ELECTRIC DISCHARGE MACHINE
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DIFFICULTIES FACED FOR MACHINING HARD AND HEAT RESISTING MATERIALS

TOOL HARDNESS

METAL REMOVAL TAKES PLACE DUE TO SHEARING ACTION

IN NON-CONVENTIONAL MACHINING (NCM) PROCESS TOOL NEED NOT BE HARDER THAN THE WORK-PIECE

HARDNESS OF WORK-PIECE IS NOT A PROBLEM

WORK-PIECE NEED NOT BE SUBJECTED TO UNDERGO ANY STRESS

INTRODUCTION
ELECTRIC DISCHARGE MACHINE

HISTORY AND DEVELOPMENT

- Manufacturers felt the need for development of new concepts in metal machining in 1960's
- As a result, NCM processes have emerged
- Conventional tools were not needed
- Instead utilizes some form of energy for metal machining
## Classification of Modern Machining Processes

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ELECTRIC DISCHARGE MACHINE

- PROCESS
  - CONTROLLED EROSION
  - SPARK GAP FLOODED OR IMMERSED UNDER THE DIELECTRIC FLUID
  - SPARK DISCHARGE IS PRODUCED BY THE CONTROLLED PULSING OF DIRECT CURRENT
  - DIELECTRIC FLUID IN THE SPARK GAP IS IONIZED USING DIRECT CURRENT
  - A SPARK DISCHARGE PASSES BETWEEN THE TOOL AND THE WORK PIECE
ELECTRIC DISCHARGE MACHINE

- ELECTRICAL DISCHARGE MACHINE (EDM)
- EACH SPARK PRODUCES ENOUGH HEAT TO MELT AND VAPORIZE A TINY VOLUME
- LEAVING A SMALL CRATER
- ENERGY CONTAINED IN EACH SPARK IS DISCRETE
- IT CAN BE CONTROLLED
- MATERIAL REMOVAL RATE, SURFACE FINISH AND TOLERANCE CAN BE PREDICTED
CONSTRUCTION

MACHINES ARE OF VERTICAL ‘C’ TYPE
COLUMN IS FIXED TO THE BASE AND SUPPORTS THE HEAD
A CO-ORDINATE TABLE MOUNTED ON THE BASE
ELECTRIC DISCHARGE MACHINE

- SINKER EDM

- SINKER EDM, ALSO KNOWN AS CAVITY EDM OR VOLUME EDM

- CONSISTS OF AN ELECTRODE AND WORKPIECE SUBMERGED IN AN INSULATING LIQUID SUCH AS, OIL OR OTHER DIELECTRIC FLUIDS

- THE ELECTRODE AND WORKPIECE ARE CONNECTED TO A SUITABLE POWER SUPPLY

- THE POWER SUPPLY GENERATES AN ELECTRICAL POTENTIAL BETWEEN THE TWO PARTS

- AS THE ELECTRODE APPROACHES THE WORKPIECE, DIELECTRIC BREAKDOWN OCCURS IN THE FLUID, FORMING A PLASMA CHANNEL, AND A SMALL SPARK JUMPS
ELECTRIC DISCHARGE MACHINE

- **WIRE EDM**
- **WIRE EDM, ALSO KNOWN AS WIRE-CUT EDM AND WIRE CUTTING EDM**
- A THIN SINGLE-STRAND METAL WIRE, USUALLY BRASS, IS FED THROUGH THE WORKPIECE, SUBMERGED IN A TANK OF DIELECTRIC FLUID, TYPICALLY DEIONIZED WATER
- WIRE-CUT EDM IS TYPICALLY USED TO CUT PLATES AS THICK AS 300MM AND TO MAKE PUNCHES, TOOLS, AND DIES FROM HARD METALS THAT ARE DIFFICULT TO MACHINE WITH OTHER METHODS
- THE WIRE, WHICH IS CONSTANTLY FED FROM A SPOOL, IS HELD BETWEEN UPPER AND LOWER DIAMOND GUIDES
- THE GUIDES, USUALLY CNC-CONTROLLED, MOVE IN THE X–Y PLANE
ADVANTAGES

- Complex shapes that would otherwise be difficult to produce with conventional cutting tools
- Extremely hard material to very close tolerances
- Very small work pieces where conventional cutting tools may damage the part from excess cutting tool pressure
- There is no direct contact between tool and work piece. Therefore delicate sections and weak materials can be machined without any distortion
- A good surface finish can be obtained
- Very fine holes can be drilled
ELECTRIC DISCHARGE MACHINE

- **DISADVANTAGES**
  - THE SLOW RATE OF MATERIAL REMOVAL
  - POTENTIAL FIRE HAZARD ASSOCIATED WITH USE OF COMBUSTIBLE OIL BASED DIELECTRICS
  - THE ADDITIONAL TIME AND COST USED FOR CREATING ELECTRODES FOR RAM/SINKER EDM
  - REPRODUCING SHARP CORNERS ON THE WORKPIECE IS DIFFICULT DUE TO ELECTRODE WEAR
  - SPECIFIC POWER CONSUMPTION IS VERY HIGH
  - "OVERCUT" IS FORMED
  - EXCESSIVE TOOL WEAR OCCURS DURING MACHINING
  - ELECTRICALLY NON-CONDUCTIVE MATERIALS CAN BE MACHINED ONLY WITH SPECIFIC SET-UP OF THE PROCESS
THANK YOU
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