4.1 **The Clean, Shale Oil Surface (C-SOS) pilot plant process**

Kent Hatfield, Craig Eatough, Steven Eatough

Combustion Resources, Provo, UT, United States

A new, Clean Shale Oil Surface (C-SOS) Process with two pending patents has the potential for high processing capacity, on-site separation, and oil upgrading. A new type of kiln replaces the complicated, low capacity retorts often employed and eliminates the need for a separate rotary kiln for spent shale recycling to reduce heating costs. A pilot-scale facility has been completed and includes shale processing and oil separation and collection steps. The vaporized shale oil is cooled by contact with a recirculating liquid in a series of five packed columns operating at progressively lower temperatures. The liquid used for cooling is a collected and recycled lower boiling oil fraction. A compressor is used to draw the gases from the entire system and to also provide a pressure discharge so that the C4-C6 compounds can be condensed from the gas stream. The remaining fuel gas can be used in the process. Each boiling point fraction is stored for later analysis. Laboratory tests will establish operating conditions and hydrogen requirements for hydrotreating and hydrocracking each of the shale oil cuts. The process is operated and controlled with a customized system which makes use of Opto 22 hardware and software. One hundred forty eight tons of oil shale ore have been acquired from the BLM White River Mine stockpile, with the assistance of OSEC and Sage Geotech. Parametric experimental tests for operation of the facility are being conducted and the results from preliminary testing will be presented. Initial objectives are to perform material and energy balances and determine product quality.