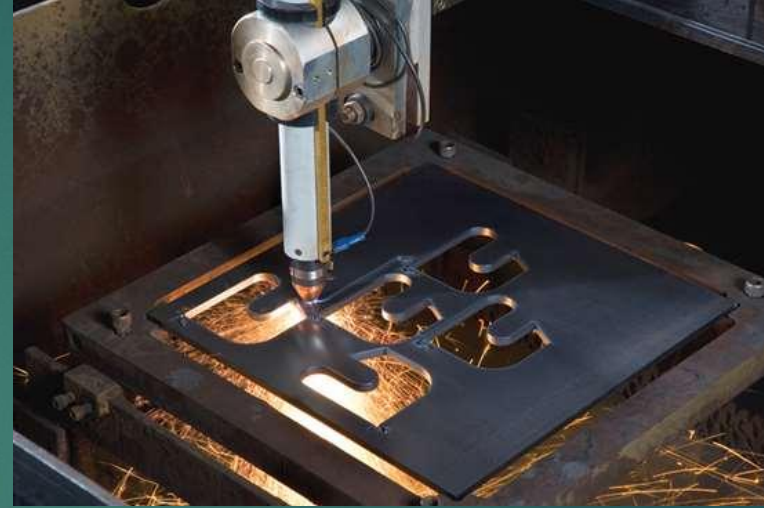


# Metallic Plate Cutting through Gas Plasma

## *Somnath Chattopadhyaya*

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# Contents

- ▶ **Oxy acetelene Cutting**
- ▶ **Pug Cutting**
- ▶ **Plasma Cutting**
- ▶ **Laser Cutting**



# Gas Cutting



# Oxy Fuel Cutting

- ▶ **Oxy-fuel cutting is a thermal cutting process that uses oxygen and fuel gas (such as acetylene, propane, MAPP, propylene and natural gas) to cut through materials.**
- ▶ **The oxyfuel process is the most widely applied industrial thermal cutting process because it can cut thicknesses from 0.5mm to 250mm, the equipment is low cost and can be used manually or mechanised.**
- ▶ **There are several fuel gas and nozzle design options that can significantly enhance performance in terms of cut quality and cutting speed.**

# MAPP Gas

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- ▶ MAPP gas was a trademarked name, belonging to The Linde Group, a division of the former global chemical giant Union Carbide, for a fuel gas based on a stabilized mixture of methylacetylene (propyne), propadiene and propane.
- ▶ The name comes from the original chemical composition, methylacetylene-propadiene propane. "MAPP gas" is also widely used as a generic name for UN 1060 stabilised methylacetylene-propadiene (unstabilised methylacetylene-propadiene is known as MAPD).



# Gas Cutting Equipment

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# PUG Cutters

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# PUG Cutting

- ▶ **PUG NM cutting machine used for straight line as well as circle cutting also.**
- ▶ **It moves on its own track for straight line cutting and performs circle cutting with the help of circle cutting attachment.**
- ▶ **This machine is compatible with Nozzle Mix torch**



# Oxy Fuel gas Welding and cutting

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## Oxyfuel Gas Welding & Cutting

- Oxyfuel is a group of processes that use heat generated as a result of the combustion of a mixture of oxygen and a combustible gas.
- Acetylene is the most commonly used in oxyfuel processes. Propane is another good source of fuel.
- The flexibility and mobility provided by oxy-acetylene welding allow its use in all metalworking industries.
- Oxyfuel welding is primarily used for maintenance, general fabrication, and repair work.

# Chemicals used

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## ■ Oxygen

- Colorless, odorless, tasteless gas
- Supports combustions & increase heat
- Produce by cooling air to a low temperature and turning it into liquid where the oxygen is separate out.

## ■ Acetylene

- Colorless, has a very distinctive odor
- Highly flammable
- Produce by mixing calcium carbide (coke + limestone burnt together) and water yields acetylene and calcium hydroxide.



# Advantages

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- The relative cost of the equipment is low.
- No electricity is required for this process.
- Can be used for welding in all positions because no electrical cables are required and the operator has precise control of the process. This process is also extremely portable.
- Can be used on both thick and thin materials, which makes it a very versatile process.
- Very clean, producing no slag or spatter that must be removed from the weld.
- Produces high quality welds when done properly.



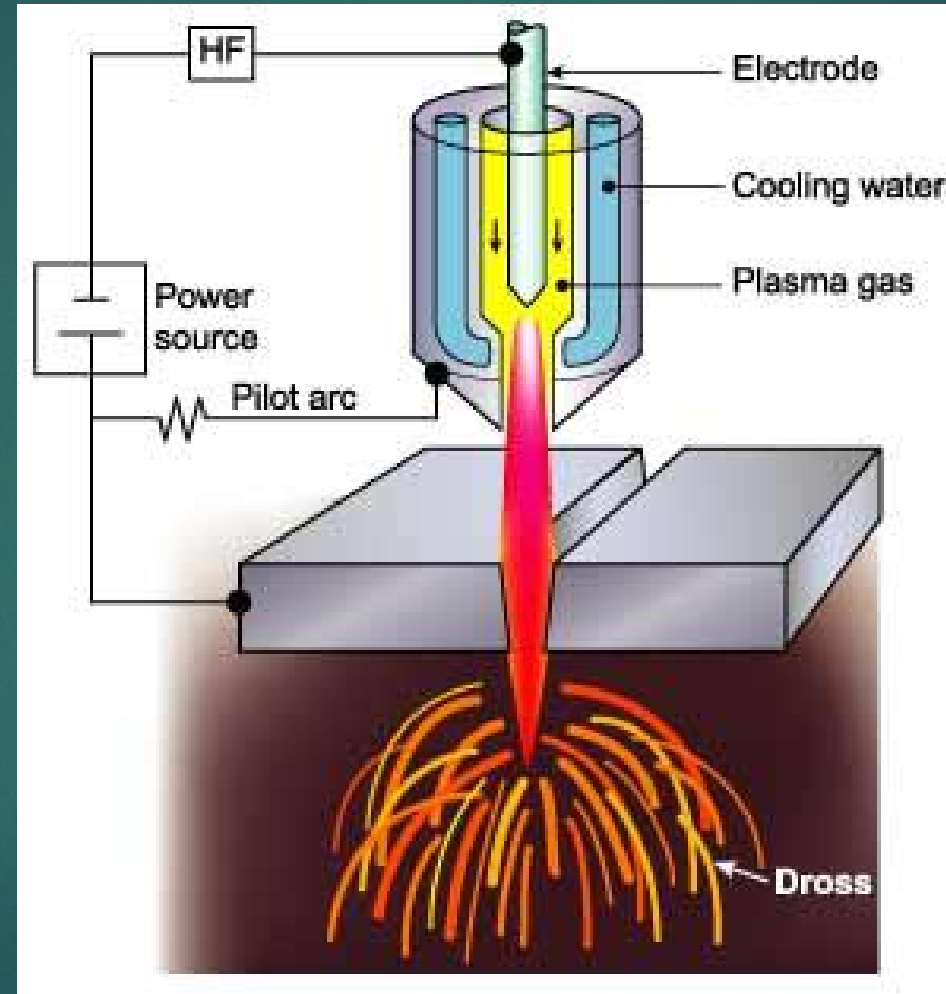
# Linmitations

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- The materials that can be welded are limited primarily to ferrous materials.
- Creates a “Hot Zone”, fire hazard, because of the sparks and flame generated in the welding process.
- Requires the handling of high pressure gases. The combination of oxygen with a fuel gas creates the potential for flashbacks and backfires.
- The process can often be slow when compared to other types of welding processes.
- Welding is limited to oxy-acetylene or oxy-MAPP.

# Plasma Arc Cutting

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# Process Fundamentals

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- ▶ The plasma arc cutting process is illustrated in the figure.
- ▶ The basic principle is that the arc formed between the electrode and the workpiece is constricted by a fine bore, copper nozzle.
- ▶ This increases the temperature and velocity of the plasma emanating from the nozzle.
- ▶ The temperature of the plasma is in excess of  $20\,000^{\circ}\text{C}$  and the velocity can approach the speed of sound.
- ▶ When used for cutting, the plasma gas flow is increased so that the deeply penetrating plasma jet cuts through the material and molten material is removed in the efflux plasma.



# Plasma Arc Cutting

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# Plasma Arc Cutting

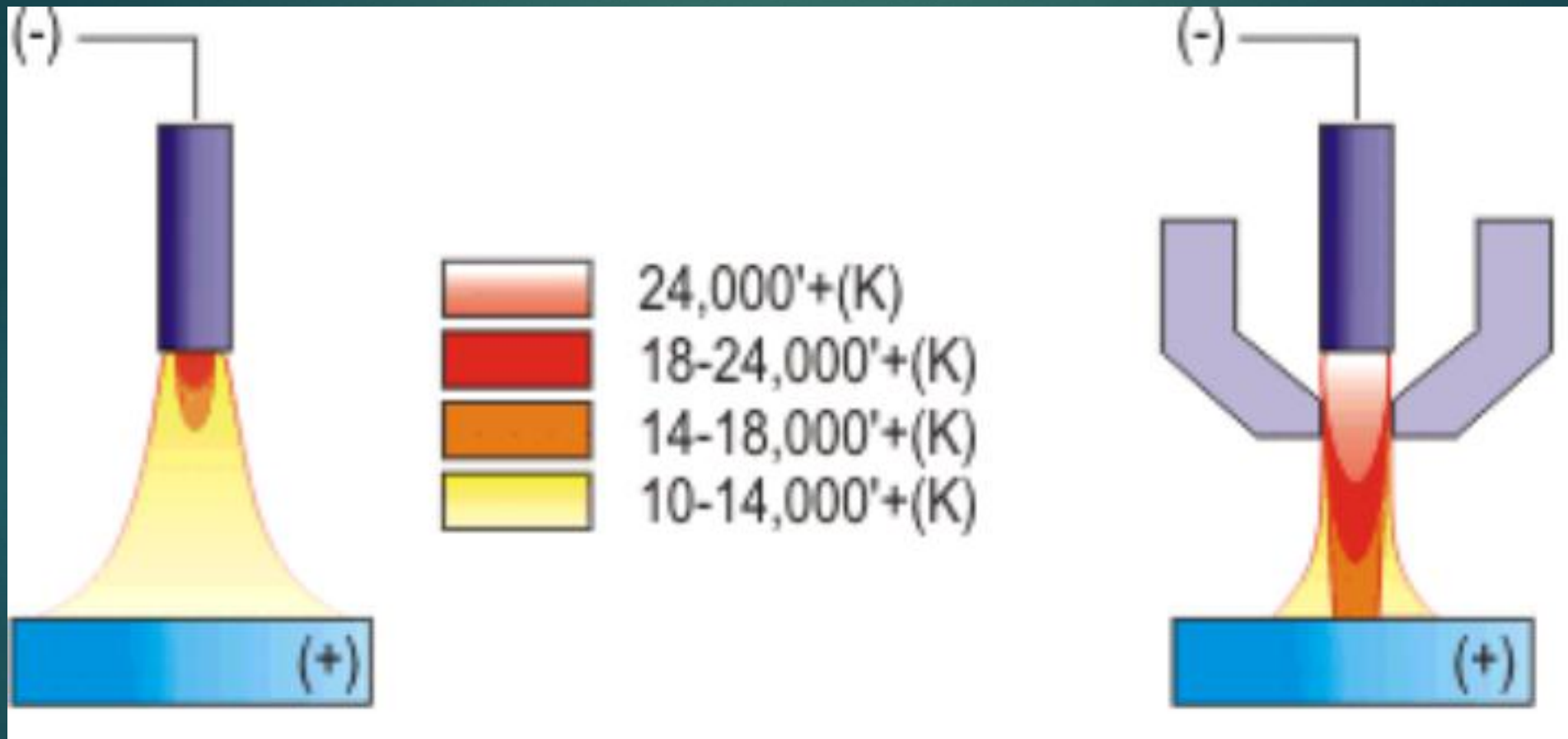
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# Temperatures of Plasma Arc

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# Why Laser is used for cuttingMachining

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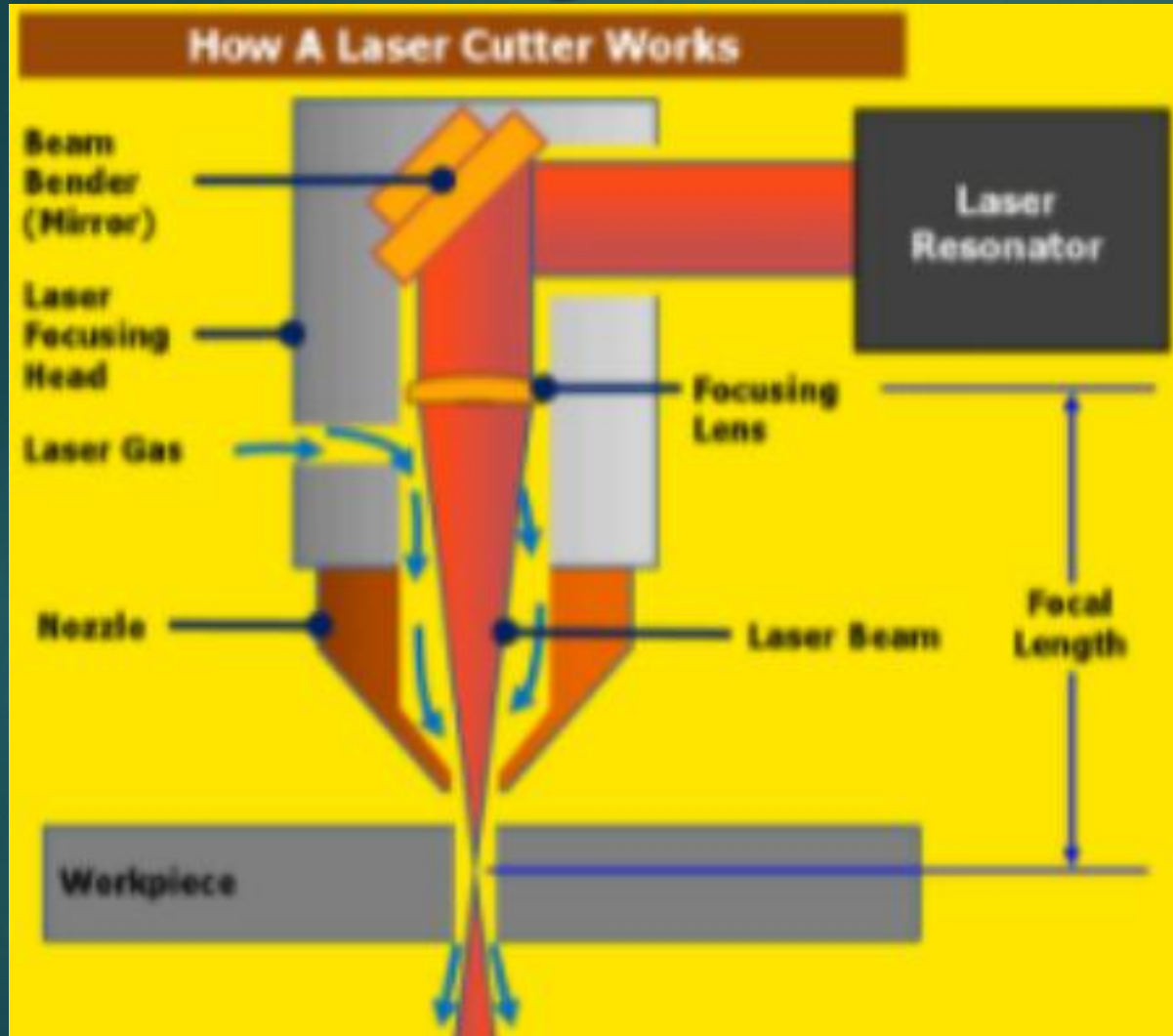
Lasers are used for many purposes. One way they are used is for cutting metal plates. On mild steel, stainless steel, and aluminum plate, the laser cutting process is highly accurate, yields excellent cut quality, has a very small kerf width and small heat affect zone, and makes it possible to cut very intricate shapes and small holes.

Most people already know that the word "LASER" is actually an acronym for Light Amplification by Stimulated Emission of Radiation. But how does light cut through a steel plate?

# Laser Cutting

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# Product

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