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THE STORY OF OIL SHALE MINING RESEARCH

During World War I an exploration expedition headed by an experienced geologist **Nikolai Pogrebov** was sent to Estonia to prospect oil shale occurences from Tallinn to Narva. They explored oil shale bed and took samples for laboratory research in Petrograd. In 1916, an experimental open cast was founded at the Järve village, and 22 waggons of oil shale were sent to Petrograd for industrial tests. The results were successful, and some private companies started to prepare mining fields.

After declaring the independence of Estonia in 1918, the Estonian Government began to occupy itself with the problems of oil shale utilisation. The Bureau of Mining Technology founded at the Kukruse mine 75 years ago, in 1923, carried out investigation and exploration projects on the concession area of the Estonian Oil Shale Co. The staff of this Bureau studied underground mining methods and designed new mines.

Above-mentioned works were planned and carried out by Estonian mining engineers employed by Estonian Oil Shale Co. (**Jaan Aarmann, Oskar Vuht, Arnold Kirschbaum, Karl Feldweber**). This company managed the mines and company departments, and in addition to that carried out the research work. In 1918-1940, theoretical research in geological field was carried out under supervision of the professors of Tartu University **Hendrik Bekker** and **Armin Öpik**. On the 64th Meeting of the Institution of Petroleum Technologists in May 9, 1922 in Paris, the problems concerning Estonian kukersite were discussed for the first time. Since then the mining and processing problems of Estonian oil shale were published in scientific and technical journals in English, German, Russian, and French languages and this action continued up to 1940. At that time, the scientists in the field of oil shale utilization and economy best known abroad were Prof. **Paul Kogerman** and **Karl Luts**.

In 1937, the Geological Committee at the Ministry of Economical Affairs was established which financed geological prospecting and exploration ordered by mining department. The members of the Committee managed and performed the fieldwork. Another institution, the Institute of Natural Resources was also established in 1937, its geological department carried out geological exploration for the mining

enterprises. Research samples taken by both institutions were analysed in the laboratories of Tartu University and Tallinn Technical University.

The department of mining at the Tallinn Technical University was established 60 years ago, in 1938.

The Geological Department belonging to the Central Industrial Research Institute had become active in 1940-1946. In 1947, the department was subordinated to the Estonian Academy of Sciences and the Institute of Geology was established. It dealt mainly with scientific problems of geology in Estonia.

Oil shale mining in Estonia was essentially expanded after World War II. An intensive and productive long-wall mining method known from Russian coal mining was taken into use. The use of this method caused the subsidence of overburden, and sometimes the ground surface collapsed. In 1946, the surveyor of the Estonian Oil Shale Mining Co **Viktor Semjonov** organized monitoring on the field of the *Käva* mine for studying the moving of overburden. Since 1949-1950, the Russian surveying institutions carried out the roof control study in all Estonian oil shale mines. In 1953, the Leningrad Mining Institute and the Russian Coal Mining Research Institute VUGI carried out extensive studies of overburden subsidence by both room-and-pillar and long-wall mining method. D. Sc. **Maksim Gazizov**, a geologist of Estonian Oil Shale Mining Co., explored the carst on Estonian oil shale fields, and adviced radical changes by distribution oil shale field and direction of mining. Prof. **Aleksandr Hanukajev** from the Leningrad Mining Institute has studied blasting problems in Estonian oil shale mines and open casts.

As the oil shale mining production was essentially raised, 40 years ago, in 1958, the Oil Shale Research Institute was established for extensive research into oil shale mining and processing problems. The main problems of the mining laboratories of the institute were:

- Room-and-pillar mining technology and roof support by anchor (**Ülo Samlan, Leo Talve**)
- Designing of mining machinery especially for oil shale mines (**Albert Tiro**)
- Blasting and drilling (**Enno Reinsalu, Roman Petrov**)
- Oil shale quality and benefication problems (**Enno Reinsalu**)
- Reclaiming of out-mined areas (**Leopold Lainoja**)
- Economical problems of mining (**Raimond Kala**)

In 1965, the mining laboratories of Oil Shale Research Institute were liquidated, and the scientists and engineers were incorporated into the technological and design department of the Estonian Oil Shale Mining Co. As that department was not a scientific institution, the Estonian Branch of Skotchinsky Mining Institute was established in Kohtla-Järve

30 years ago in 1968. The majority of leading research workers of the Oil Shale Research Institute who had research experience and had been employed by Estonian Oil Shale Mining Co. during 1965-1968 came to work in this new institution.

The task for this Estonian Branch was to research the problems regarding all the oil shale mining industry in the USSR and to help the direction of mines to solve the current problems of mining. The main problems were:

- Long-wall mining by shearer and tunnelling problems (**Alo Adamson, Viktor Andrejev, Erik Kaljuvee**)
- Roof stability, ventilation and ecological impacts of room-and-pillar mining (**Ülo Samlan, Arvi Toomik, Viktor Undusk**)
- Drilling and blasting (**Roman Petrov**)
- Surface mining and reclamation technology (**Leopold Lainoja, Nikolai Timofeejev**)
- Geology and hydrogeology of oil shale deposits (**Nina Domanova, Anatoli Levin**)
- Mining economics and oil shale mining and utilization prognoses (**Jakov Frayman, Enno Reinsalu, Galina Tishkina**)

A lot of research for oil shale mines was done by the Leningrad Surveying Institute (**Gennadi Ivanov, Aleksandr Plahhov, Vitali Steshchenko**).

After restoration the independence of Estonia, the scientific staff of Estonian Branch has been employed by the Applied Research Survey of the Estonian Oil Shale Mining Co.

The staff of the department of mining at Tallinn Technical University has been engaged in research of different oil shale mining problems:

- Research of wooden anchors for supporting the tunnels (**Ludvig Kalman**)
- Ventilation and supporting of underground workings (**Jaan Aarmann**)
- Oil shale mining, crushing and concentrating technology (**Alo Adamson, Elmar Kotkas**)
- Anchor supporting, rheology and long time stability of pillars in the case of room-and-pillar technology (**Leo Talve, Jüri-Rivaldo Pastarus**)
- Geology and mineralogy of oil shale and other useful minerals of Estonia (**Kalju Ojaste, Enn Pirrus, Alfred Reier**)
- Optimization of oil shale mining and trading (**Heino Aruküla, Enno Reinsalu**)
- History of Estonian mining activities (**Lembit Uibopuu**)

There are two active mining research institutions in Estonia celebrating the anniversary in 1998: the Mining Department at the Tallinn Technical University (since 1938) and the Applied Research Survey of the Estonian Oil Shale Company (since 1958).

Lembit Uibopuu