

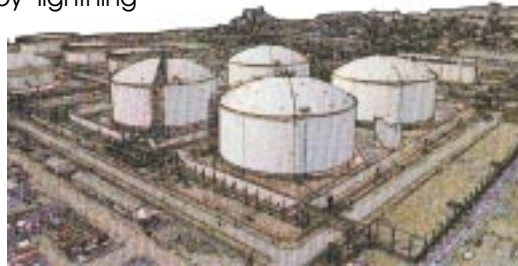


DAS[®] FLAMMABLES STORAGE PROTECTION

The Technology Advantage

The Problem

The petroleum industry's history provides ample evidence of the destructive nature of lightning activity and the resulting fires. Millions of dollars of petrochemical products and facilities are destroyed each year by lightning related phenomena in many parts of the world. Each year lives are lost as the direct result of being in personal proximity to these facilities when they are ignited or explode due to lightning. It is true that the risk of losing one tank of product is small, but it is also true that the loss of one tank and its contents in a given country will usually pay for the protection of all the petroleum storage facilities in that country.



Examples of the foregoing may be found from the Nigerian fire of 1990 where a 670,000 barrel tank was set on fire by lightning. Both the tank and its contents of light crude were destroyed. The conventional early streamer emitter (ESE) lightning protection system installed on this tank did not prevent the fire. Other examples are the recent Indonesian fires where 6 tanks were ignited by lightning activity with 2 more tank fires at another site. These are only a few examples of situations that happen each year in various parts of the world.

The American Petroleum Institute Bulletin API 2003 offers only two pages on lightning protection. The National Fire Protection publication on lightning protection, NFPA-78/780, describes the problem and some industry standard policies, but provides no positive protection solutions that are not already in use in many locations where fires have been initiated by lightning. Both the API and NFPA are revising the standards to exclude rods and include charge transfer technology (DAS) systems for protection of flammables

The Cause of Lightning Related Fires

There are two major causes of any lightning related flammables fires:

1. A direct strike to the facility, where the flammables are present. The flammables may in some way be exposed to either the heating effect of the stroke, or the stroke channel.

2. Secondary Effects. These include four separate phenomena described below. The "Bound Charge" and subsequent Secondary Arc is the most common.

Statistics indicate that the secondary effects cause most of the petroleum related fires; far more than are actually reported. The secondary effects are not always easily identified. Most of the current literature deals with the more common phenomenon such as the direct strike. These secondary effects include the Bound Charge, the Electromagnetic Pulse, the Electrostatic Pulse and the Earth Currents. Each of these phenomena can create transient voltages that initiate fires.

Charge Dissipation: Positive Protection Against Fire

An obvious solution simply stated is: "No strikes, no fires". What is equally true, but less obvious: "No bound charges, no fires or explosions". Therefore, any system that can be shown to prevent the direct strike and eliminate the potential for any bound charge will provide positive protection for flammables of any form. The LEC Dissipation Array[®] System (DAS[®]) has acquired over 25 years of history and has been proven to be such a system.

The DAS constantly drains the charge from a protected area, leaving that area and the protected site (storage tanks, etc.) virtually without significant charge even in the midst of a worst-case storm.



DAS Tank Discharge

LEC offers DAS systems engineered for flammables storage facilities worldwide installed on offshore platforms, process facilities, storage sites, pipelines and terminal facilities. LEC's patented systems *prevent* strikes to the protected site providing security and peace of mind.

Lightning Rods & Early Streamer Emitters (ESE)

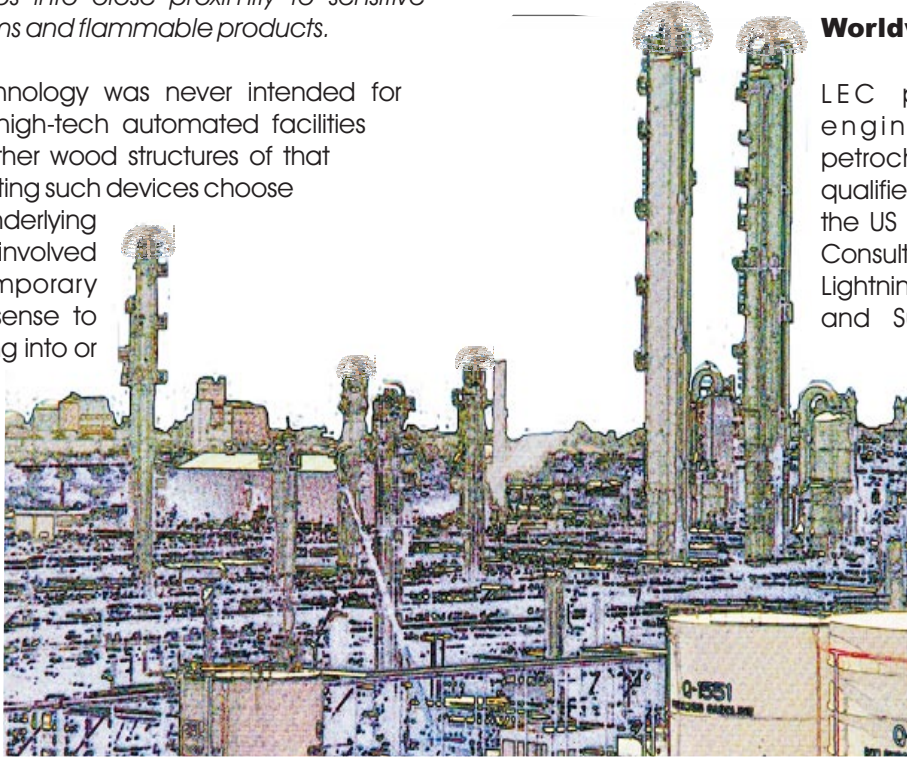
Lightning rods and so called ESE's that attempt to collect strikes are actually doing just that, *bringing millions of volts and thousands of amps into close proximity to sensitive electronics based systems and flammable products.*

This 200 year old technology was never intended for protection of modern high-tech automated facilities but rather barns and other wood structures of that day. Companies promoting such devices choose not to address the underlying problems or the physics involved in protecting contemporary systems. It makes no sense to invite dangerous lightning into or near sensitive facilities. No matter what claims are made about such devices, in the petrochemical business using them increases the risk of lightning related fires.

Different by Design

LEC technology was developed by the chief engineer on the NASA team that put the first person on the moon as well as designing the first Space Shuttle. The DAS system was developed using the NASA reliability engineering model. Since it's inception, the DAS has proved to be a highly reliable system equaling 99.7% reliability.

With several thousand installations worldwide, LEC has accumulated over 15,000 system years of reliability data on all types of installations.



Each LEC engineered system is a unique design providing elimination of strikes to the area of concern. No strikes - no costly problems.

Worldwide Services

LEC provides worldwide engineering services for petrochemical clients through qualified field representatives in the US and most other countries. Consulting services in the areas of Lightning Prevention, Grounding and Surge Protection for the industry are supported.

The Technology Choice of Professionals

LEC clients include the following: Chevron, Exxon, Shell, Texaco, Amoco, Mobil, NNPC, Corpoven, Lagoven, Pemex, Phillips, Sunoco and many others.

Call LEC today for advanced technology, engineered solutions to lightning related petrochemical site problems, with results you can depend on.

A VHS or PAL format video "Lightning Protection For Flammables Storage" is available by calling LEC. Technical papers are also available on request.



DAS Floating Roof Tank Array



Lightning Eliminators & Consultants, Inc.

"Engineered Solutions to Lightning, Grounding and Surge Problems Worldwide Since 1971"

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