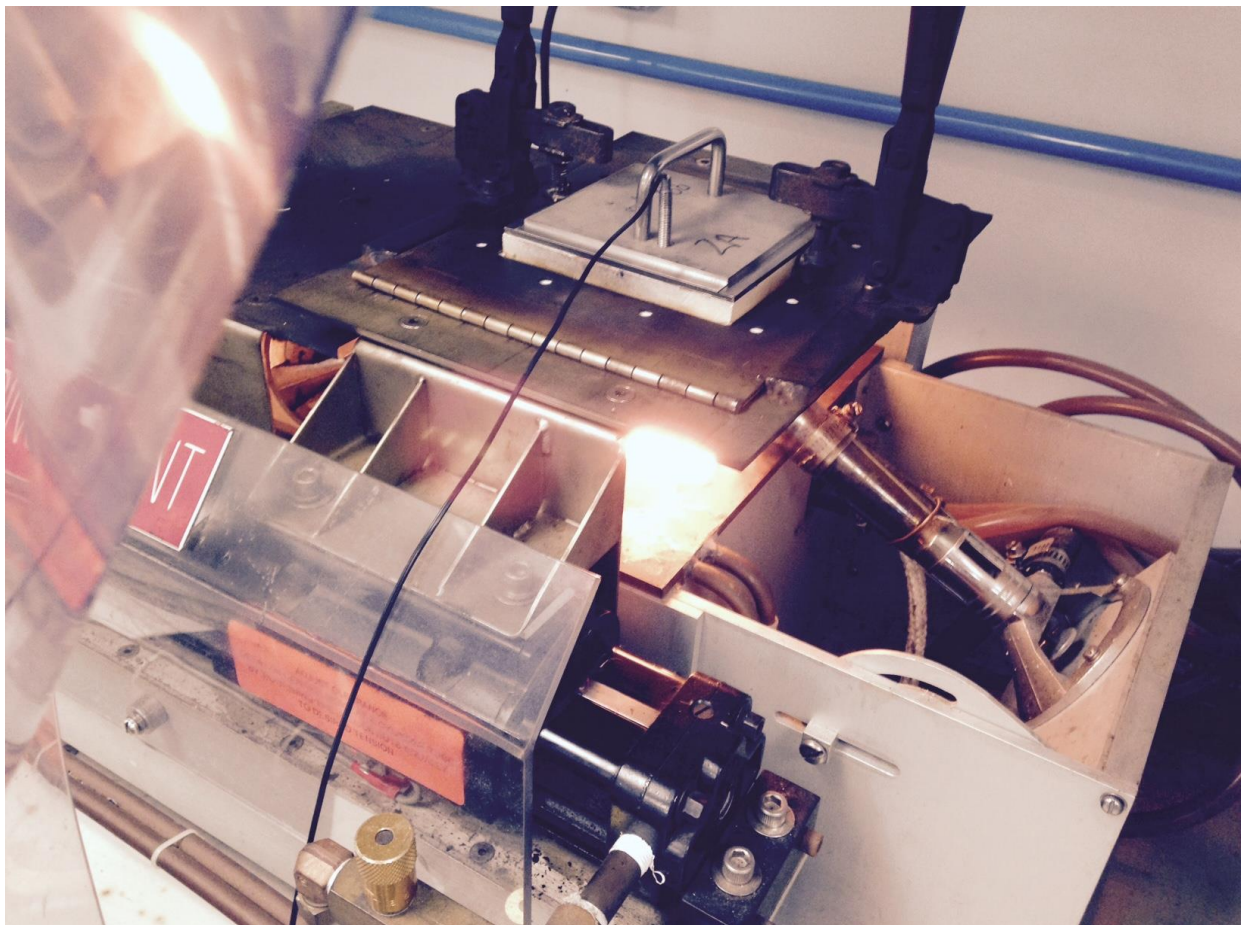




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This is a summary of some research into the thermal behavior of nomex, polyester and cotton material under a race suit, at established levels representing a 2nd degree burn from heat energy passing through the suit materials.

This study was performed using the TPP (Thermal Protective Performance) equipment in the SFI lab in Poway, CA on March 11, 2015. TPP exposure uses 2 gas burners, and 9 quartz lamps to provide a combination of radiant and direct flame heat to a driver suit fabric sample.



Thermal Protective Performance (TPP) Testing

Figure 1 is the TPP performance of a typical driver suit certified to SFI 3.2A/5, showing a time to 2nd degree burn of 10.8 seconds:

Fabric weight	11.86 oz/yd ²
Fabric thickness	60 mils
Heat flux	2.01 cal/(cm ² ·sec)
Slug exposure	No
TPP time	10.8 sec
TPP value	21.6 cal/cm ²
FFF value	1.8 (cal/cm ²)/(oz/yd ²)
Pain time	6.5 sec

Comments

15-3/11/15 #4
SFI Control Material
2 Layers

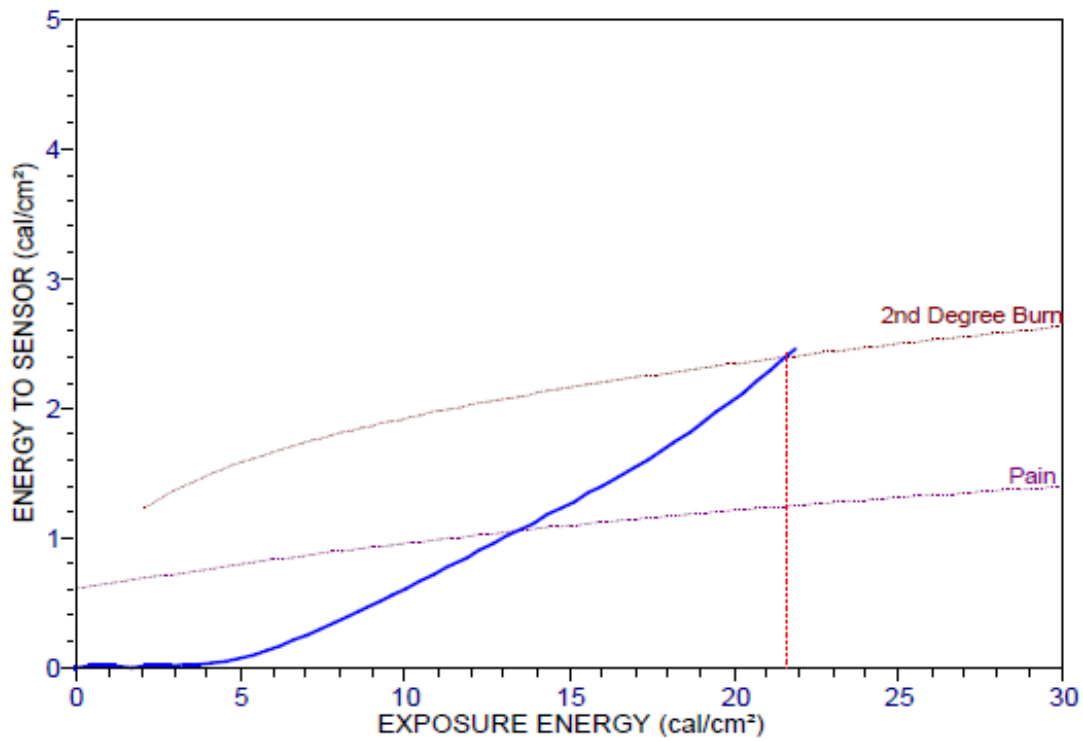


Figure 1

Figure 2 is an identical sample to that of Figure 1, with the addition of nomex underwear, certified to SFI 3.3. This is what many sanctioning bodies require to be worn under a driver's suit. Note that the time to 2nd degree burn is increased to 16 seconds. Photo 1 shows the condition of the nomex underwear, where it contacts the skin:

Fabric weight	17.74 oz/yd ²
Fabric thickness	103 mils
Heat flux	2.01 cal/(cm ² ·sec)
Slug exposure	No
TPP time	16.0 sec
TPP value	32.1 cal/cm ²
FFF value	1.8 (cal/cm ²)/(oz/yd ²)
Pain time	10.0 sec

Comments

15-3/11/15 #5
 SFI Suit + Underclothing
 3 Layers

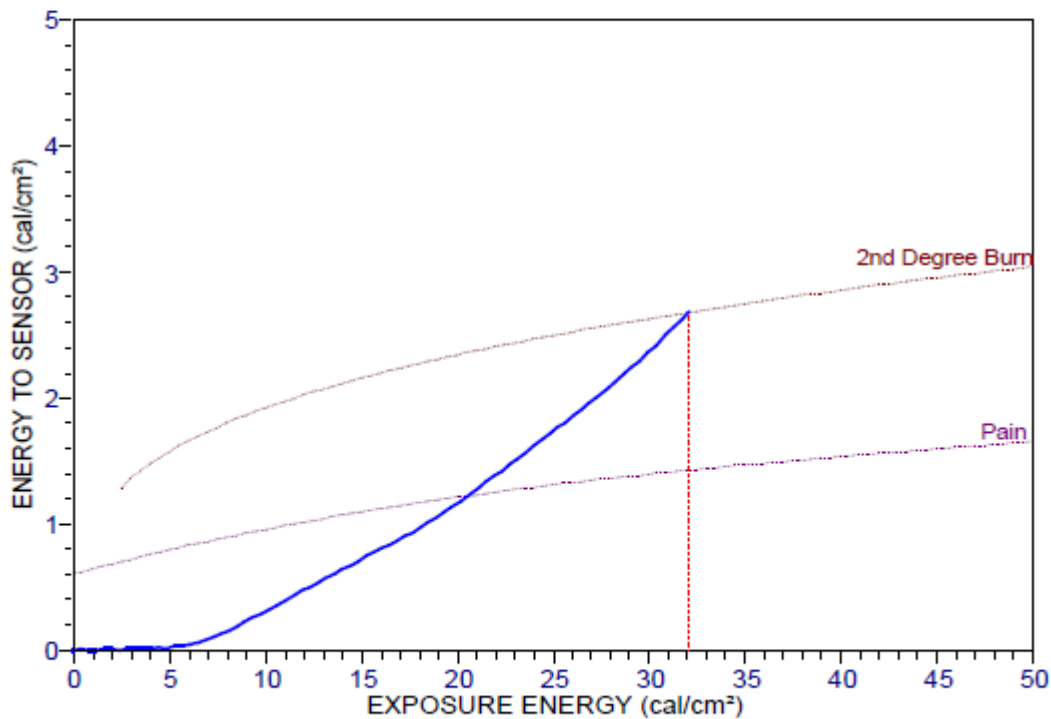


Figure 2



Photo 1, nomex underwear, 16 seconds exposure

An illustration of what happens when a polyester shirt is worn under a race suit instead of SFI 3.3 underwear: A sample of a polyester shirt was substituted for the nomex underwear, under another identical race suit sample, and the sample was exposed to the same heat source for the same 16 seconds as the sample in Photo 1. This at an exposure where a person with SFI 3.3 underwear would only have a second degree burn, their skin would still be intact, and typically treated with only ointment, and bandages if the blisters have broken.

Photo 2 shows the condition of a polyester shirt, where it contacts the skin, after the same 16 second heat exposure as the nomex in Photo 1:

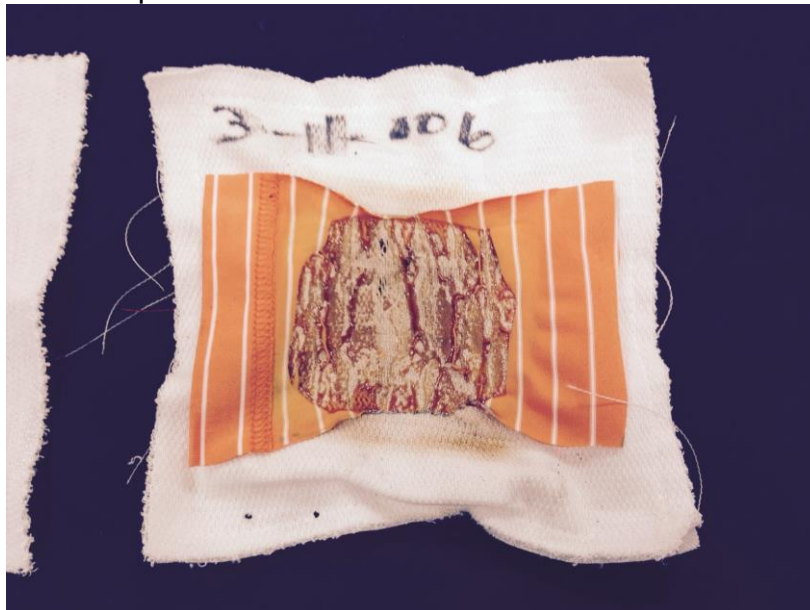


Photo 2, polyester shirt, 16 seconds exposure

When the polyester shirt melts, it becomes hot glue, and will stick to skin. For the same heat exposure, an injury that would otherwise only need ointments for treatment will now require painful scraping or removal of skin to separate the solidified polyester from the body.

To illustrate the adhesive properties of the polyester, a “skin” (leather sample) was placed over the polyester shirt, and the polyester shirt and driver suit sample were exposed for the same 16 seconds as the other samples. In photo 3, the adhesion to the leather and the fire suit is evident, as the combination easily supports a 1 lb weight pulling from the edge:

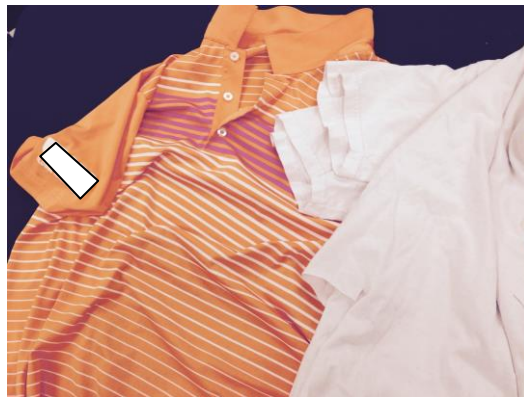


Photo 3, adhesive properties of polyester, 16 seconds exposure

Although a 100% cotton shirt does not provide the additional time to burn of the nomex underwear, unlike the polyester shirt it does not melt or stick, as illustrated in photo 4:



Photo 4, cotton shirt, 16 seconds exposure



polyester and cotton shirts

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