APPLICATION PROFILE

FLAMMABLE LIQUIDS STORAGE FACILITIES

FM-200 System Protecting a Flammable Liquid Storage Facility

INDUSTRIES SERVED

- Automobile Manufacturing
- Industrial Plants
- Process Plants
- Refineries/Chemical Plants
- Marine/Off-shore

INTRODUCTION

Flammable liquid storage facilities are in many industrial and chemical plants as well as production facilities that use flammable liquids in various processes. These facilities store the flammable liquids used in processes such as painting, lubrication, fuel, and oil in areas called "Flammable Liquid Storage Areas". These areas are segregated due to the special and careful handling required when using the flammable liquid.

THE PROBLEM: RAPID FIRE GROWTH

Because of their critical nature, the potential fire problem in a flammable liquid storage facility gets special attention. Sprinkler systems provide good back-up protection, but if a fire should occur, it must be quickly suppressed before there is a major interruption in production or severe damage to the facility. The quantity of flammable liquid alone can contribute to fires that can destroy an entire facility. Flammable liquid fires grow very rapidly because they burn the vapors of the fuel on fire creating a tremendous amount of heat. This promotes involvement of other flammable liquids stored in the hazard, which can happen instantaneously.

THE SOLUTION: DUPONT™ FM-200®

If the desire for the facility is to minimize clean-up, ensure a safe fire suppressant agent for employees, and suppress the fire quickly, then a Fike FM-200 system provides all the necessary components of the fire suppression system. Because FM-200 discharges as a gas, it extinguishes a fire without spreading the liquid. It also does not require provision for drainage and containment of liquids. If the flammable liquid storage room is occupied, you do not have to worry that a system discharge could result in a fatality. At normal design concentrations, FM-200 is safe to use in occupied spaces. In a flammable liquid fire it is important to detect and suppress the fire quickly which makes FM-200, along with the 10 second discharge time, a good choice for protection of flammable liquids.

In a fire suppression system, FM-200 is stored as a liquid in FM-200 storage containers. When called upon by an approved control panel, the FM-200 will flow through the length of piping required and will immediately change from a liquid to a vapor as it is released through the discharge nozzle.

To provide proper fire protection for a flammable liquid storage facility, it is imperative that a well-designed, fast response, and trouble free automatic fire detection system be installed. In many cases vapor or flame detection will be used. Advise should be sought when designing the detection system due to the amount of detectors available and the conditions in which they operate.

The example on the next page walks through a flammable liquid storage facility designed with a Fike FM-200 system.

EXAMPLE SYSTEM

This example walks through the design for a fire detection and suppression system in a Flammable liquid storage facility.This room contains barrels of diesel fuel, gasoline, and has storage cabinets with various fuels and amounts of flammable liquid. The room being protected is 20' X 20' in dimension with a 10 foot ceiling. The first step is to determine the quantity of FM-200 required to protect the hazard. The quantity of FM-200 required is dependent on the fuels being protected. In order to determine the FM-200 concentration required, an evaluation of the flammable liquids present must be performed. Once all of the fuels have been identified, the required FM-200 concentration is determined by choosing the fuel with the highest design concentration required. The design concentration for each fuel is determined by performing a cup burner test as described in NFPA 2001, Appendix B. A 30% safety factor is then added to the cup burner concentration, which is the design concentration for that fuel. Contact Fike for design concentrations of particular flammable liquids. For this example, gasoline requires the highest concentration of FM-200 at 7.5% design concentration at the minimum expected room temperature of 50°F.

Using the formula: $W = V/S\ (C/(100-C))$

Where: W = weight of FM-200
V = volume of the hazard protected (4000 ft3 for this example)
S = Specific vapor volume of HFC-227ea = 1.885 + .0045(T) where T = temp in °F
S = 2.11 ft3/lb. when T = 50°F
C = FM-200 concentration (7.5%)

Solving for W, this hazard requires 154 pounds of FM-200.

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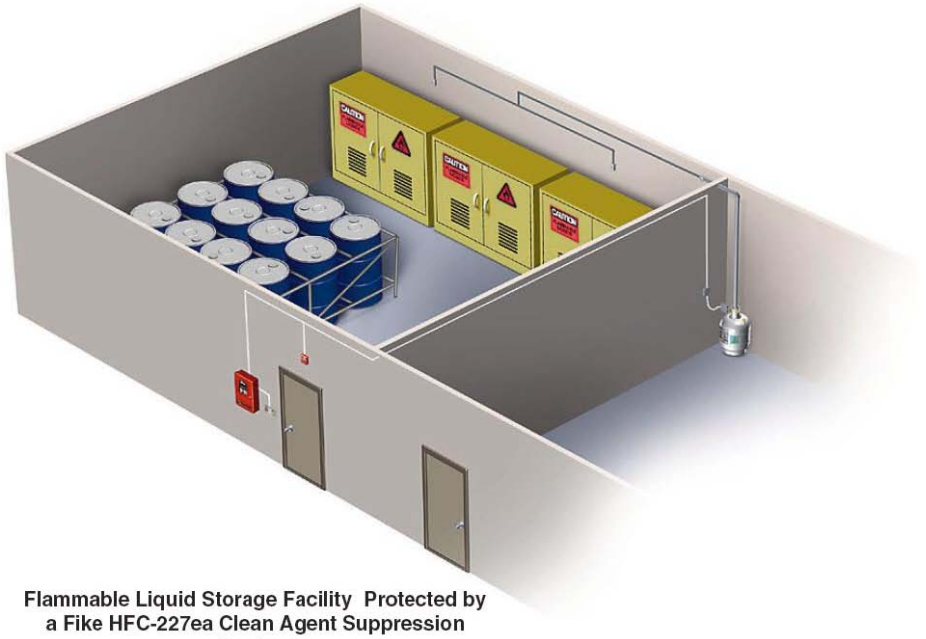
This hazard will be protected using a pre-engineered FM-200 system approach with two 180° nozzles. I have used the pre-engineered approach because I am protecting a single hazard with a single cylinder and I wanted to save engineering time doing the system design. There are benefits of designing the system engineered over pre-engineered and they are described in the FM-200 Design Guide.

The next step in designing the system is to layout the system nozzles in the protected space. As mentioned before the room requires 154 pounds of FM-200 to protect the hazard. I have decided to use two 180 degree nozzles mounted on the same wall to protect this space. I have used 180 degree nozzles to minimize the amount of piping required and to keep the piping away from air-handling units and other equipment in the center of the room. A diagram of the container and piping isometric is shown for your reference.

The next step is to lay out the detection and control system for this facility. As mentioned before, Flame detectors will be used for detection in this facility. The reason for choosing Flame detectors is that they are good at picking up small, flaming fires that develop rapidly. I am not going to discuss detector spacing of the Flame detectors due to the wide range of products available and protection objectives of the system. Fike always recommends that UL Listed and/or FM Approved detectors be used. Consult the detector manufacturer and Fike for detector spacing limitations.

The Fike SHP PRO conventional control system will be used to provide reliable detection. A layout of the control panel with accessories is shown on the hazard layout. An equipment list for this hazard is shown for your reference on the next page.



Flammable Liquid Storage Facility Protected by a Fike HFC-227ea Clean Agent Suppression System

EQUIPMENT LIST

Below is an equipment list for the FM-200 system installed in the flammable liquid stroage room on the diagram above.

Fike P/N	Description	Quantity
FM-200 Suppression Equipment		
70-087-154-1431-04	215 pound FM-200 Container Assembly w/ 154 pounds FM-200 LLI, and Pressure Switch	1
80-1115	1-1/2”-180 Degree Pre-Engineered Nozzle	2
SHP PRO Equipment		
10-051-R-1	SHP Control System	1
10-1643	Manual Release/System Abort Switch	1
20-098	Horn/Strobe	2
	Listed and/or Approved U.V. Flame Detectors	

Form No. CAAP 009, August 2010. Specifications are subject to change without notice.