



## HAZARD ALERT

# Solutions for Transformer, Lithium-ion Battery and Solar Panel Fires

Transformer, lithium-ion battery and solar panel fires are becoming more and more commonplace. In the case of transformers, the infrastructure in the United States is aging, with the average transformer being 40 years old. As transformers fail, one in five results in a fire. Lithium-ion batteries are a new technology presenting new problems as the need for these powerful cells grows, and the quest for energy self-sufficiency and prices that have dropped over 60% since 2011 have made solar panels more practical than ever.

These technologies have presented challenges for industry and firefighters. When transformers, lithium-ion batteries or solar panels catch fire, the most common response is to use water, but water will be mostly ineffective, because it doesn't penetrate and remove heat well. In the case of transformers, water cannot extinguish the hot mineral

oils. The next choice for these fires would be foam, but foam is not recommended for three-dimensional fires and foam blankets retain the heat. Foam is also highly conductive, placing firefighters in great danger. Powders have been tried, but powders don't remove the heat and can't penetrate, resulting in re-ignition.

There is a solution, F-500 Encapsulator Agent. F-500 EA extinguishes a fire three ways; it rapidly reduces the heat – remove the heat; remove the fire, it encapsulates fuels, rendering them nonflammable, and it interrupts the free radical chain reaction, greatly reducing smoke and toxins.



## Transformer Fires

In 2009, firefighters in New York City responded to another transformer fire. Foam was applied for two hours trying to protect adjacent buildings. When the power to the transformer was confirmed to be off, efforts began to extinguish the transformer. Foam had little effect. Purple K was applied, but couldn't remove the heat, so it kept re-igniting. The Hazmat team, who was familiar with F-500 Encapsulator Agent for spill control, suggested they apply F-500 EA. The F-500 EA cooled the massive metal, encapsulated and cooled the hot oil and extinguished the fire in less than two minutes.



This event led Con Edison to begin testing various fire suppression agents on energized transformers. Final testing was conducted at the Fish Kills Substation on 345 kV transformers in 2010. Con Edison concluded the only agent they recommended was F-500 EA for transformer fires. After the power is removed, F-500 EA can be safely applied without fear of electrical feedback to the nozzle if the stream comes into contact with other energized peripheral equipment.



## Lithium-ion Battery Fires

Several years ago, Bosch in Germany began extensive fire testing of F-500 EA on plastics, tires, cars, isopropanol and diesel fuel. They were impressed with the results. Bosch then began testing F-500 EA on lithium-ion battery fires. Their testing showed large amounts of water was required to extinguish lithium-ion battery fires and water caused dangerous explosions when applied to lithium-ion batteries. Other agents failed to cool or penetrate, but F-500 EA performed very well.

Bosch recommends F-500 EA be applied to lithium-ion battery fires from three feet with a conical pattern. Bosch arranged for F-500 EA to be applied from a fixed suppression system, for their warehouse storage of lithium-ion batteries. F-500 EA would also be suitable for suppression systems at peak demand, lithium-ion battery storage facilities. Hazard Control Technologies not only provides F-500 Encapsulator Agent for firefighters, but also manufactures Concentrate Control Supply (CCS) systems, engineered for lithium-ion battery warehouses or peak demand storage applications.

The Bosch testing led to further lithium-ion battery fire testing by Dekra Automobil GmbH, Daimler AG (Mercedes) and Deutsche ACCUotive in Germany. They found F-500 EA could penetrate into the battery modules and is very effective on vehicle fires, including all fuels, tires, plastics and magnesium components. They presented their findings at the SAE International 2013 World Congress in Detroit. Based on those findings, the State Fire School Baden-Wurttemberg began recommending F-500 EA for all hybrid and electric car fires.



## Solar Panel Fires

Many buildings are equipped with solar photovoltaic panels to generate electricity and they can result in roof top fires. The size of the array gives an indication of how much electricity is being generated, but the maximum is usually 600 volts at 40-240 mA of DC current. You cannot remove the power from solar panels and a UL report showed fire damage can result in new electrical paths, such as the array's frame, gutters or flashing. If the sun is shining, the panels are creating electricity. Incidents of fire are more likely to occur when the solar panels are generating power, so firefighters must be cautious, assuming there is shock potential. Also, a component of solar systems is battery storage, which can also ignite.

The last thing firefighters should do is apply foam, which is very conductive. The obvious choice is to apply F-500 Encapsulator Agent to reduce the risk of electrical feedback to the nozzle. Based on the ConEdison testing, a conical pattern from 25 feet will provide more than enough margin of safety, or streaming from 125 feet.



**HAZARD CONTROL TECHNOLOGIES, INC.**

150 Walter Way  
Fayetteville, GA 30214

TEL: 770.719.5112  
FAX: 770.719.5117

[www.hct-world.com](http://www.hct-world.com)  
[info@hct-world.com](mailto:info@hct-world.com)