Polluted effluents released into the Cher River

14 September, 2005

Saint Victor – [Allier]

France

Toxic releases
Surface treatment
Cyanides
Equipment (failures)
Organisation
Human factor
Intervention / Rescue
Fish mortality

THE INSTALLATIONS IN QUESTION

The site:

The plant, located in the town of Saint Victor in the French region of Allier, was built in 1994 and designed to perform surface treatment operations on metal parts, particularly various grades of zinc plating on automobile parts. In 2005, the plant employed 34 persons and posted sales of 1.6 M euros.

The plant consists of a 3,530-m² covered building housing 2 surface treatment lines, a rack system and a bulk system. Both systems represent a total bath volume of 196 m^3.

Effluents from the surface treatment operation are treated in an internal detoxication station before being released into the Cher. This physico-chemical station includes a dechromatation, decyanidation, neutralisation and flocculation reactor and 2 filter presses designed to recover the metal hydroxides in the form of sludge and to reintroduce the filtrate (the "juice" extracted from pressing the flocculated effluent) into the top of the neutralisation stage.

This plant is a classified installation whose operation is authorised by the prefectoral order dated April 7th, 2005.

Photo DRIRE Auvergne

The unit concerned:

The metal treatment line concerned is used for the bulk treatment (in barrels) of automobile parts. It includes : zinc plating (galvanising), nickel plating and alkaline cyanide copper plating.

The accident was caused by a leak which occurred during a pumping operation on the treatment line's catchpit. It also involved the internal detoxication station used to treat industrial effluents.

THE ACCIDENT, ITS BEHAVIOUR, EFFECTS AND CONSEQUENCES

The accident:

Photo DRIRE Auvergne

On Wednesday, September 14th, 2005 around 8.15 pm, a technician discovered a leak on the multiple treatment line slightly before the end of his shift; a filter outlet pipe on a tank containing alkaline copper cyanide had become disconnected causing the bath (approx. 1,000 l) to flow into the concrete catchpit.

The technician **immediately** informed the laboratory/environment supervisor at his home. The supervisor ordered that the surface treatment line be stopped (including the shut down of the heating system) and that the liquid be left in the catchpit. The incident was recorded in the logbook used for this purpose.

On Thursday, September 15th, another technician, with 25 years experience in surface treatment, began his shift at **5 am**. The technician observed that the multiple surface treatment line's catchpit was full of liquid, and took note of the previous day's incident entered in the logbook. He decided to use a mobile pump to transfer the product into the tank containing concentrated alkaline cyanide effluents. During normal operation, an internal system recycles this bath which neutralises the cyanides before they are released into the natural environment.

At 8 am, the laboratory/environment supervisor discussed the incident of the previous day with this technician who explained that he had pumped the liquid from the surface treatment line's catchpit into the tank reserved for concentrated alkaline cyanide effluents. Then, as he does every morning around **9 am**, he read the pollutant concentration levels at the plant's final waste release point (by colorimetric analysis).

He noted that the cyanide content was abnormally high : above 2mg/l, with a limit value set at 0.1 mg/l. He **immediately** decided to close the final waste valve and shut off the water supplies to the surface treatment lines. The final waste was directed to the safety tank designed for this purpose.

After consulting the technician once again, the laboratory/environment supervisor realised that the liquid in the catchpit had been pumped into the chromic rinse tank instead of into the tank reserved for concentrated alkaline cyanide effluents.

Throughout the day of **Thursday, September 15th, 2005,** the laboratory/environment supervisor decontaminated the polluted reactors with sodium hypochlorite and transferred the water into the safety tank.

Cleaning operations on the chromate removal system continued throughout the entire day **of September 15th, 2005**.

On Friday, September 16th, 2005 at 8 am, the laboratory/environment supervisor performed a cyanide analysis on the outlet of the dechromatation and neutralisation system: no abnormal readings were noted. The internal treatment station was thus put back into operation.

Tests were taken hourly up to **11 am**, confirming the absence of cyanide.

At 12 pm, the filter presses used for sludge recovery were placed back into operation.

At around 3.30 pm, residents living along the Cher informed the Vallon-en-Sully *gendarmerie* of dead fish in the river. The National Commission for Fishing was informed and arrived at the site around **4.30 pm**. The inquiry to determine the origin of the fish mortality was rapidly directed toward the pipe releasing the surface treatment company's effluent into the Cher River.

At around 5 pm, the laboratory/environment supervisor was contacted by telephone at his home and informed of the findings. He returned to the site and analysed the industrial wastewater final release point : he again recorded the presence of cyanide. He immediately shut down the water supply to the detoxication station and the final waste release point. After analysing this new incident of pollution, the laboratory/environment supervisor determined that the sludge treatment operation caused the cyanides contained in the filter presses to be released.

All production operations were suspended **at 6 pm**.

On Monday, September 19th, 2005, the laboratory/environment supervisor cleaned the "sludge recovery" system, the neutralisation system, the flocculation chamber and the settling tank, as these reactors had become polluted by the cyanide after the sludge was recovered on the filter presses on **Friday, September 16, 2005**.

On Tuesday, September 20, 2005, the detoxication station was re-commissioned and checks were performed throughout the day : no trace of pollution was detected. All parameters of the effluents released were below the authorised limit, in compliance with the prefectoral order dated April 7, 2005.

The consequences:

Despite risks involving the release of hydrocyanic acid during the transfer of cyanide effluents in a treatment unit which may contain acid effluents, none of the technicians were injured in the accident.

With regards to the installation :

✓ the surface treatment line was not damaged,

✓ some elements of the internal detoxication station were polluted but they were able to be returned to operational condition rather quickly.

Outside the site:

✓ according to the plant operator's estimate, approximately 20 m^3 of effluents containing cyanides at a concentration of 3 to 5 g/l was released into the Cher River,

✓ fish mortality (approximately 2.5 tons) was reported by agents of the National Commission for Fishing,

✓ no health problems were reported by residents living near the site or near the point where the effluents were released into the Cher.

Photo DRIRE Auvergne

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.

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

The "Dangerous materials released" index received a rating of 2 as, according to the estimate, 70 kg of cyanide was released, which represents 0.35% of the SEVESO Directive's upper threshold for T^+ products (20t).

The level 3 of the "Environmental consequences" index is attributed to the 2.5 t of fish that were killed (parameter Env 10).

In addition, the lack of quantified data does not allow the "economic consequences" index to be determined.

ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

The investigations conducted during the accident, on the products and the process helped determine the causes of the accident rather quickly.

The release of pollutants into the river can be attributed to organisational and human errors:

✓ a technician transferred liquid containing dangerous products (alkaline copper cyanide) into a rinsing tank whose contents were not clearly and legibly indicated,

✓ as this rinsing tank was connected to a chromium detoxication treatment system, the cyanides were not eliminated and were thus released into the Cher at a concentration well above the authorised level,

✓ the lack of written instructions regarding the actions to be taken in the case of a malfunction of the surface treatment line lead the technician to rely on his own initiative, which proved to be unfortunate,

✓ after having detected non-compliant releases of effluent, the operator stopped its operations and cleaned the treatment installations. The cleaning operations were in fact incomplete and the cyanides which remained in a portion of the industrial wastewater treatment facility (filter press) were responsible for a second release of polluted effluent two days later.

ACTIONS TAKEN

The operator was formally notified that it must comply with the requirements applicable to the operation of its installations, and as stipulated in the authorisation order of April 7, 2005, **within 2 months**:

✓ the operations involving dangerous handling operations and the operation of installations in which a malfunction could result in prejudicial consequences for the surrounding area and the environment... shall be the subject of written procedures.

✓ without prejudice to the regulatory provisions concerning worker hygiene and safety, safety instructions were drawn up and permanently displayed in the workshop. In particularly, these instructions specify :

✓ the intervention procedures in the event of abnormal or accidental situations".

In the days following the accident, the operator initiated the following actions within its facility :

✓ the identification of the tanks was improved on the surface treatment lines and the associated piping,

✓ all pumping operations performed by technicians must be monitored by a supervisor,

✓ increasing technician awareness through the creation of new procedures and posters.

These measures were established and implemented in **January 2006**.

LESSONS LEARNT

A process, even through performed on a regular basis, may still be a potential source of accidents.

Following the investigations conducted after the accident, it was noted that the operation of a surface treatment line requires that the following conditions be controlled, as a minimum:

✓ the formalisation of documents stipulating the action to be taken in case of an atypical situation,

✓ information and training of technicians in the use of these documents through regular situational exercises.