

LIGHTNING ELIMINATORS

WWW.LIGHTNINGPROTECTION.COM

IPE™

In-Tank Potential Equalizer Storage Tank Arc Discharge Mitigation

Charge Mitigation for Non-Metal & Lined Tanks Containing Flammable or Combustible Liquids

The problem of internal electrical discharges and the subsequent ignition of the vapors inside tanks containing flammable or combustible liquids is becoming more widespread as the use of non-metal and lined tanks proliferates. These types of tanks are often used to store and separate the produced water and other products from hydraulic fracturing and other processes. Because these products can be highly corrosive, the tanks are often made of either corrosion-resistant materials, such as fiberglass or PVC, or internally-lined steel, where the lining is a non-conductive material such as epoxy.

During normal operation, the tanks accumulate flammable or combustible vapors inside the tank above the fluid level. These vapors may then be ignited by an electrical discharge inside of the tank. The discharge can be caused by an accumulation of static electricity inside the tank or by a direct or nearby lightning strike. A lightning strike will cause several indirect effects to rapidly occur including: ground current transients, changes in the electric field surrounding the tank, and changes in the ground



potential. Any of these effects could then trigger an electrical discharge inside the tank.

The IPE Solution:

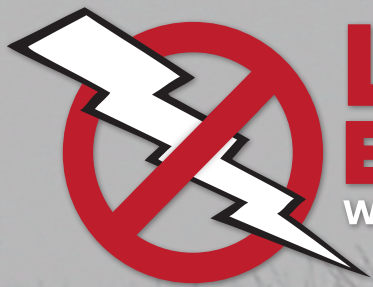
The IPE is made specifically for non-metal and lined tanks. When the IPE is inserted into a tank and externally grounded, it will discharge any static electricity within the tank's contents and also keep the potential of the tank's contents equal to ground potential. In addition, connecting the IPE to an external ground will create a partial Faraday cage, thus further limiting the electric field strength within the tank. The effects of the IPE will minimize the possibility of electrical discharge and vapor ignition within the tank.

Efficient Tubular Design: Maximizes surface exposure minimizing weight

Corrosion Resistant: All 316 stainless steel construction

Cost Efficient: Costs a fraction of competitive products

No Points: Smooth surface minimizes risk of corona and arc discharge from points.



LIGHTNING ELIMINATORS

WWW.LIGHTNINGPROTECTION.COM

Smooth Surface vs. Points

At Lightning Eliminators, we advise not using points inside of storage tanks. Any additional sharp metallic object (wires, wire brushes, etc.) when placed inside the tank, especially in the vapor space above the stored fluid, can serve to enhance field strengths during lightning events and initiate corona/arcing.

NASA research* done in association with the Lightning and Transients Research Institute shows that corona currents as low as 200 microamperes were sufficient for ignition of flammable vapors. Placing points inside a tank should be avoided because sharp objects can generate corona currents well above this value. Because it takes so little current to cause ignition, extensive grounding and bonding measures should be implemented to minimize risk. These measures include use of an IPE inside the tank and a low impedance grounding system. *NASA Technical Note D-440.

IPE Testing:

Unlike other products the IPE has undergone laboratory electrical and lightning simulation testing as well as competitive analysis. These were conducted both internally and by a third party in order to ensure that the product performs better, safer, and more effectively thus achieving the most appropriate solution for protecting non-metallic and lined storage tanks. The results can be found in the paper "*Chemical Storage Tank Arc Discharge Mitigation*"... by Albin J. Gasiewski Ph.D and Lee Howard, BSEE, published in November 2013.

