

Explosion of a Natural Gas Pipeline, Oppau, Germany 2014

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35 years experience in Chemical Industry



Sustainability Consulting 2016-

Dir. Business Developmt, 2020-2023

Owner, Process Safety Services company, Germany, 2019-

- **VP Process Safety BASF SE, Ludwigshafen, Germany**
 - **Global chief expert Process Safety 2017-2019**
 - **Global head of Process Safety 2010-2016**
- VP Technology and supply chain, PU Division, 2003-2010, Brussels, Belgium
- Project Executive New TDI plant project, 1999-2003, Geismar, US
- TDI, MDI, Polyols Production & Technology, various roles, 1991-1999, Belgium & US
- R&D Manager high pressure pilot plants,
R&D Chemist new chemical processes, 1986-91, Ludwigshafen, Germany



PHD in Physical Chemistry, Heidelberg University, Germany, 1986

Gas Pipeline Explosion 2014 (Company Gascade)

- During a pigging operation weak spots were detected in a long distance natural gas pipeline, which runs through the town Oppau, part of Ludwigshafen, Germany
- A construction crew prepared for groundwork to repair the weak spot. This required to dig out the pipeline for welding. The pipeline would have been shut down during the work.
- The preparation work included to put corrugated steel plates in the ground, which would secure the hole in the ground against collapse of the walls.
- When the corrugated steel plate was hammered in the ground, it hit the natural gas pipeline
- The 80 bar natural gas pipeline was ruptured, resulting in a large explosion and fire, killing 2 construction workers, and injuring several people
- A 100 m vertical flame burned for more than 1 hour, radiating intense heat, which melted plastic parts in a 200m radius, and destroyed the façade of neighboring houses
 - A 4 story apartment building had to be evacuated



Gas Pipeline Explosion 2014

- Heat radiation:
 - 2 fatalities, several persons severely burned
 - Plastic parts melting in 200m distance

- Houses had to be evacuated



Gas pipeline explosion 2014

Youtube video:

➤ <https://youtu.be/w4s0-skw0i0?si=-Y0Omcp17qndV9WI>

Gas Pipeline Explosion 2014 (Company Gascade)

Regulation:

- **The Energiewirtschaftsgesetz (EnWG) / Energy economy act** assigns the **responsibility for pipeline safety** to the **pipeline operator**
 - Company Gascade
- The details are regulated in the **Gas-Hochdrucksleitungs Verordnung / High pressure gas pipeline ordinance**
 - Gascade was found responsible in the legal proceedings and convicted to financial damages

Gas Pipeline Explosion 2014 (Company Gascade)

Learnings:

- Vapor clouds from ruptured pipelines can be very large, causing powerful explosions and intense fires
 - The risk is particularly high when the pipeline runs through populated areas
- Before such groundwork is started, the **underground location of the pipeline** must be exactly located !
 - Technology for that is available
 - Maps are sometimes not accurate enough
- **Work permits** for groundwork need to **address the underground hazards**
 - There are more examples of ruptured pipelines in digging operations

Propylene Pipeline Explosion, Nanjing, China, 2010

- On July 28, 2010, During demolition work for the relocation of a chemical plant, a power shovel damaged an underground 20 bar, 150 mm Propylene pipeline
 - The driver of the power shovel ran away, without warning anyone
- A huge vapor cloud formed and finally exploded.
 - In 3 km distance still 10 mbar pressure wave, breaking most windows in between
- The release was estimated at **40 – 50 tons Propylene**
 - 600 000 m³ explosive Propylen/Air mixture
 - ~ 500 tons TNT equivalent
- **12 fatalities, ~300 injured**, many of them very severely
- Destruction of the factory and neighboring houses



Propylene Pipeline Explosion, Nanjing, China, 2010



Gas Pipelines

Know and protect your underground pipelines !

Determine the exact location of the pipeline before excavation !

Address underground hazards in the work permit !

Thank you for your attention

Questions ?