



HAZARD CONTROL TECHNOLOGIES, INC.
FIRE, VAPOR, AND CONTAMINATION CONTROL SOLUTIONS

F-500 Fire Suppression Encapsulator Agent allows Hazard Control Technologies' (HCT) utility client, Dominion, to improve fire protection system effectiveness at Chesterfield plant without infrastructure upgrades.

Client: **Dominion**

Location: **Chesterfield Power Plant – Chester, VA**

F-500 CCS Implementation: **2009**

Fire Protection Engineers: **McDaniel Fire Systems, Valparaiso, IN**

Project Type: **Fire Protection Upgrades to Under Floor Areas, utilizing F-500 for rapid cooling and fire protection at their turbine generators and transformers**



Overview

Dominion had a prior unfavorable experience with a transformer failure, and the inability of a preinstalled .25 gpm/ft² system to mitigate the hazard. As a matter of fact, the use of the water deluge system, combined with inadequate containment means, actually made matters much worse.

An F-500 Concentrate Control System (CCS) was specified, because the agent solution rapidly cools and controls the fire, as well as locks-up hydrocarbon liquids and vapors. It could be added to the existing system to enhance the existing protection system effectiveness, without having to upgrade the piping, pumps, and water supply to provide a .40 gpm/ft² coverage upgrade.

Challenge

When the transformer failure occurred, the local municipal fire department was called to respond. A spewing, Class B fire was underway, as the cooling chamber around the transformer ruptured and leaked its contents. When the firefighters arrived, the plant was about to turn off the deluge system, because the containment system was going to overflow. The local FD, having taken over Incident Command, did not want to do so because the fire threatened adjacent transformers. The water-spray deluge system was allowed to continue to operate and the containment system overflowed, spreading the hazard (burning mineral oil floating on water) to adjacent areas.

Further, FM Global conducted under turbine lube oil spray fire simulations in their calorimeter and in 2004 published Engineering Bulletin 06-04.

In summary, their findings were:

- a) 50% of the fires reported in the Turbine building were oil spray fires
- b) Existing water spray densities and sprinkler head spacing are inadequate to control the fire and the high temperatures, which at the ceiling can lead to structural damage.

The recommendation is to increase coverage from .25 gpm/ft² to .40 gpm/ft², switch to higher K-factor sprinklers, and reduce head spacing to 5'. The alternate is to install and FM-Approved agent-water sprinkler system designed for a density of at least .20 gpm/ft² or the minimum required density in the Approval listing.

Substation Fires

- Burning electrical equipment is already ruined and will be replaced. The safest course of action is to **LET IT BURN**.
- Contact Dominion and wait for their personnel to arrive. **Never attempt to enter a substation without utility personnel present.**
- **Evacuate the area** and keep everyone **AT LEAST** 300 feet away from the substation.
- Electrical equipment contains oil. **Be alert for explosions and toxic smoke.**
- **Protect area exposures** to prevent fire from spreading.
- **If an equipment fire must be suppressed**, utility personnel and the incident commander will tell you how to proceed.



Solution

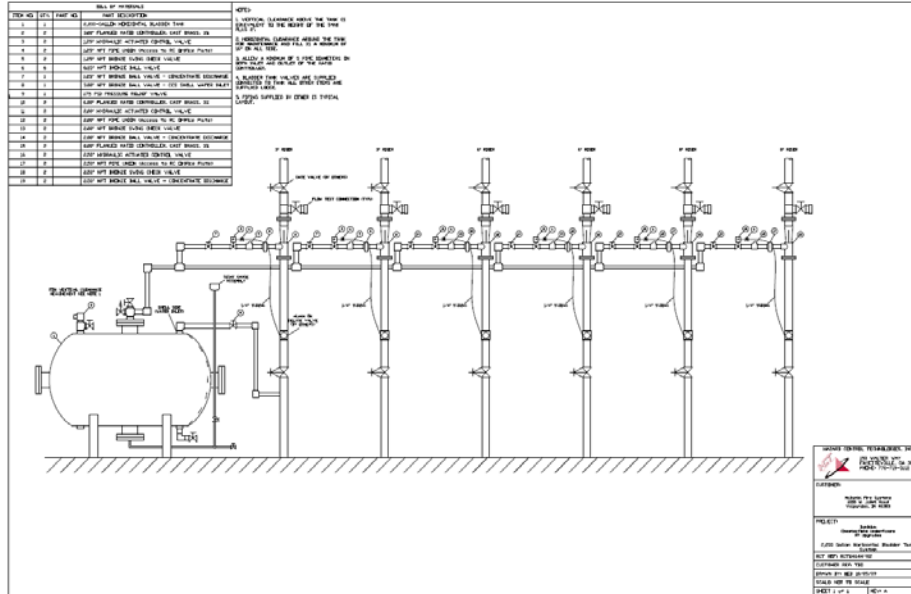
Transformers and Under Turbine Lube Oil Protection is designed in accordance with NFPA 15 to densities prescribed, but there is nothing that precludes a power plant from enhancing those systems by the addition of an HCT F-500 Encapsulator Agent CCS. In that case, they would be going above and beyond the minimums specified by code.

A Chesterfield Plant specification excerpt:

“All preaction water sprinkler systems shall be pre-connected to an F500 storage tank(s) and delivery system(s). The F500 injection for the turbine building preaction water sprinkler systems shall require manual operation using a quick opening valve such as a ball valve. The valve position shall be electronically monitored. The means for manual operation shall not require an operator to enter any area that is exposed to any event for which the F500 is needed. The F500 injection for the boiler front preaction water sprinkler systems shall inject automatically.”

The F-500 Concentrate Control Systems applied:

- (2) 2200 gallon Bladder Tanks
 - (4) each of 4”, 6”, and 8” ratio controllers
- Swing, ball, pressure relief, and hydraulically actuated control valves.
F-500 Encapsulator Agent



The F-500 CCS, using 3% Ratio Controllers, were commissioned, tested and approved. The system design is based on a 2600 gpm water flow and 30 minutes of enhanced and properly proportioned F-500 Fire Suppression capability to protect the under turbine lube oil and transformer sections from fire.

The F-500 CCS are stationed for quick injection of concentrate into the system risers, and are fully charged and ready to automatically activate on command. There are no electrical parts; the deluge valve activates the entire system when a fire is detected and the sprinkler system is activated. As soon as water pressure is sensed across the deluge valve the F-500 CCS Water Actuated Automatic Control Valve is tripped, injecting the agent into the water stream, and the resulting 3% solution of F-500 is instantly dispensed throughout the sprinkler array to attack the fire.

Since the F-500 solution rapidly cools and extinguishes the fire, minimizing damage and the subsequent runoff. Unlike foaming fire suppressants, F-500 instantly penetrates and cools instead of blanketing and retaining the latent heat of the fire. Foam blankets can maintain temperatures above combustion while waiting for the mechanism of oxygen deprivation to extinguish the fire and prevent burn-back.

Dominion realized the advantages of the F-500 Fire Suppression mechanics and made it their choice to enhance turbine lube oil and transformer fire suppression and protection at their Chesterfield facility.