6.3 **Modeling analysis and optimization for an oil shale process**

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A steady-state computer model has been developed to simulate a new vertical lump oil shale pyrolysis pilot plant in China. Physical properties for the computer model are based on two oil shale feedstocks that will be used at the new oil shale plant. A computer-based stoichiometric reactor model is used to simulate pyrolysis in the retort reactor. The pyrolysis stoichiometric equations used in computer retort reactor model are derived from Fischer Assay test data. An additional reactor model is used to simulate recycling fuel gas combustion which provides heat for the whole pyrolysis process. The pilot test results of the pyrolysis process for the two feed-stocks are available for comparison with the simulation results at various process operation conditions. The computer model was optimized by optimizing models of the gasification, water shift, and pyrolysis reactions all of which are important processes inside the retort. After optimization, model results were compared with pilot test data and were found to be in very good agreement for mass flow, flow composition, and heat balance throughout the process flow streams. This computer model was also used to investigate operation issues for the pyrolysis process such as caking prevention, oil yield improvements, waste heat utilization, and process energy efficiency improvement. Some of these findings may be used in design optimization for this process and other vertical lump retort systems.