**A Beginners Guide to Flux Cored Arc Welding**

When it comes to Flux cored arc welding or “FCAW”many people think it is a different welding “process” when in reality it is not! Even though there are books, classes and equipment specifically labeled for flux cored arc welding only, the reality of FCAW is that the process is nothing more than a different type of filler wire used in a MIG welding machine. That is it!

**Flux Cored Arc Welding Power Supplies**

The power supplies used for this welding process are typically **MIG welders without any modifications**. In some cases you might need to change out the rollers that feed the wire, as well as the contact tip to accommodate for a larger size wire. This is no different than changing to a different size MIG wire! When it comes to power supplies, there are some specifically made for FCAW, but this equipment is only used in heavy industrial applications. The main difference between a FCAW power supply and a MIG machine is how much voltage and amperage the machine is able to produce. In most cases (this includes welding shops and schools) there is no need for theses massive power supplies that are for welding extremely heavy plate. If you have a MIG power supply and a wire feed then you are ready to set it up to start flux cored arc welding.

**Flux Cored Arc Welding Electrodes**

The electrodes, or filler wire, used in FCAW is completely different then MIG welding. The main difference is that **the electrodes have a hollow center filled with flux**. The flux is what shields the weld area from the air and is the main reason this process works better outdoors. Think of this electrode as an inside-out stick welding electrode. This gives this process some real advantages over MIG welding electrodes. There are four main benefits to FCAW:

1. **Deposit rate per hour.**
2. **Welding dirty and rusted metals as thick as ½ of an inch in a single pass.**
3. **Perfect for welding outdoors, as well as for hobby welding.**
4. **Low skill level needed.**

**Deposit Rate per Hour**

The deposit rate blows away all other manual welding processes. A MIG welder could deposit up to eight pounds of wire per hour compared to a flux cored arc welder **packing in up to twenty-five pounds per hour**. This is a big advantage for companies that weld heavy plate. When it comes to weld deposit rate, FCAW can’t be beat! That is why shipyards are always using this process. Firsthand experience; I worked on a project that required installing two wave deflectors one of the world’s largest cruise ships while it was in port for 18 hours. The catch was, we needed to install the deflector and weld at least 100 feet of it in that time frame on steel plate that was almost one inch thick. This was a “never done before” ship modification that had over 5,000 people waiting on us so the ship could depart. The only way to get the welds done in this time frame was with flux cored arc welding. If any other process had been used, the ship would have been docked for at least a week, while millions of dollars a day were lost. FCAW got the job done on time, and most importantly, the job was done right the first time!

**Welding Dirty and Rusted Metals**

This is one of the few electrodes, or processes, that do not need a clean joint. Unlike MIG, Stick and TIG welding, this process can burn through rust, mill scale, and just about anything except for paint, water or oils. **This process is so good at burning through mill scale and rust that in a single pass it can weld a ½ inch plate with groove joint and achieve full penetration on both sides.** FCAW runs hot and fast in all positions, and that makes it perfect for both industrial and shipyard applications.

**Welding Outdoors and Hobbyist Welders**

If you have a MIG welder, you know that welding outdoors has some real troubles. Fortunately, if you swap out your MIG wire for FCAW wire, most of those problems go away. What happens while welding is that the flux inside the electrode helps shield the weld from wind just like a stick welding electrode. When it comes to people who weld as a hobby or for general repairs around the home or farm, the flux cored wire, in some cases, does not need shielding gas. This gives the user more flexibility with less equipment.

**Low Skill Level Needed**

Unlike many other welding processes, this electrode requires very little skill. It is just like MIG welding but much easier. The catch is, you need to how to set-up the welder properly! Once the welder is set-up properly it is a “point-and-shoot” operation with very little welding skill needed. This process, just like MIG welding, requires a precisely set-up machine for it to work well.

**Flux Cored Arc Welding Electrodes Types and Designations**

Flux core arc welding electrodes come in two types:

1. **Self-Shielding**
2. **Dual-Shielding**

**Self-Shielding** is exactly what it states. The filler wire does not require any shielding gasses to weld. This wire works well outdoors and is one of the best choices for general repairs. It keeps the process simple and cuts back on additional costs.

**Dual-Shielding** wire requires additional shielding gasses. In most cases it is a mixture called C25 or 75% Aragon Gas and 25% Carbon Dioxide Gas. The only way to know what shielding gas to use with Dual-Shield electrodes is to contact your welding supply store, electrode manufacture or a welding instructor. It is not worth guessing because you will waste your money and most likely need to remove the weld afterwards.

**FCAW Electrode Designation**

The electrodes for this process come in a variety of sizes. For most welding applications you will likely use one of the following:

* **.023**
* **.030**
* **.035**

The electrodes have a designation system that identifies the type of electrode. As an example we will use an **“E71T-1” and explain what the** coding system means.

* **E** - Stands for electrode.
* **7** – Identifies the minimum tensile strength of the weld per square inch, and in this case, you need to add four zeros (70,000). What this means is the filler metal has a minimum of 70,000 pounds of tensile per square inch of weld.
* **1** – Identifies what position the electrode is designed to weld in. There are only two designations and they are zero and one. Zero means the electrode can only weld in the flat and horizontal positions. One means it can weld in any position.
* **T** – Stands for Tubular and this will be how you know it is a flux cored electrode. If this were a MIG electrode, it would have an “S”, which stands for Solid.
* **1** – Identifies the type of flux that is inside of the electrode.

**Flux Cored Arc Welding Machine Set-Up**

Machine set-up is a critical component of the FCAW welding process. Before setting up the machine, the tension on the rollers needs to be set. **The tension should be just enough to feed the wire without slipping.** If you tighten up the rollers too much, the wire will get crushed and then you will need to re- feed the wire. The heat settings are done with voltage and wire feed speed. In some cases involving Dual-Shield electrodes there will be the additional task of setting the gas flow rate for the shielding gas. The voltage controls the heat setting, while the wire feed speed controls how much wire will flow in to the joint in “IPM” or Inches Per Minute. Since this process uses a constant voltage power supply, the amperage is regulated with the wire feed speed. The faster and harder the wire contacts the weld joint the higher the amperage. When it comes to the settings, there is typically a chart inside the welder containing a clear guideline on voltage and wire feed speed for the thickness of the metal that will be welded. **These recommended settings are not very important with FCAW.** If the puddle flows and the weld washes in then the weld is strong. If these were MIG welding machine settings, this would be very important because MIG welding requires a minimum voltage and wire feed speed for different thicknesses of metal.

When setting your machine there are two types of transfers that can be used and they are:

1. **Globular Transfer**
2. **Spray Transfer**

**Globular transfer** can be used on thinner metals and it is a setting where the voltage and wire feed speed produce a weld that **sounds like it is popping**. You typically hear a few pops per second and can see globs forming on the wire then dropping into the weld joint. To use globular you need to have a Dual-Shielding electrode. What makes this transfer possible is a high percentage of Argon gas that creates a fluid arc.

**Spray transfer** for FCAW has a **deep, fast, crackling sound** to it. Don’t confuse this transfer with true spray transfer because the voltage and amperage that are used actually spray the metal into the joint even though it crackles like a short circuit. Spray transfer is what is typically used to weld with.

Setting up your welder is best done on a piece of scrap metal close to the thickness that you are planning to weld. This is true of any other welding process and this is where you need to spend your time making sure it welds properly. The down side of flux cored arc welding is that thin metals don’t always weld well, and it is limited on the types of metal that can be welded. Very limited!

**Flux Cored Arc Welding Techniques**

The techniques used for this process are very basic and don’t require much skill besides machine setup. The first thing you need to know about is forehand vs. backhand welding. Forehand is where you push the puddle in the direction of the weld. **Forehand welding produces a shallow but wide, penetrating weld** that has a low profile. This is most suitable for thinner metals or on the cap of a weld for the sake of esthetics or appearance. **Backhand welding produces a narrow, deep, penetrating weld** that has a high profile and is best used on thick metals.

The techniques used are similar to Stick and MIG welding. **There are the whipping, circles and weave techniques/patterns.** In most cases you can use a steady travel speed with a slight side-to-side shakeof the handle to spread the weld. This is the best technique and works well in any position either forehand or backhand.

The flat, horizontal and overhead positions can be welded forehand or backhand. **More often than not, it is just a side-to-side shake of the handle to spread the weld.**

The vertical position can be welded by pointing the electrode starting at 90 degrees square to the metal that is to be welded all the way up to 45 degrees on an upward angle. Vertical welding is typically done traveling uphill. I personally don’t know if anyone welds downhill with FCAW unless it is an open root weld on pipe.

**When it comes to welding techniques, always remember that it is mainly all about machine set-up**. The vertical and overhead positions require a precisely set-up machine without any exceptions. That is what separates the pros from the amateurs. As for vertical and overhead welding, be certain that the filler wire is designed for all positions, and has the designation of “1” on the last digit of the label.

**Stick-Out – Self-Shielding vs. Dual-Shielding**

**Stick-out for self-shielding wire, in some cases, should be more than ¾ of an inch.** The reason for this is to preheat the wire to burn off any moisture that it may contain. If you are using **Dual-Shielding wire, then your stick-out should be ¾ of an inch or less** because you want the shielding gas to properly shield the weld.

In the event you are getting porosity in the weld, chances are you need to throw out the first few feet of wire because it has moisture in it from storage.

**A Beginner’s Guide to Flux Cored Arc Welding** was written exclusively for [Metal Web News.Com](http://www.metalwebnews.com/) and their readers by [Go Welding.Org](http://gowelding.org/)