

6.4 Risk Assessment in the Quality Control of Oil Shale in Estonian Deposit

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Commercial oil shale beds consist of oil shale and limestone layers of various thicknesses. The basic parameter of technological oil shale quality, calorific value, can vary considerably by location in the deposit and depends on concretion and limestone content. The task of the study is to elaborate the risk assessment methods for quality control of oil shale in accordance with technical opportunities of extraction and enrichment processes for various parts of the Estonian deposit.

The available experimental data during the last five years has served for a risk analysis of two different methods: drill-and-blast and selective mining. The drill-and-blast method has the possibility of greater productivity of extraction, but needs additional crushing, sieving and enrichment to separate oil shale and limestone. Crushing, sieving and enrichment in heavy media suspension are necessary to regulation of oil shale quality. Selective extraction allows reduction of rock mass volumes during the loading, transportation and enrichment processes and helps produce qualitative improvement.

For underground selective mining, about 23% of the limestone will be left in the mine for backfilling the excavated areas. For open mining the greatest advantage comes from the use of a surface miner. The surface miner can cut limestone and oil shale seams separately and more exactly than rippers (2-7 cm) with deviations of about one centimeter. It is estimated that precise cutting enables a surface miner to increase the output of oil shale up to one tonne per square meter.

Risk assessment allows selecting suitable ways for achieving enhancement of quality of oil shale using different mining technology in various parts of the Estonian deposit and has the ability to solve problems of quality control of oil shale in accordance with technical opportunities for extraction and enrichment processes. Risk assessment methods help correct selection of technological aspects for prospective development of mining under various mine-geological conditions.