



EU Documents of Major Importance Relevant to Issues of Mineral Resource Utilisation

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Abstract

RAW MATERIALS INITIATIVE and REPORT ON CRITICAL RAW MATERIALS FOR THE EU are two documents of major importance as regards the issues of mineral resources of the European Union. The former document calls upon the EU Member States to maximize utilisation of domestic mineral resources, especially as regards those labelled as critical, the latter concerns occurrence of some such critical minerals in the Czech Republic. In actual fact, compliance with the implications of these documents means renewal of exploitation of residual mineral resources. Nonetheless, such activity anticipates positive economic results, and these are conditioned by investment means available for resumption of production. Both investment and operating expenses can be cut down if existing mining capacities are utilized. This paper investigates possibilities of mining resumption in the Czech Republic from the point of view of the methods employed for decommissioning and closure of mines. The so-called “wet” preservation of mines is recommended both for a future easy option of accessing decommissioned underground works and the possibilities of using pit water itself or employing its energy.

Keywords: Raw Materials Initiative, Critical Raw Materials, resumption of mining, closure of mines

Introduction

Mineral resource base is a prerequisite for development of any State. Relevant EU authorities became aware of the momentous significance of the matter, when they realized that major mineral resources are concentrated in only a few states, production is in the hands of a handful of big producers, and that some states dominate production or consumption of some minerals.

In 2008, the Commission of the European Communities issued the document, The raw materials initiative – meeting our critical needs for growth and jobs in Europe. It is the implication of the document that an integrated strategy for management of mineral resources should be adopted, where supply sustainability from EU sources proper plays a major role. At the same time, the Commission calls for a minute assessment of EU critical raw material availability. The exigency had been dealt with by compiling an initial list of 14 critical raw materials in 2011. An update of the list comprising 20 materials was issued in 2014, and a list of 27 items was published in 2017. The principal classifying criterion was constituted by economic importance of specific raw materials and their supply risks. It should be highlighted that some critical materials occur in the Czech Republic as exploitable resources, for example fluorite, natural graphite or tungsten. In the Czech Republic also other two raw materials feature European prominence, namely lithium and kaolin. Responding to demands of the mentioned document, Raw Material Initiative, actually means resumption of mining production.

Is resuming of mining activities a real option?

The history of mining provides evidence of changing fortunes. We witnessed a major downturn of mining activities at

the beginning of the nineties of the past century. In the Czech Republic, a new prioritization initiative for national economy, termination of state subsidies, environmental issue emphasis, as well as political influence they all caused a complete termination of ore mining, an initial substantial reduction and later a complete closure of uranium mines. Production of lignite was almost halved in comparison to production maxima of the past mining operation. Nonetheless, reserves of formerly extracted or other minerals have been left at some mining localities.

Resuming of mining is not an issue of abstract theory. Also in the past, especially concerning ore deposits, closure or reopening of mines followed current supply and demand situation, solving of extraction technical and technological problems or simply the necessity of new mineral exploitation.

If the mine of Cínovec was closed after 600 hundred years of tin and tungsten production, it can be assumed that the production was hardly a continuous one. Apart from ore mining, also resumption of open-cast coal mining could be witnessed in the past.

Lignite mining: Very often, it has been the case that modern large-scale open pit lignite extraction comes across with remnants of former underground mining. The extraction meets with remainder of underground works, encounter unrelated materials or faces outburst of water from old mining works. Consequently, quality of the extracted lignite is impaired, people and machines are at risk of caving in, fires can start, upper bed cracks may occur, or hydrogeological equilibrium is disturbed (Zima, 2013). Nonetheless, problems are being solved and the open-cast mining continues, as only a

fraction of the lignite deposit was extracted by former underground mining.

Ore mining: Tin primary deposits in the territory of the Forest of Slavkov were exploited towards the end of the fourteenth century. From 17th to 19th century, tin mines were alternatively closed and mining resumed. Since the end of 19th century, apart from tin also tungsten has been extracted. The importance of mining for tungsten increased during the WWI and WWII.

Ore deposits of Jáchymov comprised not only silver but also uranium mineral pitchblende. The latter could find no demand and was waste heaped. At the beginning of 19th century, the pitchblende was used for colouring of glass and porcelain. Since the second half of 19th century, it has been the principal item of extraction. After WWII, uranium has become a strategic raw material.

Regarding options of resumed mining activities, on 11th October 2017, a breakthrough document, No. 713, was issued by the Government of the Czech Republic, namely „Zpráva o nutnosti zajištění ekonomických zájmů státu v oblasti využití kritických superstrategických surovin Evropské unie a některých dalších surovin (On Necessity of Safeguarding Economic Interests of the State in the Field of Utilizing Critical and Super-strategic Raw Materials of the European Union, and Some Other Raw Materials)“. The document implies increased governmental control of critical material utilization in the EU, and also tantalum, zirconium, titanium, gold, lithium, and uranium that are called strategic raw materials of the Czech Republic. The obvious burning issue is that of resuming mining activities at the locality of Cínovec.

Cínovec: The history of tin mining at the locality starts in 14th century. Over the centuries, the mining for tin and silver at the locality went through many vicissitudes. Since 1879, the importance of tungsten mining has been increasing. Old dump piles and fills were picked through to collect wolframite. Between 1931 and 1939, the pit was maintained without production. At the beginning of WWII, mining was resumed. Geological reserves of Cínovec I (old enterprise) were worked out in 1978. In 1980, mining activities at the deposit of Cínovec II (southern part of Cínovec) commenced to be finished in 1990.

In 1992, the whole mining area of Cínovec was decommissioned. The Pit I of Cínovec was flooded up to the level of the third floor, from which, through a system of gangways, water flows off at the German side of the Ore Mountains. The Pit II of Cínovec was flooded up to the top level. The third vertical opening – Winze, K 20225 – was backfilled (Kafka, 2003; RD Příbram, 2010).

The Czech mining company, Geomet Limited, was granted exploration permits for Sn, W, Li and other reserved minerals. This company is a subsidiary of the European Metal Holdings Limited (EMH). Recently, test boring has been realized by the company, EMH, and the results give evidence to the fact that the deposit of Cínovec is the largest lithium deposit in Europe and the fourth largest non-brine deposit of lithium in the world (European Metals, 2016). An investment presentation of the company, EMH, from November 2018 shows targeted production rates to be minimally p. a. 22 500 tons of lithium carbonate or p. a. 25 600 tons of lithium hydroxide, inclusive tin and tungsten by-products.

The presentation's investment costs are in excess of USD 390 million, and the isometric model of the underground mine implies usage of the existing underground works. As such, reopening of closed mines poses problem to be solved.

Closure of mines and options for their reopening

Technical measures applied for decommissioning of ore mines included removing of machinery installations to avoid contamination of water by harmful substance, and disposal of entry and long workings. Pits and winzes were decommissioned by (Kafka, 2003):

- Complete fill-up and covering of the pit by a reinforced concrete slab installed at ground level.
- Installation of a reinforced concrete slab at a certain depth and filling the pit above the slab up to ground level.
- Closure of the pit entrance by a reinforced concrete slab, and progressive flooding of the mine.

The first method excludes possibility of resuming mining activities at the pit. If the fill-up had been hardened, putting down of a new shaft next to the filled-up working is necessary. This demands high financial investment and implementation time.

The second method would have been difficult to adopt because of safety precautions. The unhardened fill-up implies cavernous structure which, with lapse of time, may cause sinking of the backfill.

The third method is seemingly the simplest method to apply but it is not as easy as it seems to be.

Not only water from the pit itself but also water from all other underground rooms next to the pit must be removed. Cases might exist, when lowering of the water underground level would only be necessary, nevertheless, this option might also imply necessity of a long-term drainage of water and its purification before watercourse emptying.

Discussion

So far, guiding principles for application of mine closure methods have consisted in execution cost and implementation rapidity. It is obvious that determining factors for mine closure implementation are constituted by efficient safety and precaution provisions. With regard to cyclical development of mining, mine closure planning should consider, whether the mineral deposit has been depleted or some reserve for future exploitation has been left.

If the depletion of currently exploited minerals or other accompanying minerals is the case, safety and financial costs determine adoption of the closure method.

If some mineral reserve exists at the locality, the mine closure method should be employed that would enable resuming of mining activities in future. Past experience and good practice suggest flooding of the pit, i.e. the “wet” method of preservation. Obviously, this is conditioned by stability of environment against contamination, which condition is usually satisfied as regards ore deposits.

If resuming of mining activities is considered an option, the decommissioning project and its implementation should be oriented by the simplest way of reopening the mine in future.

Conclusion

From the point of view of safety, an ideal mine closure method is represented by placing of hardened backfill inside all underground workings. Domestic mining has practical experience with this method – ore mine of Křižanovice and coal pit, Jan Šverma, of Žacléř.

In perspective of renewing mining activities, it is the “wet” preservation, which is an obvious option. Even if the pit

is not reopened in future, it may serve the purpose of a water source or hydro energy reservoir.

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Dokumenty UE o duším znaczeniu dla zagadnień wykorzystania zasobów mineralnych INICJATYWA W SPRAWIE SUROWCÓW i RAPORT NA TEMAT KRYTYCZNYCH SUROWCÓW DLA UE to dwa dokumenty o duším znaczeniu dla kwestii zasobów mineralnych Unii Europejskiej. Pierwszy dokument wzywa państwa członkowskie UE do maksymalnego wykorzystania krajowych zasobów mineralnych, zwłaszcza w odniesieniu do tych, które są oznaczone jako krytyczne, drugi dotyczy występowania niektórych takich krytycznych minerałów między innymi w Czechach. W rzeczywistości zgodność z implikacjami tych dokumentów oznacza odnowienie eksploatacji pozostałych zasobów mineralnych. Niemniej jednak taka działalność przewiduje pozytywne wyniki gospodarcze, które są uwarunkowane środkami inwestycyjnymi dostępnymi do wznowienia produkcji. Zarówno koszty inwestycyjne, jak i operacyjne można ograniczyć, jeżeli zostaną wykorzystane istniejące zdolności wydobywcze. W artykule przedstawiono możliwości wznowienia wydobywania w Czechach z punktu widzenia metod stosowanych do likwidacji i zamykania kopalń. Tak zwane „mokra” zamknięcie kopalni jest zalecana zarówno dla przyszłej łatwej opcji dostępu do wycofanych z eksploatacji robót podziemnych, jak i dla możliwości wykorzystania samej wody pitnej lub wykorzystania energii.

Słowa kluczowe: inicjatywa na rzecz surowców, surowce krytyczne, wznowienie wydobywania, zamknięcie kopalń