

Improvement of Technologies for Mining Waste Management

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Abstract. Mining waste reduction methods include all mining processes beginning from resource distribution until final products in the plant. For comparing and testing possibilities of mine waste reduction, a cooperation project has been set up aiming to create a transnational network with regional networks. The activities carried out on the regional and transnational level will secure better access to knowledge, state-of-the-art technologies and good practice. The study addresses all the waste management challenges and opportunities facing the Baltic Sea Region mining industry, which should be understood as extending to all forms of extraction of natural non-renewable resources.

In addition to the main mineral resource, oil shale, there are sufficient reserves of limestone and dolomite, peat, sand, gravel and clay. Phosphorite and granite are considered as occurrences in today's economic situation, in spite of the fact that phosphorite has been extracted for 70 years in the past. All previous mining activities have produced mining waste, e.g. the total volume of waste rock from Estonian oil shale mining is more than 76 million m³ and covers about 790 ha [21][22][23][24]. From an environmental point of view Estonia is in good position, not having acidic reactions and having neutralising alkaline limestone present in all mining areas. Thanks to this, reclamation is easily done with the help of the same mining equipment. Water is purified in settling ponds and does not require additional chemical treatment. For underground mining, the main concern is the stability of the room and pillar mining area [25][27].

Similar problems are found in Sweden and Finland. In Sweden, there are several old deposits from shale mining, the largest one (Kvarnsjö) contains some 40 million m³ of crushed processed black shales and contains several metals of potential value.

Keywords – mining, waste management, pilot unit, Baltic Sea Region, oil shale, sand, gravel, waste heap.

1 INTRODUCTION

Mining waste management issues have to take consideration in all mining sites. The main aim of mining waste management is to use Best Available Technology (BAT) in production line, giving minimal waste and best products. How to use old waste heaps as raw material is also a problem. A possible solution is to test different mining waste reduction methods and choose the most practical technology for the site [9][12].

In Estonia, two types of mining waste are currently produced: waste rock from oil shale separation and limestone mining fines (grain size 0–4 mm) from crushing and screening. In addition, previously deposited phosphate rock flotation sand and uranium ore processing waste are being handled. Estonia has 48 mining waste objects [11]. Some of them are limestone fines, but most are oil shale fines.

Mining waste is located and measured in amounts and substances: 1) waste rock dumps are located in huge amounts near the areas of abandoned mines; 2) mining waste contains very often metal elements, including a mix of rare earth metals; 3) the total amount mining and mineral processing wastes stored on the waste facilities.

The aim of this study is locate mining waste heaps and analyze mining waste reduction methods and find solutions to use mining waste as product in different mineral resources.

2 METHODS

Mining waste reduction methods include all mining processes beginning from resource distribution until final yield in the plant. For comparing and testing possibilities of mine waste reduction the study addresses all the waste management challenges and opportunities facing the Baltic Sea Region (BSR) mining industry, which should be understood as extending to all forms of extraction of natural non-renewable resources.

The majority of all excavated materials are used in civil, industrial and road building, renewing of road network and railways alone needs many million cubic meters of building stone, gravel, sand and other materials [30].

The Estonian Road Administration put into practice in the spring 2012 the directive regulating mineral resources used in the determination of roadworks. This directive restricts greatly the amount of suitable mineral resources, because filtration coefficient requirements not being fulfilled. In case the quality of a natural resource does not meet the requirements, one option is to use a variety of enrichment to improve the quality. Many quarries, where mining permit is issued, intended for use in road construction, drop out of the competition, because the natural quality and the processed quality are not as required.

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