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Hydrogen and water requirements for the Clean Shale Oil Surface (C-SOS) process

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Combustion Resources, Inc. has developed a new patent-pending Clean Shale Oil Surface (C-SOS) process which makes use of a patent-pending rotary kiln of simple design and high processing capacity to drive the shale oil from the rock. This presentation focuses on hydrogen and water requirements for this process. This process allows for on-site upgrading of the raw shale oil to finished gasoline and diesel transportation fuels. Innovative work on the upgrading process component will be outlined. During the shale oil/spent shale separation process, the shale oil will be condensed into different boiling fractions and each analyzed for nitrogen, sulfur, metals and hydrogen/carbon (HC) content. Boiling fraction samples will then be separately hydrotreated with selected catalysts at specified pressures and temperatures, taking into account nitrogen, sulfur and HC levels. Results of these tests define the hydrogen requirements for upgrading of shale oil from this process. Process water requirements include water use in hydrogen production for (1) kiln firing, (2) oil shale upgrading, (3) plant cooling, (4) steam generation and direct process water contact. Water requirements for raw shale mining and spent shale reclamation were not included. Through innovative design methods, including use of air-cooling, very low process water requirements were identified and will be reported. Planned work includes the pilot-scale demonstration of shale oil fraction collection and upgrading technologies.