Overflow of a tank inside an oil depot

7 September 1999

Grigny (Essonne)

France

Hydrocarbons
Pipeline
Alarm
Reduced activity
Response
Explosive atmosphere
Management

THE FACILITIES INVOLVED

The site:

The company was operating along the banks of the River Seine a depot for oil and petroleum products with a capacity of approximately 85,000 m³. Service at the site initially started up in 1964. This storage capacity was divided among 28 tanks, whose individual capacities varied between 1,400 m³ and 11,500 m³. The products stored at the facility were for the most part heating oil, gasoline and diesel.

The site was supplied by 2 oil pipelines, one coming from the port at Le Havre (Seine-Maritime Department) the other from the Grandpuits refinery (Seine-et-Marne Department). Supply by lorry was also an option at the Grigny facility. The site comprised 20 stations for loading road tankers.

THE ACCIDENT, ITS CHRONOLOGY, EFFECTS AND CONSEQUENCES

The accident:

The accident occurred according to the following chronology:

- 11:28 pm: Completion of the filling sequence by the site operator on 5 tanks, involving a total volume of 2,640 m³ transferred for 28 hours by pipeline. Shortly thereafter, residents living near the depot reported a suspicious odour of hydrocarbons. The local fire-fighters were notified and dispatched to the scene.
- 12:00 am: Upon their arrival onsite, the fire-fighting crew confirmed the need to halt use of both the rail lines and waterways at the periphery of the facility, yet without being allowed to enter inside the depot boundary.
- 3:00 am: When the Cabinet Director of the Essonne Departmental Prefecture arrived at the installation, fire-fighters were finally granted access to the tanks, as prior to Prefecture intervention the local manager of the depot operating company had refused assistance from emergency services. Fire-fighters observed that Tank no. 3, with a capacity of 2,450 m³, had overflowed and moreover that several m³ of unleaded gasoline had collected in the ancillary retention basin. The crew proceeded by covering the suspect basin with a foam blanket.
- 4:00 am: End of the basin covering operation, which lasted approx. 1 hour due to the combination of a series of unfavourable circumstances: lack of adequate flow and pressure in the internal network during premixing, a valve break causing partial shutdown of the fire protection network.

Consequences of this accident:

Several cubic metres of product flowed into the retention basin. Though no impact on the environment was reported, the discharge did give rise to a major source of potential hazard in areas outside the basin. This situation could have easily degenerated into an actual accident (e.g. fire ignition) and wound up offering many considerations during feedback analysis.

The European scale of industrial accidents

By applying the rating rules applicable to the 18 parameters of the scale officially adopted in February 1994 by the Member States' Competent Authority Committee for implementing the '*SEVESO*' directive on handling hazardous substances, and in light of information available, this accident can be characterised by the four following indices:

The parameters composing these indices and their corresponding rating protocol are available from the following Website: http://www.aria.developpement-durable.gouv.fr.

Since the quantity of product released is not known with certainty, the "quantity of hazardous substances released" index was scored a "1".

With no reported deaths or injuries, the "human and social consequences" index was rated a "0". Similarly, no environmental or economic consequences were observed, thus resulting in zero readings for the corresponding parameters.

THE ORIGIN, CAUSES AND CIRCUMSTANCES SURROUNDING THIS ACCIDENT

An analysis of the hydrocarbon pipeline transfer operation leading to the depot's fixed storage capacities allowed the Classified Facilities inspection authorities to identify the following operating protocols with deficient safety measures:

- In order to avoid internal handling steps, the intake valves on the 5 selected tanks were opened and the tanks connected to one another;
- The 3 tanks positioned at a height of 1.5 m above the 2 other tanks (for which the head loss in the supply pipes was least) were filled beyond their most upper limit, with the tank levels then evening out by means of gravity flow;
- To accomplish this step, the high and very high level alarms has to be deactivated, which as a result removed one of the site's lines of defence: the retransmission of signals to allow the pipeline management company to halt delivery upon alarm signal detection was thus no longer operable;
- In the case of this incident, such a level difference was responsible for generating overflow in a basin associated with one of these tanks;
- Since deliveries lasted more than 24 hours, they spread over periods of less intense activity, when the depot was staffed by just 1 or 2 employees.

Besides, the sequencing of both the safety enforcement operations following the incident and the inspection conducted the next day by the Classified Facilities Inspectorate revealed inadequacies in the site's existing safety measures, namely:

- Subsequent to a modification in the depot's internal electrical network, which had been performed several months prior, the operator was unable to restart the installation's fire pumps from the backup supply (electric generating sets);
- The hydraulic fire protection network was partially inoperable. In fact, after detecting a leakage on a tap, the site operator closed off a portion of the facility's premixing network, thus blocking the injection of foam into 2 storage tanks, numbers 26 and 27, equipped with capacities of 2,350 and 3,800 m³, respectively (which accounts for the difficulties encountered by fire-fighters during the night).

ACTIONS TAKEN

An inspection was performed the day after the incident, as inspectors were fearful of finding serious malfunctions as a result of observations both from their efforts and collected from the fire-fighter units deployed during the night-time intervention. The inspection concluded a lack of compliance with the regulatory requirements (especially Prefectural orders).

Subsequent to the findings and proposals derived during the inspection, the Prefect enacted a decree requiring additional measures be adopted as an emergency response. In particular, the operator was requested to stop supplying the depot via pipeline until the level probes on the tanks and could be checked and the accident report released.

Furthermore, the operator was issued a 24-hour legal notice to restore full capacity to the facility's fire network. Once this step accomplished, it was proposed that fire and emergency services conduct a fire drill so as to test the newly-revamped safety systems.

LESSONS LEARNT

This incident once again drew attention to a number of points, including:

- controlling alarms that had deliberately been deactivated;
- automated product transfers by pipeline at night using the reduced personnel resources available on the depot site;
- the site's limited capacity to manage a crisis situation: the staff members present initially refused access to first responders without being able to solve the problem at hand themselves;
- the availability of backup equipment had become insufficient due to modifications introduced in the electrical installation and hasty repairs on the hydraulic system;
- a flawed safety management organisation, which was responsible for the operator being unaware of his own depot deficiencies.

It should be pointed out that regulations published shortly before the accident had emphasised some critical aspects for which noncompliance issues were noted: for example the Ministerial circular issued on 6 May 1999 related to the extinction of flammable liquids fires, which specified the coefficient values to be used when calculating extinction rates under deleterious circumstances, such as operating with a reduced staff.