Oxy-Acetylene Brazing Class Outline

Equipment Introduction

The oxy-acetylene torch can be used for cutting steel, welding steel, brazing and heating metal. The oxy-acetylene torch is a safe tool if used properly. However, if it is used incorrectly, serious injury can occur to you and the equipment. Understanding and utilizing the safety procedures are required to be able to operate this equipment in the Metal shop.

The **6 main components** that make up the oxygen acetylene equipment are:

1. Safety equipment
2. Oxygen & Acetylene Cylinders
3. Gauges & Regulators
4. Hoses & hose fittings
5. Gas mixing attachment (handle w/ needle valves)
6. Cutting attachment (ask if you want to use this)

Oxy-Acetylene Safety

- You must be trained / certified before using the oxy-acetylene torch
- Make sure you do not have a butane lighter in your pocket – they can explode!
- Perform all brazing and cutting in the welding area – ventilation issue
- Make sure the work area is clear
- Do not weld or cut a closed container
- Do not allow oil or grease to come in contact with hoses or equipment
- Open the cylinder valves slowly – stand to the side!
- Light the torch with the striker – do not use a match or a lighter
- Bend the end of the brazing rod to identify the hot end and to prevent eye injury

Personal Safety Equipment

The correct safety equipment must be used when using the oxy-acetylene equipment.

- Wear approved shaded oxy-acetylene safety glasses - #3 or greater
- Use gloves during torch operation and when handling hot metals
- Long clothing to protect from INFRARED RADIATION and SPATTER

Oxygen & Acetylene Cylinders

The oxygen and acetylene cylinders are designed to hold high-pressure gases. There are some important things to remember when using these cylinders:

- Cylinders must always be stood upright and be secured by a chain
- When not in use (regulator mounted) they must always have a valve protection cap in place
- Cylinders should be stored in a cool dry place away from direct sunlight or extreme cold
- Color of cylinders vary with supplier – all tanks will be marked as to contents
- It is recommended that you should not run any tank below 50 PSI

Oxygen Cylinders

- Usually taller than Acetylene; 2200 PSI when full
- The **double seated** cylinder valve must be opened fully or it could leak!

Acetylene Cylinders

- Usually larger in diameter and shorter; 250 PSI when full.
- The cylinder valve should only be opened ¼ to ½ a turn.
- The cylinder should never be laid down as this will result in the gas becoming unstable:

  The cylinders are filled with an absorbent material, like diatomaceous earth, and a small amount of acetone. The acetylene is pumped into the cylinders at a pressure of about 300 psi, where it is dissolved in the acetone. Once dissolved, it loses its explosive capability, making it safe to transport. Being a liquid, acetone can be drawn from an acetylene cylinder when it is not upright. Improper storage can cause the acetone to separate from the material & become unstable. You should **not** store acetylene cylinders on their side, but if they are, you must let the cylinder **stand upright for a minimum of 2 hours** before using. This allows the acetone to settle back to the bottom of the cylinder. When the cylinder valve is opened, the pressure drop causes some of the acetylene to vaporize into gas again and flow to the torch.

Hoses & Hose fittings

The oxy-acetylene hoses are made out of a durable rubber that is designed to withstand different pressures. There are several things to remember about the hoses:

- Red = Acetylene (propane in burning area) - Acetylene fittings are notched, left-hand thread
- Green = Oxygen - Oxygen fittings are smooth and right-hand thread
- Both hoses should always be fitted with anti-flash back arrestors
- Keep the hoses away from work area, torch flame, sparks and hot metal
- Do not kink the hoses
- Wrap the hoses when not in use

Pressure Regulators

The pressure regulators enable the user to reduce the high pressure contained in the cylinder to a usable working pressure. There are several handling and set up procedures that are important to the overall operation of the pressure regulator. The pressure regulator on each tank has two gauges:

1. Cylinder pressure
2. Working or line pressure to the hoses

Gas mixing attachment (handle w/ needle valves)

1. The valves on the torch handle are needle valves and should never be over-tightened
2. The acetylene valve lines up with the red hose
3. The oxygen valve lines up with the green hose
4. The handle is fitted with spark arrestors

How to Set Up, Light, Adjust and Shut Off an Oxy–Acetylene Torch

REMEMBER: Always Handle Acetylene First!

Overview

Using an oxy-acetylene torch is a simple and safe procedure if the correct process is followed. The process consists of three main parts:

1. Setting up the torch
2. Lighting and adjusting the torch
3. Shutting off the torch

Setting up the torch – Handle Acetylene First

1. **Acetylene**:
   a. Open the acetylene **cylinder valve** ¼ to ½ turn
   b. Open acetylene valve on the torch handle about ½ turn
   c. Adjust the acetylene regulator adjusting screw until 5 pounds pressure is read on the low-pressure gauge **WARNING: Acetylene becomes extremely dangerous if used above 15 pounds line pressure**
   d. Close the torch acetylene needle-valve
2. **Oxygen**:
   a. Open the oxygen cylinder valve all the way until the valve stops
   Do not stand in front of the gauges when opening the oxygen bottle to prevent serious injury if the high-pressure regulator valve fails
   b. Open the oxygen valve on the torch handle about ½ turn
   c. Turn the oxygen regulator adjusting screw clockwise until 5 pounds pressure is read on the low-pressure gauge
   d. Close the torch oxygen needle-valve
3. Before lighting and using the torch, check the system for leaks:
   a. Close the cylinder valves. If a cylinder gauge shows a pressure drop, there is a leak
   b. If a leak is indicated, listen, smell and touch around all fittings and hoses, or use soapy water to find the leak

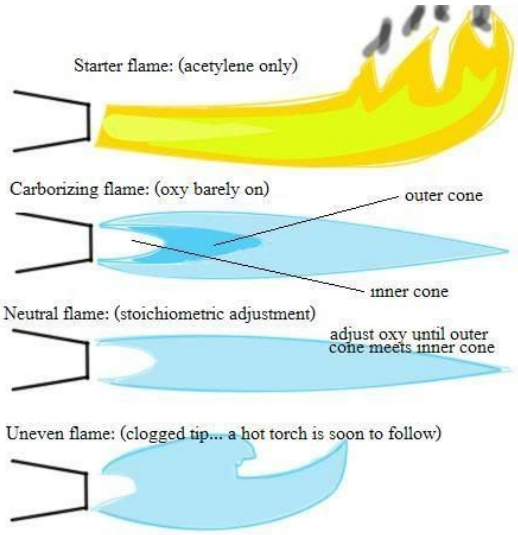
Lighting & Adjusting

1. Open the torch handle fuel needle-valve no more than ½ turn.
2. Position the tip of the torch down and away from your body and hold the striker in your other hand so only the head of the striker is in front of the torch tip. Practice using the striker with the fuel shut off.
3. Use the striker to light the torch - **Never use a lighter, matches, or other burning material to light the torch.**
4. Adjust the torch fuel needle-valve until the flame gives off little black smoke.
5. Slowly open the torch oxygen needle-valve to create a neutral flame.

Neutral flame: (equal amounts of oxy/acetylene) has a rounded white inner cone (stinger) used for brazing steel.

Carburizing flame: (less oxygen) has a longer feathered blue inner cone.

Oxidizing flame: (excessive oxygen) has a short pointed white inner cone.



Shutting Down Torch – Acetylene First

On the torch handle:

1. Shut off the torch acetylene needle-valve first, which extinguishes the flame
2. Shut off the torch oxygen needle-valve

Shutting Down System – Acetylene First

1. On the Cylinders:
   a. Close the acetylene cylinder valve
   b. Close the oxygen cylinder valve
2. Back on the torch handle:
   a. Bleed the acetylene line by opening the torch acetylene needle-valve until the pressure reads zero on both the high and low-pressure gauges (If the torch will be left for more than a few minutes and then reused, both lines must be bled before lighting the torch again)
   b. Close the torch acetylene needle-valve
   c. Bleed the oxygen line by opening the torch oxygen needle-valve until the pressure reads zero on both the high and low-pressure gauges
   d. Close the torch oxygen needle-valve
3. Wrap up hoses

BRAZING WITH OXYACETYLENE

1. The two pieces of steel to be brazed are cleaned with grinder, removing mill scale, grease and dirt. Flux is applied to the bronze rod or the steel. This protects the area to be brazed, preventing oxidation (oxidation will prevent the bronze rod from flowing along the joint).
2. The area is preheated by holding the torch a small distance from the steel. This slowly warms up the two surfaces to be joined and evaporates the water in the flux.
3. The flame is focused at one end of the joint, raising the temperature of the steel to 'red heat'. Brazing rod is fed into the joint. The molten brazing rod follows the heat of the flame, as the torch proceeds along the joint, until the brazing is complete.
4. The steel is allowed to cool slowly. When cold, a wire brush is used to clean the joint, revealing a 'bronzed' line of solder, which holds the two pieces of steel permanently together.