Special Hazard Fire Suppression Systems

Fire Protection Solutions

Rim Seal
Automatic Fire Suppression Systems

Foreword

Rim Seal floating roof (FR) tank fires represent one of the most dangerous threats for chemical and petrochemical storage farms. Over the years, the world has experienced several rim seal fires and some of them have developed into large disasters. Generally, fire investigations have led to the conclusion that the fires were mainly caused by lightning, even though other causes could have occurred such as: sparks due to electrostatic charge, hot work accidents or uncontrolled exothermic chemical reactions. The latter is observed when the combustible liquid stored is crude oil, characterised by a high concentration of Hydrogen Sulphide. If it leaks from the seal, traces will be left in the internal tank shell. In such a situation, the Hydrogen Sulphide in contact with rust and air may react developing pyrophoric iron. The reaction is highly exothermic and may release enough heat with a high risk to cause ignition.

Background

The need for fast fire detection & suppression has become paramount and has pushed the fire industry towards the development of fire suppression systems that will act on the fire outbreak in its early stages of development. In fact, whatever causes are involved, when a fire develops in a floating roof tank and the phenomenon takes place in the rim seal zone, a fast and effective fire system is needed to avoid disastrous developments. In this respect, NFPA 11 recommends the use of foam systems which act directly on the foam dam. These systems have been shown to be effective but, their lead time to be operative, may be of concern. In this regard, an additional fire system capable of acting faster and more effectively is needed. The automatic rim seal fire suppression system is the solution to cope with a fire outbreak in its initial stage and, by means of its instrumentation, signals to activate the traditional fire systems.

From the fire engineering point of view, there are two recognised fire suppression techniques used to detect and fight a rim seal fire. The first is by means of foam based fire suppression units, whereas the second relies on halocarbon

based firefighting units. Even though the two techniques act towards the same objective, the phenomenon used to gain fire control or extinguishment is different and requires an expert fire engineer to perform the project analysis of the seal and the product contents in order to select what is the best approach for the specific fire risk. Once the basic technique is selected, the next step is the definition of the unit architecture function of the site's environmental condition, fire detection response time, interface with other systems, discharge logics and consideration among the units of the same FR tank. SA Fire Protection is a leader in providing rim seal fire detection and suppression solutions for floating roof tanks, capable of delivering a wide range of rim seal system configurations, to satisfy every fire hazard, environmental condition and system control architecture.

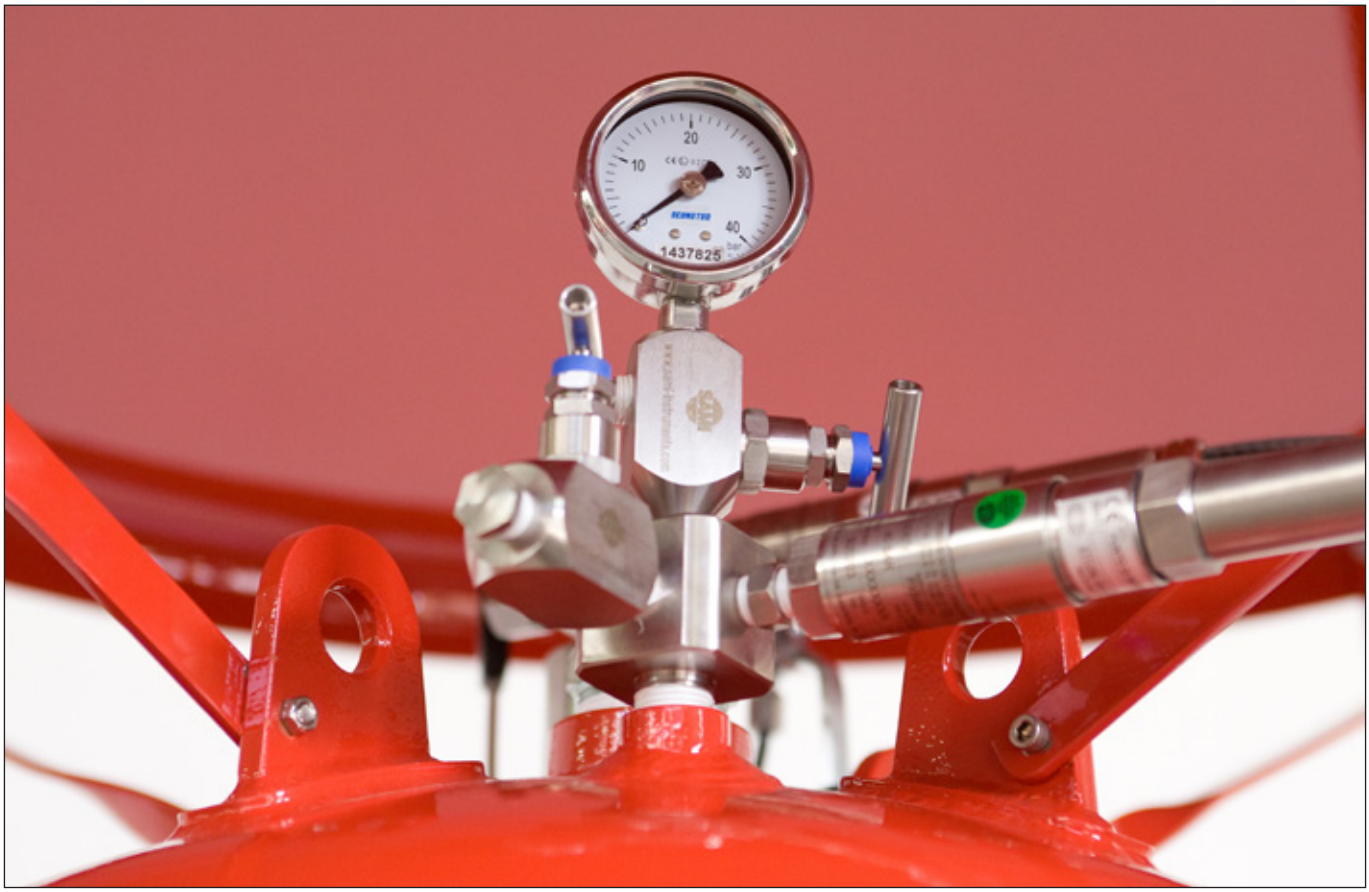
Principle of Operation

The Automatic Rim Seal Fire Suppression System is a package with an integrated linear fire detection system. The unit is designed for fast detection and suppression, releasing the extinguishing agent directly on the rim seal zone by means of directional nozzles.

The unit is installed on top of the floating roof and a pneumatic detection line runs along the whole protected arc which is used as a fire detector and system actuator. In case of fire outbreak in the rim seal zone, the detector melts and the unit is actuated instantaneously releasing the extinguishing agent. The system is designed to discharge in a very short time variable from 30 to 40 seconds, to extinguish the fire and avoid a fire spread.

The coverage of every unit shall be evaluated depending on each tank, its foam dam geometry and the classification of its contents. However, in most cases the unit is valid for roughly 40 meters of seal circumference protection.

Depending on the client specification, controls on board the foam unit can be achieved with two or more Ex pressure



switches, monitoring system pressurisation, activation and discharge. Level Controls can be used for halocarbons to monitor gas leakage. The contacts are then hardwired in a local JB and use a cable turnbuckle to exit the tank zone. Outside the tank there is an Ex ia JB with I.S. barriers used to interface with dedicated F&G or with other existing control systems. Every tank may be configured in a common zone or in a sectional zone depending on client activation preferences. Connections with F&G panels or other control systems may be achieved hardwired as well, via an ATEX compliant wireless communication system, including a master wireless panel with repeating antennas.