

# THE PROBLEM OF ECOLOGICAL DANGER OF EXCAVATIONS OF POTASH MINERAL FERTILIZERS

*Ferents N.A.*

Lviv State University of Life Safety

In Ukraine, in particular in Prikarpatye, are located unique polyminerals ores, similar which in the world haven't enough. Their structure includes over 10 different minerals (actually therefore they are polimineral). Intensive developing of polimineral ores of Stebnik city was conducted at the time of the USSR. However, Stebnik's salt sources are known for a long time. Each salt well gave on the average 300 liters of hydrochloric solution for a day. From one liter of solution (depending on concentration) got about 100 - 150 of kitchen salt. Boiled down it in metal vessels-panvas. It was the long and difficult technology. It came to the end with a salt baking in a metal vessel of a conic form which called "fire chamber". Salt in such form could be seen on a table in each house and in an easter basket [2].

In 1772, after the first distribution of Poland, Stebnik came to be under the power of Austria. New owners, having become owners of salt mines, built new mines, established steam-engines, improved the production technology. Hydrochloric solution in mine received by means of fresh water which started from the river Solyanitsi. In 1911 production of kitchen salt reached 50 thousand tons for a year. As a result under Stebnik's territory big chasms-lugovna were formed, and there are 12 of them. One of them – "Brook" – contained in herself 30 554 cbm. of water. Three of them are filled up. Others are for today big threat not only for Stebnik.

Development of deposits of potash ore – to kainite became a turning point in the history of mine. In 1873 the engineer of mine Edward Vindikevich sent kainite to the Berlin laboratory to research. Potash salt appeared remarkable mineral fertilizer. The first attempts of its industrial production in 1911 were carried out by JSC "Cali". From year to year production of kainite grew. If in 1923 it was made by only 9400 tons, in 1939 it was 205 thousand tons of mineral fertilizers. On the basis of advanced technologies of that time the enterprise let out highly profitable and competitive production. With arrival of the Soviet power in 1939 production of kainite grew, and in 1940 made already 260 thousand tons for a year. On an industrial basis it was put an salt production.

The Stebnik state mountain-chemical "Polimineral" was formed in 1946 on the basis of the potash field rich on unique deposits of polimineral ores with stocks about billion tons. Until 1939 in Stebnik annually extracted some hundred thousands tons of potash ore, from 1946 its production grew to 1 million t. In general until 1988 here annually extracted over three million tons of potash ore. The total of the extracted ore from 1923 to 2001 makes 74 305 148 tons [2].

Until 1966 the Stebnik potash combine let out only rawground kainite (without enrichment) with  $K_2O$  contents about 10% and kitchen salt. In 1966-1967 the chemical concentrating factory which let out potassium-magnesium mineral fertilizer (kalimagneziya) with  $K_2O$  contents to 17–18% is constructed. The technological scheme of processing of potassium-magnesium ores it was developed at All-Union research institute of a galurgiya (St. Petersburg, Russia). The essence of

this technology consisted in dissolution of potash salt breeds by hot water, sedimentation of the insoluble clay rest and separation from a deposit of the shined high-concentrated brine and kalimagneziya crystallization from it. However the polimineral composition of potash ores and the high contents at them a clay material (10–15%, sometimes to 20%) considerably complicated technology of their processing. Practically this technology was very imperfect. To waste got not only a clay material, undissolved and ship's biscuits, but also a brine, with the high content of chloride sodium and potassium-magnesium salts.

To Stebnik the field of potash salts was fulfilled by two underground mines with a general power of 4 million t a year. The system of development was chamber-subsurface, height of cameras of 40-60 m, width – 15-22 m, length – 30-150 meters. Ore production, according to initial projects, was carried out without a laying of the fulfilled cavities. For years of work of the enterprise on several underground horizons from 90 to 370 meters cavities about 33 million cubic meters and tens kilometers long were formed. Cavities are divided by interchamber partitions. Penetration into mines of water leads to washing out of partitions, and consequently to a catastrophic flash of a terrestrial surface and formation of failures. Over cavities houses, high-voltage lines, the railroad which connects Truskavets to Kiev, the highway, water rutting which feeds with water of Drohobych, Stebnik are located.

Emergency break of a surface water in underground excavations as a result of an earthquake in Romania of 1978 was especially dangerous. Since then water fills in underground cavities, washes away salt support between the horizons and developments. Water is sated, and already salt brine should be pumped out constantly. Such brine contains K, Mg, Na, S, Cl, Ca, other microcells. In cavities as a result of impregnation of a surface water and on a surface (as a result of their annual pumping out) about 3 million m<sup>3</sup> of a brine collected.

Process of destruction of interchamber partitions in Stebnik's underground developments already has negative manifestations – deformation of blocks under the railroad, on the street of Borislavsk, Solets, under the White Coast is found.

Mining is accompanied by processes of karsting, most intensively such processes develop in salt breeds. The karst is strengthened by technogenic influence distribution differs from development natural by bigger speed and intensity of development, the considerable areas and depth. In the territory of the mining region of Stebnik activization of a superficial karst, development of such phenomena, as shifts, collapses, taluses is observed [3].

Recently there was a new genetic type of earthquakes – the earthquakes caused by engineering activity of the person, or so-called technogenic earthquakes. In Ukraine technogenic earthquakes are also possible. Near the city the Valley during 1974-1976 took place a number of earthquakes which were felt in a zone to epicenter with intensity of 3 - 6 points. Strongest of them took place on January 14, 1976 intensity 5–6, on February 7 on March 1976 - 6 and 1 1976 – 5 points. Probably, they were caused by water forcing in productive layers on Valley oil fields. On June 7, 1987 there was a technogenic earthquake in the city of Kalush of the Ivano-Frankovsk area to intensity 3–4 points. This earthquake was caused by a collapse of a roof of old salt developments [4].

Problems of Stebnitsky SMCE "Polimineral" can become the reason of a technogenic catastrophe in Lvov – to an earthquake. Through threat of its emergence in a zone karst downfall a site of underground developments of the “Polimineral” enterprise it is planned to create seismological station.

**Conclusion.** Thus, developed excavations also are unmortgaged Stebnik SMCE "Polimineral" create threat of technogenic safety of Lvov area.

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