



Upcycling – an important addition to the industry’s vocabulary

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Recycling is not a new concept to the aluminium industry as nearly 60% of the aluminium used in the UK is recycled metal. However, legislation such as the End of Life Vehicles Directive, which states that by 2015 95% of a vehicle’s weight should be recovered or re-used, together with the need to reduce carbon dioxide emissions from metal production and vehicles, means that the amount of aluminium in a vehicle, and the amount of recycling, must increase. Legislation aside, when we consider that remelting aluminium consumes only 5% of the energy needed to produce the primary metal, as well as preserving natural resources, there is also a strong environmental argument. However, there are major challenges in terms of the quality of metal from recycled scrap. This is proving to be a barrier to recycling aluminium, particularly into high performance automotive applications where the use of primary metal based alloys predominates.

The main issue is the increased amounts of inclusions and impurity elements in recycled post-consumer scrap. These inclusions can cause severe losses in ductility and strength, and certain impurity elements significantly reduce corrosion resistance. Conventional wisdom states that the amounts of such inclusions and impurities must be reduced by a chemical refinement approach, but this is a high cost and low efficiency process.

Innoval Technology Ltd is working with the Brunel Centre for Advanced Solidification Technology (BCAST) to develop recycling technologies to process aluminium scrap using an alternative approach involving turbulent high shear melt processing. This is a relatively low-cost method for potentially producing higher grade aluminium products from old scrap. The approach has been termed upcycling in contrast to the current concept of recycling, where the scrap is converted into existing or lower grade alloy.

The BCAST technology provides a family of step-change metal processing techniques for producing high quality and low cost metallic components or feedstock materials directly from melts of post-consumer scrap. Following melt processing, solidification takes place under unique conditions of uniform temperature, uniform chemistry, well-dispersed nucleation agents and fast heat extraction. The result is a refined cast microstructure with increased tolerance to inclusions and impurities, and improved mechanical properties. This novel technology has the potential to blur the distinction between cast and wrought alloys and to deliver alloys based on secondary metal with equivalent properties to those made from primary metal. By making aluminium more economically attractive to car manufacturers, this could dramatically increase the use of aluminium in automotive applications.

Innoval Technology is delighted to be in partnership with BCAST and industrial consortia to bring this exciting new technology to applications within the UK casting industry.