SCIC
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PreDigest

Lightning Protection for Floating Roof Tanks

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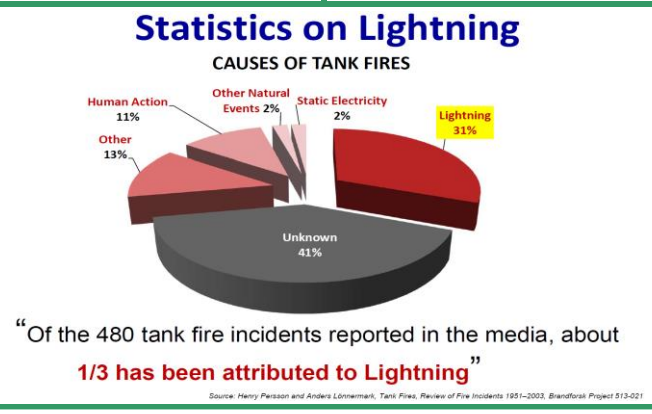
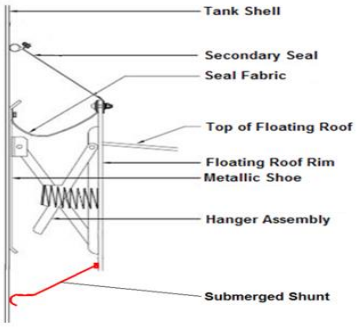
Singapore is one of the most lightning prone countries in the world with an average of 168 thunderstorm days per year. Therefore, it is important to address the detrimental effects of lightning, especially in the oil and gas industry. In one of the major studies conducted on tank fires by the Swedish National Testing and Research Institute in 2004, it was discovered that almost 1/3 of the 480 tank fire incidents reported in the media was caused by lightning. Another study sponsored by 16 oil industry companies also found that 52 out of 55 rim seal fires (95%) were caused by lightning.



In order to address the issue of tank fire, reference is made to the fire triangle, which basically states that for a fire to start, the three elements of **ignition source, oxygen and fuel**, must be present. Remove any one of these elements and fire can be prevented. The most inexpensive and practical method is to focus on the prevention of ignition sources.

Shunts. One traditional way to prevent arcing or sparking in tanks is to maintain equipotential through bonding between the floating roof and the tank shell so as to prevent electrical discharge between them. In a detailed study done by the API (American Petroleum Institute) and Sinopec, it is verified that ALL tanks, even newly built, experienced arcing. The study found that there can be arcing as long as small gaps exist; meaning not just between the floating roof and tank shell but also between the roof and the guide poles. With aging/wear and tear, the problem is compounded exponentially. Therefore, exposed shunts are not a reliable way to mitigate the risks of arcing.



Retractable Bypass Conductor. The introduction of a retractable bypass conductor has allowed for a relatively easy and inexpensive way to bond floating roofs and tank shell on both old and new tanks while ensuring the shortest possible grounding route with very low resistance. API545 recommends that EACH (not the sum) of the bypass conductor have a maximum end to end resistance of 0.03 ohms. In order to achieve this, the braided tape is typically made of copper. However, copper is prone to corrosion, especially in a hazardous environment where certain chemicals such as Hydrogen Sulphide is present. In countering the issue of tape corrosion, aluminium alloy tape version of the bypass conductor is available that not only meets API's low resistance requirement, but also provide higher corrosion resistance than Copper.

Aluminium alloy tape offers permanently low impedance reliable galvanic connection between the shell and floating roof. Aluminium tape version of the retractable bypass conductor offers the best of both worlds in terms of low resistance and reliability in corrosive environment over copper tape. The implementation of reliable grounding together with other components of lightning protection helps prevent fires in the flammable storage facilities due to lightning.

This article was contributed by Critical Facility Pte. Ltd. (formerly Hitachi Critical Facilities Protection Pte. Ltd.)

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An initiative of the Process & Engineering Committee

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