CHAPTER 9

CONCLUSION

Experimental investigations have shown that the generated heat in cylindrical grinding could be effectively utilized as a new heat treatment process. With the existing knowledge in grind hardening and based on the test results the following findings are presented:

- The grind hardened parts are characterized by fine grained martensitic layers, which was obtained by short time austenisation of surface layers with self-quenching.
- The application of coolant may avoid thermal damage and improve surface finish, but it has negligible effect in quenching.
- The surface roughness values are more or less consistent and at acceptable level.
- Surface cracks are not found in the grind hardened component which is also checked by using Electro Magnet Crack Detector. Machine Parts that are used under normal loading conditions can be easily grind-hardened.
- Residual stresses obtained on the surface of the specimen are compressive in nature, which is an added advantage in enhancing the fatigue behaviour. These negative residual stresses also slow down the crack initiation and propagation in grind hardened components.
- Possible industrial applications for surface hardening by the grinding lie in the production of running faces for rotary shaft seals, camshaft, lateral faces of the bearings, guide ways and many other functional surfaces which are frequently ground (Figure 8.60).
The theoretical temperature model is developed by using grain contact model to find out the temperature at the interface between the cutting grain and the work-piece, which gives the best agreement with the suggestions given by Doyle and Dean (1980). Actually the temperature developed at the contact area is the main source for the phase transformation, i.e., austenite to fine martensite.

Summing up it has to be noticed that the adoption of this new surface strengthening method includes great economical and ecological potential. In today's customary production after soft machining, the materials are transported for heat treatment. Where the parts are charged, purified and subjected to the heat treatment. Then they are de-charged, transported back and incorporated into the process flow, before final hard machining is undertaken. So this new method has increased integration level and it is also a technological alternative to the other surface hardening processes. This leads to shorter production sequences and reduced through put time as well as decreased cost.

It is to be concluded that the quest to find a way to reduce the cost involved in the manufacturing has attained its culmination. Based on this investigation, this new heat treatment process, **Grind Hardening**, would be a small beginning in the achievement of economic manufacturing and in a broader perspective for an integrated manufacturing system.