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EDITOR'S PAGE

NEW TRENDS IN ESTONIAN OIL SHALE INDUSTRY

Energy crisis is visible. It is difficult to pay attention to anything else when we do not have the energy we need. It drives economic growth all over the world; it gives us comfort and security. The ever worsening availability of traditional energy sources, as well as the growth of energy prices and world energy consumption have generated global interest in oil shale resources for oil and power production. Oil shale deposits range from the Early Palaeozoic to the Cenozoic in age and its reserves in the world are immense, exceeding the resources of other solid fuels (coal, lignite, brown coal) everything taken together. Total shale oil resources are estimated to be 3.2 billion barrels, more than three times higher than the proven conventional oil reserves.

We cannot afford energy at any cost. It means that we have to ensure that we take good care of the environment as well as society together. World oil shale science and technology have a long history, however, with considerable ups and downs. Depletion of oil reserves and emphasis on energy security can be expected to give an impetus to much wider and more complex oil shale research in the near future.

The role of oil shale is very important in Estonian economy, particularly in employment and regional development. The oil shale industry accounts for 4% of Estonia's gross domestic product. At the same time, it is responsible for generating the majority of wastes polluting air, water and soil. At present oil shale is chiefly used for production of power, heat and shale oil, and small amounts go also for cement production.

Up to 1960, the main oil shale consumers were the Kohtla-Järve and Kiviõli shale oil plants, and the railway. Fine oil shale was used as a fuel at local power stations. Later large power stations using oil shale were launched in Narva – the Baltic Thermal Power Station in 1966 and the Estonian Electric Power Station in 1973. This altered the structure of oil shale consumption: about 80% of the oil shale mined was used for producing energy. Oil shale production reached its peak in 1980 when 31.3 million tons was mined. By now oil shale production has stabilized at a level of some

17–18 million tons per year. In 2011 18.7 million tons of oil shale was mined.

Most of the oil shale mined in Estonia today is used as a feedstock for the production of energy. The energy company Eesti Energia AS with its 500, 000 customers and more than 8000 employees is the leading Baltic energy utility as well as one of the biggest companies in Estonia, which generates 95% of the electric power produced in the country. Now the situation will be changed, because from January 1, 2013 the energy market will be opened in Estonia to free competition. Also from the start of the third phase of the EU Emissions Trading System, from 2013 onwards, the energy sector must buy all its allowances at auctions or in the market.

The price of oil shale electricity is hard to be reduced, because variable expenses exceed the anticipated long-term market price, and millions of EUROs have to be expended to remove slag heaps and clean the ground-water and air. It means that in the open market it is difficult for oil shale energy with high CO_2 emissions and environmental problems to be competitive. The assessment of subsidies and their size should presuppose a broad-based social agreement and depends on politicians, because state taxes and the green energy support remain fully under the politicians' control. But one is clear – more producers with low variable expenses in the market give the opportunity to receive lower-price electricity.

A greater prospect is in shale oil market. The total oil resource in the Estonian deposit is close to 1000 million tons. Presently shale oil is mainly used for producing fuel oil, and small amounts go to the production of calcined petroleum coke and road asphalt. Also phenols, resins, glues, impregnators, tanning agents, mastic, and other products are produced. During the last decades, two methods were used for shale oil processing. The Kiviter process (vertical retorts with internal heating, some 1000 t oil shale per day) with the use of enriched high-calorific oil shale ensures a 15–17% oil yield. Unfortunately, large amounts of organic matter get lost with harmful semicoke, which is deposited in large waste piles.

The Galoter process with the solid heat carrier, in which poorer fine oil shale is used, has lower environmental impacts. The process is based on introducing dried oil shale, less than 25 mm in particle size, into an aerofountain drier where it is mixed with the hot (740–810 °C) shale ash produced from oil shale semicoke. In the Galoter process the oil yield is 11.5–13%, which is 3–5% less than in the Kiviter process, but advantages are: ash is less harmful to the environment, the concentration of organic substances is below 1% and unriched oil shale of lower calorific value can be used. Narva Power Plants plan to install two new Galoter (TSK-280) devices, thus bringing the daily throughput of oil shale to 12,000 tons. Viru Keemia Grupp in Kohtla-Järve started to install new Galoter devices and this brings the total number of solid heat transfer retorts to six with a total throughput of some 6 Mt of oil shale per year in the near future. All this together with vertical retorts would supply more than 7 million barrels of

shale oil per year. Market conditions are good and it means that our oil shale industry should move more to oil processing.

Another promising area in the oil shale industry is the gasification of oil shale. Also gas supply is open to act as market rules. In Soviet Estonia the development of the oil shale industry was the main priority and mining capacities increased rapidly. This was primarily needed to supply the city of Leningrad with power and oil shale gas. By the end of 1954 more than 227,000 flats accommodating a total of 2.5 million people had been gasified on the basis of Estonian oil shale. The production of oil shale gas from kukersite oil shale was an industrially successfully implanted process. But only a comprehensive economical analysis can give an answer about the profitableness of this kind of production. Important are also environmental problems, first of all, those related to the residue of organic matter in the solid rest of pyrolysed oil shale.

The energy system is the single largest source of anthropogenic greenhouse gases, therefore it is no surprise that decarbonising the supply of energy services is a key element of climate change policy. The world faces a global energy dilemma: can we have secure, reliable and affordable supplies of energy and, at the same time, manage the transition to a low-carbon energy system? The International Energy Agency forecasts a 40% increase in global energy demand between 2007 and 2030 and identifies China and India as the main focus of growth. As we know, China is one of the biggest miners of oil shale in the world and the major polluter of the environment as well. It is now widely recognised that the current carbon-based energy system is unsustainable and costly, both financially and environmentally. We should take it into consideration in Estonia too and the decrease of the share of oil shale energy here is unavoidable. It means that we sould find for oil shale more profitable fields of use with less environmental impact.

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