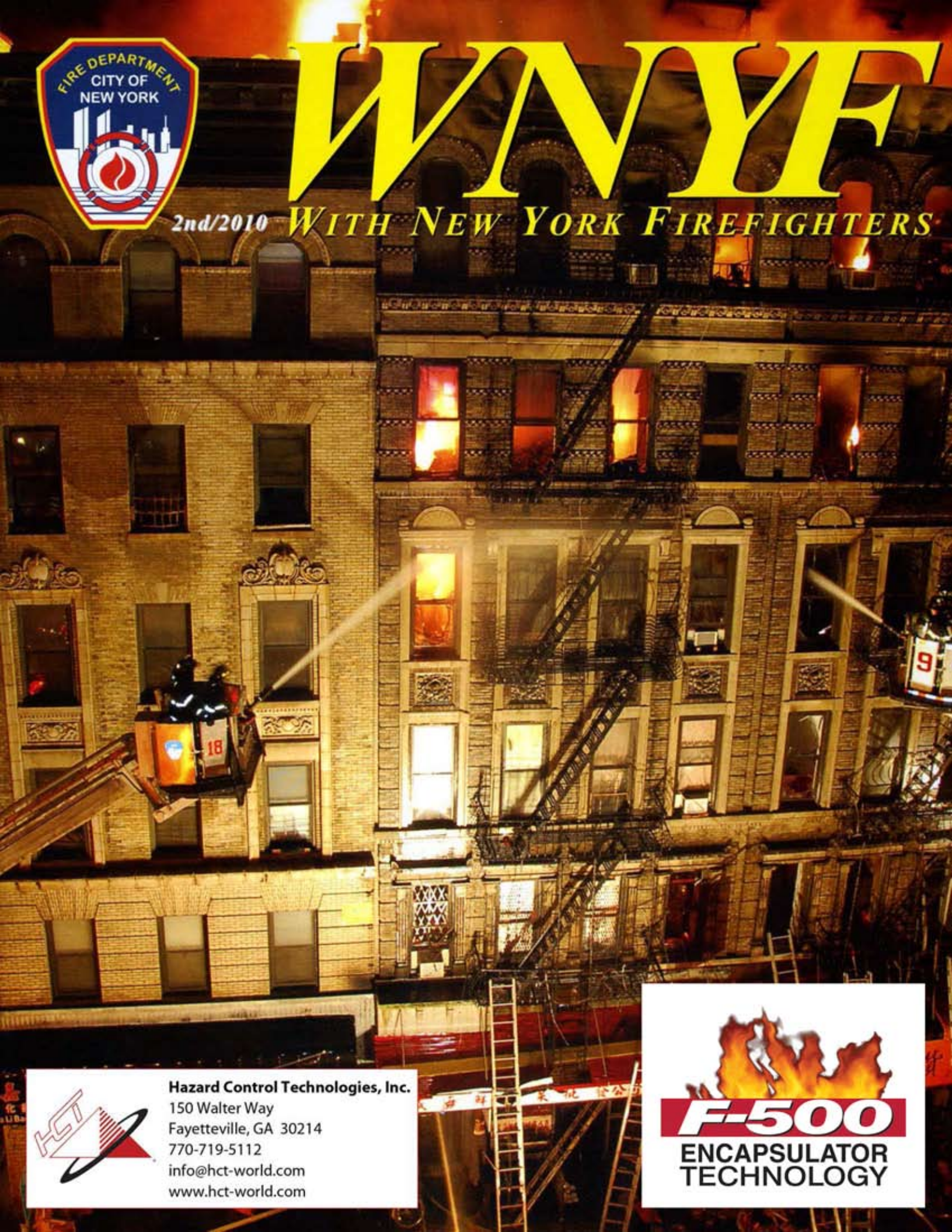




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F-500
ENCAPSULATOR
TECHNOLOGY

Queens Transformer Fire Prompts Use of New Technologies

by Deputy Chief Steven Kubler

Friday, July 24, 2009, was an exceptionally beautiful summer day. While in quarters that morning, Deputy Chief Steven Kubler, Division 14, heard Box 6334 transmitted for a car accident at the intersection of 244th Street/Northern Boulevard, Douglaston. What seemed like only a moment later, he heard the Officer of Engine 313 tell the dispatcher that they did not have a car accident at this location but, instead, a transformer fire. The engine Officer then asked at 0759 hours that a 10-75 signal be transmitted for the Box and ordered the necessary fire tactics to be employed.

Lieutenant John Downey, the Officer in command of Engine 313, quickly sized up the situation and realized the potential for fire spread from the transformer to Exposure #4, a three-story commercial building. With this in mind, he ordered the placement of Engine 313 apparatus to the south side of Northern Boulevard and the deck gun of the apparatus was placed into operation while a hand-line simultaneously was stretched to provide exposure protection. Both of these lines operated from a position on Exposure #1 between the transformer and Exposure #4.

On arrival of the second engine company, Engine 306, a hand-line was stretched to the roof of Exposure #4 with the assistance of Engine 320, the third-arriving engine company. After assisting with the stretching of the second line, Engine 320 proceeded to stretch a hand-line to the first floor of Exposure #4. Engine 326, the fourth-due engine, stretched a 2½-inch hand-line to protect private dwellings on 243rd Street. From this position, they were directly behind Exposure #4. (This hand-line later was turned to a portable Akron New Yorker.)

While en route to the Box location and still some distance away, Chief Kubler heard Battalion Chief John Marinaro, Battalion 53, give a preliminary report that they were operating using four lines. Hearing this transmission, Chief Kubler ordered the dispatcher to transmit a second alarm for the Box at 0805 hours. Although not on the scene, the reason for this action was obvious. If four lines are in operation with just an All Hands assignment, there would be no reserve units to do anything else. Also, there would be nobody for relief purposes. (Battalion Chief Robert Bohack, Battalion 47, was on his way to work and stopped to take command until Chief Marinaro arrived. Chief Bohack assisted Chief Marinaro until operations stabilized with the arrival of additional forces.)

While responding, it is important for Incident Commanders (ICs) to try to be proactive. Response times must be figured into the equation. In the outer areas of Queens, units are spread far apart and additional resources have significant lag time in arrival. ICs can always send units back if they aren't needed. However, at this operation, additional units, indeed, were necessary.

All units that were operating lines were careful not to place water on the involved transformer. All aspects of AUC 338, *Application of Water Streams on Live Electrical Equipment*, were being complied with.

While engine companies were protecting exposures with hose-lines, ladder companies were busy searching all exposures for possible extension of fire, as well as evacuating occupancies where there was a possibility of exposure to smoke from the transformer. This included occupancies on the southern side of Northern Boulevard, as well as 243rd and 244th Streets. The northern side of Northern Boulevard is a cemetery and, therefore, coupled with the width of Northern Boulevard, did not present any exposure hazard.

All the while, units operated with all protective equipment



Engine companies protect exposures with hose-lines, preventing the fire from extending beyond the transformer.

photos by Battalion Chief Steven San Filippo unless noted otherwise

photo by Rob McDermott, CTU

until a determination of the burning transformer oil (whether PCB or not) could be determined.

On arrival, Chief Kubler was briefed by Chief Marinaro of all actions taken. At this point, the two Chiefs verified where units were operating and what their assignments were. Since a second alarm already had been transmitted and they knew that this would be a prolonged operation, the Firefighter from Division 14 immediately began to set up the Command Board on the northern side of Northern Boulevard in front of Exposure #1. He was assisted by the back-up Firefighter of Division 14. (Whenever the Division responds to a structural operation, the back-up Firefighter responds with the Division to assist the Division Firefighter in the

many tasks that must be performed in the early stages of operations before logistical help--such as FieldComm, etc.--arrives.)

All on-scene units now were heavily engaged in the immediate concerns. This included first making sure that all life hazards were addressed and then preventing the fire from extending beyond the transformer. The next step was to gather as much information as possible from Con Ed, as well as any other agencies to formulate the strategy to successfully bring this operation to a conclusion.

Con Ed was consulted with the following questions:

1. What was the approximate estimated time of arrival (ETA) of shutting off power to the involved transformer?
2. How much fluid did the transformer contain?

Foam Operations at Queens Box 33-6334

by Battalion Chief Steven San Filippo

A signal 10-86 (foam operation) was transmitted for Queens Box 33-6334, Northern Boulevard/244th Street, for a fully involved transformer fire on Friday, July 24, 2009. The fire created multiple problems and required the need for foam, Purple K and a new product (F-500) for total extinguishment.

The immediate concern was the community center on the Exposure #4 side of the fire. Reporting into the Command Post, Battalion Chief Steven San Filippo, Foam Manager, was informed by Assistant Chief James Esposito, Command Chief, to start setting up the required foam resources that would be needed. At that time, Chief San Filippo conferred with Battalions 49 and 44, the two Foam Coordinators assigned on the 10-86, and developed a plan of attack.

They decided to use Ladder 164's tower ladder, a hand-line operated by E-260 and two Purple K hand-lines from E-326's Purple K unit. The two Purple K lines were operated by Engine 315, Engine 326's back-up unit, which picks up the required equipment when the primary unit is unavailable. (All back-up and primary units are trained equally in the operation of the apparatus.) Additionally, they had a unique opportunity to use a product called F-500, which enables FDNY to use its

standard educators, hose and nozzles. Currently, Haz-Mat 1 carries five-gallon containers and their members manned this hand-line.

F-500 background

F-500, manufactured by Hazard Control Technology, is a new product that the FDNY is piloting. This product is not considered foam, with which most FDNY units are familiar.

F-500 has been used at spe-

One of the two Foam Coordinators, who supervised operations at this incident.

cific fires; mainly transformer and small metal or Class D fires (titanium). The product has many additional applications and myriad uses.

Foam/Purple K operations

All units on the 10-86 were assigned to the staging area and supervised by Battalion 44, the Foam Resource Unit Leader. As units were put into operation and given their assignments, the foam response was beginning to come together. Foam Carrier 294 supplied concentrate to Engine 294's apparatus (using the portable FIMM), which supplied solution to Engine 72's manifold.

Supplying foam solution to the manifold enabled FDNY to produce foam from a tower ladder (Ladder 164), a hand-line manned by Engine 260 and, if the need arose, to employ additional hand-lines or large-caliber appliances. In addition to the foam capabilities, Engine 315 stretched two hand-lines from Engine 326's Purple K apparatus and stood by. After consulting with Lieutenant John Cassidy, Haz-Mat 1, it was decided to use F-500 and give FDNY the opportunity to evaluate its effectiveness at an actual incident.

Power removal confirmation

On confirmation that power was removed, the initial tactic was to use Purple K powder on the transformer oil. The powder appeared to extinguish the fire, but due to the inability of Purple K to cool the surrounding metal, the oil continued to self-ignite and burn.

The next tactic involved Haz-Mat's hand-line with a fog nozzle, applying F-500 at three percent. This product controlled the fire and had the ability to cool the surrounding metal enough to contain and stop re-ignition of the dielectric oil. After Haz-Mat had control of the fire, members applied a foam blanket using flouropolydohl at three percent in the transformer trough to prevent any chance of re-ignition of the dielectric oil.

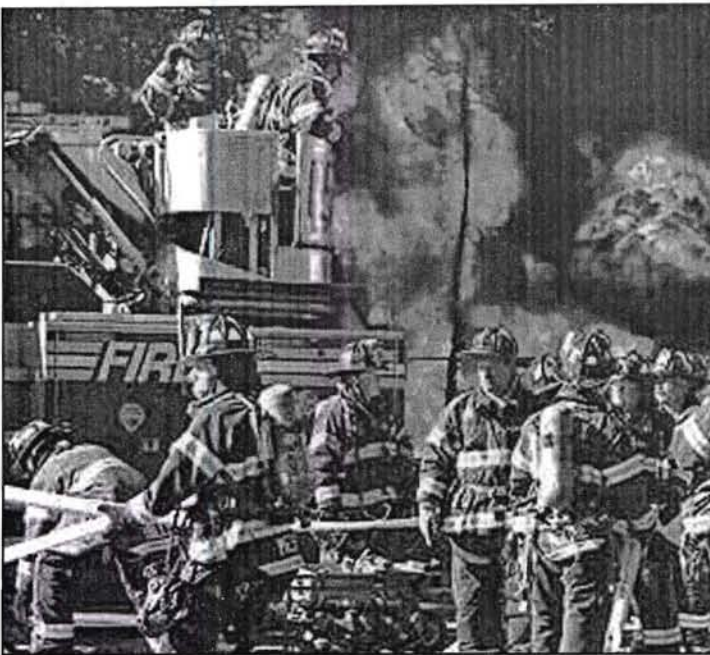
Conclusion

This operation was located in an area where the exposures were not a severe problem. That factor gave FDNY the opportunity to try various extinguishing agents--such as foam and Purple K--at the Department's disposal. Additionally, members employed one of the newer products--F-500--which, through a pilot program, will continue to be evaluated to determine its effectiveness and usefulness to the FDNY.

About the Author...

Battalion Chief Steven San Filippo is a 32-year veteran of the FDNY. He is assigned to Operations as the Foam Manager. He completed the West Point Counter-Terrorism leadership and FDNY Officers Management Institute (FOMI) programs. He is attending John Jay College, studying for a bachelor's degree in fire and emergency. He is also a member of the Department's Incident Management Team that responded to New Orleans for Hurricane Katrina. He is a frequent writer for WNYF.





Transformer fire at Queens Box 33-6334, Northern Boulevard/45-08 244th Street, July 24, 2009.

3. What type of fluid did the transformer contain and was it PCB-contaminated?
4. Was it possible to get an MSDS (material safety data sheet) on the transformer?
5. What was the capacity of the dike that surrounded the involved transformer?
6. Was there any danger of involvement of the adjacent transformer?
7. How would shutting power off at this location affect the immediate neighborhood?

As usual, Con Ed personnel were very receptive to FDNY's concerns and extremely cooperative. They began working on all of the above requests immediately.

As additional units arrived, the operation was sectored. Chief Marinaro was put in charge of operations in the Exposure #2 Sector. Battalion Chief Eugene Marmann, Battalion 52, was placed in charge of operations in the Exposure #4 Sector. Battalion Chief Richard Schluock, Haz-Mat Battalion, was assigned as the Haz-Mat Branch Director and operated with Haz-Mat 1, Engine 274 and Squad 288 members. These units performed atmospheric readings throughout the operation to check on LEL (lower explosive limit) levels. Battalion Chief Stephen Browne, Battalion 50, was assigned as the Safety Coordinator and supervised the evacuation of homes on the Exposure #3 side. Battalion Chief John McGuire, Battalion 54, was assigned as the Resource Unit Leader and helped coordinate all on-scene units. Battalion Chief Michael DeGennaro, Battalion 49, was assigned as the Foam Coordinator.

While waiting for confirmation of *power off* and as units arrived, a number of lines were stretched for foam operations. The Satellite unit set up the manifold and Ladders 152 and 164 were supplied. Additionally, the Purple K unit responded and stretched their hand-line of Purple K to a position to be used once *power off* was confirmed.

The Command Chief, Assistant Chief James Esposito, arrived on-scene and assumed command. Chief Kubler was reassigned as Operations Chief. Chief Esposito was apprised of all actions taken. He ordered a Command Channel placed into operation and called a third alarm at 0854 hours for logistical reasons. The Chiefs knew the operation would last a while (the incident was placed *under control* at 1049 hours) and they wanted to be able to replace units as needed.

With the Command structure now in place, members awaited

further information from Con Ed. They stated that the fluid in the transformer was non-PCB and provided a testing sheet, dated April 5, 2009. They also stated that it would be some time before power could be confirmed off. In regards to the capacity of the dike around the transformer, it had a capacity of several thousand gallons and the fluid in the transformer was only several hundred gallons. Finally, they assured FDNY that there was no danger of involvement of the other transformer. With this additional information, positions were maintained and members awaited *power off* verification.

While continuing to protect the exposures with water, an additional problem presented itself. Due to the amount of water that was being used, the basement of Exposure #4 was beginning to flood. Further, it was stated that the water appeared to be contaminated with some kind of oil. Due to the need to continue the exposure protection, this was a problem that could not be solved immediately. Whether the water was contaminated had to be verified before it could be pumped out. The Department of Environmental Protection (DEP) took samples and the condition was monitored.

During this waiting period for *power off*, the Chiefs were given the luxury of formulating a plan for final extinguishment. After gathering intelligence on-scene, the course of action to follow was determined. First, the Purple K would be used to knock down the fire. Once this had been accomplished, a new technology, F-500, would be used by Haz-Mat 1 via a hand-line. The purpose of F-500 is to remove heat. If additional resources were needed, the foam lines would be put into operation.

Word came from Con Ed that power was confirmed off. The plan was put into operation. Unfortunately, like all good plans, this one was not perfect. The Purple K was unable to totally extinguish the fire because one area of the burning transformer was inaccessible to the agent. Thus, the plan was altered. One area that could not be extinguished with the Purple K was still not out. The F-500 was applied to this area. It was very effective in reducing the heat immediately and final extinguishment was accomplished. As a precaution, the F-500 was applied continually until temperatures of the transformer were in the 100- to 120-degree range. Finally, conventional foam was applied to try to prevent the areas that the Purple K had extinguished from re-igniting. This proved successful, with a foam blanket applied.

With the transformer extinguished, consideration returned to the problem of flooding in Exposure #4. As stated earlier, DEP was testing the sample taken from the water. It was agreed that if the sample was contaminated, Con Ed would handle any necessary cleanup. They already had vacuum trucks on the scene for this purpose. As a necessary precaution, all FDNY members exposed to the water in the basement were decontaminated prior to leaving and had their bunker gear taken for decon.

Final thoughts

- Sector operations as soon as possible. As operations expand, it is impossible to control everything without help.
- Keep in constant contact with utilities. Additional information may be needed at any time.
- Over prolonged operations, weather conditions must be considered. At this incident, wind conditions changed from the outset of operations. Members who were not exposed initially were exposed later to smoke from the burning transformer. This also applied to the need to evacuate additional occupancies that were not an initial consideration.
- Good initial tactics by first-arriving units can make all the difference. At this operation, the first-due engine knew that protecting Exposure #4 was a priority and the Officer issued the proper orders to make sure that it was done.

F-500 and its Use at Queens Box 33-6334

by Lieutenant John Cassidy

Transformer fires pose a number of challenges that need to be overcome for extinguishment to take place. The two most common types of electrical transformers are air-cooled and oil-cooled. The transformer at this incident was an oil-cooled unit.

All transformers have large amounts of mass due to the metals used in their construction. This mass serves as a large heat reservoir. If not cooled down quickly, it will be a constant source of re-ignition. The main areas of the transformer usually are enclosed with metal walls that make it difficult to get at the seat of the fire.

Oil-cooled transformers often will have both spill fires and running fuel fires. This occurs as the oil boils and expands, as was the case at Box 6334. While Purple K is a very effective agent on Class B fires, there were a number of problems that it could not overcome at this incident. First, the Purple K could not penetrate to the seat of the fire due to the metal enclosure. Second, Purple K does not cool the burning material.

Haz-Mat Company 1 members monitored the progress of the Purple K attack with their thermal imaging camera and observed active flaming through the Purple K cloud. Haz-Mat 1 used the F-500 agent to knock down the fire and cool the body of the transformer. The initial extinguishment took place in approximately two minutes. Haz-Mat 1 and HMTU/Engine 274 continued to apply agent until the temperature of the transformer and the oil contained within it no longer were considered a source of re-ignition.

The thermal imaging camera was used to track the progress of the cooling process. During the initial stages of cooling the transformer, once the application of F-500 stopped, the temperature would rise. When the temperature stabilized, the application of F-500 was discontinued. Battalion Chief Steven San Filippo, Foam Manager, used the Department's foam resources to apply a foam blanket to the transformer oil that had collected in the pit.

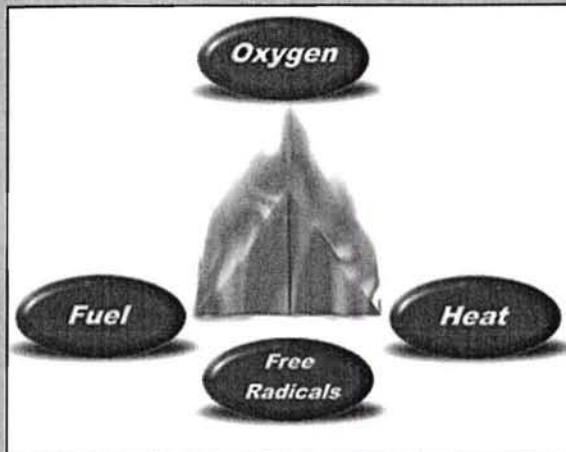
Using foam at these types of fires is difficult because of the challenge of getting foam to the seat of the fire. Also problematic is that flowing fuel prevents an effective blanket from being formed. The water in foam initially provides cooling, but then after the blanket is formed, it acts as a thermal insulator.

F-500 and why it worked

F-500 is not foam and does not form a foam blanket. F-500 is considered a wetting agent that falls under the NFPA 18 standard and is UL-listed for Class A and Class B fire suppression. Wetting agents reduce the surface tension of water and increase the wetted surface for the given amount of water. The reduction in surface tension allows F-500 to penetrate into the pores on the surface of the material. It is this combination of attributes that leads to a dramatic reduction of temperature.

The burning material and surrounding non-combustible materials are cooled below the auto-ignition temperature of the burning material. F-500 acts on individual legs of the fire tetrahedron (see graphic at left) simultaneously. Foam separates the fuel from oxygen by forming a foam blanket. Foam is ineffective on flowing fuel and multi-dimensional fires.

When applied at the proper ratio, F-500 separates the fuel and oxygen by encapsulating the fuel in a chemical cocoon at the molecular level. The encapsulated fuel is neutralized and will not re-ignite even if disturbed. When F-500 was applied at this transformer fire, the fuel and transformer unit and internal oil were cooled. The flowing oil was cooled and neutralized; subsequently, the fire was quickly brought under control.



Recommendations

The unique properties of F-500 have contributed to a number of successful FDNY operations, including multiple transformer fires, combustible metal fires and vapor suppression of flammable/combustible liquids at haz-mat incidents. Incident Commanders should consult with the Haz-Mat Group to see if F-500 can be applied at a given incident. Con Edison currently is testing F-500 for expanded use at its facilities.

About the Author...

Lieutenant John Cassidy is a 14-year veteran of the FDNY. He is assigned to Hazardous Materials Company 1. He holds an AAS degree in Biomedical Engineering from SUNY-Farmingdale and a BSN degree in Nursing from SUNY-Stony Brook. This is his first article for WNYF.



- New technologies should be used whenever possible. The use of both Purple K and the new F-500 were instrumental in the control of this fire. Additionally, it was possible to monitor the heat of the transformer with thermal imaging cameras, thereby tracking the progress of the above-mentioned F-500 in heat removal.
- Having the Command Chief on-scene made it possible to concentrate totally on the operations tactics. The Command Chief was the Incident Commander and took over the responsibilities of interaction with involved agencies, as well as overall coordination of the incident.
- At prolonged operations such as this, particular attention must be paid to logistics. Members will become fatigued due to necessary use of all PPE and must be relieved as necessary. It is equally important to relieve units that will not be needed for operations. This will make them available for other responses if necessary.
- All Officers must be vigilant to maintain safe operating distances. During extended operations, it is common to see units

moving in closer and closer as time goes on.

- Per the Emergency Response Plan, Hazardous Materials, section 19.1.2, clean-up operations are not Fire Department functions. However, the FDNY is responsible for ensuring that clean-up operations take place. In this particular operation, Con Ed handled the contaminated water from Exposure #4, while DEP was left on-scene to oversee the operation.
- This operation was conducted on a major Queens thoroughfare during rush hour. Police were needed for both traffic control, as well as rerouting. Reopening a major roadway should be given consideration when possible. The effects of a shutdown of such a roadway can have far-reaching effects.



About the Author...

Deputy Chief Steven Kubler is a 31-year veteran of the FDNY. He is assigned to Division 14. As a Battalion Chief, he served with Battalion 4; as Captain, with Engine 259; as Lieutenant, with Engine 55; and as a Firefighter, with Engine 212 and Ladder 138. He attended Empire State University. This is his third article for WNYF.



Members are urged to review "Utility Hazards, What You Should Know About 10-25 Responses," by Battalion Chief Frank C. Montagna, in the 3rd/2004 issue of WNYF.