

## Electrochemical Cutoff Machine Training

### **1 - What's the likeliest cause of discolored ends? Too much current?**

*Discolored ends- this can be from heat or from oxide. If you are getting actual burning on the ends , that would be usually be from too high a feed rate and/or too little electrolyte. The ECG process should not generate much heat so if you see burning you will probably also see burrs. You will almost always see some brown or gray oxide deposits left on the or near the end of the tubes. This is normal. As the ECG process oxidizes the material, some of the oxide is deposited on the part. The oxide can be removed by passivating, electropolishing or other brief chemical etch.*

### **2 - Do you recommend different wheels based on the different types of materials we cut?**

*Wheels- Everite has a number of different wheel specs and sizes available. There are also different thicknesses. The standard general purpose wheel is the 10 x .070 A100RBC. This is an aluminum oxide (AlOx) used widely for cutoff of stainless steel tubing. We also make plain silicon carbide (SiC) wheels, combination grit and diamond and CBN. The 10 x .040 thick wheels are also popular for cutoff. These are helpful on cutoff of very small diameter materials or very flexible tubing such as Nitinol. The thinner wheel will put less pressure on the part during the cut and save kerf loss.*

### **3 - How much of a difference is there when cutting tubing versus cutting wire? Is it simply a function of overall material removed?**

*Tubing vs. wire- there really is no difference in cutting a solid bar or tubing except that there is more metal removed with a solid. This will cause more current draw and more wheel wear. Typically you would cut at a slower feed rate for solid materials. The limiting factor is the available current in the power supply, typically 300 Amps for a cutoff machine.*

### **4 - How much does the electrolyte affect performance? I'd heard that the amount of electrolyte directed onto the wheel combined with the general location of the stream can affect performance. Is this true? What about overall cleanliness of the electrolyte?**

*Electrolyte- The electrolyte is a critical part of the ECG process. It is also the most difficult variable to monitor and control. The feed rate, voltage, type of wheel, workpiece material, type of electrolyte and electrolyte concentration are very stable variables but the electrolyte flow is not. You machine should have a flow meter to measure the flow rate, but how much to apply and on which nozzles really needs to be determined by trial and error. Too little electrolyte will cause burrs and possibly a short circuit while too much electrolyte can cause out of square cuts, too much edge rounding,*

length variations, electrolytic attack of the fixture and clamps and also housekeeping issues. People often treat electrolyte like coolant - more is better - but that is usually not the case. The cleanliness of the electrolyte is a complex issue. As the electrolyte is used it absorbs the metal oxides that are generated in the cut. The dissolved metals cannot be filtered out. There are also particles from the wheel and some abrasively removed material that can be filtered out. After the point of saturation, all of the oxides will become sludge, which can be filtered but may be too much for the normal filters. At this point it is probably best to change the electrolyte. The electrolyte will almost always cut even if it is very dirty, but it may result in clogged filters, nozzles and pumps. Dirty electrolyte can also clog the bore of small tubing making it difficult to clean after cutoff.

**5 - What's the biggest contributor to non-square ends? Is it the squareness of the wheel (dress) or feed rate or other?**

Out of square ends can be caused by a number of factors.

A) Wheel dress- the wheel should always have a good square edge. An angle on the wheel will tend to force it to walk to one side during the cut.

B) Warp- Warped or cupped wheels can cause out of square or uneven cuts.

C) Too much electrolyte- Excess flow will wash out more of the top of the tube than the bottom. Keep in mind that the top of tube is exposed to the wheel for a much longer time than the bottom of the tube and the electrolyte will continue to erode the material while it is in contact with the wheel. A dwell at the bottom of the cut will help allow the bottom of the cut to catch up with the top.

D) Excess feedrate. Feeding too fast through the part can cause the wheel to bend and cut out of square. This will also cause more wheel wear, which will require dressing more often.

**6 - What cut length tolerance can be expected?**

On older Everite machines such as the TC1A and TC1C a tolerance of +/- .005" should not be a problem. The machines are usually very repeatable once the machine is adjusted to the correct size. On the Ultracut SR7 series tolerances of +/- .0015 are normal.

**7 - What can cause cut lengths to vary out of tolerance?**

Many different things can cause variation on cut length. The machine must be in good mechanical condition. Worn out or poorly maintained machines will always make it difficult to hold size.

Variation can also be due to improper clamping of the tubing. Be sure that the correct fixture is used and that the work is held securely by both the feed and work clamps. The rubber clamp pads must be uniform in thickness and not worn or cracked. The clamping fixtures should be checked for wear or burrs that may prevent the material from clamping securely. Each tube should be checked for positive clamping action.

*Excess electrolyte flow can also cause length variation. A controlled flow sufficient to make the cut is better than a flood of electrolyte.*

**8- My parts are out of square on one end only. What can cause this?**

*This condition is usually from a warped or cupped wheel. Note which side of the wheel is producing the non-square cut. Remove the wheel and mount it the opposite way. If the problem follows the wheel then replace the wheel. If the non-square end remains on the same side then there could be a fixture or clamping problem. Uneven electrolyte flow can also cause this. Be sure that both sides of the wheel receive even amounts of flow. Also check that the cutoff wheel is centered in the fixture slot to. It is important to make the cutting conditions equal on both side of the wheel. Possibly the spindle head and/or or the spindle motion is not square to the fixture. If this is the case, realignment of the work head may be required.*

**9- What is the correct voltage and feed rate to cut with?**

*Every job will have 'best' setting and there is no exact voltage or feed to use. For most small OD tubes we recommend starting with 8 volts and 1 inch/minute feedrate. Voltage and feedrate can be varied to suit the application. A higher voltage will cause more edge rounding and reduce wheel wear but end squareness or length tolerance may suffer. Increasing the feedrate will reduce cycle time but wheel wear will increase and too high of a feed rate can cause burrs or burned ends.*