

OIL SHALE AS A POWER FUEL

Oil shale is an energy-producing raw material widely distributed in the whole world. Oil shale resources are often estimated basing on the yield of oil formed at thermal decomposition of oil shale organic matter. Thus it is considered to be an additional reserve of liquid fuel.

However, oil shale is a fuel that may be directly combusted in boilers of power plants. The Republic of Estonia is the only state in the world that provides itself with electricity generated at oil shale-fired power plants. If needed, Estonia can export power as well. We have gained a more than 80-year experience of oil shale combustion at power plants.



Oil shale resources in Estonia are huge – estimated to exceed five billion tonnes. Two mines and two openpits are in operation. Estonian oil shale is a fuel characterized by low moisture content (11–13%), high content of mineral part (60–65%), low heating value (8.3–8.5 MJ/kg), and considerable amount of chlorine in its organic matter (0.75%). As for the composition of mineral part, oil shale is comparable with fuels of a most complicated nature as it contains much calcium, silicon, iron, sulphur, alkali metals etc. Such a specific composition causes numerous troubles at combustion – fouling of heat transfer surfaces of boilers, high-temperature corrosion, special problems at heat exchange, cleaning of heating surfaces from ash deposits, the impact on the environment etc.

Until the middle of the 1940s oil shale lumps were combusted on the grate. Thereafter the technology of pulverized firing was taken into use. By now we have reached an era in which combustion in fluidized bed is being applied. The first boilers with circulating fluidized bed were started in 2004. This technology has proved to be successful with regard to both the efficiency of heat production and environment protection.

The development of technology of oil shale combustion has occurred synchronously with general trends in solid fuel combustion, but the design of

oil shale boilers (especially design and location of heat transfer surfaces) differs from standard solutions because of special features of oil shale composition.

While the efficiency of oil shale combustion is high, thermal efficiency of an energy block as a whole is not high enough yet. Steam parameters determine the efficiency of the whole energy unit, and the key question is how to switch to supercritical parameters.

This special issue of *Oil Shale* is dedicated to oil shale as an energy-producing solid fuel combusted at thermal power plants.

Problems of oil shale combustion in boilers with circulating fluidized bed are dealt with. The impact of power production on the environment is examined in numerous papers as well.

Professor Arvo OTS

The papers published in this issue have been discussed and approved by Editorial Board and presented for publication as the special issue of the journal. The papers have been prereviewed.

Professor A. Ots, Member of Estonian Academy of Sciences, is the editor of this special issue.