CHAPTER 12

CONCLUSIONS AND PLANS FOR FURTHER WORK

The investigations under this study were carried out to assess the vibration response of plastic inserts used for guideways and the vibration behaviours of beds. The dynamic tests were carried out under the following conditions.

a) response characteristics of rolling friction guideways and guideways with plastic inserts under non-sliding condition.

b) response of various slideway pairs under non-sliding condition.

c) response of slideways with plastic inserts under sliding conditions

d) effect of thickness of plastic inserts on vibration response

e) vibration behaviour of epoxy concrete and cast iron beds

The following conclusions have been drawn from the experimental investigations.

12.1 CONCLUSIONS

12.1.1 with regard to the guideway with rolling friction elements the experimental observation indicates that the change in pitch length do not appreciably affect its harmonic response.

12.1.2 The response curves for different diameter rollers indicate that they are almost similar for all rollers except at resonant frequencies of excitation, where the velocity of vibration increases with increase in diameter.
12.1.3 A comparison of the vibration response of the guideway with rolling friction elements with that of the guideway with plastic insert Turcite B shows that the velocity of vibration in the case of cast iron - Turcite B is approximately one seventh that of the guideway with rolling friction elements which confirm the excellent damping property of the plastic inserted slideways.

12.1.4 A comparison of vibration response of different slideway pairs under identical non-sliding condition confirms the excellent damping characteristics of the plastic inserts SKC 3, Diamant Moglice, Turcite-B and Teflon.

12.1.5 A significant observation from this investigation is that the vibration response of the machine tools having plastic slideway inserts is unaffected by the feedrates of the machine. The investigation also reveals that the thermosetting resins SKC 3 and Diamant Moglice are better than Turcite B and Teflon inserts.

12.1.6 The comparison of the surface finish of the components produced on the lathes fitted with plastic inserted guideways as well as conventional guideways showed that the finish with the machines fitted with plastic insert is better.

12.1.7 It can also be noted that the natural frequency of the slideway system does not show any change with sliding velocity for all the plastic materials investigated.

12.1.8 The experimental study on the effect of thickness of plastic insert on the vibration response of guideways bonded with different
plastic inserts show that plastic inserts of 1.5 mm thickness is optimum for machine tool slideways for better dynamic performance.

12.1.9 There is no significant difference between the surfaces produced in shaping and milling processes for bonding of plastic inserts.

12.1.10 In the case of design of machine tool structures with epoxy concrete a one to one approach for sizing of the structural elements will result in a poor design. Instead an equal weight approach with increased wall thickness will result in a structure with superior damping than that of a conventional cast iron bed.

12.2. FURTHER WORK PLANNED

The experimental investigations performed and the conclusions drawn under this research work may not be complete in all respects. It is worthwhile to extend investigations plan further, to obtain a better understanding of the dynamic behaviour of various plastics and epoxy concrete. Towards this, the following work is planned.

12.2.1 An investigation on the vibration behaviour of different plastic inserts in an actual machine tool under identical conditions. Some work in this direction has already been initiated on a PSG CNC lathe shown in Appendix 5.

12.2.2 Analysis of vibration during cutting tests on machine tools fitted with plastics under varying feed rates is planned, extension of this work.
12.2.3 Investigations on the dynamic performance of epoxy concrete beds with varying composition of resin and aggregate is being undertaken. The effect of reinforcement is also planned to be studied.

12.2.4 Another proposal is to study the performance of epoxy concrete beds with built-in cast iron or steel guideways but coated with anti-friction materials like SKC 3, Diamant Moglice, Turcite-B and Teflon in an actual machine tool.