ABSTRACT

The present study is concerned with the cold forming of hexagonal nut blanks. Chapter one has been devoted to the introductory presentation. The importance of the product and the various methods of production have been dealt with. Literature survey describing the loading analysis of the closed die forgings has been done. Survey of the upper bound method has also been done which is further utilized in the theoretical analysis of the problem. In the die set there is a central circular punch with different nose shapes and also an outer hexagonal punch. It goes into a hexagonal shaped die thereby transforming the material into the desired hexagonal nut blank.

Chapter 2 presents the method proposed by the author for the production of hexagonal nut blanks. The main process along with the experimental setup has been described. The practical data computed through the experiments has been given and the observations and results so obtained have been provided. It has been shown that in the proposed method the material wastage is very less as is to the extent of 5 to 10% of the total volume of the nut blank. The studies are made with different shapes of the punch nose, and the flat punch gives the least wastage without any abnormal increase in load.

In the present work four different types of
central punches have been used. The end shapes of these punches are conical, parabolic, spherical and flat. In Chapter 3 an upper bound has been proposed for each of these cases by an assumed kinematically admissible velocity field and the non dimensional forging pressure calculated. The theoretical results and the practical results have been compared and they have a good agreement.

An economic analysis for the various available methods has been done in chapter 4. The data has been collected from the various industries around the Northern Region. The analysis has been done for the proposed method also. It has been found that in the proposed method the flat punch gives the maximum material saving and the least cost. Further the various methods have been correlated and it is found that the proposed method is the least costly out of the available methods.