What is Welding?

Welding is nothing more than the art of joining metals together. By comparison, wood is joined by nails, bricks are held together with mortar; metal is joined by welding! What makes welding such a big deal is that the world’s infrastructure depends on it! Everything you touch everyday that is made of metal is most likely welded in one form or another. It is one of the most valuable technologies that played a huge part in the industrial revolution, and is the backbone to the world’s militaries.

Welding today is comprised of three main ingredients which are required to join metals together:

1. An electrical power source to produce an arc.
2. Some form of shielding to protect the weld from the air.
3. Filler material to fill the weld joint.

The ways these three ingredients work together are:

1. The weld area needs to be shielded from any air around it. This is important because oxygen and other gasses in the air make welds brittle and porous.
2. Electricity to produce an arc. An electrical arc melts metal in fractions of a second and is hot enough to melt any known metal!
3. Filler metal is added... which is how two pieces of metal become one.
Stick Welding (http://gowelding.org/new/welding/stick-smaw/)

Stick Welding is a slang term commonly used for Shielded Metal Arc Welding or “SMAW”. Stick welding is the most basic and common type of welding processes used. It is also the first process learned in any welding school. Stick is the most trouble free of all of the welding processes and is the fundamental basis for all the skills needed to learn how to weld!

Stick welders have four main components:

1. A ground lead or clamp
2. A welding lead or stinger
3. A constant amperage power source
4. The electrode or welding rod to weld with

The process is simple! The ground clamp is attached to the work or metal to be welded. Then the welding lead, or stinger, gets the electrode inserted in it. Finally, the power supply is turned on and only requires the user to strike the metal to ignite it. Once that is done, the arc starts and the electrode begins to burn. This creates a shielding gas and deposits metal into the joint that is being welded. The slag from the electrode needs to be cleaned or chipped off as soon as the weld is finished.
TIG Welding (http://www.gowelding.org/welding/tig-gtaw/)

TIG Welding is also a slang term commonly used for Gas Tungsten Arc Welding or “GTAW”. TIG welding also goes by the term HeliArc welding. TIG welding is the most difficult of the processes to learn, and is the most versatile when it comes to different metals. This process is slow but when done right it produces the highest quality weld! TIG welding is mostly used for critical weld joints, welding metals other than common steel, and where precise, small welds are needed.

TIG welders have six main components:

1. A constant amperage power source (many times a Stick welding power supply).
2. A ground lead or clamp.
3. A welding lead or TIG Torch.
4. A non-consumable Tungsten electrode to produce the arc (the Tungsten electrode does not add to the weld joint).
5. Shielding gas to protect the weld area from the air (typically pure Argon gas).
6. The filler wire to add to the weld joint with the other hand.

TIG welding equipment varies greatly in the sense of bells and whistles. The simplest TIG welders are a Stick welder power supply with a TIG torch attached to the welding lead, and the other hose is attached to a bottle of Argon gas. This is how the largest defense contractors and engineering companies set up their TIG welders for pipe (http://www.gowelding.org/welding/tig-gtaw/pipe-walk-the-cup/). The way this process works is simple. First, the ground clamp is attached to the metal to be welded, a Tungsten electrode is inserted into the TIG torch, the Argon gas is turned on and now the torch is feeding Argon gas through the torch, the power supply is turned on, and now all it takes is a scratch of the Tungsten to strike an arc. Once the arc strikes the Tungsten just produces an arc and starts to melt the metal, after that you simply add filler wire to the joint with the other hand.

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MIG Welding (http://gowelding.org/new/welding/mig-gmaw/)

MIG Welding is a slang term that stands for Metal Inert Gas Welding, the proper name is Gas Metal Arc Welding or “GMAW”, and it is also commonly referred to as “Wire Wheel Welding” by Unions. MIG Welding is commonly used in shops and factories. It is a high production welding process that is mostly used indoors.

http://www.gowelding.org/welding/
MIG Welders have five main components:

- A constant voltage power supply.
- A wire feed to feed the filler wire through the welding lead to the MIG gun.
- A ground lead or clamp.
- A welding lead or MIG gun.
- Shielding gas to protect the weld area from the air.

MIG welding is not that simple when it comes to setting up the equipment but the skill required is a lot less than Stick welding. The way MIG welding works is you attach the ground clamp, the work then power source is turned on and finally the shielding gas needs to be turned on. After that you need to set the voltage, wire feed speed that is counted in IPM (inches per minute), and shielding gas flow rate that is counted in CFH (cubic feet per hour). Then simply hit the trigger and the MIG gun starts feeding shielding gas and wire to the weld joint. Once the wire hits the weld joint it begins to arc and the wire melts and starts filling the joint.

Flux Cored Arc Welding

Flux Cored Arc Welding "FCAW" is nothing more than a different welding wire or electrode for a MIG welder! FCAW wire is a hollow or tubular wire that has a flux inside of it that provides a shielding from the air when it is welding. What this does is help a MIG welder to weld in windy conditions and it increases how much weld can be welded per hour. The powder flux inside also has metal mixed in it to increase the weld deposit rate.

FCAW is the fastest of all of the manual welding processes. FCAW wire has two types:

- **Self Shielding** - Self shielding wire is just that! It has enough flux inside that no other shielding source is needed.
- **Dual Shielding** - Dual Shield is a wire that helps shield the weld but also needs a source of gas just like a MIG welder.

Flux cored arc welding is similar to Stick welding when it comes to slag. It also has a slag that covers the weld that needs to be cleaned after the weld is finished.

Welder Safety