

## **A customizable wire electric discharge machine**

Wire Electric Discharge (WED) machining (also known as electric spark-machining) is a non-conventional machining technique and involves performing cutting (machining) through heat generated due to an electrical spark. The machinability of any material with WEDM does not depend on hardness of the material. However, the commercial machines are usually very costly and large in size (they require a dedicated room of size  $\approx 12 \text{ ft} \times 12 \text{ ft} \times 12 \text{ ft}$ ). Small scale industries and teaching/research institutes cannot afford the large space and cost. The cost of this machine would be less than 1/4th of the cost of the machines available in the market. The size of the disclosed machine is  $4 \text{ ft} \times 2 \text{ ft} \times 2 \text{ ft}$  and hence it can fit on a table top. Thus, the invention proposes a cost-effective customizable miniature WEDM.

The machine has lower cost and occupies lesser space. Therefore, industries can benefit from this machine to increase their production without financial or real estate burden. Especially, small scale industries, research institutes or small engineering colleges who cannot afford large machines can also utilize this machine for in-house fabrication of small jobs, teaching and research activities. For example, the spark in WEDM cannot be probed easily because sensors cannot be placed very close to it. This machine can be effectively used to understand the process physics, by closely probing the spark.

Further, the process settings (i.e. input parameters like voltage, current, pulse ON time, pulse repetition frequency, as well as material of the dielectric, wire material, wire diameter, etc.) cannot be varied beyond a certain range in the machines available in the market today. In contrast, this invention discloses a fully customizable machine such that, all the input parameters can be changed easily. This facility can be used to find an optimum set of parameters for any material. For example, off-the-shelf WED machines are “designed” for metals and hence cannot give best results with ceramics/semiconductors. The customizability of the machine can be exploited to find optimum settings for non-metallic materials mentioned above.