# METHOD AND SETUP FOR WIRE ELECTRIC DISCHARGE DOUBLE HELIX TURNING

## IITM Technology Available for Licensing

### Problem Statement

- Demand for high aspect ratio holes on Ti-6Al-4V is high in aerospace, biomedical and chemical industries, but machining the same is very challenging due to the low thermal conductivity and debris accumulation in the machining zone.
- Conventional drilling methods struggle with high aspect ratio and deep hole drilling due to issues like inefficient chip removal, increased cutting forces, and elevated temperatures.
- **Technology development to modify the geometry of Electric Discharge Drilling (EDD) tools by fabricating micro double-helical grooves on EDD tools in a single pass to enhance debris removal.**
- Performance analysis of Solid, single-helical and double-helical electrodes by drilling through-holes on Ti-6Al-4V workpiece

### Intellectual Property

- **IITM IDF Ref. 1798**
- **IN 491648 - Patent Granted**

### TRL (Technology Readiness Level)

**TRL - 4: Technology validated in lab scale.**

### Technology Category/ Market

**Category - Advanced Machining Tools**
**Applications**- Aerospace, Automotive
**Industry-** Industrial Machinery, Aerospace, Automotive Manufacturing.
**Market** - Global Drilling Tools market size is estimated to be worth USD 6525 million in 2022 and is forecast to a readjusted size of USD 8184 million by 2028 with a **CAGR of 3.8%**

### Research Lab

**Prof. G.L. Samuel,**
Dept. of Mechanical Engineering

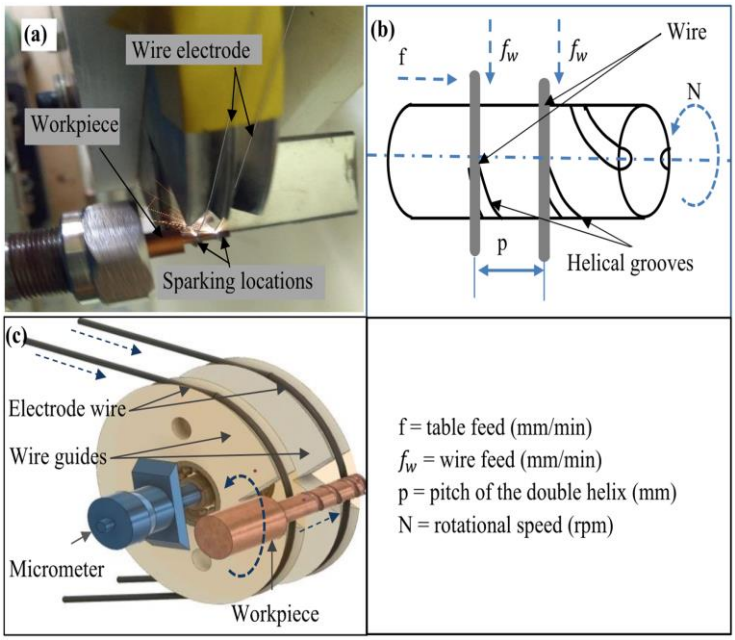


**FIG. 1.** (a) Sparking at two locations, (b) Schematic representation of the mechanism of double helix machining, (c) Components of the sparking system.

### Technology

1. **Multi-Electrode Wire Setup**: The disclosed setup for electric discharge machining includes multiple electrode wires positioned at predetermined distances. This setup enables simultaneous machining at multiple locations on the workpiece.
2. **Use of Discs for Electrode Guidance**: The setup involves discs that facilitate the movement of the electrode wires, ensuring precise positioning during machining. Each disc is placed at a preset distance, aiding in the control of the machining process.
3. **Formation of Helical Grooves**: By maintaining a spark gap filled with dielectric between the electrode wires and the workpiece, the method forms helical grooves on the workpiece's surface. This enables the creation of intricate patterns, like double helical grooves

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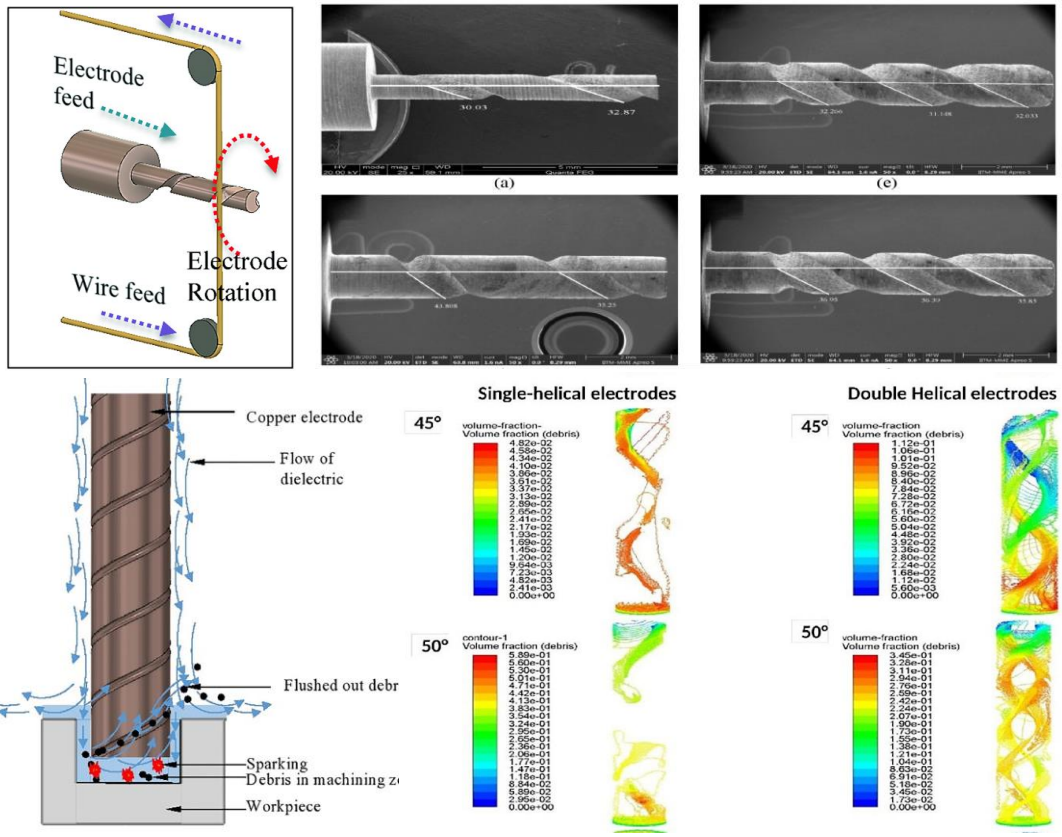


**FIG. 2.** Illustrates method providing electric machining of grooves on a workpiece and flushing simulation

## Key Features / Value Proposition

### 1. Enhanced Machining Efficiency

- Micro double-helical grooved electrode performs better in debris removal and its transportation from the machining zone

### 2. Technology for microfabrication

- Developed and demonstrated technology for fabricating double helical grooves on mesoscale cylindrical rods by Wire Electric Discharge Turning

### 3. Cost Reduction

- By enabling machining of complex features in a single setup, it reduces the need for multiple machining operations, thus lowering costs.

### 4. Improved Flushing Characteristics

- The formation of helical grooves enhances flushing, improving chip removal and reducing the risk of tool damage

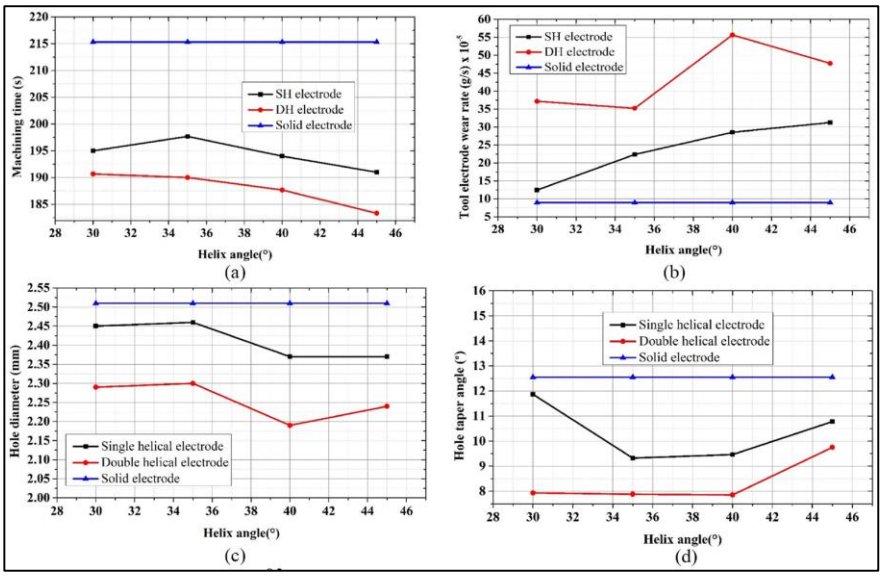


**FIG. 3**. Plots of: (a) machining time, (b) electrode wear rate, (c) hole diameter, (d) hole taper angle, when drilled with solid, single-helical and double-helical electrode at different helix angles.

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