REMEDIATION OF A TAILING POND IN EASTERN SLOVAKIA

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Introduction

Due to adverse effects on the environment, tailing ponds are classified as a very problematic area. It negatively affects all compounds of the environment, including humans, animals, and plants. Tailing ponds mainly affect the bedrock, the quality of air, soil, groundwater, and surface water [1, 2]. People living near a tailing pond are afraid of the sludge as it may pollute the soils and water resources in the surroundings. The tailing pond is located in the eastern part of Slovakia and geologically belongs to the volcanic formations of the Neogene Western Carpathians. Sediments consist mainly of clay, sandstone, gravel, etc. Neogene volcanic rocks are represented by formations with andesites, tuff rocks and rare rhyolites [3]. Next to the tailing is a stream that flows into the Ondava River basin. The source of contamination of these watercourses is the sludge pond. Arsenic contamination in this area has been reported since 1995 and represents one of the most serious environmental risks in Slovakia. The water in the watercourse has a high content of total As in the range from 300 to 11,000 $\mu g.l^{-1}$, as well as a high salinity. The high concentration of As, combined with the high salinity of water, threatens the potential use of water for the surrounding fields, but also for safe irrigation and drinking water [4].

The aim of the study was to propose a suitable method for reclamation of the devastated area, on which there is currently a tailing pond with pollutants and to choose the most suitable method of restoration for the tailing.

Results

Crops for biomass

During last years, before closing, wet ash and slug was stored in the tailing. After closing, the pond must be isolated from the surrounding environment to stabilize the impact. The top surface of the tailing is covered in stabilizer and soil to prevent the leakage of rainwater into the lower layers of solid pollution and thus also prevent the subsequent run-off of the accumulated liquid waste.

Building of a recreation and regeneration centre

After reclamation, first a grassy area and later also trees and plants (e.g. meadow flowers) are planted. Between these plants and trees, a multifunctional playground, where not only children but also adults can play, is build. Near the playground, a freshwater lake with fish, which will then be used for fishing is built. There are several benches around the lake.

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Discussion

The surface treatment of a tailing can be divided into two most basic stages: technical and biotechnical stage. For preventing unfavourable processes in the tailing, it must be insulated, drained from surface and rainwater, but also biological reclamation must be done, for example: soil movement, storage, spreading, etc. To prevent the formation of acids and bases, the sludge must be sealed and insulated properly. It is important to develop selective disposal, so hazardous waste must be deposited in the lowest layer as far as possible. As a result, hazardous waste will not come into contact with fertile soil and will therefore not have any negative effects on plants or even animals. Waste that is not inert must not come into contact with groundwater or seepage liquids. The toxic material must be covered with a neutral material, or if necessary, the storage with toxic material can be covered with a waterproof material for safety. In the final step of the reclamation of the sludge, the material, that is applied to the top layer, works for a long time, which means that it can be compressed or otherwise deformed. The sealing system must sufficiently work against certain water leaks, such as surface water or leak liquids. It is important that this system is resistant to the physical and chemical influences anytime. This sealing layer still needs to be enriched with other technological layers, e.g. drainage, separating, protective or reinforcing.

Conclusion

In Slovakia, there are several tailing ponds that pose not only a great environmental burden but also risk for people's lives. One of them is in the east of Slovakia. There were released polluting (toxic) substances such as PCBs, fly ash and other hazardous substances, which are still deposited in the tailing pond. If it is not closed, the sludge pond will have negative effects on the environment.

It is proposed that the tailing pond be closed as soon as possible, secured against further leakage of pollutants and subsequently recultivated (reclaimed). When proposing the reclamation of the given site, it was found that two ways would be the best for the area, and they are: cultivation of biomass and building of a recreation and regeneration centre. At this resort there would be a playground, a small lake, but also a lookout tower. In both the proposals, their advantages and disadvantages were evaluated. Reclamation will take place through a combination of technical and biotechnical stages. These proposals would be a great plus and benefit not only for the tailing pond but also for the environment and the surroundings of the pond, as high concentrations of heavy metals were also found in the Ondava River.

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