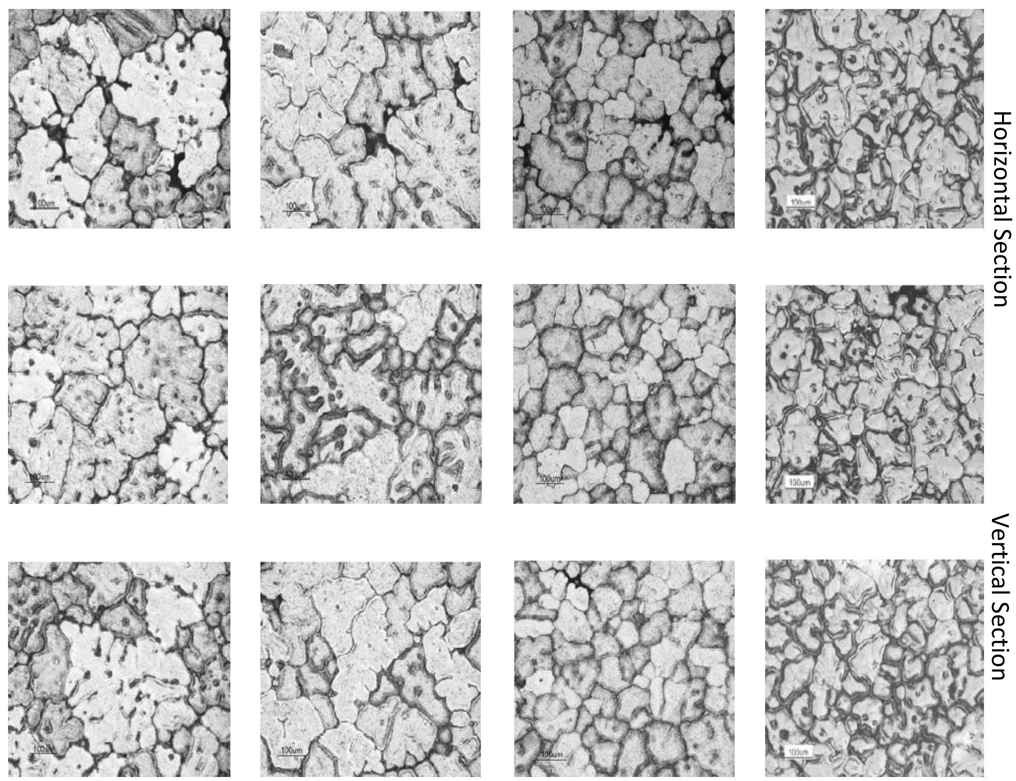
THE ADVANCED CASTING RESEARCH CENTER – ACRC

Project Fact Sheet

THE EFFECT OF MECHANICAL MOLD VIBRATIONS ON THE CHARACTERISTICS OF ALUMINUM CASTING ALLOYS

The effect of controlled mechanical vibration of the mold during alloy solidification on the dendrite coherency point, the hot tearing tendency, and the microstructure of aluminum casting alloys was evaluated.

Microstructure of B206 alloy as a function of vibration acceleration (g):



Mold vibration: None 1.5 g 2.0g 3.0g

Crack Susceptibility Criterion (CSC_M) for B206 alloy as a function of vibration acceleration (g):

	None	1.5g	2g	3g
Temperature at 0.6 fraction liquid (°C)	630.8	630.8	630.8	630.8
Temperature at 0.1 fraction liquid (°C)	592.3	592.3	592.3	592.3
Temperature at 0.01 fraction liquid (°C)	504.3	504.3	504.3	504.3
Time taken from 0.6 to 0.1 fraction liquid (s)	198.6	198.6	194.0	133.7
Time taken from 0.1 to 0.01 fraction liquid (s)	144.0	147.6	141.2	134.3
$T_{dc} - T_s$	141	140	141	138
CSC_M	**22.3**	**16.5**	**8.4**	**11.0**

BENEFITS

Mold vibration reduces grain size.

Mold vibration increases grain compactness.

Mold vibration shifts the dendrite coherency point towards lower temperatures.

Mold vibration lowers feeding-related defects in castings - particularly the incidence of hot tears.

Mold vibration helps distribute the primary silicon particles more uniformly.

Mold vibration allows refinement of the primary silicon particles without the use of chemical additives.

IMPACT

Mold vibration allows casting of typically difficult-to-cast alloys.

Mold vibration may reduce the solidification time, which reduces the overall casting cycle time, and in turn enhances the economic competitiveness of the process.

FOR MORE INFORMATION, PLEASE CONTACT:

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