Course Name: Theory of Fire Propagation (Fire Dynamics)

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Week – 02

Lecture – 01

Module 1 – Basics of Fires

Definitions

Smoldering:

Fire represents chemical reactions in the gas phase and is often referred to as a flaming reaction. On the other hand, surface reaction over hot char of a charring material is non-flaming. No flame or fire is observed, and a red-hot zone is seen, as in the case of cigarette burning. This is called smoldering. The porosity of the material, oxygen concentration and its diffusion, and heat loss to the ambient dictate the smoldering process. Smoldering can initiate a flaming combustion (fire), or at the end of the flaming combustion, smoldering can occur. Smoldering occurring in an oxygen-limited environment inside a compartment leads to the generation of hot fuel gases, which can auto-ignite when exposed to a sufficient amount of atmospheric air. This is called backdraft and is dangerous, particularly for firefighters.

Smoke:

If the fuel has unsaturated hydrocarbons, carbonaceous particles, called soot, are formed in the fire. The hot gaseous products, along with soot, are called smoke. Smoke point quantifies the burning rate of the fuel when soot is formed. Smoke has common pollutants such as carbon monoxide (CO) and nitric oxides. When materials such as plastics burn, more harmful pollutants, such as dioxins, are formed. Smoke in a compartment fire decreases the visibility significantly within the compartment at a particular stage of the fire.