CHAPTER – 6

CONCLUSIONS AND SCOPE
FOR FUTURE WORK

In this chapter, some concluding remarks have been made based on the present study carried out on sink-EDM process. Further, the scopes for future work have also been indicated.

6.1 CONCLUDING REMARKS

In this research work, the Material Removal Rate (MRR) and Tool Wear Rate (TWR) were mathematically modeled and analyzed through Response Surface Methodology (RSM) while investigating the effect of tool shapes such as triangular, square, rectangular and circular with size factor consideration in sink-EDM process (Chapter-4). The present research work also deals with the RSM based investigations on MRR and TWR to study the effect of tool taper angle with size factor consideration in sink-EDM process (Chapter-5). The experiments were planned as per Central Composite Design (CCD) and second order mathematical models were developed to establish the relationships between the process parameters (discharge current, pulse on-time duration, pulse off-time duration, tool area and tool taper angle) and the responses (MRR and TWR). The Analysis of Variance (ANOVA) was employed along with Fisher's test (F-test) at 95% confidence interval to verify the lack-of-fit and adequacy of developed
models. Confirmation test were also conducted to ascertain the accuracy. Based on the experimental results, the following conclusions are drawn within the ranges of the process parameters selected.

- The main effects of process parameters such as discharge current, pulse on-time, pulse off-time and tool taper angle, higher-order effect of pulse on-time, pulse off-time and interaction effect of discharge current and pulse on-time have significant contributions in MRR.

- The process parameters such as discharge current, pulse on-time, tool area and tool taper angle the higher-order effects of discharge current, pulse on-time and pulse off-time along with the interaction effects due to current and pulse on-time, current and tool area, pulse on-time and tool area, current and tool taper angle have significant effects on TWR.

- The MRR increases linearly, whereas, the TWR increases non-linearly with discharge current.

- Initially, the MRR increases with pulse on-time duration and then starts decreasing even after further increase in pulse on-time duration. On the other hand, the TWR suddenly decreases with increase in pulse on-time duration at the beginning and then starts decreasing slowly and remains constant for longer pulse on-time durations.
• The MRR increases with increase in pulse off-time duration in the beginning up to halfway and then starts decreasing with further increase in pulse off-time duration. On the other hand, the TWR decreases with increase in pulse off-time duration in the beginning up to halfway and then starts increasing with further increase in pulse off-time duration.

• From the direct effect graphs and the area graphs of MRR and TWR, it is revealed that the best tool shape with size factor consideration for higher MRR and lower TWR is circular followed by triangular, rectangular and square cross sections.

• The MRR increases linearly with increase in tool taper angle. Whereas, with increase in tool taper angle the TWR decreases linearly.

**6.2 SCOPE FOR THE FUTURE WORK**

The present work can be extended in a number of directions as suggested below.

1. The effect of other process parameters can be studied by including them in the modeling of sink-EDM process.
2. An attempt can be made to study the effect of tool shapes and tool taper angle with size factor consideration with different dielectric flushing conditions in sink-EDM process.

3. The similar modeling can also be carried out in sink-EDM process by varying some more qualitative process parameters.

4. The effect of hollow tools on performance characteristic in sink-EDM process can be compared with that of solid tools.

5. Performance characteristic of sink-EDM can also be studied for different tool electrode materials and workpiece materials.

6. The effect of polarity combined with different tool electrode materials and workpiece materials can also be studied.

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