Accident at AT-Tuote Oy Sipoo facility

March 2nd, 2018

Accident Investigation Report

dnro 4044/00.05.12/2018

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Chain of events

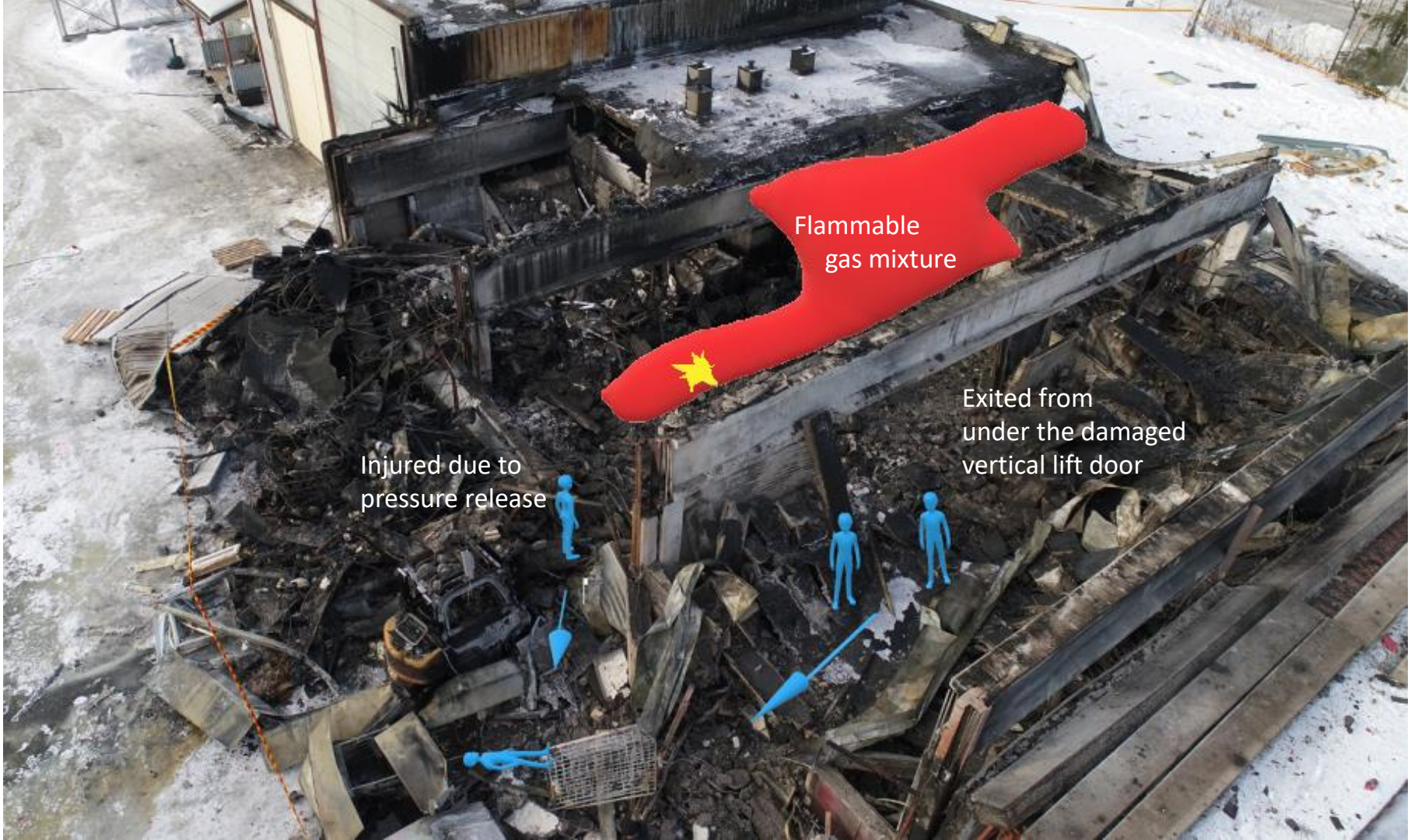
- On the day of the accident the plant was operating as usual: aerosol products were being filled in two filling rooms
- The workers had not detected anything out of the normal
- A few weeks earlier the distiller that was used to distill acetone had been temporarily inoperative. The cause of the problem had not been identified. At the time of the accident the only running process related to chemicals was the acetone distiller.
- A few moments before the accident the people working in the first filling room had exited the building. There were two people working in the second filling room.

Chain of events

- An explosive gas mixture ignited when a worker opened a vertical lift door from the outside.
- A worker was injured due to the pressure release
- The pressure wave broke lightweight concrete blocks in the exterior wall, and doors and windows were thrown out into the yard
- The acetone mixture and LPG pipelines were damaged which resulted in a flammable liquid and gas release into the production facilities. This caused that the fire developed rapidly inside the building.

Accident causes

- The source of the leak could not be identified with certainty
- It is deemed probable that due to inadequate ventilation solvent vapours or flammable gas accumulated in the upper parts of the building.
- Ignition was probably caused by the stopping mechanism of the vertical lift door, static electricity or an electrical appliance.
- According to the workers inside the building, the indoor gas detectors did not sound an alarm before the accident.


Flammable
gas mixture
Exited from
under the damaged
vertical lift door
Injured due to
pressure release

Chain of events

- The workers who were in the second filling room exited from under the vertical lift door that had been damaged by the pressure release.
- One of the workers who were outside called for help, the other helped the injured worker.
- As the fire developed it was decided that the injured should be moved to the rallying point.
- The production manager closed the fire doors between the storage and production facilities. The doors had been opened by the pressure release
- The first units of the fire and rescue services arrived in approx. 10 minutes
- The fire was extinguished with fire fighting foam

Technology related recommendations

- Adequacy of ventilation must be monitored regularly
- Pressure relief must be designed and carried out so that the buildup of pressure cannot cause collapse of structures or buildings, or damage to pipelines
- There must be enough gas detectors in facilities where explosive mixtures may be present
- Alarms from gas detectors must be detectable in all places where workers may be in danger and near entrance doors.
- Vertical lift doors are not suitable as emergency exits
- The amount of hazardous chemicals in the production facilities should be limited to be as low as possible (e.g. the needs of one shift).
- It is recommended to attach the gas alarm to the safety automation system, e.g. to de-energize electrical equipment and close valves

Recommendations related to organizational activities

- Tasks that are meant to ensure safety must be identified, as well as workers who are responsible for the execution of these tasks
- The management must supervise that these tasks are carried out
- The company must be aware of the legislation that regulates its activities
- The company must systematically monitor how the implementation of demands and recommendations from authorities are carried out
- Systematic maintenance must be carried out. Records must be kept of all implemented maintenance activities
- The workers must be trained to work safely, and they must be told about the plant's hazards. Temporary workers must also be trained.
- The company must inform the supervising authority when changes are made that concern the handling and storage of hazardous chemicals.