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MANUFACTURING MANAGEMENT

From basic machining to quality product

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Investigation of Corner Radius using Micro Wire Electro Discharge Machine

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1. Introduction

Micro Wire EDM is a method to machine conductive materials with a thin electrode that follows a programmed path. The electrode is a thin wire. As the wire been set, it uses sparks of electrical energy to progressively erode an electrically conductive workpiece along a path determined by the relative motion of the machine axis. There is no physical contact between the wire and the part being machined. Rather, the wire is charged to a voltage very rapidly. This wire is surrounded by de-ionized water. When the voltage reaches the correct level, a spark jumps the gap and melts a small portion of the work piece. The de-ionized water cools and flushes away the small particles from the gap. The wires are usually made of Brass, Copper or Tungsten, Zinc or Brass coated. Multi coated wires are also being used. Micro wire diameters range can be from 0.25mm to 20 micrometers although smaller and larger diameters are available. The wire must have sufficient tensile strength and fracture toughness as well as high electrical conductivity and capacity to flush away the debris produces during the cutting. The hardness of the work piece material has no damaging effect on the cutting speed. However, cutting speed can varies according to the conductivity and the melting properties of materials. For example, aluminum, a good conductor with a low melting temperature, cuts faster than steel. On the other hand, carbide, a nonconductor, cuts much slower than steel.

Although the micro wire-EDM process has been a key process for the tooling and manufacturing industry, especially for the production of punches and dies, the exact mechanism of the machining process is not yet clearly understood by many in the manufacturing community. The metal removal process of micro wire-EDM involves complex, stochastic and time-varying characteristics. Moreover, the process features change