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Short Communication

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Cyanides Disaster on Bečva River Discovery

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ABSTRACT
The cyanide accident on the Bečva River on Sunday, September 20th, 2020 occurred during the period of the strictest COVID-19 social restrictions and under the most unfavourable natural and travel conditions. All authorities and laboratories were operating under emergency conditions. For every trip to the site, which was 250 km from my place of residence, I had to obtain special police permission, and it was not possible to stay in any hotel at the location.

Keywords: Cyanides Disaster, Bečva River, Plant

Introduction

The Bečva River below the town of Valašské Meziříčí (Czech Republic, part Moravia) has an average discharge of about 15 m³/s, but at the time of the accident there had been prolonged drought, and the flow was only 2.65 m³/s. About 40 metric tons of fish died suddenly in the river, mostly (56% of them) was Chondrostoma nasus, 15% was Barbus barbus. Also, the benthic organism (Trichoptera, Mollusca and others) was hardly damaged. On the first day the cause of the accident had not yet been identified. No one noticed the characteristic coloration of fish typical for cyanide poisoning. Only on the third day was it discovered and chemically confirmed that the cause was cyanide poisoning. A stretch of 40 km of the watercourse was affected. The highest detected (though probably not the actual peak) concentration of cyanide was 0.124 mg/l CN-. In addition, a specific accumulation of metals Zn, Ni, Cr, Cu and Co was later detected. It was marked as the" fingerprinting". Suspicion fell on industrial plants in the area and control samples were taken from all accessible wastewater outlets. Three sources were decisive in terms of the scale of the accident: the petrochemical plant DEZA, the municipal wastewater treatment plant in Valašské Meziříčí City, and the water and energetic company Energoaqua Rožnov, which treats chemical wastewater and discharges into the Bečva River in Valašské Meziříčí via a separate sewer pipeline. No other polluter is connected to this 13-km-long polypropylene chemical sewer. Sources from the town of Valašské Meziříčí were gradually excluded, and the petrochemical company DEZA was excluded already on the first day because it has a separate new treatment plant where fish were still alive in the effluent flowing into the Bečva. Nevertheless, I checked it two more times. On September 21st, 2020, late, next day, the sewer of Energoaqua Rožnov company leading to the Bečva River was inspected and a cyanide concentration of 1.69 mg/l was found. In the following days cyanides were still present, but their concentration and the concentration of fingerprinting metals decreased. The legal problem was that no sample had been taken from the suspicious sewer on the first day of the accident. This later became the basis of the company's defence in court. I knew this argument from other accidents and had to adapt the investigation accordingly. A later balance calculation showed that, even with a very conservative estimate (in favour of the polluter), at least 37.5 kg of CN^- must have entered the Bečva River. By my opinion, non-official, was mass about 75 kg.

Initial investigative actions were accompanied by mistakes by the authorities, but the actual cause had originated from an error by the local authority and the energy company operating the WWTP long before the accident. The town of Valašské Meziříčí, on whose territory the accident began, had no emergency plan prepared. It did not even have the necessary maps, and the water authority was headed by a person without the required qualifications. Responsibility?

On Friday, September 25th, a wave of intense rain passed through the region during the night and morning, and in the

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afternoon the river carried a flood wave with a discharge of up to 240 m³/s, which completely erased traces of the accident (for example sediments). It forced hydrobiologists out of the riverbed where they had been collecting benthos samples. I was appointed by the Police to investigate the accident only on that day and arrived at the site for the first time on Sunday, September 27th, 2020. By that time there were no detectable traces left in the river. Nevertheless, using parallel limnological methods and audit procedures, and in cooperation with several specialized institutions, it was possible to identify the culprit and, most importantly, prove the responsibility and bring the case to court proceedings.

For evidence it was first necessary to determine the transport time of toxic substances in the river from the sewer outlet to the place where the accident had been identified. I carried this out using a non-toxic coloured tracer (fluorescein). However, it was necessary to wait almost two months for the lowest possible river flow. In the meantime, I investigated by the treatment plant operator, hydrobiological and chemical inspections at the plant, and experienced COVID-19 for the first time. Additional measurements determined the inflow time from the suspected location responsible for the accident so that the time of the accident in the treatment plant operation could be specified as precisely as possible. During the investigation the treatment plant operator absolutely refused any cooperation other than that ordered by the Police. This put the operator conflicted with the Czech Water Act, which requires cooperation.

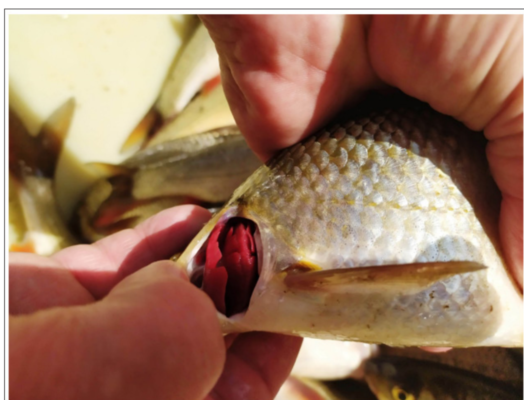
There were many factors supporting the occurrence of the accident, but together they created a coherent picture supported by numerous individual pieces of evidence. A number of analyses and investigations were carried out concerning several companies located in the industrial area managed by Energoaqua company. Cyanides were detected both in wastewater and in the river, together with certain metals used in electroplating technology. Cu, Zn, Cr and Ni were used in the companies in area. Zn, however, was usually not monitored, although it is highly toxic to fish. Occasionally cobalt (Co) also appeared; its properties are like Zn. Cyanides and metals clearly entered the industrial WWTP from companies performing electroplating and having contracts with the WWTP operator, even though the operator was not authorized to treat cyanide waters or liquid wastes containing cyanides. There were at least three such companies in the area. This combination of metals did not occur in other wastewaters, especially not in municipal wastewater or wastewater from the DEZA plant. This was an important finding.

The operator of the treatment plant made serious mistakes in managing all technological processes. Analytical chemical controls were carried out poorly and the sampling of incoming waters was inadequate. Waters from galvanizing operations were not tested at all. The operator did not even have the correct operational scheme or operating regulations available. In written operational instructions for staff, two directives were even found describing how operators should discharge wastewater before sampling so that exceedances of permitted limits would not be detected—essentially a direct instruction on how to cheat. According to the provided operational documentation it was not possible to operate the treatment plant with an average flow of 4,445 m³/day properly and safely. A wastewater treatment plant dealing with cyanides, toxic metals, chemical substances and fluorides was operated by people without the required qualifications. Some measuring instruments were not functioning correctly. Overall, the operation was neglected and poorly maintained. During several months of investigation repeated significant operational leaks of metals and especially precipitated sludge were detected and documented photographically. Chromium, copper and nickel had appeared regularly in wastewater in the past and were confirmed again. Zinc content had never been prescribed for monitoring by authorities and therefore was not controlled. Cobalt appeared irregularly. In one company small amounts of gold (Au) and rhodium (Rh) were used, but these were not detected in chemical analyses. Municipal sewage also entered the chemical sewer, which complicated the investigation at the beginning. Operators arbitrarily and illegally mixed wastewaters of different origins and compositions.

Following an earlier accident (1976), the wastewater treatment plant had two balancing lagoons installed at the outlet. Each had a volume of 13,000 m³. Their purpose was to stop any toxic leak and return the water back to treatment. However, the treatment plant operator, in cooperation with an incorrect and unqualified authority, obtained false permission to change the use of these emergency lagoons into reservoirs of clean water. For commercial reasons the operator had to increase the supply of ultra-pure water for microchip production and needed an operational reserve, so the wastewater lagoons were used for this purpose. At the same time the production of fluoride waters increased, and the treatment plant was often heavily overloaded. Unsatisfactory treatment results were concealed

by changing, without authorization, the sampling system for wastewater discharged into the river and falsifying results. Even so, exceedances of discharge limits were recorded. At the outlet of the treatment plant the operator also dismantled monitoring equipment and analysers without permission.

During the investigation the company director did not allow us access to the operations centre database, so we only had some screenshots from the monitor. Later, police experts managed to break the computer code and download the data in a usable form, but that happened only after I had already completed my expert report. Therefore, I worked only with data provided in PNG and PDF formats. By analysing the time course of the accident, we determined the probable time when toxic substances were released from the treatment plant. We verified that it happened during the night shift, when the operator fell asleep and suddenly discharged a significant tank of untreated cyanide wastewater into the plant outlet. Data from the operational computer later confirmed this in terms of volume. An incorrect coagulant (Al instead of Fe) was used for cyanides, and foam at the river outlet was masked by using silicone defoamer. Several other defects contradicting proper techniques (BAT) were also identified. During the investigation the company management did not take any corrective measures but instead attempted to reject and conceal all findings.



The conclusions of my expert report also criticize several shortcomings in Czech legislation that contributed to both the occurrence and the investigation of the accident. Political interests and attempts to accuse an innocent company DEZA for political reasons also entered the case. Unlike another accident on a different river one year earlier, however, this case was brought to court, and the result was somewhat surprising. The Energoaqua company was finally convicted as the originator of the accident and fined financially after an appeal, but the company director, although responsibility had been demonstrated, was acquitted. In a related proceeding in 2025, the official who had issued the permit to change the use of the lagoons at the company's request was finally convicted. Efforts to amend national legislation ("Lex Bečva") ended unsuccessfully. Moreover, some powers were removed from the Czech Environmental Inspectorate.

Another very serious and widely known accident occurred one year before Bečva accident, in the summer of 2019, involving a leak of Impralit wood-treatment chemical containing the dangerous pesticide propiconazole, with a clearly identifiable culprit. The origin was a German wood-processing company near Klatovy town. The toxic substance escaped during improper handling of a wood-impregnation bath into a stormwater sewer discharging directly into a stream. The water foamed intensely and most fishes died. The Úhlava River, which serves as a drinking water source for the regional city of Plzeň, was poisoned. The city had to secure an alternative water source for its water supply for a considerable time (and expensive operational costs). Subsequently the Berounka, Vltava and Elbe rivers were affected, with detectable traces of the substance as far as Dresden in Germany with its water supply sources. This accident was thoroughly investigated by other experts, but their results did not lead the Police of the Czech Republic to indict the German company, so the case never reached court or punishment, although it was well monitored and evaluated. Such is Czech justice.

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