



CASE HISTORY

Dominion-Mount Storm Power Station Improves Turbine and Transformer Fire Protection with F-500 Encapsulator Agent

F-500 Fire Suppression Encapsulator Agent allows Dominion to improve fire protection system effectiveness at Mount Storm facility without infrastructure upgrades

Client: Dominion

Location: Mount Storm Power Station – Mount Storm, WV

F-500 Encapsulator Agent CCS Implementation: 2008

Fire Protection Engineers: FE Moran, Northbrook, IL

Project Type: Fire protection upgrades to under floor areas, utilizing F-500 EA for rapid cooling and fire protection at their turbine/generators and transformers



Overview

Dominion recognized that their existing fire protection systems protecting three turbine/generator units were inadequate. An F-500 EA Concentrate Control Supply (CCS) system was specified, because the agent solution rapidly removes the heat from the fire and renders hydrocarbon liquids nonflammable and nonignitable, quickly extinguishing these three-dimensional, Class B fires. The F-500 EA CCS system was added to the existing fire suppression system to enhance the current system's effectiveness. There was no need to upgrade the piping, pumps and water supply to achieve the recommended .40 gpm/ft² application rate.

Challenge

Dominion Power had conducted several in-house fire performance tests with various agents. They simulated

small scale under turbine lube oil fires, by creating a hydraulic oil leak onto steam line insulation. The heat of the steam line ignited the hydraulic oil. They also tested 4 x 4 foot and 12x12 foot pan diesel fuel fires with F-500 EA solution against plain water at various application densities. FM Global also conducted full-scale, under turbine lube oil spray fire simulations in their calorimeter and published Engineering Bulletin 06-04 in 2004.

Engineering Bulletin 06-04 summary:

- 50% of the fires reported in turbine buildings were oil spray fires
- 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 Dominion testing concluded that the F-500 EA cooled the diesel fuel rapidly, from 1200°F to 200°F, in seconds, whereas the water cooled somewhat at first, but kept fluctuating. Also, at an application density of .20 gpm/ft², F-500 EA extinguished the fire three times faster than plain water at twice the application rate of .40 gpm/ft². The F-500 Encapsulator Agent rapidly reduced the heat, extinguished the fire and encapsulated the fuel, rendering it nonflammable and nonignitable. Removing the heat assured reignition did not occur.

Solution

The recommendation was to increase coverage from .25 gpm/ft² to .40 gpm/ft², switch to higher K-factor sprinklers and reduce head spacing to 5 feet, but this would have been a very expensive conversion. Instead, Dominion decided to supplement the existing sprinkler system with F-500 EA, to exceed the performance of the recommended system.

Transformer 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 F-500 Encapsulator Agent CCS System. With a CCS System, they would be going above and beyond the minimums specified by the code.

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.



The F-500 EA Concentrate Control Supply Systems Installed:

2 - 2500 gallon Bladder Tanks

1 - Protecting 10 Transformers and 1 Turbine Generator

1 - Protecting 5 Transformers and 2 Turbine Generators

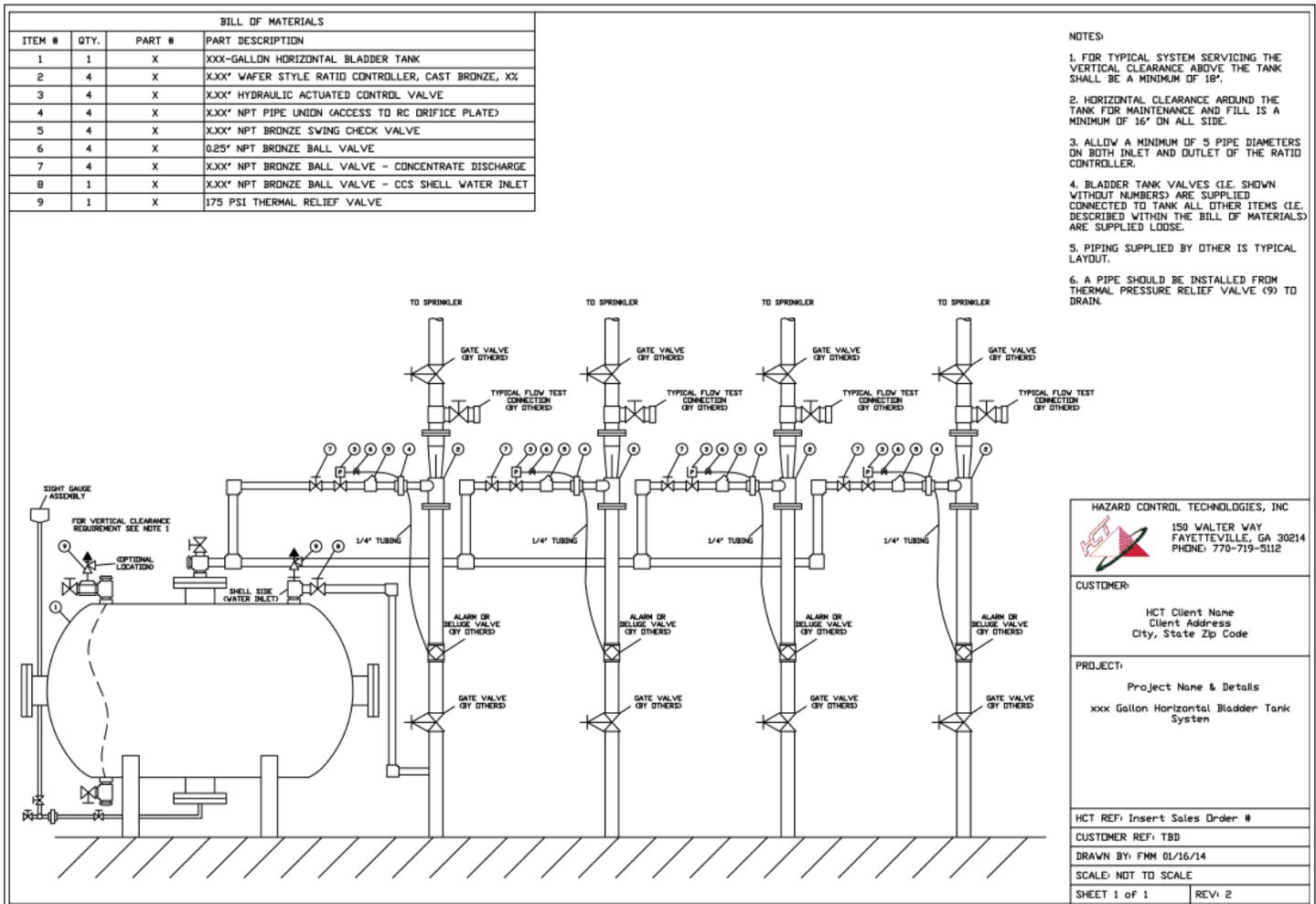
Separate, heated buildings for each tank

18 separate deluge valves and ratio controllers

Swing, ball, pressure relief and hydraulically actuated control valves

F-500 Encapsulator Agent





The F-500 Encapsulator Agent Concentrate Control Supply systems with 3% ratio controllers, were commissioned, tested and approved. The system design is based on the applicable water flow and duration of enhanced and properly proportioned F-500 EA to protect the under turbine lube oil and transformer areas from fire.

The F-500 EA CCS systems 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, activating the sprinkler system. As soon as water pressure is sensed across the deluge valve, the F-500 EA CCS Water Actuated Automatic Control Valve is tripped, injecting the agent into the water stream. The resulting 3% solution of F-500 EA is instantly dispensed throughout the sprinkler array to attack the fire.

Since the F-500 EA solution rapidly cools and extinguishes the fire, damage and runoff are minimized. F-500 EA instantly penetrates, encapsulates and cools to extinguish a fire, making it ideal for three-dimensional fires. Compare F-500 EA to foam, which extinguishes a fire by creating a blanket to separate the fuel from the oxygen. Forming a blanket on a three-dimensional fire further complicates the use of foam. If you can form a blanket, the foam blanket can trap in the heat, above autoignition temperatures. Any break in the blanket will result in reignition of the fuel.

NFPA 11, Annex A.1.1 - "Foam is not suitable for three-dimensional liquid flowing fuel fires or for gas fires."

Dominion realized the advantages of the F-500 Encapsulator Technology for fire suppression and made it their choice to enhance their turbine lube oil and transformer fire suppression systems at their Mount Storm facility.



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