Rim Seal Automatic Fire Suppression System
Foreword
Rim Seal floating roof tank fires represent one of the most dangerous threats for chemical and petrochemical storage farms. During the years the world has experienced several rim seal fires and some of them have developed into large disasters. Generally fire investigation has led to the conclusion that fires were caused mainly due to lightening even though other causes such as sparks due to electrostatic charge, hot work accidents or uncontrolled exothermic chemicals reaction occurred.

The latter was observed when combustible liquid stored is crude oil characterized by an high concentration of Hydrogen Sulphide. If it leaks from the seal traces in the internal tank shell will be left. 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 high risk to cause ignition.
**Background**

The need for a fast fire detection & suppression has became paramount and has pushed the fire industry towards the development of fire suppression systems that will take action on the breaking out of fire in its early developing stage. 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 operational may be of concern.

In this regard, an additional fire system capable of acting faster and 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 the fire event to activate the traditional fire systems.

**Principle of operation**

The SA/Fps Automatic Rim Seal Fire Suppression System is a foam package with an integrated pneumatic\(^1\) linear fire detection tube. The unit is designed for fast suppression and release of the foam solution directly on the rim seal zone by means of low expansion directional nozzles.

1 As optional the Rim Seal System can be equipped with a traditional Linear Heat Detector. In this case, the system is activated by a solenoid valve 24 Vdc installed under IS barriers for installation within Atex Zone 0.
The unit is installed on top of the floating roof and it is kept pressurized with nitrogen. A pneumatic detection line runs along the whole protected arc and is used as a fire detector and system actuator. When a fire starts in the rim seal zone, the pipe melts and a pressure drop is sensed by the actuator which instantly releases the extinguishing agent. The foam solution is then directed into the distribution circuit where the low expansion nozzles discharge into the fire zone. The system is calculated to discharge in a very short time variable from 30 to 40 seconds in order to extinguish the fire and avoid fire spread.

The coverage of every unit shall be evaluated depending on each tank, its foam dam geometry and the NFPA 30 classification of its contents. However, in most cases the unit is valid for roughly 40 meters of seal circumference protection.

On board every of unit, there are two Ex pressure switches used to control system pressurization and activation respectively. 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 Exia 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 the exiting cable turnbuckle installed.

Connections with F&G panels or other Control Systems may be achieved also via a ATEX compliant wireless communication system by including a master wireless panel with repeating antennas.
System technical Features

Standard units are manufactured taking into account installation within harsh industrial environment. Therefore their components are selected using materials highly resistant to aggressive atmospheres.

The instrumentation includes a pneumatic actuator, a pneumatic actuated discharge valve, a safety relief valve, a pressure gauge, two low pressure switches. All electrical instruments are wired into the Jb installed on one side of the unit.

The unit is equipped with a sun shield which protects it from direct sun radiation.

<table>
<thead>
<tr>
<th>Components</th>
<th>Standard Material</th>
<th>Optional Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumatic Valve</td>
<td>Stainless Steel</td>
<td>Bronze</td>
</tr>
<tr>
<td>Ball Valve</td>
<td>Stainless Steel</td>
<td>-</td>
</tr>
<tr>
<td>Safety Valve</td>
<td>Brass</td>
<td>-</td>
</tr>
<tr>
<td>Ball Valve</td>
<td>Stainless Steel</td>
<td>-</td>
</tr>
<tr>
<td>Pressure Gauge</td>
<td>Stainless Steel</td>
<td>-</td>
</tr>
<tr>
<td>Low Press. Switches</td>
<td>Stainless Steel</td>
<td>-</td>
</tr>
<tr>
<td>Actuator</td>
<td>Stainless Steel</td>
<td>-</td>
</tr>
<tr>
<td>Nozzles</td>
<td>Brass</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Shield</td>
<td>Stainless Steel</td>
<td>-</td>
</tr>
<tr>
<td>Tank</td>
<td>Carbon Steel Hdg</td>
<td>Stainless Steel</td>
</tr>
</tbody>
</table>

Operational Settings:

- Design Pressure: 28 bar
- Working Pressure: 25 bar
- Fluid Operational temp.: +0° / +50° C*
- Metallic Parts Design: -10° / +90° C
- Extinguishing quantity: 150 lt Foam Solution
- Discharge Time: 30 to 40 sec.

* Lower Temperatures available upon request
System technical Features

Components:

- Actuator, a pneumatic actuated discharge
- Tank:
  - Low Press.
  - Pressure Gauge
  - Safety Valve
  - Ball Valve

Contact:

S.A. Srl
Fire Fighting Systems & Equipment Manufacturer

Via Teocrito 6
98040 Saponara M.ma (Messina) - Italy
www.sasrl.it

Contacts (Italy)
Telephone: 0039 090 332242
e-mail: info@sasrl.it

Contacts (International)
Telephone: 0039 050 703006
e-mail: export@sasrl.it