Eutectic Al-Si alloys are important non-ferrous casting alloys. Different methods have been applied to improve their casting characteristics, microstructure and their mechanical properties. The application of mechanical vibration to the mold during solidification process is one of these methods.

In this study, the vibration is applied in thin wall mold castings made from mild steel to investigate its effect on the efficiency of production with respect to misrun defects and the quality of the castings.

The effect of mechanical vibration in vertical and horizontal modes on the properties of Al-Si (10.5-13.5%Si) alloy during solidification process was investigated. This was done in the frequency range from (0,2,3,12,60) Hz and at two vibration intensities which expressed two different amplitudes; high intensity at(1.6V,4Amp.) and low intensity at(0.8V,2Amp.). Fluidity measurements in addition to the hardness test, surface roughness test and microstructure analysis were carried out on the samples that taken from the castings. Improvements were observed in fluidity when the vibration was applied vertically. In this case, the metal fillability increased with increasing vibration and fluidity reached its maximum value equaling to (19 cm) at (60 Hz) and low intensity.

It was found that the mechanical properties such as hardness enhanced to (83 RHB) at the frequency of (12 Hz) and high intensity in comparing with no vibration case where hardness was (50 RHB). While roughness decreased from (1.643 µm) in no vibration case to (0.791µm) with frequency of (60 Hz ) and low intensity. It was also concluded that vertical vibration of molds during solidification process had a refining effects on the grain structure more than horizontal mode with increasing frequency and intensity of vibration.

Moreover, it was found that the optimal work conditions in horizontal mode were under the application of vibration at low frequency and low intensity for microstructure examination, hardness test and surface roughness test. While fluidity increased with increasing vibration and approximately it reached (17 cm) at high frequencies. Cast hardness enhanced from (50 RHB) in no vibration case to (73.33 RHB) at (2.3 Hz). On the other hand, surface roughness decreased to (0.837...
µm) in comparing with no vibration case where it was (1.643 µm) at a frequency of (2.3 Hz) also.