

## Comparative Assessment of MRR, TWR, and Surface Integrity in Rotary and Stationary Tool EDM for Machining AISI D3 Tool Steel

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**Abstract :** Electric Discharge Machining (EDM) is a well-established and one of the most primitive unconventional manufacturing processes, that is used world-wide for the machining of geometrically complex or hard and electrically conductive materials which are extremely difficult to cut by any other conventional machining process. One of the major flaws, over all its advantages, is its very slow Material Removal Rate (MRR). In order to eradicate this slow machining rate, various researchers have proposed various methods like; providing rotational motion to the tool or work-piece or to both, mixing of conducting additives (such as SiC, Cr, Al, graphite etc) powders in the dielectric, providing vibrations to the tool or work-piece or to both etc. Present work is a comparative study of Rotational and Stationary Tool EDM, which deals with providing rotational motion to the copper tool for the machining of AISI D3 Tool Steel and the results have been compared with stationary tool EDM. It has been found that the tool rotation substantially increases the MRR up to 28%. The average surface finish increases around 9-10% by using the rotational tool EDM. The average tool wear increment is observed to be around 19% due to the tool rotation. Apart from this, the present work also focusses on the recast layer analysis, which are being re-deposited on the work-piece surface during the operation. The recast layer thickness is less in case of Rotational EDM and more for Stationary Tool EDM. Moreover, the cracking on the re-casted surface is also more for stationary tool EDM as compared with the rotational EDM.

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