CCPS
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Process Safety Beacon

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Messages for Manufacturing Personnel

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What? No Spark?

Photograph courtesy of EPA

Reference Web site http://www.epa.gov/swercepp/pubs/pdtirept.pdf

Here's What Happened

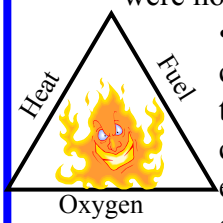
This terminal had just started storing large quantities of flammable liquids. Activated carbon drums were used in the vent system to control hydrocarbon emissions and odors. Each tank was to have a flame arrestor and a foam fire protection system, but they were not installed before filling the tanks. Suddenly, there was an explosion and a fire. Emergency response personnel arrived, residents living nearby were evacuated, and fire fighting and emergency control started. It took 3 days to put the fire out and deal with other issues such as contaminated fire water run off and spillage from other tanks.

What Went Wrong?

There are many causes of this accident, but let's focus on the fire triangle.

All three components of the "Fire Triangle" (heat, fuel and oxygen) were present. Let's see how that happened:

- **Fuel** came from the organic materials in the vessel vapor space;
- **Oxygen** came from the air in the vessel vapor space (the vessels were not nitrogen blanketed) and,
- the only remaining component needed to start the fire was **Heat**. Did it come from a loose electrical connection, static electricity, or hot work?



No! In this case, the vent system carbon filters led to the explosion and fire.

How Can a Carbon Bed be an Ignition Source?

- When organic materials pass through activated carbon, a chemical reaction occurs that can cause ***significant*** amounts of heat to be generated. **In fact, the carbon got so hot that it reached the autoignition temperature of the tank vent gas.** That was the **"spark"** that led to this explosion!

- A few autoignition temperatures you might want to know about:

• acetylene	305 °C
• n-butane	405 °C
• hydrogen	400 °C
• propane	450 °C
• methane	540 °C
• carbon disulfide	90 °C

Check out the EPA alert on carbon drums at http://www.epa.gov/swercepp/pubs/carb-ads.pdf