FIREHOUSE® Weekly Drill

Drill #100: Chemistry of Fire

Introduction

The most important objective an Incident Commander can focus on is that of firefighter safety! To assist him in this very important challenge, he must master the chemistry of fire. Understanding the reactions of the various chemicals will have on a fire during the combustion process is essential for the safety of the firefighters.

One key term used is that called matter. In general terms, matter is anything that occupies space and has mass (size or volume) and can be perceived by one or more of the five different senses (sight, hearing, touch, smell and taste). Matter comes in three states.

- ***Solid*** – consists of a portion of matter having definite volume and shape
- ***Liquid*** – has definite volume, but not any definite shape. It will, however, take on the shape of the container or vessel to which it is stored. In many cases, the matter will turn into a gas when exposed to the atmosphere, or when placed under pressure and heat.
- ***Gases*** – will neither have shape or volume associated with them. And can be flammable or non-flammable in nature.

Matter can be either organic or inorganic. Organic matter is found in items that once were living organisms and contain carbon, hydrogen and oxygen. As mentioned, organic chemicals contain some form of carbon and hydrogen (more commonly called a hydrocarbon). Depending on the number of carbon atoms that combine with the hydrogen atoms will determine its property and what type reaction it will have.

Product Properties

The properties of a product will have a direct behavioral predictability associated to it, such as the boiling point. Boiling point defined is the temperature at which liquids must be heated in order to turn into a gas. Then there is the vapor pressure, or the amount of force that is pushing vapors from a liquid, and vapor density, the weight of a gas in relation to the air, which is rated at 1.0.

So if the gas has a vapor density greater than 1.0 it is going to lay low and hug the ground or floor. On the other hand, if the vapor density is less than 1.0, the gas will rise into the air.

Specific gravity is the weight of a liquid in relationship to water, that has a rating of 1.0. Much the same as the vapor density, if a specific gravity is less than 1.0 it will have a tendency to float on the surface of the water. But if it is greater than 1.0, then it will sink into the water. In some cases, the material will dissolve and mix in with the water. This is said to then be water soluble.

Flash and Fire Points

The final two points of this lesson are that of the product's flash point and fire point.

The flash point is the temperature at which a liquid will give off enough vapors to ignite or flash, but does not sustain a high enough percentage to continue the burning process. However, should the liquid be heated to the point that it will produce a vapor, which can ignite and sustain a continuous flame, it is said to have reached its fire point. This point is at the lowest temperature at which the liquid produces these sustainable vapors.

–Prepared by Russell Merrick