

## Methodological approach on uranium mill tailings decommissioning designing

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A distinctive feature of uranium mining and milling facilities is environmental contamination with solid, liquid and gaseous radioactive waste. The waste are the largest volume in the nuclear fuel cycle and major contributors to the formation of radiation-dangerous situation for the population and the environment despite their relatively low radioactivity. In the past remediation of uranium mining and milling sites including tailings was not considered in detail. Current analysis of the collected materials is allowed to establish features that are valid for the uranium mines post-operational time.

Procedure of non-exploited tailings and other former facilities condition estimation was developed in the course of scientific researches for various climatic zones and highlands. On the basis of field observations and laboratory studies the structure of Atlas on technogenic deposits typical for the uranium mining industry has been created. It was developed and implemented a penetration technique survey of decommissioned tailings which allows to avoid a reasonless risk for personnel when virgin tailings mass sampling.

On the scientific research basis it was determined that a specific approach and technological scheme of remediation should be applied for each climatic zone. According to conducted studies a particular approach should be used to objects located at the arid areas.

As to tailings feature, a special moisture condition inside the tailings bulk is the main difference between the arid area and areas of continental and acutely continental climate. The water lens may be formed in the tailings body if to neglect this factor. According to the studies the nature of water lens formation partly corresponds to desert groundwater feeding regimes through aeration area.

Analysis of the nature shows that for a very long period a water-saturated zone may be formed in the tailings body. The zone is isolated from the surface by mulch layer preventing evaporative processes. Actual data of tailings deposits condition dependent on particles size, density and time of tailings stabilization permit to create a long-term prediction methodology of their humidity condition. According to these predictions it should be developed technical regimes excluding depression curve get into a lower slope of washing type tailings pond.

The "Methodology on environmental pollution damage evaluation of decommissioned uranium mining and milling facilities and estimation of remediation economic efficiency" has been developed and implemented for assessment the remediation works efficiency.

In this Methodology a determination of social damage (damage to health), environmental damage to natural resources (air, water, territory, etc.), property damage (property losses of individuals and legal persons) can be carried out.

Economic efficiency of remediation is confirmed if the revenue of the performed works is positive.

Summary assessment and use of all the above proposed procedures means a methodical approach to the decommission designing of milling plants tailings.

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