SECTION SEVEN - CONCLUSION
CONCLUSIONS

1. In accordance with the pressure-wave theory the superimposed vibration during solidification leads to a considerable graphite nucleation in white cast iron. Linear simple harmonic motion of the mould giving rise to the standing wave pattern comprised of pressure and rarefaction, is ideally suitable for nucleation of graphite.

2. Curvilinear oscillation and rotation of the moulds as induced by vibrators II and III of the present investigation can not produce an ideal rarefaction in a standing wave pattern. So they are not effective in graphite nucleation.

3. Solidification under vibration achieves a faster kinetics of first stage graphitisation. The pearlitic malleable iron can be produced by sealing vibrated castings for shorter period of time.

4. The increase in the vibrational amplitude accelerates the rate of first stage graphitisation.

5. Inoculation in castings solidifying under vibration opposes the effect of vibration.

6. First stage graphitisation of vibrated white iron castings is essentially a diffusion controlled
precipitation process. It becomes nearly complete
only after 10 hours of annealing at temperatures between
850°C-950°C.

7. Like metal mould castings the sand mould-castings are
also sensitive to the vibrational effect. Accelerated first
stage graphitisation is equally possible in sand mould
castings solidified under linear simple harmonic vibration.

8. Higher amplitude of vibration causes a greater growth
of graphite nuclei. This produces a less hidden volume
of graphite within the heat-treated castings solidified
under vibration.

9. Nodular graphite is formed in white iron castings solidi-
ﬁed under vibration. The growth of graphite crystals
from the vibrated melt is essentially a curved ‘a’ - axis
crystal growth.

10. Tensile strength of 35 kg/m² with 4-5% elongation is
achievable in vibrated sand mould castings annealed for
10 hours at 925°C. The static toughness of the castings
(area under stress-strain curve) is an increasing function
of amplitude of vibration.

11. Hot forging of white cast iron imparts structural ﬁnerness
by way of breaking down the cementitic net work. This
improves the ﬁrst stage graphitisation kinetics.
12. Beyond a critical percentage of deformation, massive graphitisation takes place with a flaky morphology of graphite. The critical deformation percent at which such massive graphitisation takes place is a function of alloy chemistry.

13. Below the critical deformation percent the graphite formed in hot forged white cast iron is generally of vermicular type.

14. First stage graphitisation of white cast iron can be improved by any means if (a) the number of graphite nuclei is increased and/or (b) the dissolution of cementite in austenite is enhanced by imparting structural fineness.

15. The application of vibration in a solidifying grey cast iron melt causes a reduction in eutectic cell size along with a shortening of flake length.

16. The effect of vibration in inoculated castings is opposite to that in the un inoculated castings.

17. Ultimate tensile strength of grey iron cast under vibration is considerably increased. Tensile strength of grey cast iron increases linearly with decreasing eutectic cell size.

18. Structural fineness of grey cast iron can be effectively described by its eutectic cell size. Eutectic cell size measurement can be used as an effective non-destructive test for quality control in industries.