STABILITY OF THE DAM AT THE SILLAMÄE TAILINGS POND

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1. Introduction

The tailings pond at Sillamäe is contained by a dam located 30 to 50 meters from the waters of the Baltic Sea, which provide intense erosional pressure. The tailings pond was begun in the 1950s, at which time the height of the dam was 12 m. It has been increased since then to 25 m. The apparently relatively unplanned buildup of the dam and a lack of maintenance have led to a decrease in the stability of the dam. In the worst case, the dam could fail and release the chemically and radioactively hazardous tailings into the sea. Estonian, Norwegian, Swedish, and Finnish specialists have investigated various aspects of the dam’s stability. This paper summarizes their findings and makes recommendations for further work.

2. Construction of the Tailings Pond and Investigations of Dam Stability

2.1 CONSTRUCTION OF THE TAILINGS POND

Material from ore processing at the Soviet Sillamäe Metallurgy Plant was initially deposited directly on the ground at Cape Päite, the location of the current tailings pond, with no confining structure. Some of the material filled in natural depressions and pits. In the summer of 1959, construction started on a dam to contain the material, with the boundaries of the current tailings pond (Fig. 1). The dam was constructed from local gravel. Cross dams formed three compartments. Initially, tailings were sent to the western compartment. Oil shale ash was transported in a water slurry from the power plant and deposited in the middle and eastern compartments. The water was removed through wells. Soil was not compressed in the foundations of the dam.

At the end of 1962, transport of tailings to the western compartment was stopped. The absolute height of the tailings at the pipe mouth was 12.35 m. In 1964, tailings were sent to the middle compartment, and the dam height was raised to 16 m. Tailings were diverted back to the western compartment in the summer of 1964, so that the...
The middle compartment could dry out, and tailings were delivered to the middle compartment after August 1964. At the end of November, construction of the dam to the eastern compartment began.

Records are not available for the period from 1964 to 1984. In 1984, all three compartments were filled, and the dam was raised to an absolute height of 22 m. The current absolute height of the dam is 24.5-25.5 m. The fill was gravel, pit sand, oil shale ash, limestone, debris, and trash, which was not compressed during construction.

Initially, uranium was produced in the Sillamäe Metallurgy Plant from local dictyonema shale. Later, concentrates were imported from Czechoslovakia, Hungary, the German Democratic Republic, Poland, and Romania. Early in the 1970s, loparite processing was started with material from the Kola Peninsula. This material contained uranium and thorium, which were sent to the tailings pond. The plant currently is operating at about 20% of capacity, producing rare earths and rare metals from concentrates imported from Solikamsk.

2.2 SUMMARY OF INVESTIGATIONS 1965 - 1992

The archives of Silmet Ltd., from the Sillamäe Metallurgy Plant, indicate that twelve investigations were made from 1965 to 1992. Four of these investigations [1, 4, 7, 12]