

Effective Learning from Incidents

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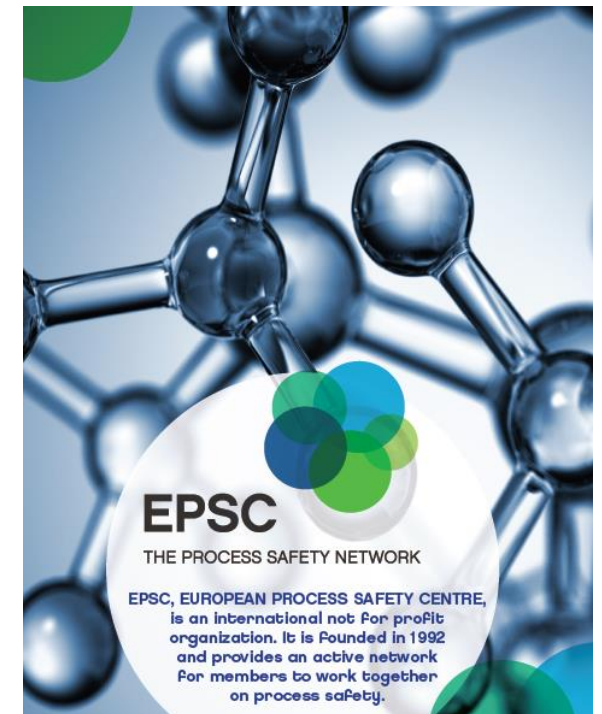


Achema, June 2018

About EPSC

European Process Safety Centre

- Intense Industry Network for companies and associates
- Best practices documents
- Working Groups
 - Pharma
 - Semi Quantitative Risk Analysis
 - Loading & Unloading
 - The Human factor in Process Safety
 - RAST tool for aided risk analysis
 - Digitization & Big Data



www.EPSC.be

Learning From Incidents

- ▶ Recent incidents
- ▶ Open culture vs Fear
- ▶ Limiting factors
- ▶ Other Industries



EPSC Learning Sheets

- ▶ Awareness
- ▶ Relevant incident – Anonymous
- ▶ Intense discussion – how does that work here?
- ▶ Not saying what is bad and good (No “you should”)
- ▶ Addressing the good industrial practices
- ▶ Easy accessible: www.EPSC.be

- ▶ Establishing a more open culture to learn together!

Furnace Fire

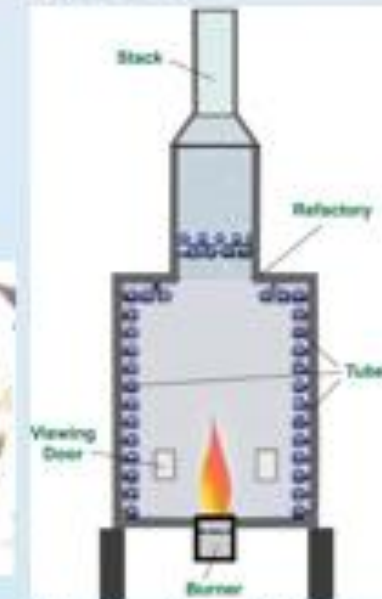
EPSC Learning Sheet , January 2018

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What Happened:

At refineries large furnaces are used to heat-up hydrocarbons for refining. A red hot spot was identified on a furnace tube that later ruptured. The hydrocarbons entered the furnace and created a large fire in which an operator died.



Aspects:

- The temperature in the furnace is above the design of the carbon steel tubes. Only because of the liquid flow in the tubes, the steel is cooled to acceptable temperature
- Respect the temperature window and check for red hot spots on the tubes, visually or using IR detection
- When a hot spot is detected, take the pre-defined actions
- Good burner pattern can avoid flame impingement on tubes
- Carbon deposit in the tubes can be a cause for red spots
- Temperature difference between the different tubes exiting the furnace can be a good indicator to shut down the furnace



Furnace tube rupture scenario must be well studied and protected

Barge hold explosion

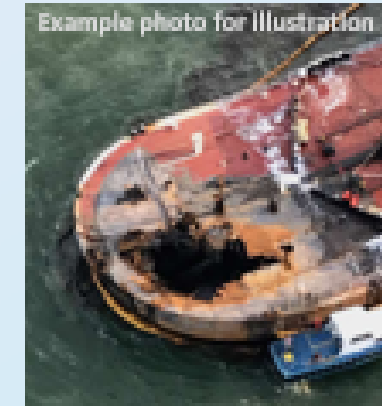
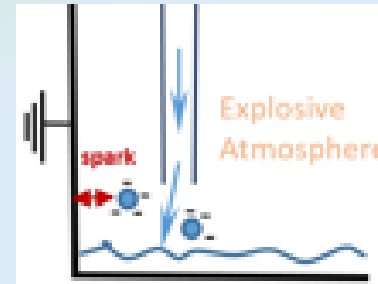
EPSC Learning Sheet , May 2018



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What Happened:

While loading kerosene from a refinery into a barge an explosion in the hold took place. Charged droplets after splash loading was the most likely ignition source.



Aspects:

- Substances with low electrical conductivity and flash points below 20 °C are hazardous, and form explosive atmospheres
- When filling an empty vessel initial loadings speed must be below 1 m/s to avoid charged droplets! The initial pump speed must be part of the signed loading agreement
- Filling pipe design can reduce droplet formation by splash loading
- The incident happened after low ambient temperature resulting in dry air, that only slowly dissipates electricity
- A connected barge is a process part to be reviewed in a PHA
- While crude tankers are made inert by exhaust gases, the holds in barges contain air and potential explosive mixtures
- Grounding is important but does not avoid the creation of charged droplets that can generate a spark



Avoid Splash Loading of hydrocarbons

Thank you for your attendance

- ▶ Questions?

Leaking Flange

EPSC Learning Sheet
June 2017

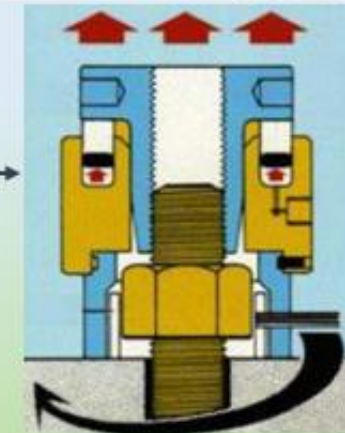


What Happened: In a refinery desulfurization unit a flange leaked hot hydrogen, that took fire. The flames impinged on a reactor that got leak and a large fire started.



Aspects:

- Hydrogen flames are difficult to see in day time
- Bolt tension can change overtime especially at equipment with temperature cycles
- Document the Packing and ideal Bolt Tension for critical flanges
- Use a Torque Wrench, attention for friction!
- Rotaboltstm can measure and adjust bolt tension during use
- Also available Pre-Clamping Cylinders to assure bolt tension on large flanges
- Consider to not insulate critical hot flanges, so leakages can be detected
- Consider a PM or monitor plan



Take Care of Critical Flanges

Available on
www.EPSC.be

Condensate Explosion

EPSC Learning Sheet , September 2017



What Happened:

31/05/2005

On the roof of a water / natural gas condensate storage tank at a gas production site, welding work was done. A handle of a manual operated valve was in open position creating a direct connection between the welding spot and the content of the tank. Due to the explosion two died.



Aspects:

- Lack of focus on process safety issues
- Confusion about the wording : “Condensate” on a gas production site is not similar to water: in Oil&Gas production it refers to hydrocarbons produced together with natural gas. A natural gas condensate vapour can ignite and explode when mixed with air. The contractors doing the work were unaware of this.
- Permit issuer and the permit holder had different perceptions on the location where the welding work was to be executed.
- The tank roof was not recognized as an ATEX zone 0 while the tank was not made free from the hazardous hydrocarbons.
- The new lines under construction were not properly isolated from the tank containing hazardous hydrocarbons. A valve could be opened that allowed hydrocarbons from the tank to flow to the hot spot and ignite.
- Blind faith of contractors in safety on site

Hot work in zoned areas is dangerous

Steam Release

EPSC Learning Sheet , November 2017



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What Happened:

During reinjection of a clamp on a flange of 70 barg 290 °C water line, the 20 bolts failed and steam was violently released. Two contractors died.



Photo not from the incident



Aspects:

- High pressure steam release is dangerous: besides the pressure and heat, steam also eliminates visibility and oxygen
- Stress Corrosion Cracking phenomenon in bolts or studs should always be considered even when bolt material has been selected as SCC resistant (e.g. threaded rolled ASTM A193 Grade B7 bolts and studs)
- During (re-)injection of a clamp the tension on the studs can be increased with 10 to 20% (from experiment)
- Caustic is used for pH control in steam systems. High caustic can weaken the carbon steel piping and bolts after leakage: attention for white deposit
- A Clamp is a temporary solution, plan removal at installation



Clamp reinjection brings hazards and needs special attention



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Thank you for your attention

- ▶ Questions

