# THERMAL REACTION CAUSES ABOVEGROUND STORAGE TANK DAMAGE

## DESCRIPTION:

A chemical reaction took place in a sulphur scrubbing[1] process that caused a thermal (heat) reaction. The sulphur scrubber was connected to aboveground storage tanks that contained hydrocarbons. A chemical reaction ignited the material in the tanks, causing the top of the tank to separate and lift from the structure.

Oxygen was introduced to the scrubber by fluids transferred from a tank truck creating a high temperature reaction in the scrubber. Under normal conditions, the sulphur scrubbing medium responds by a chemical reaction and removes $H_2S$ from hydrocarbons. If oxygen is present, the chemical by-product (iron sulphide) further responds by producing a thermal reaction. When temperatures exceed the autoignition point, a bed fire will occur.



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[1] One of several methods to remove toxic or corrosive compounds from hydrocarbons and neutralize it.

## CAUSE:

- Fire and explosion hazards caused by iron sulphide will spontaneously ignite when exposed to oxygen.
- Oxygen was introduced into the scrubber unit from the tank truck vent which contributed to the thermal reaction.
- Vent gas from the tank truck should not have been comingled into the scrubber and the aboveground storage tank. Engineering criteria for the scrubber unit did not include the addition of vent gas, and the operation and its hazards should have been re-assessed.
- When the scrubber unit began to heat up excessively, the process should have been shut down.
- Supplier did not make manufacturer's equipment specifications for the harmful substance available to the supervisor.

## CONTRIBUTING FACTORS:

- Inadequate protective equipment on the scrubber unit, such as the use of a flame arrester and/or backflow device.
- Failure of a procedure or practice for additional vent gas inclusion to the - scrubber.
- No safety data sheet (SDS) for the sulphur scrubbing medium.

## CORRECTIVE ACTIONS:

» Full hazard reviews with all affected personnel to be conducted before using chemical scrubber systems.
» Designate a scrubber system for storage tanks, refrain from comingling vent gases with those from other operations at the site.
» All scrubber units to have the safety data sheet (SDS) and safe operating procedures at each site.
» All SDSs will be reviewed and understood before operating the equipment.

## ADDITIONAL RESOURCES:

Video demonstrating the flammability of iron sulphides:
https://www.youtube.com/watch?v=EIe7mH9gHc8

WorkSafeBC Bulletin:
https://www.worksafebc.com/en/resources/health-safety/hazard-alerts/pyrophoric-materials-fire-explosion-hazard?lang=en