15 Questions

About the Authors

1. Describe the authors of *Complete EDM Handbook*.

A. Carl Sommer

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2. On what principle did this father and son team build their company to become the largest wire EDM job shop west of the Mississippi River?

3. Describe how following this principle will make for successful business practices.

4. What was Reliable EDM able to accomplish by modifying their wire EDM machines?

Chapter 1
Understanding Electrical Discharge Machining

1. Concerning machining methods, what rank is EDM?

2. List the three basic EDM methods.

3. On what principle does the EDM process work?

4. Describe this process for:

A. Wire EDM

B. Ram EDM

C. Small Hole EDM Drilling

5. What kind of material can be EDMed?

6. How have wire EDM cutting speeds changed since wire EDM was introduced?

7. Describe fuzzy logic.

8. List at least four innovations in the EDM industry.

9. What is one of the biggest difficulties concerning accuracies in the machining trade? Why is this issue so important?

10. If a ten inch piece of steel heats up ten degrees, how much will it expand?

11. Describe an automatic production cell.

12. What three things do the authors say customers want?

13. How can we make America more productive?

14. What can you do to make America more productive?

Chapter 2
Wire EDM Fundamentals

1. When was the first wire EDM produced?

2. How fast did the wire EDMs cut in the '70s?

3. How fast can they cut today?

4. How accurately can wire EDM cut?

5. How heavy can parts weigh for wire EDM?

6. Why is wire EDM such a serious contender with conventional machining?

7. What are design engineers doing as they discover the advantages of wire EDM?

8. What is the difference in speed between cutting exotic alloys and mild steel using wire EDM?

9. Describe a fully automated wire EDM.

10. What does CNC mean?

11. Describe spark erosion.

12. What is deionized water, and what does it do?

13. What happens between the electrode and the workpiece when sufficient voltage is applied?

14. What is the function of the pressurized dielectric fluid?

15. What does the resin do?

16. What does the filter do?

17. What is the function of the servo system?

18. Describe the four steps of the EDM process.

19. What machine best describes the wire EDM process?

20. Describe independent four axis.

21. Up to what angles can wire EDM machine cut?

22. Describe submersible wire EDM machining.

23. Under what circumstance is submersible machining particularly beneficial?

24. What is important for companies to do to remain successful?

25. How tall can the author's company EDM parts?

Chapter 3
Profiting with Wire EDM

1. What are manufacturers discovering about the use of the new generation of high-speed wire EDMs?

2. Describe the accuracies and finishes achieved with wire EDM.

3. Draw a picture of an edge that has been stamped and an edge that has been wire EDMed.

4. Describe how damaged parts can be repaired with wire EDM.

5. Why is there decreasing need for skilled craftspersons?

6. What effect does material workpiece hardness have with wire EDM?

7. What is digitizing?

8. How thin of a wire can some EDMs cut?

9. Why is wire EDM so reliable?

10. List at least ten parts that can be made with wire EDM.

11. What advantage is it to cut thin shims with wire EDM rather than with laser?

12. What are the factors in determining machining costs for wire EDM?

Chapter 4
Proper Procedures for Wire EDM

1. In planning work for wire EDM, what is a good way to visualize the machine?

2. List the three methods to pick up dimensions on a part.

3. What happens if scale is in a hole that needs to be picked up?

4. What is automatic pick up?

5. What happens if the holes are not square when they are picked up?

6. What will happen if the holes have ragged edges?

7. Where is the best place to put starter holes?

8. Where should starter holes be placed for cutting out thin slots? Why?

Chapter 5
Understanding the Wire EDM Process

1. What tolerances can wire EDM machines hold?

2. Why is wire EDM able to get such a fine finish, even on tall parts?

3. What is the wire kerf for a .012" (.030 mm) wire?

4. What will always happen when inside corner radii are machined with wire EDM?

5. What must be done to achieve very sharp outside corners?

6. List the three main reasons for skim cuts.

7. Wire EDM is a stress-free cutting method. What causes metal to move when it is cut with wire EDM?

8. What determines the hardness and toughness of tungsten carbide?

9. When tungsten carbide is EDMed, what is eroded away during the EDM process?

10. What is polycrystalline diamond?

11. What two things does the pressurized deionized fluid do?

12. What precautions can be taken to avoid flushing pressure loss?

13. What is the wire EDM ideal metal thickness to obtain the maximum square inches of cut per hour?

14. List some of the factors that can alter the cutting speeds of wire EDM.

15. List some outcomes when the wire electrode meets impurities.

16. Describe recast and heat-affected zone.

17. What practically eliminates the heat-affected zone?

18. What do some wire EDM machines come equipped with to minimize heat-affected zones?

19. Describe and list the advantages of non-electrolysis power supplies.

20. What is the advantage of heat treating steel before the EDM process?

21. When EDMing large sections, list the actions that can be taken to relieve inherent stresses.

22. List the reasons to leave a frame around the workpiece.

23. Why is it important that on some operations the frame should have sufficient strength?

Chapter 6
Reducing Wire EDM Costs

1. Why are costs reduced when creating one slug with wire EDM?

2. Why is having the flush nozzles on the workpiece the most efficient way to cut for wire EDMing?

3. Give an example of when it is better to machine parts after they have been EDMed.

4. What are some factors that should be considered when parts are stacked to be wire EDMed?

5. Why would putting in holes after the EDM process reduce costs?

6. Why does cutting with thin wire electrodes increase costs?

7. What are common wire sizes for EDMing?

Chapter 7
Advantages of Wire EDM for Die Making

1. Describe old-fashioned tool and die making?

2. How close did the author grind the die sections that were stacked together?

3. What was the cutting clearance between the die and the punch?

4. A human hair is approximately .002" thick. Write down from the author's notes the procedures he used to grind on a surface grinder the tip of the floral pick. (Try to imagine this accuracy. Be relieved—wire EDM has eliminated this process.)

5. Describe how tools and dies are made using wire EDM.

6. What effect has wire EDM had on tool and die makers?

7. What has been the overall effect of wire EDM on tool and die making?

8. List the advantages of one-piece die sections.

9. List at least six other advantage of wire EDMing die sections.

10. In building large die sections, what caution should be taken?

11. List six methods in holding small punches.

12. If a punch needs to be skimmed because tight tolerances are required, what should be done?

13. Why is it good to avoid sharp corners in building dies?

14. In building a cutoff die, why should the heel of the cutoff punch be a slip fit in the die section?

Chapter 8
Wire EDMing One-Piece Stamping Dies

1. What advantages are there in building one-piece stamping dies?

2. Where should the starter hole be placed in one-piece stamping dies?

3. When should the tool steel be hardened?

4. In close tolerance dies, what should the heat treater do to the steel?

5. What is the advantage of mounting the stripper on the bottom of the die section before wire EDMing?

6. From the diagrams, describe a compound blanking die.

7. Why is it so important to mount the hardened steel on the die set before wire EDMing?

Chapter 9
Fundamentals of Ram EDM

1. List the various names for ram EDM.

2. What is ram EDM generally used for?

3. List and explain the two significant improvements in spark erosion from the two Russian scientists.

4. How did the transistor aid in ram EDM?

5. Describe the difference between wire EDM and ram EDM.

6. What surrounds the electrode and workpiece in ram EDM?

7. What function does the dielectric oil have when electricity is first supplied?

8. What happens when sufficient electricity is supplied between the electrode and the workpiece?

9. What happens during the off time of the electrical cycle?

10. What determines the depth of workpiece erosion?

11. What effect does polarity have on the workpiece and the electrode?

12. What happens in the no-wear cycle?

13. Describe fuzzy logic.

14. What should be done concerning fumes from ram EDM?

Chapter 10
Profiting with Ram EDM

1. When is it profitable to machine blind cavities with ram EDM?

2. Why is it possible to EDM thin sections?

3. What is the possible accuracy of ram EDM?

4. What effect does workpiece hardness have on the EDM process?

5. How do some ram EDMs put threaded holes into hardened parts?

6. List four applications for ram EDM.

7. What kinds of materials can be machined with ram EDM?

8. How can mold makers increase the speed of their molds?

9. Why does carbide cut slower than steel?

Chapter 11
Ram EDM Electrodes and Finishing

1. What is the function of the electrode?

2. List the factors that need to be considered in selecting electrode material.

3. What are the two main types of electrode material?

4. Why is graphite a commonly used electrode material?

5. Describe the Galvano process for metallic electrodes.

6. How are custom molded metallic electrodes made?

7. What is one of the major problems with graphite?

8. What factors determine the cost and cutting efficiency of graphite?

9. What are the two general rules for choosing the type of graphite material?

10. Where does the heaviest electrode wear occur? Why?

11. Describe the process for abrading graphite electrodes.

12. Describe the ultrasonic machining process for graphite electrodes.

13. What is an efficient way to machine intricate graphite electrodes?

14. What does the C axis do on a ram EDM?

15. What determines the amount of overcut that occurs in an EDMed cavity?

16. When do maximum and minimum overcuts occur? Explain the reasons.

17. Why can there be significant differences in the heat-affected zones between wire and ram EDM?

18. List the different layers that occur when EDMing.

19. What has happened with the newer power supplies concerning heat-affected zones?

20. What significantly reduces heat-affected zones?

21. What causes rough and fine finishes when EDMing?

22. What have some manufacturers done to produce mirror finishes?

23. Describe the mirror finishing process.

24. Describe the micro-machining process.

Chapter 12
Dielectric Oil and Flushing for Ram EDM

1. Describe the three important functions of the dielectric oil.

2. Why is the coolant system important?

3. What is flash point?

4. List some of the factors that make flushing so important?

5. What happens with improper flushing?

6. What happens when arcing occurs?

7. When and why is arcing most likely to occur?

8. What are the issues concerning dielectric oil volume and pressure?

9. Describe pressure flushing through the electrode.

10. Describe pressure flushing through the workpiece.

11. Describe suction flushing through the electrode.

12. Describe suction flushing through the workpiece.

13. Describe jet flushing.

14. List and describe the three types of pulse flushing.

15. What does the filtration system do?

Chapter 13
Reducing Costs for Ram EDM

1. In machining large cavities, what helps to reduce costs?

2. Describe the different procedures for cutting a hex with ram and with wire EDM.

3. With the advent of solid-state power supplies and premium electrodes, what is now possible with roughing electrodes?

4. What are the advantages of electrode and workpiece holding devices?

5. How has orbiting reduced costs concerning electrodes?

6. How does the orbital path aid in flushing?

7. In orbiting, both the bottom and the sides of the electrode can be used for finishing. How does this reduce costs?

8. List and describe the twelve possibilities for orbiting machining.

9. Describe microwelding.

10. Describe the use of abrasive flow machining to remove recast layer from EDMing.

11. Describe the use of tool changers.

Chapter 14
Small Hole EDM Drilling

1. What are some of the common names for small hole EDM drilling?

2. What kind of materials can be drilled with small hole EDMing?

3. List some applications for small hole EDMing.

4. Describe how small EDM drilling works.

5. What does the pressurized dielectric fluid accomplish?

6. What does the servo mechanism do?

7. What kind of electrodes are used for small hole EDMing?

8. How deep have holes been drilled using this process?

9. What benefit does the high pressure have on drilling?

10. What does the servo motor do in small hole EDM?

11. What is the major difference between a metal disintegrating machine and a small hole EDM drill?

12. What happens to cutting speed when large holes need to be drilled with small hole EDMing?

13. Compare drilling on curved and angled surfaces with conventional drills and small hole EDMing.

14. How does material hardness affect small hole EDM?

15. What is the difference concerning the burrs from conventional drilling versus small hole EDMing.

16. When are conventional drills most likely to break?

17. What is the difference in the torque conditions when drilling with conventional machines versus drilling with small hole EDM?

18. Why does small hole EDMing produce straight holes?