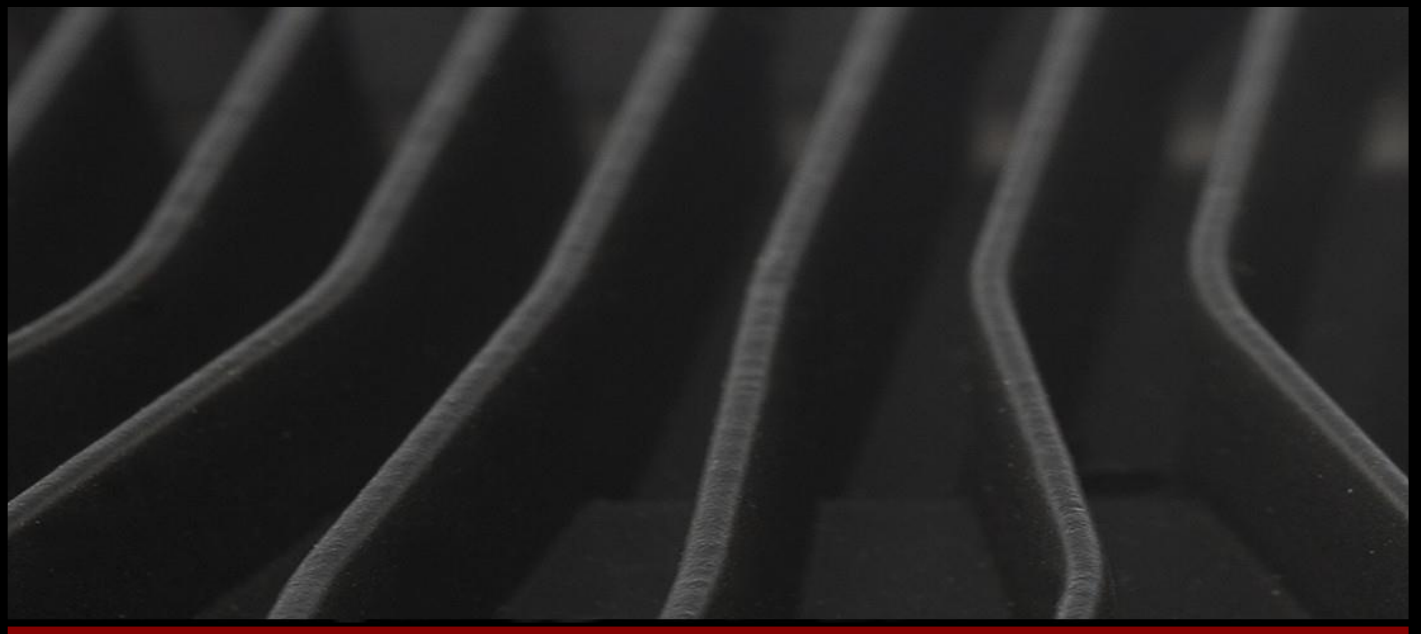
Zinc Heatsink Case Study:

Loewe TV Heatsink



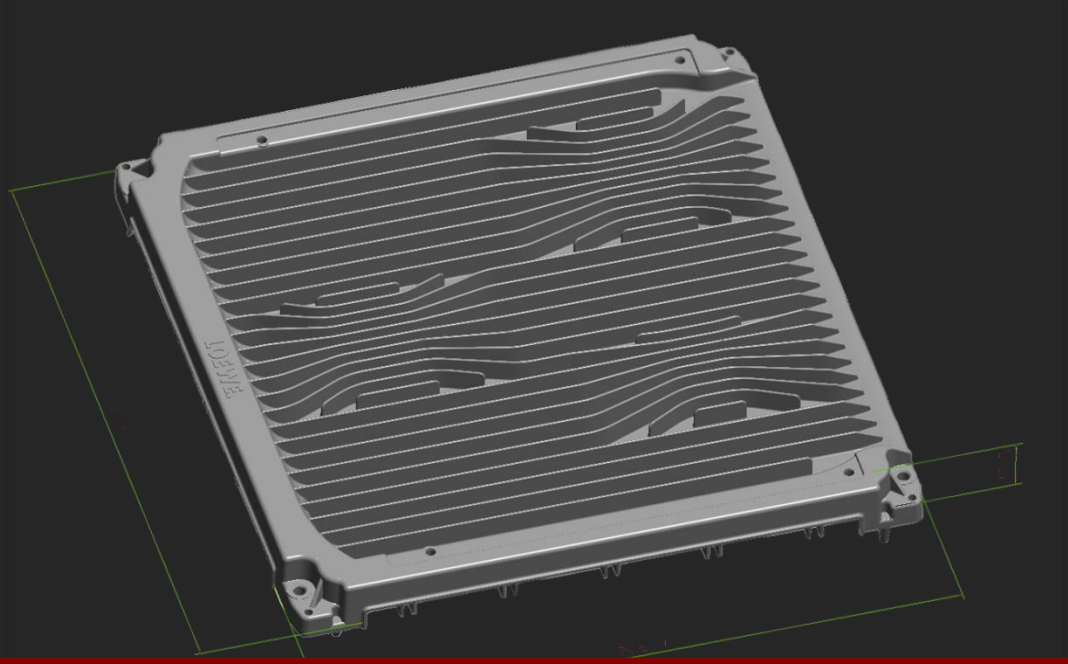
Loewe and Bruschi

Loewe commissioned Bruschi a heat sink made of a different material than the usual one.

The original idea was to develop the heat sink in aluminum, as it is commonly done. Bruschi's challenge was to propose an alternative solution that would grant the same performances while adding a significant economical saving.

Many tests were run through the use of simulations programs and on prototypes using heaters to reproduce the final working conditions.

The report below summarize this experience, focusing on the difference between Zinc and Aluminum in terms of thermal conductivity and, above all, on the saving obtained by Loewe thanks to the choice of Zinc.



Goal of the test:

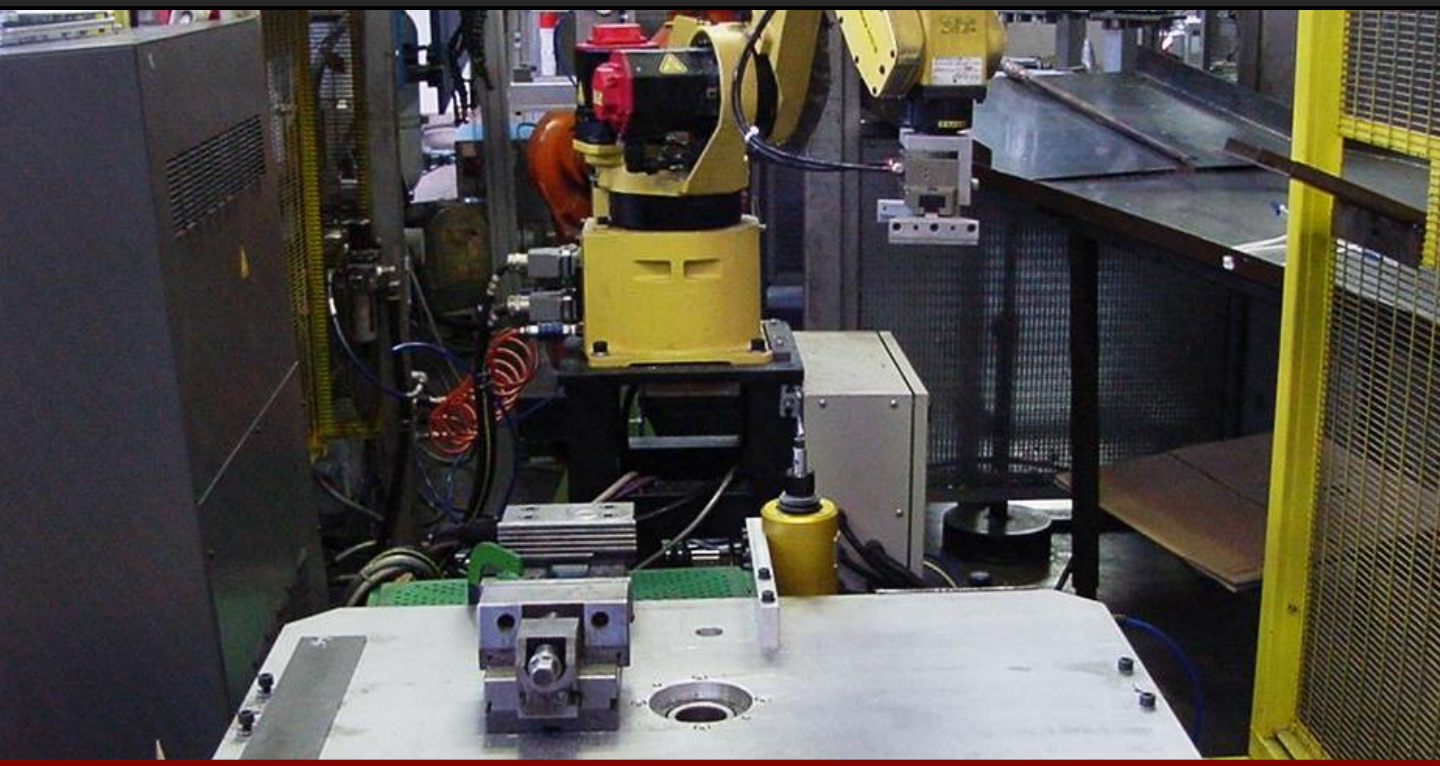
Demonstrate the equivalence of thermal conductivity between zinc alloys and aluminum alloys for a heat sink project.

Theoretical Premise:

Usually, materials with an high thermal conductivity value are also good heat conductors. Obtaining a higher thermal conductivity value in a comparison test means quicker cooling and heating processes for heat sinks.

Thermal conductivity:

In die casting the most used alloys are A380, equivalent to EN1706 AC46500 (aluminum) e ZP5 (zinc). Their thermal conductivity values are essentially the same: A380 T.C. value is 109 W/m°K, while ZP5 T.C. value is 108,9 W/m°K*.



* Link to the source

Zinc vs Aluminum

When looking at the provided data, there are no substantial differences regarding thermal conductivity between zinc alloys and aluminum alloys. Not only the use of Zamak does not affect the thermal conductivity, but it also provides some significant advantages in terms of cost reduction. In this particular case, Zamak offers many benefits in comparison with aluminum, such as:

- **Die lifespan**: a zinc diecasting mold usually lasts 5/10 times longer than a mold for aluminum (almost 100.000 castings for aluminum versus 1.000.000 castings for zinc alloys)

- **No secondary processing needed**: zinc alloys' high adaptability makes them castable in a number of shapes and thicknesses, making it possible to obtain the desired product with no further processing

Thermal conductivity test

Comparison between

ZP5 and A380

In order to prove these theories, two different prototypes of the same product were prepared: one made of aluminum alloy and one made of zinc alloy, so as to compare both materials performances.

General data

Heat exchange value : 50 W/m2/K on the top of the part
Heat exchange value : 10 W/m2/K on the bottom of the part
Ambient temperature : 20 °C

Metals

Zamak ZP5: Thermal conductivity 108,9 W/m°K

Aluminum A380: Thermal conductivity 109 W/m°K

The results showed that zinc alloy and aluminum alloy had the same performance in terms of thermal conductivity.

Thermal conductivity test

Comparison between

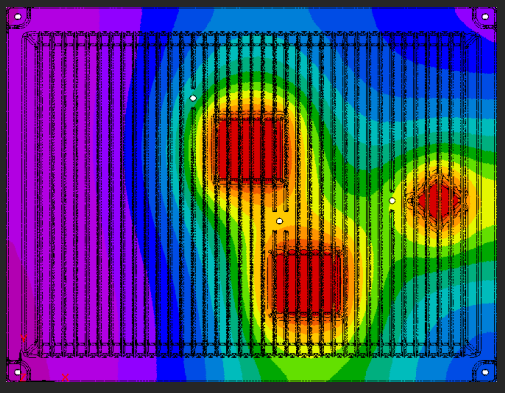
ZP5 and A380

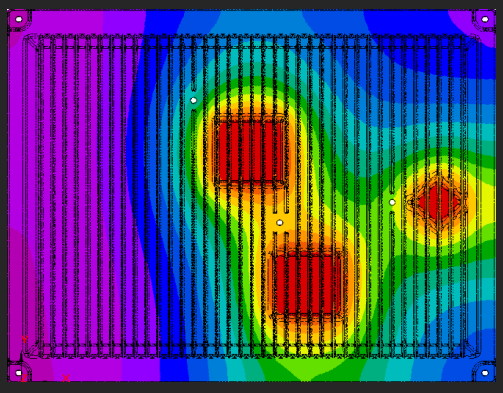
Zamak ZP5

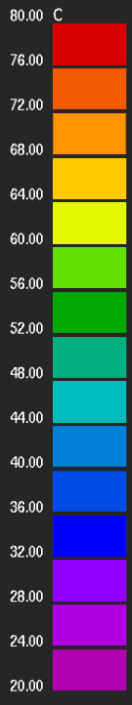
Aluminum A380

Test top view

Ambient temperature : 20 °C / Time 10000 s

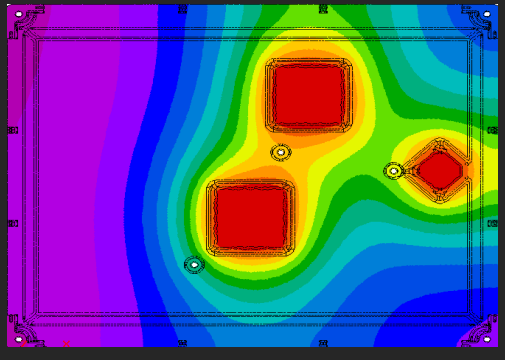


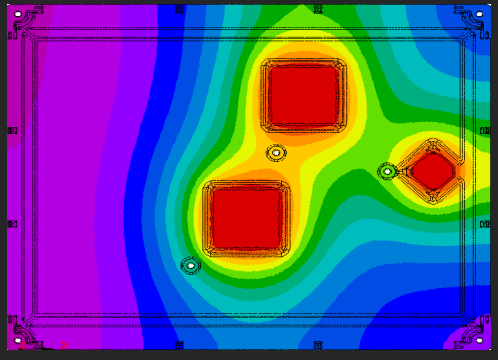




Bottom view

Ambient temperature : 20 °C / Time 10000 s





Conclusions

Thanks to the same value of thermal conductivity, the heat dissipation in permanent regime is the same. Therefore the production of a zinc heatsink was possible, leading to a significant economical saving for the costumer.

When comparing the estimate costs, choosing zinc over aluminum led to a saving through:

- **Increased die life**: 4%
- **No secondary processing**: 13%

Tot. 17%

About Bruschi

For over 70 years Bruschi has been working in industrial production in the field of zinc die casting. Over time the company distinguished itself for efficiency, accuracy, ability to listen to its customers' needs and innovative drive in technology, co-design and mass production.

Bruschi technicians apply know-how acquired by working in many sectors of industry during co-design activities with the client. In fact it is an interdisciplinary knowledge placed at the service of the client's engineers.

A huge expertise in the zinc alloy die casting industry allows to anticipate customers' needs and expectations, by providing engineering solutions to accelerate time of delivery, improve performances, and simplify integrations.

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