

VIII. CONCLUSION & FUTURE SCOPE

The research presents a way of optimizing the cutting parameters in a simple machining process like rough turning for double response and single MPC system wherein the optimum condition set was found to be A1B3C3 (highest S/N ratio), i.e. 2° rake angle, 710 rpm and 0.4 mm/rev which corresponds to surface roughness of 1.2 µm and material removal rate of 132.481 mm³/sec. This result is ideal when the prime requirement is to maximize the MRR. On the other hand, the optimum setting of the control factors by analysis of main effects plot was found out to be A1B3C1, i.e. 2° rake angle, 710 rpm and 0.2 mm/rev which corresponds to surface roughness of 0.86 µm and material removal rate of 68.843 mm³/sec. This result is ideal when the prime requirement is to minimize the surface roughness. This could be extended to more number of responses for further increment in operational efficiency. The membership functions for the linguistic variables could also be modelled more carefully. The paper also proves that Fuzzy Inference Systems in combination with Taguchi's DOE & ANOVA can prove to be powerful tools aiding in effective utilization of machining processes.

REFERENCES

- [1] R. K. Roy – Design of Experiments using the Taguchi Approach; John Wiley & Sons, April 2001.
- [2] Ranganath M. S., Vipin, and R.S. Mishra, “Effect of Cutting Parameters on MRR and Surface Roughness in Turning of Aluminium (6061)”, International Journal of Advance Research and Inovation, Vol. 2, Issue 1, pp. 32-39, March 2014.
- [3] J. L. Lin and C.L. Lin, “The use of grey-fuzzy logic for the optimization of the manufacturing process”, Journal of Materials Processing Technology, pp. 9 – 14, November 2005.
- [4] J. L. Lin, K. S.Wang, B. H. Yan, and Y. S. Tarn, “Op- timization of the electrical discharge machining process based on the Taguchi method with fuzzy logics” Journal of Materials Processing Technology, Vol.102, pp.48-55, 2000.
- [5] Ranganath M. S. - Application of TAGUCHI Techniques in Turning, AKN Learning, September 2015.
- [6] Y. F. Tzeng and F. C. Chen, “Multi-objective optimization of high speed electrical discharge machining process using a Taguchi fuzzy-based approach”, Materials and Design, Vol. 28, pp. 1159 – 1168, 2007.
- [7] O. Yilmaz, O. Eyercioglu , and N. N. Z. Gindy, “A user-friendly fuzzy-based system for the selection of electro discharge machining process parameters”, Journal of Materials Processing Technology, Vol. 173, No. 3, pp. 363 - 371, March 2006.
- [8] H. Vasudevan, N. C. Deshpande, and R. R. Rajguru, “Grey Fuzzy Multiobjective Optimization of Process Parameters for CNC Turning of GFRP/Epoxy Composites”, Procedia Engineering, Vol. 97, pp. 85 – 94, 2014.

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