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Oxygen combustion application and simulation analysis in SJ – Pyrolysis retort Process

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The SJ–Pyrolysis retort process is a lump retort with direct heating developed by the Shenmu Sanjiang Coal Chemical Company in China that shows robust operation performance with low maintenance cost. This paper reveals a series of new developments and tests conducted on the SJ pilot retort of 1 tonne per day capacity to improve the performance and to meet more strict environmental regulations. The significant amount of Greenhouse Gas (GHG) emissions from the pyrolysis process and the large amount of low-heat value retort gas are two challenges addressed. Oxygen combustion tests have been conducted in the SJ pilot retort. This paper reveals the test results and the impact on the SJ–Pyrolysis process performance and improvement in the heat value of the retort gas. These tests have shown that the SJ–Pyrolysis retort process could be adapted to oxygen combustion mode pyrolysis without any significant impact on the plant performance or hazardous risks. The heat value of the retort gas has improved significantly and could be used as fuel gas or syngas for chemical industry. A computer model was established based on the pilot process conditions. The heat and mass balance analysis was carried out to reveal the impact of scale up and the economic benefit for a commercial plant. This paper describes the model that was used to simulate this process and compares the pilot results with model results, which show good agreement. This paper also reveals the SJ–Pyrolysis pilot test results for two different types of oil shale that come from different oil shale mines. The test results showed that the SJ–Pyrolysis retort process works well for both of the oil shale types with little modification to the design of the retort. The oil yield is more than 85% of the Modified Fischer Assay value. This result indicates the potential application of the SJ–Pyrolysis to oil shale deposits in other countries.