

Pilot plant test data for Combustion Resources' Shale Oil Surface process

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Combustion Resources' Clean Shale Oil Surface (C-SOS) Process with two pending patents has the potential of high processing capacity with on-site oil separation and upgrading. The completed pilot-scale facility includes shale processing in an indirect, cross-fired, rotary kiln, followed by shale oil separation from spent shale, and gas and oil collection. The shale oil is cooled by contact with a recirculating liquid in a series of packed columns operating at progressively lower temperatures. The liquid used for cooling is the recycled lower boiling point shale oil fraction. A compressor is used to draw the gases from the entire system and to provide a pressure discharge so that the lighter hydrocarbon compounds can be condensed from the gas stream. Over 35 pilot plant runs have been completed during the past ten months. Laboratory property measurements characterized the feed shale and the spent shale together with the oil products and the fuel gas. Oil conversion percentage from the feed shale was determined and material and energy balances evaluated. The indirect-fired, rotary kiln, with an internal shell of 0.83 ft diameter by 7 feet long, has a peak capacity of about 6 tons/day. Test variables included kiln shell rotation rate, shale moisture percentage, shale feed rate, steam sweep gas rate, natural gas burner firing rate and shale particle size. Test oil shale was obtained from the U. S. Bureau of Land Management, White River Mine, Utah storage pile, ground to - 3/8 inch, and was of medium quality. Run times were up to 25 hours. Tests have established kiln operating conditions for maximum throughput. Kiln test data have been evaluated and compared with kiln model predictions. Hydrogen requirements for hydrotreating and hydrocracking were determined for these product shale oil cuts. This work is sponsored by DOE/SBIR with Mr. Robert Vagnetti as DOE Program Officer.