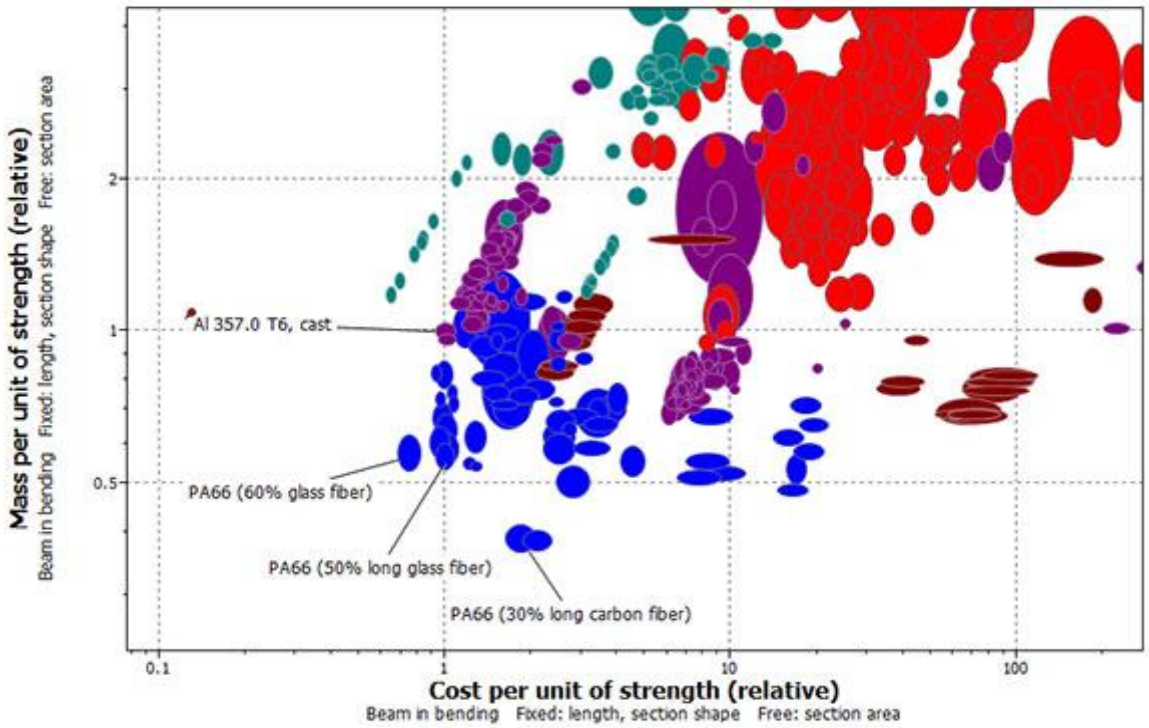
## Finding an alternative for a metal alloy automotive part

Many companies consider replacement materials for a metal during product design or re-design as they seek to meet lightweighting and cost-reduction objectives. In this case study, Granta has investigated replacing a metal alloy from the more than 3,500 alternatives in the MaterialUniverse.

Granta took a typical example of a manufacturer seeking a lighter, cheaper alternative for an automotive cross-beam – it is made from a cast aluminium alloy, bolted to the vehicle's underside, and its length and section shape are fixed. Any alternative material is subject to these constraints, it must have adequate stiffness (>12GPa) to support some of the gearbox weight, it must perform in a given temperature range (-40C to 100C) and be resistant to salt water, oil and fuel – and it must be suitable for near-net-shape volume production. There is some freedom to increase the part's cross-section if a lower-strength material is selected.

In the CES Selector software, we began by considering every material n the MaterialUniverse – metals, alloys, hybrids and polymers. By applying the design constraints and limiting the production method to casting or injection moulding, we reduced the potential replacement materials to around 500. We used the CES Selector charting functions to plot mass per unit of strength versus cost per unit of strength and this showed potential alternatives including stainless steel and a range of polymers.



The chart above, which has the existing cast aluminium alloy as a reference, shows that a glass-fiber-filled polymer would be around 40% lighter and 20% cheaper – significant improvements that we can be confident merit further investigation. Early identification of an alternative material offers opportunities to reduce development costs and risks, and increase the likelihood of project success.