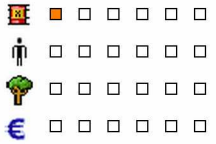
Natural triggering event: Lightning



Ignition of a process water tank at a refining unit subsequent to a lightning strike

17 September 2011

Feyzin (69)

France

THE ACCIDENT AND ITS CONSEQUENCES

During a storm warning phase, lightning struck the refinery in 2 spots: at a flare and on a tank. The tank in question (2,000 m^3, stationary roof) was recovering process water, which contained varying hydrocarbon load amounts, from the atmospheric distillation unit. Following the strike, the tank caught fire and ripped open along the weakest weld, with the tank roof becoming dislodged and dangling from the shell. The internal emergency plan was activated and adjacent units placed in safe operating mode.

The tank had not been equipped with a retention basin. Traces of foam reached the Rhône River Canal via the stormwater drainage network. The tank was isolated (installation of an effluent bypass leading to other facilities), placed in a safe mode and then drained and dismantled.

ORIGIN / CAUSES

Accident investigations confirmed that:

- the tank had indeed been struck by lightning;
- the tank had been properly grounded and inspected;
- the tank roof thickness was sufficient to directly withstand a lightning strike, in compliance with standard practices;
- the tank vents had been equipped with flame guard devices but not flame arrestors.

According to the hypotheses forwarded by an expert commissioned by the refinery operator, this event was caused by:

- the presence of a hydrocarbon supernatant (produced due to the malfunction of a stripper), resulting in the creation of a vapour space;
- ignition at one or more vents, with spreading of combustion inside the tank, which in turn caused the explosion.

ACTIONS TAKEN

The operator focused efforts on the following tasks:

- administrative modifications: evaluation of lightning analyses, with a request submitted to update risk analyses for the atmospheric distillation unit as well as the other units (as formalised by official notification);
- inventory of tanks operating under identical conditions and verification of the presence of flame arrestors;
- inspection of flares by use of a drone device;
- a contract established to identify the location of lighting strikes during stormy weather conditions;
- inclusion of the damaged tank in the unit's safety report, even though it was not performing the function of storing flammable liquids.

LESSONS LEARNT

On the scale of a refinery, the contents of smaller-sized storage facilities whose effluent may potentially comprise flammable liquids are vulnerable to the risk of lightning, which along with the risk of accidental spillage of contents must be included in the relevant safety reports.

Moreover, the terminology used to designate complex equipment must be clearly identified according to a protocol shared by all parties involved in refinery operations. According to the operator, the term flame guard (i.e. a "grating") was apparently widely used in the oil industry to refer to the more specialised flame arrestor device.