

10.3 **Process Modeling for the Development of Oil Shale Retorting Processes**

Rick Sherritt, Jimmy Jia, Meilani Purnomo, Jim Schmidt

PROCOM Consultants Pty Ltd, Darra QLD, Australia

Today's commercially-available process simulation software packages are valuable tools at all stages of the development of oil shale conversion processes. The simulators' built-in unit operation models can be used to represent all oil shale processing steps including drying, pyrolysis, combustion, heat recovery, oil recovery and gas cleaning. Most simulators allow the creation of user-defined oil-shale-specific components that do not exist in their databanks. Pure mineral components can be split and lumped together to derive a reduced number of components and corresponding thermodynamic properties that reduces complexity but still adequately represent all mineral reactions. For organic components with unfixed elemental composition such as kerogen and char, thermodynamic properties can be derived from correlations for coal. Example simulation models for hot solid recycle and gas recycle processes are given.

Once a model is developed, simple laboratory tests can be used to characterize the feed and a process can be evaluated. At the piloting stage of process development, the same model can be used to check and reconcile pilot plant data and derive better model parameters automatically using the simulators' optimization feature. With more operating data, model parameter correlations can be derived. Once tuned with operating data, the validated model is the ideal prediction tool for evaluating alternate feeds and processing conditions. The predictor model can be used to generate design information for future plants and to minimize projected capital and operating costs. The capability and intricacies of a few popular simulators to model oil shale retorting processes are compared.