Effect of high temperature solution heat treatment time on quality index and morphology of A356 DC alloy

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ABSTRACT
Al-Si die casting Aluminum Alloys, such as A380 and A356 are extensively used in automotive die casting applications due to low thermal expansion coefficient and excellent mechanical properties. The relatively high Silicon (Si) content is inevitable in these alloys due to its role in increasing fluidity and reducing shrinkage. However, Si-phase morphology often have an impact on the mechanical properties. This study aims to highlight how altering the morphology of Si phase in A356 can influence the mechanical properties by the mean of solution heat treatment. High temperature solution heat treatment was applied for 1, 4, 6, and 8 h to investigate the effect on mechanical properties and morphology of A356. The solutionization results in significant improvement to the alloy Quality Index. The solution treatment also results in lowering ultimate tensile strength (UTS) while increasing the elongation of the alloy. The microscopic observation reveals that lamellar eutectic Si structure is broken upon solution heat treatment and subsequently spheroidizes into smaller granular structure, which results in improvement of the elongation and Quality Index.

KEYWORDS
Aluminum alloy; Die casting; Heat treatment; Solution

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