

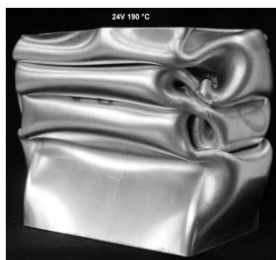
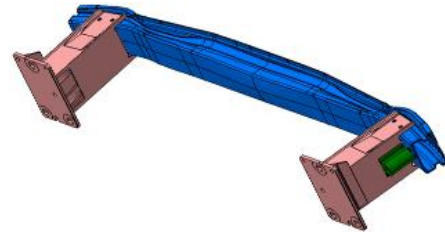
## Ductility of aluminium crash box alloy 6063

### Motivation

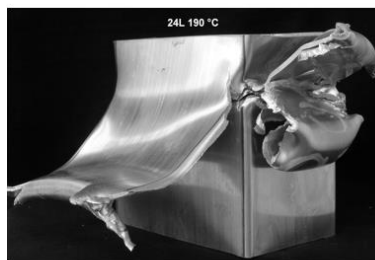
Benteler Automotive Raufoss is proud of saying they are a major supplier of crash protection systems to automotive producers like Audi, BMW, Porsche, Daimler, Landrover/Jaguar and Volvo. In specific, we deliver front – and rear bumper systems. A bumper system generally consists of a stiff bumper beam and two crash boxes, all made from extruded aluminium profiles. The crash box must be ductile, it means it should fold in a nice manner and absorb energy in a crash. For some time it has been known that the crash box profile needs to be rapidly cooled when exiting the extrusion press, in order to obtain the required ductility. However, no one has provided any microstructure explanation or evidence as to why the rapid cooling improves the properties. We can say that the grain structure, as observed in a light microscope, cannot explain the phenomenon, so the answer has to be found by use of instruments that can offer a much higher magnification, such as an electron microscope.

### Your project

You will get crash boxes cooled differently and characterised by crushing (folding) tests, tensile test and a special profile wall bending test. This material should be characterised in a light microscope to reveal the grain structure and in the transmission electron microscope to look at the distribution of hardening precipitates, especially comparing the conditions at grain boundaries.



Water cooling



Air cooling

It is possible to have a 6 weeks summer job at Raufoss in 2021 (vacation week 29 and 30). You will then be introduced to the production processes in Benteler, especially extrusion, and it will be possible to do some of the material testing described above in this period.

A summer job is not a pre-requisite for selecting this topic.

### Requirements

Background in materials physics/solid state physics/metallurgy, foresee a carrier in the industry.

### Contacts

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