

UTILIZATION OF OIL SHALE SEMI-COKE – STATE OF ART AND PROSPECTS

Dr Rein KUUSIK, SC Kunda Nordic Cement Aadu Kana(a), dEstonian University of Life S Kadri Karp(b), TUT Ants Martins(c), TUT Tõnu Pihu(d), University of Tartu Toomas Tenno(e), TUT Andres Triikkel(f)

Tallinn University of Technology (TUT), Leading Research Scientist, 5 Ehitajate tee, 19086, Tallinn, Estonia, rein.kuusik@ttu.ee

- (a) Dr
- (b) Prof
- (c) Dr
- (d) Dr
- (e) Prof
- (f) Prof

Characterization of semi-coke (SC) forming at retorting of oil shale (OS) as well as a review about the latest results in utilization of its residual value in different directions will be presented. Equilibrium and non-equilibrium processes of interaction of the components of SC and water will be discussed and modelled. Environmental hazards of deposition of SC and possibilities of decreasing those hazards will be analyzed.

Different aspects of utilizing the remaining energetic value of SC via combustion of it in grinded form in pulverized firing (PF) boilers have been discussed. No specific combustion problems should be present, but some flow handling problems could rise due to higher capacities needed to keep nominal heat rate of boiler. By combustion tests it was shown that lumpy SC with moisture content $W_r < 10\%$ can be burnt in circulating fluidized bed mode individually, at $W_r > 10\%$ small amounts of OS must be added. Calculations show that the heat output of boiler using annually 525 000 t of dry SC will be 114 MWth. Additional utilization of the physical heat of hot (500 °C) SC increases the total heat output up to 121 MWth.

Industrial-scale test at operating cement plant (SC Kunda Nordic Cement) demonstrated the possibility of using SC, but also pointed out the problems limiting the share of SC that could be added as a component to the raw materials flow.

A recultivation substance was obtained by neutralizing alkaline SC with acidic sphagnum peat at the volume ratio 1 : 1. It can be enriched with nutrients using organic residue such as sewage sludge, manure, etc. Using of the formed recultivation substance – compost gives additional yield by strawberry, beetroot and rutabaga. The positive effect of composts could be related to the increase in soil pH – from 5.4 to 6.5 as well as to increased content of available macronutrients.