Portable Plasma Cutter

What it is:

- Portable plasma cutter is used to cut electrically conductive materials like steel, aluminum, and brass.
- It uses an ionized gas (plasma) to create an arc that melts and cuts through the material.

What it does:

- Provides precision cuts in metal with minimal distortion.
- Can handle various thicknesses of metal up to 5/8" clean cuts and 7/8" sever cuts.
- Offers high portability, making it suitable for both workshop and fieldwork.

Why it is useful:

- Produces clean, accurate cuts quickly and efficiently.
- Reduces material waste compared to traditional cutting methods.
- Versatile for a variety of projects, from intricate designs to heavy-duty applications.

Demonstration

1. **Setup**:
    - Connect the unit to a power source.
    - Attach the air compressor hose from wall to plasma cutter machine.
    - Check consumables (torch tip and electrode) for cracks, defects, debris, or wear and tear.
2. **Operation**:
    - Turn on the machine and adjust the amperage for the material thickness. Check the chart on the cart.

- Demonstrate cutting by holding the torch at the correct angle for the torch tip (approx. 90°) and moving smoothly along the marked cutting line.
- Show examples of cuts at different speeds and angles to highlight best practices. Too fast will not cut through material, too slow will burn large holes or weld the material behind it.

Safety Discussion

Protective Gear:

- Wear safety glasses and fixed shade 5 welding helmet.
- Use fire-resistant gloves and clothing (leather gloves, leather aprons, leather foot covers, and no skin exposed. Use pliers to grab materials after cuts as they will be hot.
- Ensure proper ventilation in the work area. Turn on snorkel ventilation and adjust it to work piece. Be sure general shop ventilation is on too.

Operational Safety:

- Always inspect the machine, cables, and torch before use.
- Avoid cutting near flammable materials. Ex. Paper, rags, paints, wood.
- Never touch the cutting area immediately after use—metal edges will be hot.

Work Environment:

- Keep a clean and organized workspace. Nothing below material to be cut. Proper footing on ground. No papers, wood, paint cans, or other flammable materials near by.
- Ensure fire extinguishers are nearby or know where they are located.
- Maintain a safe distance from other students during operation.

Remind students to always prioritize safety and practice before attempting cuts.

Outcome

By the end of the demo, students will understand the function and operation of the portable plasma cutter, its applications in metalworking, and how to use it safely and effectively in the shop.

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Introduction

The portable plasma cutter is a powerful tool used for cutting conductive metals quickly and efficiently. While versatile and effective, improper use can lead to serious injuries. Always follow these safety guidelines to ensure a safe and productive workspace.

Potential Hazards

1. **Electric Shock**: Plasma cutters use high voltage to create the arc, which can cause severe injury or death if mishandled. Do not become part of the circuit (body between torch tip and material to be cut). Be sure ground cable is secure to material to be cut.
2. **Fire Hazards**: Sparks and hot metal can ignite flammable materials in the work area.
3. **Eye and Skin Injury**: The plasma arc emits intense light and heat that can cause burns or eye damage.
4. **Respiratory Hazards**: Cutting metals can release fumes and particulates that are harmful if inhaled.
5. **Contact Burns**: Hot metal edges and the torch tip can cause burns if touched directly after cutting.

Safety Guidelines

1. Personal Protective Equipment (PPE)

- **Eye Protection**: Always wear safety glasses and a welding helmet with shade 10+ filter to protect against the intense light.
- **Gloves**: Use fire-resistant gloves to protect hands from sparks, heat, and sharp metal edges.
- **Clothing**: Wear flame-resistant apron (leather apron) and pants. Avoid synthetic fabrics, which can melt. No exposed skin.
- **Footwear**: Use foot protectors to protect feet from falling metal and sparks. Sit close to table to avoid foot hazards.

- **Respiratory Protection**: Use a respirator or dust mask when cutting for long periods of time.

2. Work Area Preparation

- **Clear Flammable Materials**: Remove any paper, cloth, wood, or chemicals from the cutting area.
- **Ventilation**: Ensure proper airflow to disperse harmful fumes. Use an exhaust fan and general shop ventilation.
- **Fire Extinguishers**: Know where fire extinguishers are nearby and know how to use it.

3. Tool Inspection and Setup

- **Check the Equipment**: Inspect the plasma cutter, cables, and torch for damage before use.
    - Check torch tip and clean with small file if needed.
    - Some steel blueing will be too thick to start plasma. If so, clean where ground connection will go and clean area to be cut.
- **Secure the Workspace**: Clamp the metal securely to prevent movement during cutting.
- **Air Supply**: Verify the air supply is connected and pressure settings are correct.

4. Safe Operation

- **Start-Up**: Follow the manufacturer's instructions for powering on and setting up the plasma cutter.
- The nozzle tip determines the amperage range
- Amperage can go down from max torch tip setting but cannot go above.
- **Torch Handling**:
    - Keep your hands and body clear of the cutting arc.
    - Check ground cable
    - Maintain a 90° torch angle and a steady speed for accurate cuts. If torch is not angle properly, plasma pours out the side and ruins touch tip.
    - DO NOT go over the same cut twice.

- **Distance**: Ensure others maintain a safe distance from the cutting area to avoid injury from sparks or debris.

5. Post-Operation Safety

- **Cool Down**: Allow the torch and metal to cool before handling. Quench materials in water after cuts. Do not leave cut materials unattended.
- **Disconnect**: Turn off the plasma cutter and air compressor and disconnect from the power source.
- **Clean Up**: Dispose of metal scraps safely and organize tools to prevent accidents.

Emergency Procedures

- **Fire**: Alert Teacher immediately, Teacher will either extinguish fire using the nearest fire extinguisher or evacuate shop.
- **Burns or Electric Shock**: Immediately inform the instructor and seek first aid.
- **Fume Exposure**: Move to a well-ventilated area and notify the instructor if experiencing difficulty breathing.

Key Takeaways

- Always wear the correct PPE.
- Inspect the equipment and workspace before starting.
- Follow the proper operating procedures to minimize risks.
- Be aware of your surroundings and ensure others maintain a safe distance.
- Safety first—report any incidents immediately!

Stay alert and stay safe!

Portable Plasma Cutter Safety Test

Name: _____ **Date**: _____

Instructions: Read each statement carefully and circle **True** or **False**.

1. Portable plasma cutter can be used to cut materials like wood and plastic.
    - **True** / **False**
2. Wearing gloves and apron is not necessary when operating the plasma cutter.
    - **True** / **False**
3. It is safe to operate the plasma cutter without inspecting the cables and torch for damage.
    - **True** / **False**
4. Sparks and hot metal edges from the plasma cutter can cause burns and fires if proper precautions are not taken.
    - **True** / **False**
5. Safety glasses and a welding helmet with an appropriate shade filter are required to protect your eyes from the plasma arc.
    - **True** / **False**
6. Compressed air is harmless and can be used to clear off materials, clothing, and skin.
    - **True** / **False**
7. It is acceptable to touch the metal immediately after cutting since it cools down quickly.
    - **True** / **False**
8. Proper ventilation is important when using the plasma cutter to avoid inhaling harmful fumes.
    - **True** / **False**
9. You should maintain a 45° torch angle and steady speed for accurate and clean cuts.
    - **True** / **False**

10. After using the plasma cutter, it is important to disconnect the power and allow the torch to cool before handling it.
    - **True** / **False**

Answer Key:

1. False
2. False
3. False
4. True
5. True
6. False
7. False
8. True
9. False
10. True