

OIL SHALE FLUIDIZED BED RETORTING TECHNOLOGY WITH CFB FURNACE FOR BURNING THE BY-PRODUCTS

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Abstract: The plant unit which consists of a fluidized bed retort and CFB furnace for burning the by-products of retorting (semicoke and semicoke gas) is presented in this presentation. The oil shale retort consists of a fast fluidized bed shaft, coarse semicoke bit, semicoke separation chamber and cyclone for the separation of fine semicoke particles. The crashed oil shale and hot ash from the CFB ash separator are fed concurrently into the fast fluidized bed shaft. For fluidizing the mixture of oil shale and hot ash particles, the recycle semicoke gas is used. The pyrolysis of oil shale begins in fluidized bed and is completed in the semicoke separation chamber.

The retorting process in the fluidized bed retort depends substantially on the fraction composition of oil shale: on the one hand, the large amount of coarse particles in the prepared shale enables to remove coarse semicoke particles directly from fluidized bed (during processing and combustion the oil shale particles preserve the permanent volume), but on the other hand, the overall load of the retort will decrease while the increase of bed depth is not desirable. Practically, the fraction composition of prepared oil shale depends on the crushing technology.

The coarse semicoke particles are separated from fluidized bed directly while the medium size particles are separated from the gases in the semicoke separation chamber and the finest semicoke particles in the cyclone.

The semicoke and semicoke gas are completely burnt in the furnace of circulated fluidized bed boiler in the temperature range from 800 °C to 850 °C. In this temperature range the retention of sulphur dioxide formed during the semicoke and semicoke gas combustion is provided for about 99% due to the high CaO content in the semicoke ash. Hot fly ash is separated from the ash-laden furnace gases and partly fed into the fluidized bed retort as a solid heat carrier. The remainder of hot fly ash is cooled and fed back into the furnace for the control of combustion temperature or separated from the process. The steam generated by combustion of semicoke and semicoke gas could be used for electricity or/and heat production.

The semicoke ash is separated from flue gases in the CFB ash separator. A part of separated hot ash is fed into the fluidized bed retort as a solid heat carrier material and the rest into the furnace through the ash cooler or separated from the process.

The described plant unit is useful for retorting oil shale and other solid hydrocarbon-containing fuels. The advantages of the present retorting process and system are: improved oil yield, greater throughput, lower retorting time, avoidance of moving parts in the retorting zones, reduced downtime, etc. A new plant unit for oil shale oil production has been elaborated and defended by the Estonian Utility Model EE 2007 00671 U1.