FOAM SYSTEMS

APPLICATION

CASE STUDY

High Expansion Foam for Coal Dust Applications

ANSUL®
Experts In Global Fire Solutions
ISO 9001 Registered

Overview

The potential hazard & attributed to coal dust exist in any utility mine, or operation that has to deal with the day -to-day activity of transferring coal. Not only does coal have the ability to spontaneously combust under certain circumstances & the coal dust particles may build up and cause explosions. This is especially true for the more volatile low-sulfur western coal which many utilities prefer for environmental reasons. Recently, Ansul worked with a utility in the Midwest, to look at fire suppression options that can be used by plant firefighters under these severe conditions. This inquiry eventually lead to a successful demonstration of a JET-X. High Expansion Foam System on an eight-story coal transfer house.

Problem/ Application

From the major explosion that occurred in 1980 at the Powerton Plant in Illinois, to the recent blast that shook the State Line Energy Station In Indiana, coal dust explosions are a continuous threat to power plants that handle and store coal. Over the past decade, many utilities have switched to low-sulfur western coal, which happens to break down into dust particles more easily than Midwest or eastern coals. This increases the risk of potential dust explosions and fires.

Tons of coal are moved from train cars to the furnace through great lengths of overhead and underground coal conveyors. Enclosed areas such as coal transfer houses, rotary car unloading houses, and underground coal conveyors are the most dangerous and of greatest concern.

Even with taking all precautions including constant mal dust cleaning, safety training, dust collection equipment and heat detectors, these fires continue to occur. Conveyor friction can generate sparks that can trigger a fire or explosion, as can any major jostling or disturbance. In one known case, activation of the water- deluge fire suppression system formed a combustible coal dust cloud within the transfer house that ignited and ripped portions of the corrugated metal exterior from the structure. Luckily there were no major injuries from this explosion. However, plant downtime and structural damage can easily run into the millions of dollars from one of these incidents.

Due to their switch to using 100% western coal, this particular utility began looking into alternative forms of protection which lead to their interest in high expansion foam.

High Expansion Foam

The ever increasing number of fires occurring in warehouses, storage buildings, basements, tunnels, etc. suggest that many fire situations are now being encountered where firefighters using a traditional low expansion foam or water are unable to reach the source of the fire. In addition, the risks are no longer just class A or Class B materials; they are hazardous toxic chemicals or explosive dust particles. Ansul high-expansion foam systems offer a fire extinguishing method that seeks out and extinguishes the fire at the source. The foam blanket that is produced by this system transports water to the fire, excludes oxygen at the source of the fire, suppresses and encapsulates the toxic vapors and particulate. High expansion foam systems are designed in accordance with NFPA UA: *Standard for Medium and High Expansion Foam Systems.*

JET-X is the product name for Ansul's high expansion foam products. JET-X foam concentrate is a synthetic-based formulation comprised of hydrocarbon surfactants, solvents, and stabilizers for use with medium and high expansion foam generators. It is transported and stored as a concentrate to provide ease of use and considerable savings in weight and volume. JET-X is an environment-friendly foam which is biodegradable and not subject to EPA reporting.

JET-X foam concentrate used to produce foam with expansion ratios ranging from 50:1 to 1000:1 depending upon the type of generator and its operating pressure. It can be proportioned with fresh, salt, or hard water. When used with JET-X High-Expansion Generators, recommended proportioning is at 2.75% (2.75 gallons JET-X concentrate with 97.25 gallons of water).When used with medium expansion foam nozzles, it is typically proportioned at 2%.

With a fixed system, JET-X concentrate is typically stored in a bladder tank (ASME code) proportioned to a properly sized high expansion foam generator(s). The JET-X foam generator delivers a mass of uniform bubbles in which the foam solution is expanded to as much as 1000:1.The high expansion foam is achieved by coating a perforated screen with a foam solution comprised of water and JET-X high expansion foam concentrate while a high volume of air is blown on the screen to produce the expanded foam. The largest JET-X generator will produce nearly 20,000 cubic feet (566 ml') per minute of foam at 100 psi (6.9 bar) inlet pressure.AD JET-X generators are water-powered and require no other source of power, such as electric motors or gasoline engines.

Scope & Goals of Demonstration

The largest of the power plant's four transfer houses was chosen for the demonstration. The estimated building size is 40' x 50' x 75' (ht) or approximately 150,000 cubic feet (12d5x23 m or 4248 m3).The goal of the testing was to 6ll the building with high expansion foam within a 10-minute period and observe the flow of the high expansion foam and its effect on the coal dust inside the building. Ansul supplied equipment included:

- One 6(}.gallon (2Z7 L) prepiped vertical bladder tank with 2" proportionner. (This system can also be trailer mounted.)
- 60-gallons (227 L) of JET-X foam concentrate
- One JET-X-15A UL-approved high expansion foam generator with the capacity for 17,410 cfm (493 m3/min) of expanded foam flowing at 145 gpm (549 L/ min) at a pressure of 75 psi (5.1bar) at the inlet to generator. The generator is 5.3' x 5.3' x 3.8'and has a weight of 350 lbs. (1.6x1.6x1.2 m- 159kg)

The bladder tank system was placed outside the building on the ground floor while the generator was mounted on the top floor of the building, approximate1y 10' (3 m) from the ceiling. The size of the generator is based on a formula that includes submergence volume (cfm), submergence time (min), compensation for normal shrinkage (1.15 fixed), and compensation for leakage (not used for this application).

Results of the Program

The discharge test went extremely well with JET-X foam filling the building to an elevation of approximately 65'(20 m) within 10 minutes. Just as important, there was no major disturbance of the coal dust. One of the utility fire specialists correctly noted that "the foam had a lava effect. A portion of the foam escaped through coal conveyors on either side of the building. This was not accounted for ln the original calculations. Based on this test (for a permanent system), a leakage factor of 1.3-1.4 would be used and approximately 85-90 gallons (322--341L) of JET-X foam concentrate would be required to fill this size of a building. Each transfer house is a different size; thus, a calculation would have to be made for each building (although Ansul would recommend a leakage factor of at least 1.3 for each application).

Ansul also demonstrated a 30 gallon (114 L) mobile cart filled with JET-X concentrate with three discharge devices including a standard foam nozzle, a medium expansion JET-X nozzle, and a JET-X-2 high expansion generator. This testing demonstrated to utility representatives the versatility of foam- from the wetter low-expansion foam to be used outside on a smoldering coal pile to a dryer medium or high expansion foam that can be used for underground coal conveyors. The test also proved that the foam concentrate (JET-X or SILV-EX Class A) could be quickly transported throughout the facility with the use of the mobile foam cart.

The utility representatives were impressed with the demonstration and noted the definite advantages of the system:

- Minimal turbulence upon discharge and an impressive smothering effect, eliminating additional explosions while putting out the fire.
- Easy to use and understand.

Non-firefighting personnel even on night shifts, can activate the system for emergency situations.

- Limited water is required with minimal water damage.
- Safe, reliable, easy installation; no electrical requirements; system equipment is UL listed.
- Mobile equipment and different types of foam application nozzles/ generators offer great versatility under emergency situations.

The utility is presently reviewing foam equipment options for permanent system installations.

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