

Ultrasonic Energy - extending the limits of light metal processing

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Abstract

Located in Le Locle – Switzerland, MP Interconsulting is a company with extensive knowledge of research and development (R & R&D) of ultrasonic technology equipment/systems for industrial applications.

The ultrasonic equipment developed by MPI, based on multifrequency, multimode, modulated technology (MMM), can vibrate liquids (creating cavitation) and masses of any shape and size almost spatially uniformly without creating standing waves. In liquids, cavitation is the most significant phenomenon responsible for realizing porosity reduction and grain refinement (or creation of refined and uniform microcrystalline metal structure).

Several different approaches have been developed and effectively applied in both static casting (gravity casting) and continuous casting (twin roll) during the last years. It has been shown that MMM technology significantly improves the mechanical properties of aluminum and magnesium alloys during melt treatment. Such improvements come from the high degassing rate where the cavitation mechanism, besides intensifying the diffusion of hydrogen atoms into the bubbles and removing the bubbles to the bath surface, also plays an important role in the formation of acoustic flows, increasing the diffusion mechanisms, namely the transport of hydrogen atoms to the vicinity of the formed bubbles. The combined effect of these two mechanisms is responsible for the higher removal rate of hydrogen and density increase during the ultrasonic degassing process compared to the rates achieved by applying argon degassing.

Another aspect that deserves attention is the level of refinement of the alloy. With the application of the sonic and ultrasonic MMM technology, it is possible to acoustically "activate" the liquid and facilitate the refinement of an alloy during the solidification step.

The presentation will cover the basics of MMM ultrasonic technology as well as how this technology can improve mechanical properties of light alloys. Many ultrasonic systems are still in their infancy and require further work and development depending on the conditions and processes. Therefore, our goal is to discuss and share value creation ideas with AMAP cluster members so that we can further enhance the MMM technology and identify research and knowledge development fields together with AMAP members and research institutes at RWTH Aachen University.