

# LIGHTNING ELIMINATORS

WWW.LIGHTNINGPROTECTION.COM

## About Lightning

### Principles of Cloud-to-Ground Lightning

Lightning is caused by the build-up of static electricity within a thundercloud. Negative charge accumulates on the bottom of the cloud and induces an equal positive charge on the surface of the earth. When the potential between the cloud and ground reaches about a billion volts, a downward leader begins to move from the cloud towards the earth. When the downward leader gets to about 200 meters from the earth, upward streamers are launched from the earth towards the downward leader. When the downward leader connects with an upward streamer, then the visible lightning strike is formed and massive current flows between the cloud and earth. For more information please visit: [www.lightningprotection.com/preventing-direct-strikes](http://www.lightningprotection.com/preventing-direct-strikes)

### What is Your Lightning Risk?

The chance that your facility will be hit varies on a number of factors such as location, structure height, temperature, and humidity. If all the factors are just right, even areas with infrequent thunderstorms can experience rare, but high intensity, lightning strikes.

Lightning can have devastating effects on any operation, whether taking a direct strike or being subjected to the secondary effects from nearby strikes. A single lightning strike to a mission-critical facility poses unacceptable risks which can cripple operations. These risks include fire, loss of product, damage to infrastructure, communications downtime, and loss of life.

### How Much will the Next Strike Cost?

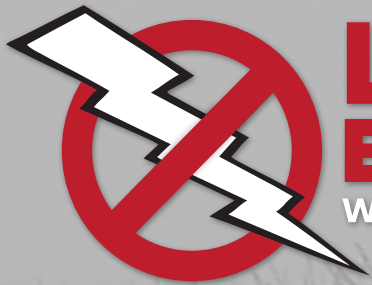
In petrochemical facilities, lightning ignites fires that consume millions of dollars of product. The resulting downtime, environmental cleanup, repair, and community impact can be just as costly. For power generation and utilities, the effects can be equally troubling. Lightning may strike at any point on the grid, destroying expensive equipment and leaving customers in the dark.



Lightning also poses unacceptable risks for electronics and communication systems. Because a lightning strike causes an electromagnetic pulse (EMP), the result can be major equipment damage, critical data loss, and lost business opportunities. This risk is shared by data centers, emergency services, corrections facilities, government and military facilities, process manufacturing, and transport hubs but is often overlooked until too late. Unlike antiquated lightning rod concepts, DAS prevents direct strikes, minimizing the risks to your operation. The benefits can be substantial: reduced maintenance costs, improved reliability, increased personnel safety, and a healthier bottom line.

### The DAS Solution

DAS is the number one lightning protection solution implemented by facilities today, because it prevents direct lightning strikes and their related secondary effects. DAS's are being used by numerous Fortune 100 companies to protect their mission critical operations. DAS technology was introduced in 1971. Since that time, over 3,000 systems have been installed in over 80 countries, accruing over 50,000 system-years of operating history. Throughout this time, the DAS has achieved a success rate of over 99%. Why collect a lightning strike when you do not have to?



## Lightning & Tank Storage FAQ

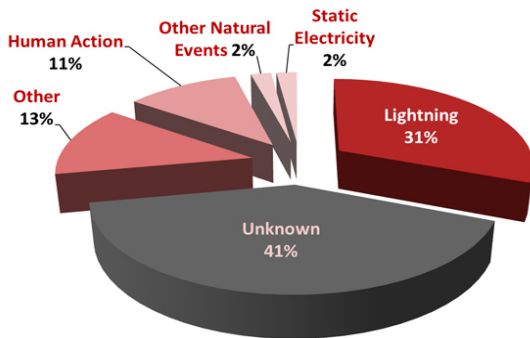
### How Often Does Lightning Ignite Tank Fires?

"Of all the 480 identified fires, lightning was declared to be the cause for ignition in about 150 of the fires. It should be noted that for about 190 of the fires, there is no information available about the ignition source."

In addition, the study found that 80% of all tank fires occur when the tank is more than half full.  
— *BRANDFORSK Project 513-021*

"Looking specifically at storage and processing activities, lightning accounts for 61% of the accidents initiated by natural events... in North America, 16 out of 20 accidents involving petroleum products storage tanks were due to lightning strikes."  
— *Journal of Hazardous Materials 40 (1995) 43-54*

Lightning is the leading known cause of fires in steel tanks.

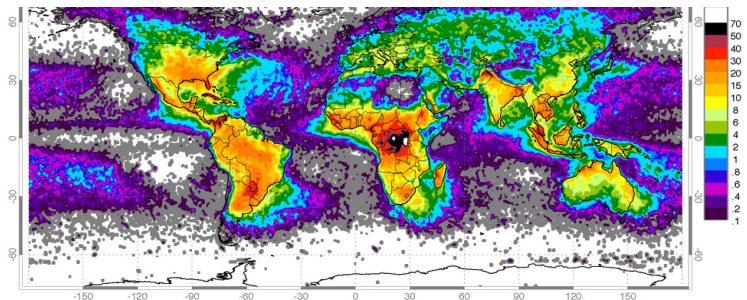


### Recent Tank Fire Examples:

- **2013-Venezuela-Puerto La Cruz Refinery:** a lightning strike halted production at the refinery that produces approximately 187,000 barrels per day
- **2013-Louisiana/U.S.A-Denbury Resources, Inc.:** Lightning strikes destroying 2 tanks and over 85,000 gallons of crude oil | Estimated loss - \$360,000.00
- **2013-Texas/U.S.A.-Ft. Worth Natural Gas, Inc:** over 233,000 gallons of crude and combined oil lost and 2 tanks destroyed | Estimated loss - \$750,000.00
- **2012-Thailand/Map Ta Phut Industrial Park-Bangkok Synthetics Co (BSC):** Lightning Strike at

a toluene vessel - 12 dead, 129 injured, environmental damages, fines and plant closure, manufacturers of 140,000 tonnes/year of butadiene (BD), 55,000 tonnes/year of MTBE, 55,000 tonnes/year of butane LPG, 40,000 tonnes/year of C4 raffinate (isobutylene) and 35,000 tonnes/year of butene-1: Reported Losses exceed \$1 Billion

- **2012-Malaysia-PETRONAS/MISC:** Oil Tanker Struck by lightning killing 1 crew member leaving 4 others missing. Reported losses > \$40 Million
- **2011-Texas/U.S.A.-Green Tide Salt Water Disposal Facility:** Equipment Losses - \$530,000.00
- **2010-North Carolina/U.S.A.-Greensboro Refinery:** Lightning struck a tank holding 40,000 gallons of Gasoline. Tanks were protected by lightning rods. Cost estimated at over \$250,000.00
- **2008-Kansas/U.S.A-Magellan Oil Refinery:** Over \$ 10 Million as of 3 months after the incident and still counting
- **2007-South Africa-The Engen Refinery:** Lightning starts a fire on a tank holding 7.5 million liters of petroleum. It lasted 57 ½ hours damaging about \$16 million USD worth of petrol and equipment



### Lightning on the Rise:

According to a 2013 study conducted by Stanford and Purdue Universities from a peer-reviewed report published by Proceedings of the National Academy of Sciences—"By the century's final 30 years, the study forecasts, the eastern United States could experience severe thunderstorms an average of nearly 7.5 spring days, an increase of almost 42 percent. A 15 percent increase is forecast during June, July and August." — *The New York Times, Michael Wines, September 23, 2013*