Combustion and Fire

CONTROL of fire was an important discovery. Fire, when controlled, allows us to operate machines, cook our food, regulate environmentally controlled buildings, and cut metal, among many other things. Our ability to manipulate metal, create electricity, and control our indoor environments is part of what we call civilization.

Technology can create fire and control some fires. Although a lot is known about fire, not all fires can be controlled. Uncontrolled fires can cause injury, loss of property, and death. Most losses to fire can be prevented.

Objectives:

1. Identify the three components of fire.
2. Recognize safe and unsafe conditions.

Key Terms:

combustible
fire triangle
fuel
heat
oxygen

The Components of Fire

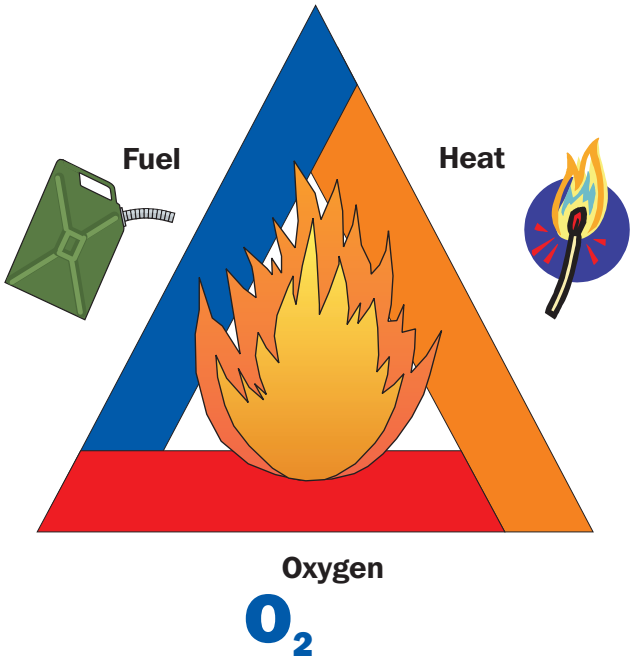
For fire to be produced, three components must be present at the same time and in proportions dictated by science. The components are fuel, heat, and oxygen. They form what is called the **fire triangle**.

Fuel is a combustible material. **Combustible** means that a substance will burn in the presence of oxygen and heat. Burning is a rapid form of oxidation. Typical fuel products are engine

fuels, oil, paper, wood, and propane and some other gaseous products. Even metal will burn in the presence of oxygen if the temperature is hot enough. The oxy-acetylene torch uses this principle to cut steel.

Heat is energy that causes temperature to rise. Changing temperature from 70 degrees to 300 degrees in a kitchen oven is accomplished by using heat.

Oxygen is a clean, odorless gas that makes up an estimated 21 percent of our atmosphere. Oxygen by itself does not burn, but it must be present for any other material to burn. Because it is part of the atmosphere, oxygen is nearly always present.



If any one of the three components is missing, a fire cannot be started. With the removal of any one component, the fire will be extinguished.

FIGURE 1. The fire triangle.

Fire Safety

If any one of the fire triangle components is missing, fire will not occur. If any one of the fire triangle components is removed, fire will be extinguished. An understanding of the fire triangle is essential for preventing fires, starting fires, controlling fires, and stopping fires. The prevention of fires goes hand in hand with safe use of equipment and work areas. Proper storage of combustible materials decreases the chance of fire. A clean work area can prevent fires by controlling combustibles and limiting their exposure to heat. When highly combustible materials are present, as during spray painting, special areas should be used to control heat and prevent fires. Paint booths were developed for this purpose and are very effective.

FIGURE 2. This furnace fire is a controlled fire.

Fire should be used only in areas that limit the potential for starting unwanted fires. Sometimes the area of a fire cannot be controlled very well, and special precautions should be followed. Get assistance of individuals who have training in fire management when working where the predic-

tion and control of fires is difficult. An example of an area difficult to control might be a large brush pile or a native prairie.

FIGURE 3. This forest fire is an out-of-control fire (Courtesy, USDA)

Summary:

Fire safety and the control of fire are related to the fire triangle—fuel, heat, and oxygen. An understanding of the fire triangle is essential for preventing fires, starting fires, controlling fires, and stopping fires. Fire can be very damaging when out of control and very useful when under control.

Checking Your Knowledge:

1. What is the fire triangle?
2. Describe the role of oxygen in the fire triangle.
3. Define *heat.*

Expanding Your Knowledge:

Set up four columns on a sheet of paper or on your computer. In Column 1, list combustible products. In column 2, match these products to productive uses in agriculture. In column 3, indicate how fire was used to make the products. In column 4, indicate whether the use of the items is a fire hazard.

Web Links:

The Fire Triangle
http://www.pp.okstate.edu/ehs/MODULES/Exting/exttri.htm

How Fire Works
http://science.howstuffworks.com/fire.htm