

9. WORK DONE AND CONCLUSIONS: The prototype Rotary Combustor was assembled and installed on the T-850P CNB boiler at the CONSOL Energy site in South Park, Pennsylvania. Several design improvements were investigated and implemented during the assembly to improve the prototype Rotary Combustor operations compared to prior tests at Detroit Stoker in Monroe, Michigan. An Operating Manual and Safety Review were completed.

The shakedown test phase was initiated. Two major problems were initially encountered: binding of the rotating drum at operating temperatures, and reduced fluid-bed pressure drop after short periods of operation. Plating the brush seal rotary land ring with a chrome carbide plasma spray and lubricating the seal prior to each test sufficiently resolved these problems to permit a limited number of operations tests.

The two principal accomplishments are sustained operation burning a high-Btu fuel, and operation in the gasifier mode. The concept of using steam injection with the plenum air for temperature control in the fluid bed is demonstrated.

Unlike previous tests at Detroit Stoker, sustained operation of the prototype Rotary Combustor was accomplished burning a high-Btu fuel, metallurgical coke. The prototype Rotary Combustor was operated with coke in gasifier mode on two occasions. Fluid-bed temperature spiking was minimized with manual control of the feeds (coke, air and steam), and no clinker formation problems were encountered in either test. Emission levels of NO_x were measured at about 270 ppmv, which are higher than the 100 ppmv target values for the device. This is assumed to be because of the aforementioned temperature spiking.

The primary operating problem remains control of the fluid-bed temperature. Although improvements were made, steam flow control was manual, and very coarse. To accomplish this will require finer control of the steam flow to the rotary drum air plenum, and development of an algorithm for automatic control using the Moore APACS™. This is the recommended succeeding step in the development of the Rotary Combustor for industrial use.

10. PLANS FOR THE COMING YEAR: The final report will be completed in the first quarter.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. The two principal accomplishments are sustained operation burning a high-Btu fuel, and operation in the gasifier mode. The concept of using steam injection with the plenum air for temperature control in the fluid bed is demonstrated.

III. ARTICLES/PRESENTATIONS

12. "Development of a Rotary Combustor for Refiring Pulverized Coal Boilers," by M. J. Virr, US DOE PETC Contractors Meeting, Pittsburgh, PA, July 1996.

“Continued Development of the Rotary Combustor for Refiring Pulverized Coal Boilers,” by M. J. Virr, Seventeenth Annual International Pittsburgh Coal Conference, Pittsburgh, PA, September 2000.