Title:

A Method of Reducing CO_2 Emissions from Surface Oil Shale Retorts

Abstract: (Your abstract must use 10pt Arial font and must not be longer than this box)

The most recent designs for surface retorting of oil shale (i.e., Galoter, LLNL/HR, ATP) provide pyrolysis heat by mixing the raw shale with hot recyled solids. The recycled solids are heated by direct combustion of the residual hydrocarbons in the spent shale. This combustion produces carbon dioxide both by oxidation of these residual hydrocarbons and by decomposition of dolomite and calcite which make up a large portion of the raw shale. These carbonates begin to decompose at temperatures as low as 570˚C. The result is high concentrations of carbon dioxide in the combustor flue gas.

New developments in the electrical power industry are focusing on improved processes for flue gas CO_2 removal and processes are also being developed for replacing hydrocarbon fuels with hydrogen. The hydrogen is produced by gasifying hydrocarbons and the carbon dioxide that is produced is easily separated at the high pressures of the gasification process.

The same benefits can be achieved using hydrogen for indirect heating of oil shale retorts. The Pumpherton and Davidson retorts that were operated commercially for many years were indirectly heated. However, new designs offered higher throughput rates and higher efficiency. This paper presents a comparison of the early indirectly heated retorts with the modern retorts. Results of modeling studies are also presented. It is shown that pyrolysing oil shale in a rotary kiln fired indirectly with hydrogen produced from coal results in greatly reduced carbon dioxide emissions as well as acceptable throughput rates and energy efficiency.