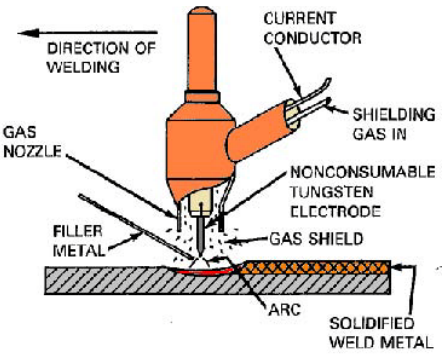
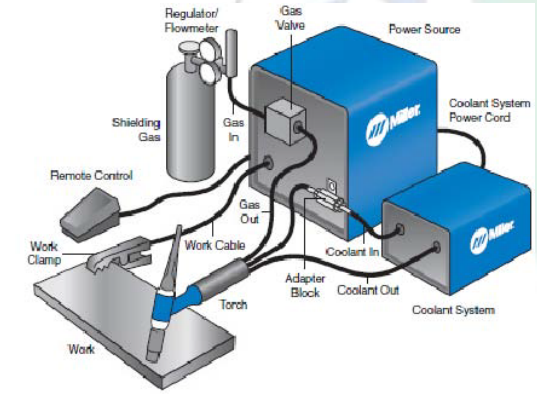
Tungsten Inert Gas Welding (TIG)

Tungsten Inert Gas Welding, also known by its acronym as TIG welding, is a welding process that uses the heat produced bby an electric arc created between nonconsumable tungsten electrode and the e weld pool. This electric arc is produced by the passage of current trough aa conductive ionized inert gas that also provides shielding of the electrode, mmolten weld pool and solidifying weld metal from contamination by the atmo osphere. The process may be used with or without the addition of filler metal us sing metal rods.



Electric arc: The process can be used with eeither direct o alternating current, the choice is depending largely on the metal to be welded. Direct current with electrode negative offers the advantage of de eep penetration and faster welding speeds. Direct current with electrode possitive I highly unrecommended
because causes electrode overheating and is s rarely used. Alternating current provides cathodic cleaning which removes refractory oxides on materials like aluminum and magnesium allowing superior quality welds. Other types of welding current are avaailable for particular applications like sine-wave or sq quare-wave alternating current and pulsed direct current.

Electrode: In TIG welding, *tungsten* refers t to the element used on the electrode. The function of tthe electrode is to serve as one of the electric terminals which supplies the heat t required to the weld, for this reason tungsten is chose en because, as a pure element, it as the highest melting point in close to whic ch it gets thermionic becoming a ready source of electrons. Great care mu ust be taken so that the tungsten electrode does not contact the weld pool inn any way or the gas flow rate is sufficient to protect it, in order to avoid its contamination resulting on faulty weld. Some other elements may be add ded to the tungsten, like cerium, lanthanum, thorium and zirconium creating g electrode alloys that improve arc stability, emissivity and bring higher mellting points. Tungsten electrodes may be uses with a variety of tip configurat tions and finishing's depending on its welding applications.



Shielding gases: Argon and helium or mixtures of both are the most common inert gases used for shielding, allthough argon is more extendedly used providing excellent arc stability and h having a cleaning action in certain materials. Helium, unlike argon, as a high t thermal conductivity which results in a deeper penetrating arc, however beca ause helium is a light gas it is less higher than argon in order to provide the same shieldi ing, adding the fact helium cost is considerably more higher then argon, heliu um welding becomes more expensive and as to be weighed against the penetration increase and increased travel speeds, makin ng it more suitable for thick materials, metals with h high thermal conductivity or high speed mechanized welding. Mixtures of both h gases are used when is useful to balance the two gase es characteristics.

Applications

TIG welding has become indispensible as a tool for many industries because of the high quality welds produced at relativ vely low equipment cost. It is used extensively in the aerospace and nuclear indu ustries, also often used for small jobs, maintenance and repair work because of its flexibility and ease of control, however requiring great care and skill from thhe welder. It provides precise control of heat input, for that reason it is preferred for joining thin gage metal and to produce weld close to heat sensitive components. Furthermore then the manual welding techniique TIG welding can be applied on semiautomatic , automatic and machine weldding, it can be also be used for spot welding in sheet metal applications. The pro ocess can be used to weld almost all metals, it is specially used for joining alum minum and magnesium which form refractory oxides, and for reactive metals liike titanium and zirconium that can become embrittled. The mains process limitations are the low de eposits rates provided by this method, also it requires high skill welding tec chnique where tungsten electrode contamination may occur and shielding becommes difficult on drafty environments.