

EDITOR'S PAGE

TODAY'S RAINBOW ENDS IN FUSHUN

There is a legend my old friend US oil shale expert Robert Loucks from Colorado used to tell me – a story telling that there is a pot of gold buried at the end of Rainbow. The only thing you need to do is just to find out where the rainbow ends.... But the trick is that rainbows often tend to change their location, so sometimes the pot of gold is not there any more when you start to dig.



Digging with high expectations but poor preparation was exactly what happened in Colorado back in the eighties of the last century but this is obviously not the case on the opposite side of the globe today. Oil shale fellows of Fushun Mining Group, Liaoning Province, China, seem to know exactly where the Rainbow really ends, and they have planned their activities accordingly.

Fushun region has a long oil shale development history – almost as long as Estonia. Already in the early twenties of the last century oil shale retorting in simple vertical retorts was started, shortly followed by commercial-scale operations. A number of technological modifications were implemented for Fushun type of retorts during almost seventy years of commercial operation, dozens millions of tonnes of oil shale were processed and millions of tonnes of oil products produced.

No doubt that the end of the fifties and the beginning of the sixties was the most successful period for oil shale industry within the last century. Vast amounts of shale were processed into oil in many locations all over China, but mainly still in Fushun and Maoming.

Since 1965, oil shale usage in Fushun started to decline, and in the middle eighties SINOPEC Ltd, the operator of oil shale processing facilities in Fushun region, finally shut down all oil-shale-related operations. That was the end of one period in the Fushun oil shale development history.

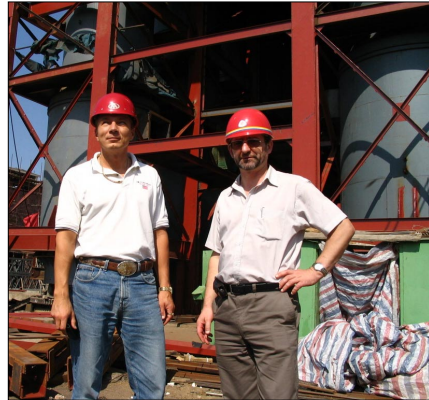
Fortunately Fushun area is not only blessed with coal and oil shale recourses, but also with open-minded people – in the late eighties another local company, Fushun Mining Group, applied for approval to start a new oil shale industry additional to their coal-based operations. The decision-making process was surprisingly quick, and a new oil shale processing plant with twenty next-generation Fushun-type retorts was started up in 1991. New era in oil shale development began.

Today Fushun operates one of the newest oil shale plants in the world – since 1991 they have constructed and put into operation eighty new Fushun-type retorts, a boiler plant and a small-scale power plant operating on shale gas. Eighty retorts are operating in four independent sets, twenty retorts in each. In 2003 total throughput of the plant was close to 3 million tonnes of shale, what gives Fushun factory the first place in the world by capacity.

Today's Fushun retorts are typical vertical retorts with three sections – preheat/drying, retorting and combustion section. Oil shale is moving through retort by gravity and is removed from the retort through rotating hydro seal – similar to the system used in Kiviter retorts in Estonia.

Besides some similarities in construction and operation, Fushun and Kiviter retorts have a number of significant differences as well:

1. Fushun retorts are operated in sets and have some units of equipment designed for the whole set, not for a single retort:
 - Each set of retorts (not each retort as in the Kiviter case) has its own heat carrier preparation unit.
 - Rotating hydro seals of ten retorts have a common engine for their moving – each rotating hydro seal is connected to the long shaft of that engine.
2. Gas heat carrier is prepared in heating furnaces located next to the retorts. Heating furnaces are operated in two cycles – combustion cycle and gas heating cycle:
 - During the combustion cycle shale gas and air are inserted into the furnace and combusted there. Hot combustion gases pass through the furnace heating it up to 1000 °C. Finally all combustion gases are directed into stack. After the completion of the heating cycle, air and combustion gas pipes will be closed and combustion process will be finished.
 - During the following heating cycle shale gas is inserted into the opposite part of the furnace, heated up by the heat accumulated inside the furnace and, reaching finally the temperature 750 °C, moves out from the furnace. The leaving hot gases are directed to the retorting section of each retort by gas pipes.
3. Hot gases and oil vapors move from the bottom to the top directly (in Kiviter process they move diagonally).
4. There is a combustion section in the bottom zone of Fushun retorts, where oil remains and residual organic matter of oil shale are combusted before their removal from the retort.
5. In the condensation system there are no Venturi pipe and undirect water and air coolers. There are water and air direct-cooling scrubbers instead.
6. There is no further treatment to get different grades of oil – oil goes to the market as one product. However, heat values of the produced oil and gas are higher compared with Estonian oils and gases from the Kiviter process.



Mr. J. Purga visiting construction of the new oil shale plant at Fushun, China, in 2004



All the surplus gas produced at Fushun Mining Group oil shale plant is used in local boiler house or in recently installed combi power plant operating four 350 kW Otto engines for power generation. Before using in engines, H_2S is removed from the gas by a simple but high-efficient unit designed at the plant.

Market conditions for shale oil in China are extremely favorable because of total liquid fuels' shortage. Selling price of shale oil exceeds shale oil selling prices in Estonia and Western Europe by over 50%.

In addition to the existing factory there is a new oil shale plant under construction currently – two sets with 40 new retorts identical to the existing ones will be started up in April next year.

Since 2001 Fushun Mining Group has been searching for advanced technology for processing fine-grade oil shale as Fushun retorts accept only lump shale. As the result, Canada's ATP process has been selected for implementation in the nearest future. Feasibility Study is conducted, and the project for construction of 1.75 million-tonne ATP plant is waiting for the imminent approval.

Development of oil shale industry has always been and still is challenging and involves higher risks compared with processing and development of conventional fuels. Therefore it is always a great pleasure to see this industry blooming, no matter in which corner of the globe.

On behalf of OIL SHALE Advisory Board I wish all the best to our Fushun colleagues and certainly hope that their success story puts the Rainbow over other oil shale deposits around the world as well.

Jaanus PURGA
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of Viru Chemistry Group Ltd.