# GAS EQUIPMENT

Gas equipment allows the ultimate in diversity of process while being the most economical for initial investment. The most common gas combination used is oxygen and acetylene.

Acetylene being the hottest of the fuel gases gives the operator the ability to pin point a flame or spread out the heat as required, with the proper equipment. Oxygen when added to the flame causes the fuel to bum hotter. Other common fuel gases are propane/butane, natural gas, hydrogen, MAPP and hybrid forms of propane with hydrocarbon additives.

Other than natural gas most compressed gases are stored in portable pressurized cylinders. These containers are made specifically to transport and safely store each type of gas. A pressure regulator is connected to each appropriate cylinder to allow the reduction of high pressure gas into a controllable low pressure gas. This low pressure gas is sent down a proper hose (one for the fuel and one for the oxygen, if required) to the control handle or torch. The process will determine the type of torch and tip combination. The most common gas processes are:

### Soldering – Brazing – Welding – Heating – Cutting

**Soldering** is accomplished by heating the base metal to a temperature hot enough to melt the filler solder (though the base metal never melts). Because this is done at fairly low temperatures (840 degrees F or lower) the torch often requires only fuel gas. The tip that attaches to the torch is designed to derive the oxygen it needs from the atmosphere. Select the proper tip shape and size for the proper job. The torch and tip are made to bum a specific fuel by the manufacturer. Do not change fuel types.

**Brazing** yields stronger joints than soldering (though normally not used on structural welds) still doesn't melt the base metal even though filler metal is applied at temperatures above 840 degrees F. The equipment used to braze is the same as for welding, though some soldering torches can accomplish some light duty brazing tasks.

**Welding** takes place by melting the base metal together of the item(s) to be joined. Filler metal is added for some joint requirements. Due to the tedious procedure, this process is normally reserved for thin sections of metal. Acetylene is used as a general purpose gas for welding most metals. Acetylene puts carbon back into the molten weld pool, this is required when welding common steel such as mild steel because they loose carbon when melted. The other fuel gases do not replace the lost carbon, so the welds may be brittle. This transfer of carbon causes color changes when welding precious metals such as gold or silver, therefore other fuel gases are more appropriate for these metals.

The welding torch is basically a handle with two valves. 1; To control the fuel flow, 2; For oxygen control. Connected to the torch is a mixer (often supplied as part of the tip end). This blends the fuel and oxygen together then sends the blended gas to the tip end. The blend continues through the small hole at the end of the tip. This is where the flame is lit. The tip ends come in a variety of hole sizes, depending on how much of a flame is required for different thickness of material. Torches and tips are made to a certain burning ratio, so be sure to use the proper fuel gas that the equipment was designed for.

**Heating** is used for a variety of purposes such as bending, stress relieving, hardening or softening metals. There are specific torches made exclusively for heating but most heating is accomplished by simply replacing the welding mixer and tip with a multiflame heating mixer and nozzle, also known as a "rosebud". Since this requires a lot more fuel be sure to check the tip volume requirement chart to be sure you have cylinders that can supply enough volume of gas.

**Cutting** on ferrous metals such as mild steel is one of the quickest ways to shape metal. The material to be cut is heated to a molten stage then pressurize oxygen is introduced causing the metal to actually burn. You may have heard this process be referred to as "burning". Theoretically, once you initiate the cut you could turn off the preheat flame and continue to cut indefinitely, with only the cutting oxygen on (provided you were able to keep the proper speed of travel, height from the cut and if there were no impurities in or on the material). Non Ferrous metals such as aluminum, copper, brass and nickel alloys do not react to this “burning” so they only melt. Therefore they are not usually cut with this process. Cast iron has too high of a carbon content to cut with this process.

Acetylene is the most popular fuel for cutting because the time required to preheat the material to initiate the cut is shorter than other Fuels. Acetylene is also the most expensive of the fuel gases. Another draw back for acetylene is that due to the combination of carbon and heat, the edges of the cut tend to become flame hardened making them harder to grind or process later.

Originally cutting torches were made as a separate piece of equipment from a welding torch. Cutting torches are still widely used. Now there is the option of a "cutting attachment" giving more versatility to your welding torch. A cutting attachment connects to the welding torch (where the mixer and tip end would normally go) converting your welding torch into a cutting torch. A cutting attachment diverts the oxygen from the welding handle into two different routes. One route directs the oxygen to be mixed with fuel to provide a flame for the preheat portion of the cutting tip. The remainder of the oxygen becomes available for the cutting stream. When the cutting lever is depressed the oxygen eventually flows through the hole in the center of the cutting tip, creating a cut.

Recommended Safety Equipment: Welding Goggles (shade #5), Safety Glasses, Gloves, Protective Hat and Clothing, Respirator or Welding Fume Mask or Exhauster, Check Valves, Flash Back Arrestors, Fire Extinguisher, Safety Curtains and any other requirements to provide a safe work environment.

### WHAT IS MAPP GAS?

Dow Chemical Co. developed Mapp® in the 1960's as a safer fuel to replace acetylene in industrial oxygen cutting and brazing systems. In the 1970's the Turbine Swirl Tip turned out to be an ideal air/Mapp® device and eliminated the problems encountered with earlier air/Mapp®) tips. Mapp® Gas is a stabilized, shock proof, liquefied acetyletic compound that, when used with a good Turbine Tip, burns 400º to 500º F. hotter than propane, but not as hot as acetylene. In addition to being shock resistant and safer than acetylene, Mapp® Gas has an extremely bad odor which makes it impossible not to notice a leak. SIWS