Natural gasoline extraction and syngas production from oil-shale retort gas

Master Thesis

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Abstract

The objective of the thesis was to evaluate options to optimize the Petroter shale oil production process in Viru Keemia Grupp by gaining additional value from a by-product: semi-coke gas.
Currently the gas is utilized by combustion in a power plant, producing electric energy and heat. The economic value of this utilization method is low, ca4€/MWh. SO_2 emissions are generated in the combustion process, asthereisH_2S content in the gas. To meet environmental regulations, significant expenses are made to capture and deposit the SO_2 emissions. These expenses contribute to the low economic value of the combustion process. Two different options were investigated. First option was to capture the natural gasoline fraction from the gas prior to combustion and gaining additional economic value from the gasoline sales. Second option was to separate H_2 S and CO_2 from the gas prior to combustion and convert those into valuable products - solid sulphur and syngas, a mixture of H_2 and CO – in a novel AG2S™ process. This way, H_2S can be neutralized completely and S generation can be avoided. Additional economic value can be gained from sulphur sales, syngas sales or combustion, and elimination of SO_2 removal costs.
Two possible methods for gasoline fraction recovery were investigated: condensing by cooling the gas and recovery in a simplified lean oil absorption system. Simulations for both methods were carried out in Aspen HYSYS® software. Simulations for AG2S™ process were carried out in a special calculation package at Politecnico di Milano. Calculations for acid gas separation system were carried out in Aspen HYSYS® software. The financial effect of the optimization options were evaluated, based on the calculated revenues, capital and operational costs.