

Hydrochloric acid leak at a storage site

May 12, 1999

Villeneuve-la-Garenne [92]

France

Acids

Handling of modifications

Onsite works / maintenance

Verifications / inspections

Facility design

Subcontracting operations

Communication / information

FACILITIES INVOLVED

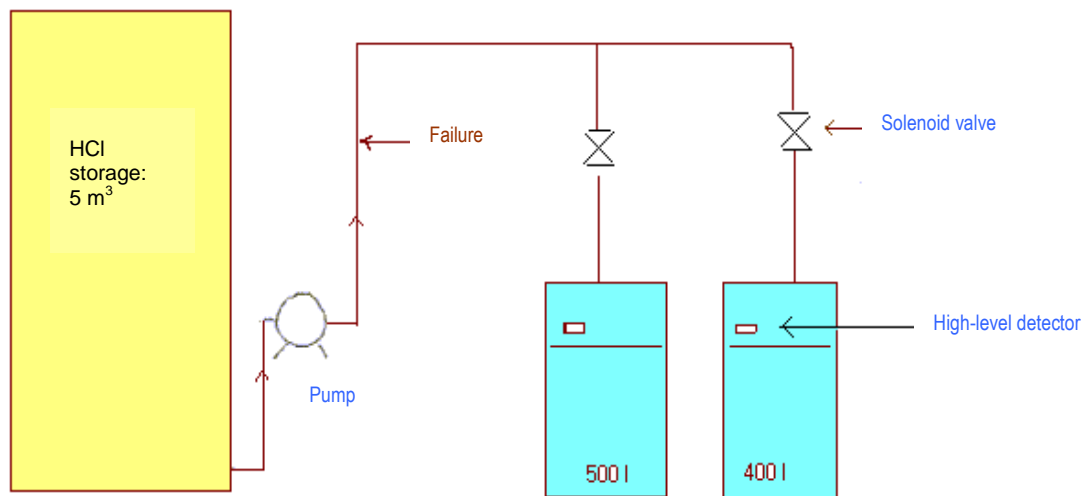
The site:

The site of this accident was being operated by a pharmaceutical group within a heavily urbanized environment. The plant was producing pharmaceutical active principles with high value-added content.

The unit involved:

The unit involved in this accident was dedicated to storing 35 percent hydrochloric acid used for regenerating ion-exchange resins.

The installation:



THE ACCIDENT, ITS CHRONOLOGY, EFFECTS AND CONSEQUENCES

The accident:

A plant employee noticed a whitish cloud; he sounded the alarm and called external fire-fighters to the site.

The cloud was due to a leak in the hydrochloric acid storage area; 500 litres of acid were collected in the retention pit, and an equivalent quantity splattered outside the pit onto a concrete slab where nearby tanks had been installed. The acid vapours released formed a fog.

A water curtain was deployed to disperse these vapours. An employee turned off the hydrochloric acid transfer pump, and the facility manager ensured that no hazards extended beyond the plant boundary. In-house responders set up an extraction-ventilation system and spread soda ash over the floor. By the time fire-fighters arrived on the scene, the emergency situation was under control.

Consequences of the accident:

Though effective incident management measures were able to avoid bodily injuries, the cost of the accident was estimated at 700,000 francs (installation: 400,000 francs, extra costs engendered due to suspending operations for 7 months: 250,000 francs, and additional works and meetings: 50,000 francs).

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 the information available, this accident can be characterised by the four following indices:

Dangerous materials released		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human and social consequences		<input type="checkbox"/>	<input 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 composing these indices and their corresponding rating protocol are available from the following Website: <http://www.aria.developpement-durable.gouv.fr>.

The overall level of the "hazardous materials released" index yielded a "0", given that 35 percent hydrochloric acid is not a SEVESO material.

The "human and social consequences" index also registered a "0" reading since no injury resulted from the accident.

The "environmental consequences" index was recorded at "0", with no impact on the environment feared due to the accident.

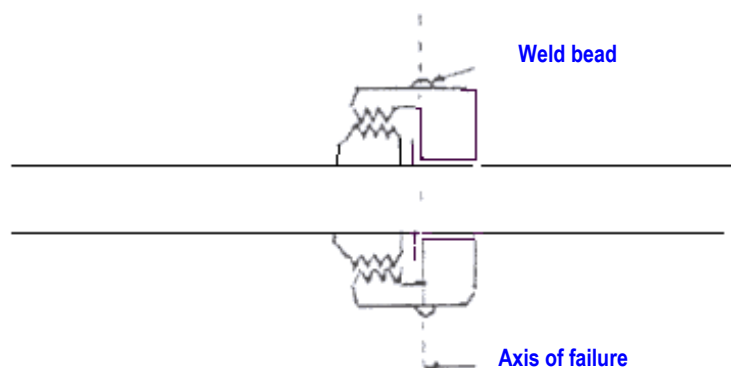
The "economic consequences" index scored a "0" as well: property damage amounted to less than €0.1 million (i.e. parameter €15).

THE ORIGIN, CAUSES AND CIRCUMSTANCES SURROUNDING THE ACCIDENT

The accident happened just over a month following some major modifications to the facility. A new, 5-m³ tank made of HDPE had been installed, along with a new pump. This equipment only lasted a short while however, as a higher-capacity pump (100 l/min) was introduced on the advice of the installer. A check valve was also set up downstream of the pump (as a means of protection against a pressure surge), and a gas extractor was placed upstream.

The leak resulted from a break in the 3-piece fitting; this failure had actually occurred during the previous set of works and was since re-welded by a plastics specialist. The weld turned out to be ineffective and the need for repair was not reported to the site operator.

On the day of the accident, an electrician modified the installation with the intention of programming pump start-up to coincide with the opening of solenoid feed valves on both hydrochloric acid tanks. The pump was activated but the valves remained closed. Pressure therefore increased inside the pipes until failure of the 3-piece fitting.



Not only had the pump been oversized, but the device relief valve had been placed too far from the pump (at the upper storage tank level). The pipe support structure was inadequate. As a final point, the only pump shutoff button was located adjacent to the pump itself and hence could not be easily accessed.

ACTIONS TAKEN

In order to correct the malfunctions recorded, several modifications were carried out:

- √ Both the check valve and relief valve were removed.
- √ The PVC piping introduced into the installation without first inspecting all of the welds was replaced by braced PVC pipes: an expert evaluation had found defects at the level of taps located on the polyethylene tank dome.
- √ The piping was tested at 10 bar for an hour. No hydraulic trial had actually been conducted following the initial works. The remainder of the installation, which had not undergone any changes, was tested at 5 bar for a total of 5 hours.
- √ The tank was verified by being filled with water until overflowing. Three additional emergency shutoff switches were installed to allow turning off the facility remotely. All automated controls were also verified and an installation application procedure was drafted.

LESSONS LEARNT

The accident, though of limited consequences, could have produced a much more serious outcome given the quantity of spilled hydrochloric acid.

This accident illustrates the importance of monitoring modifications from their initial design until final works acceptance (including close and effective inspections). The absence of controls made it possible to overlook the "amateur" repair job performed by the subcontractor as well as inappropriate modifications to the automated mechanisms by the electrician. These mistakes, combined with a poor installation design (improper assembly of an oversized pump, insufficient pipe support structure, just one shutoff button placed in an awkward position) and lack of familiarity with guidelines, were the causes of this accident.