

Release of toxic gas from a vacuum truck at an installation for treating hazardous waste

29th December 2005,

Stuttgart – Germany

Toxic release
Hazardous waste
Vacuum truck
Safety management

THE INSTALLATIONS IN QUESTION

The hazardous waste treatment facility is located in the commercial port area of Stuttgart. The facility receives a wide range of hazardous wastes in a variety of containers. Some wastes can be treated on-site and others must be transported to other facilities to be treated.

THE ACCIDENT, EFFECTS AND CONSEQUENCES

The accident

On 29th December 2005 an accident took place in a hazardous waste treatment facility in which an employee was killed and six others (two employees, two members of the emergency services, and two employees of contact companies) suffered injuries and required hospital treatment.

The cause, based on current knowledge, was the release of hydrogen sulphide (H₂S) from the tank vent of the vacuum-truck whilst liquid wastes were being pumped from steel drums into the vacuum-truck. A fork-lift truck driver who happened to be in the immediate vicinity was found dead near by; the cause of death being the toxic effects of hydrogen sulphide. Five of those treated in hospital were also suffering from the health effects of hydrogen sulphide

The fire-brigade could not identify any hazardous gas concentration on arrival at the scene. The fire-brigade then left the site. To secure the scene for the police investigation, the police ordered that the contents of the suction hose should be drawn into the vacuum-truck. The vacuum pump was restarted and once again hazardous sub-stances were released from the tank vent. This process led to the collapse of the vacuum-truck driver. As a result the police ordered that the operation should cease and the fire-brigade and an emergency doctor were called to the scene.

European scale of industrial accidents

By applying the rating rules of the 18 parameters of the scale made official in February 1994 by the Committee of Competent Authorities of the Member States which oversees the application of the 'SEVESO' directive, the accident can be characterised by the following 4 indices, based on the information available.

Dangerous materials released	 <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Human and social consequences	 <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Environmental consequences	 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Economic consequences	 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

The parameters that comprise these indices and the corresponding rating method are available at the following address:
<http://www.aria.ecologie.gouv.fr>

The level 1 of the index concerning the quantity of dangerous materials released (in the meaning of the SEVESO Directive) expresses the small quantity of toxic substance (H₂S) which was released (parameter Q1).

The level 2 given to the human and social consequences is due to the one fatality and the number of people suffering from the effects of the toxic substance (H₂S) (parameter H3, H4 and H5).

The economic consequences was not evaluated.

Finally, there is not any noticeable consequence regarding environmental consequences.

ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

The immediate cause of the production of toxic gas was the combining of liquid wastes which on mixing react together releasing H₂S. An organo-sulphur (thio) compound was mixed with an organic, acidic compound leading to an unexpected liberation of hydrogen sulphide

The indications are that the organisational measures which had been taken were not adequate to prevent this event.

The operator was not able to demonstrate that adequate measures for the identification, assessment and documentation of the hazards of the individual containers of hazardous waste received. The hazardous wastes which were received in drums and brought together in a vacuum-truck were to be transported from the waste treatment facility to another location because they could not be treated on site. The operator was not able to demonstrate that adequate measures were in place to regulate how the drums should be pumped into the vacuum-truck (order, ruling out of any hazardous chemical reactions). There were no adequate measures for the safe discharge of gases vented from the vacuum-truck.

ACTIONS TAKEN

As a result of this incident there is a criminal investigation which is ongoing. This is also a reportable incident under Seveso II.

The mixing of hazardous waste in the vacuum-truck is no longer carried out and the operator transports the drums of waste, untreated to another location.

Operators and inspectors need to be made aware that vacuum trucks have potential hazards relating to their operation and that under no circumstances should it be tolerated that chemical reactions be carried out in the tank of the vacuum-truck. The treatment of hazardous waste should be carried out in a controlled manner in designated reactors with suitable monitoring equipment.

Vacuum-truck operations may be carried out at a number of sites; therefore the State Institute for Environment, Measurement and Nature Conservation Baden-Württemberg issued the following recommendations to the regional governments of Baden-Württemberg.

Prevention measures

1. Problematic wastes, that is, wastes which either have hazardous characteristics themselves or on mixing with other substances may release hazardous substances must receive special consideration.
2. The safety critical parameters / characteristics for these wastes must be defined.
3. The safety critical characteristics which have been defined for the identification of the waste and which regulate the further treatment, e.g. pH, must be tested for every container (drum, IBC, tank) which is delivered, documented and confirmed with a signature
4. Procedures must be defined for the handling of containers which deviate from the criteria.
5. If more than one container of problematic wastes are to be combined (in a vacuum-truck), then a list of the containers together with their hazards, and the safety critical parameters is to be made and the operation assessed as to its feasibility. Following this a mixed-sample of those wastes which are to be combined is to be taken. The order of mixing is to be noted.
6. If it becomes apparent that a combining of the wastes is only possible under compliance with a particular order of mixing, then this order is to be laid down in writing and the adherence to this order is to be controlled and documented.
7. Before initiating the pumping process the tank vent of the vacuum-truck is to be connected to a suitable exhaust gas system. If this is not possible, then the location and orientation is to be chosen so as the vapours may be vented safely at all times.
8. Access to the area in which the vacuum-truck and pumping operation are located for persons not involved in this procedure is to be prohibited. The area is to be clearly marked and cordoned off.

LESSONS LEARNT

- ✓ Operations involving the use of vacuum-trucks may lead to the release of hazardous gases / vapours.
- ✓ Where ever possible, measures need to be taken to avoid the release of toxic (or flammable) vapours from the vent of the vacuum truck tank and to prevent the exposure of employees and others to such hazards.
- ✓ Vacuum trucks are not suitable for processes involving the mixing of hazardous wastes which may lead to a chemical reaction and the subsequent release of hazardous gases or vapours.
- ✓ The treatment of hazardous wastes requires a robust safety management system with:
 - ✓ Clear definition of responsibilities for all operations within the treatment facility
 - ✓ Definition of and testing for safety relevant criteria and characteristics (e.g. pH, Temperature, colour, viscosity, odour, phase separation) to enable hazardous wastes to be accepted and treated or transported safely,
 - ✓ Documentation of the whole process from the acceptance of a hazardous waste to its disposal including all safety critical criteria and characteristics