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5 THINGS OIL AND GAS WORKERS SHOULD KNOW ABOUT FLASH FIRES

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DEVELOPING A THOROUGH, RESEARCHED PPE PROGRAM WITH TRUSTED FLAME-RESISTANT FABRIC FOR EVERYDAY WEAR IS CRITICAL TO PROTECT YOURSELF, AND YOUR TEAM MEMBERS, AGAINST POTENTIAL INJURIES FROM UNEXPECTED FLASH FIRES.

Workers in the oil and gas industries are at a much higher risk for flash fires due to the nature of the flammable materials and liquids present in their work environments

Flash fires are a type of short duration fire that spreads via a rapidly moving flame front through diffuse fuels in the air (gas, vapors, or dust without production of damaging pressure). Flash fires are sudden, fuel-limited, moving fires that typically last a few seconds and could occur in the oil and gas industry. Three seconds or less is enough time for a flash fire to burn a worker's exposed skin and ignite regular, cotton or poly/cotton work wear. While flash fires cannot be completely prevented, oil and gas workers can take strategic precautionary steps to give themselves a few seconds of escape if a flash fire occurs. Below are five critical things that oil and gas workers should know about flash fires, from their cause and duration to adequate personal protective apparel.

01 Flash fires have various causes and are short and intense.

Fire is a complex chemical chain reaction that requires three components to occur: a thermal source (heat), oxygen, and fuel. The fuel could be any number of hydrocarbons typically found in the oil and gas environment. Even combustible dust may be fuel for a flash fire. Once the fuel and air are in the correct mixture, ignition can occur from various heat sources, like welding sparks, tool sparks, running engines, or static electricity.

A flash fire is a rapidly moving flame front that spreads through diffuse fuel in the air and has a heat flux of approximately 2 cal/cm^2. Workers in the oil and gas industries are at a much higher risk for flash fires due to the nature of the flammable materials and liquids present in their work environments. When a flash fire occurs, it is generally a few seconds because it is fuel limited.

02 Flash fires are different from fuel-fed fires.

Flash fires and fuel-fed fires are different hazards, and it's critical to distinguish between the two for various safety reasons.

- Flash fires are fuel-limited, have a typical momentary duration of only a few seconds and self-extinguish.
- Fuel-fed fires last much longer and will burn as long as there is a fuel source present.

As flash fires and fuel-fed fires present different hazards, they each require varying levels of flame resistant (FR) personal protective equipment (PPE). Fuel-fed fires require primary protective apparel, such as turnout gear, which is heavier in construction. Secondary apparel, or daily wear FR, is designed for continuous wear for protection against short duration thermal exposures such as flash fire, arc flash and molten metal splash. FR clothing can help minimize burn injuries from flash fires and is available in comfortable, breathable constructions that allow wearers to work comfortably throughout their day.

That said, it's vital for oil and gas technicians to adequately understand the specific hazards they face on the job, and whether their hazards align with flash fires or fuel-fed fires. Qualified safety personnel must perform a risk assessment in that work environment to determine the level of PPE required.

03 Flash fire injury can be increased by non-flame-resistant clothing, so avoid wearing “fuel” and instead wear daily wear FR clothing.

The science of fire is complex but has three basic steps:

a) The initial thermal source causes material (for example, non-FR clothing) to break down, or decompose, into smaller molecules that are vaporized into gaseous fuel.

b) The fuel in the gas phase reacts with oxygen in the air to produce light, heat and reactive molecules, called radicals.

c) The produced heat and radicals lead to further decomposition of the material (for example, non-FR clothing) and the production of additional fuel - furthering the chain reaction of the fire triangle.

In the event of a momentary flash fire, everyday non-flame-resistant work clothes can act as fuel, ignite and will continue to burn even after the source of ignition has been removed. This is where the saying “Stop, Drop, and Roll” comes into play as a person’s non-FR clothing will remain on fire until they put the fire out. A clothing fire can continue to burn well after the brief flash fire event is over, resulting in more extensive burn injuries for individuals wearing clothing made with non-FR fabric.

So, if your job puts you at risk of flash fire exposure, wear daily wear FR clothing (FRC) because FR apparel provides two key roles and one outcome in protecting oil and gas workers:

Role 1: Self-extinguishes to mitigate burn injuries when the source of ignition is removed.

Role 2: Provides insulation to reduce percent body burn (% of second-degree burn and third-degree burns).

Outcome: By reducing a burn victim’s body burn percentage by self-extinguishing and providing insulation, FRC increases the wearer’s chance of survival.

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FR clothing can help minimize burn injuries from flash fires and is available in comfortable, breathable constructions that allow wearers to work comfortably throughout their day.

03 Flash fire injury can be increased by non-flame-resistant clothing (cont.)

The combustion process has many intricate layers, presenting various opportunities for FR apparel to snuff out the flame. Unlike standard, non-FR clothing, FR apparel is uniquely engineered to interrupt one or more of the fundamental steps required for flames to propagate. Simply stated for a complex process, FR apparel removes the fuel and/or terminates flame propagation radical reactions (oxygen) from the fire triangle and causes the fabric to self-extinguish.

Developing a thorough, researched PPE program with trusted flame-resistant fabric for everyday wear is critical to protect yourself, and your team members, against potential injuries from unexpected flash fires. It's as simple as selecting to wear a different work shirt, but as meaningful as helping protect one's life.

04 Comfort = Protection: Not all FR clothing provides the same protection and comfort.

Protection: Determining which FR apparel is best suited for your specific hazard and work environment is a significant task, but there are industry standards available to aid in this process. The National Fire Protection Association (NFPA) created guidelines and standards to aid the industry. NFPA 2112 is the consensus certification standard on FR garments for protection of industrial personnel against short duration thermal exposures from fire, providing clear, third-party certified testing guidelines.

One requirement of NFPA 2112 is for flash fire testing to be conducted on the FR fabric through a three second flash fire exposure with a pass/fail criteria of 50 percent total body burn under the manikin testing protocols of ASTM F1930 (Standard Test Method for Evaluation of Flame-Resistant Clothing for Protection Against Flash Fire Simulations Using an Instrumented Manikin). If the fabric has a % body burn of less than 50%, the fabric meets NFPA 2112 criteria. There is a substantial difference between a 49% and 7% body burn, so consider the body burn percentage data of FR fabrics along with the comfort feedback of the FR fabric.

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04 Comfort = Protection: Not all FR clothing provides the same protection and comfort. (cont.)

Comfort: Comfort is subjective, so employ an on-site wear test to develop a consensus of what FR fabrics and garment styles are considered comfortable. A wear test is a great opportunity for employee engagement! Tip: involve influential floor or field leaders in the wear test; when an influential worker buys in to the FR clothing, the rank and file worker will likely follow suit. Worker wear tests are critical since an FR garment can't protect if it isn't worn!

Also, consider the companion standard of NFPA 2112, which is NFPA 2113 - the Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Short-Duration Thermal Exposures from Fire. NFPA 2113 has a wealth of information, most notably language around a workplace hazard analysis to determine when and where to select FR clothing as PPE.

It's important for your organization's FRC to be certified to NFPA 2112 for flash fire hazards. FR apparel standards for other hazards, such as arc flash, use ASTM F1506 to comply with NFPA 70E and the FR, arc rated (AR) garment will have an arc rating number and a PPE Category label in the FR/AR garment. Most of the latest FR fabrics in the marketplace today are blends that offer dual hazard protection and improved wearer comfort. Selecting comfortable FR/AR garments that meet NFPA 2112 certification for flash fire hazards is a critical step in selecting the most effective PPE to minimize burn injury.

Fabric is the single most important aspect of a garment when it comes to FR protection as well as comfort. There is a vast range of FR fabric available, however, each FR fabric performs differently in terms of protection, comfort and shrinkage control. It's critical to have an understanding of the FR fabric manufacturer—its reputation, history, and technology—and the specific science used to give your FR garment protective and comfort properties.

Unfortunately, FR qualities are not visible, so you must verify the performance of your FR apparel. For oil and gas workers exposed to flash fire hazard, having a daily workwear garment that is third-party certified to NFPA 2112 is a necessary starting point. The ending point would be that the FR clothing provides the necessary wearer comfort and value attributes to ensure that FRC is worn properly and consistently.

05 Proper maintenance is key to FR apparel performance.

Care and maintenance not only extends the life of FR apparel but it is also essential to allowing the garments to protect oneself to its fullest capability in the event of a flash fire. Keep FR apparel well maintained, patched with the correct FR fabric when needed, and as clean as possible, as flammable contaminants can compromise its performance. Check with your FR fabric or garment provider for proper care and maintenance instructions or simply review the laundering instructions on the garment's tag. Some job sites may prevent clothing from being totally spotless, so for dirtier tasks, consider wearing a disposable FR coverall over daily FR apparel to reduce soiling.

Oil and gas workers routinely work in areas where the flash fire hazard exists. Understanding the risks at hand, the various facets of flash fires and trusted ways to protect oneself are the first steps in creating a safer work environment for these key industries.

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