

# VIBRA SCREW CASE HISTORY



C-246

## Bin Activators' Key to Fluidized Bed Combustion: Low Sulfur — High Energy Efficiency

### Customer

Institute for Mining and Minerals Research (IMMR), Kentucky Center for Energy Research Laboratory, Lexington, Kentucky, 40512.

### Problem

The IMMR is operating an Atmospheric Fluidized Bed Combustion unit (AFBC) for the Kentucky Energy Cabinet (KEC) to demonstrate that sulfur from high-sulfur coals can be trapped during combustion to comply with air quality standards without the need for stack-gas cleaning equipment required in conventional boiler systems. The AFBC unit is operated by feeding coal and limestone into a "fluidized" combustion chamber. During combustion, sulfur in the coal is oxidized, forming  $SO_2$ . The  $SO_2$  reacts with the crushed limestone to form calcium sulfate, which is removed as the spent bed material.

### Design Problem

In order to facilitate efficient combustion and sulfur capture, the coal and limestone transport system was designed to ensure that the materials move from preparation to combustion without packing or bridging. The coal and limestone are crushed from 3-inch lumps to no larger than 1/4-inch and 1/8-inch, respectively, in the preparation and storage building located outside the combustion laboratory. The crushed coal and limestone have bulk densities of 45 and 90 lbs. per cubic ft., respectively. After crushing, the materials are conveyed pneumatically to live bottom storage bins. These bins had to be designed so that flow to the combustor is smooth and without interruption.

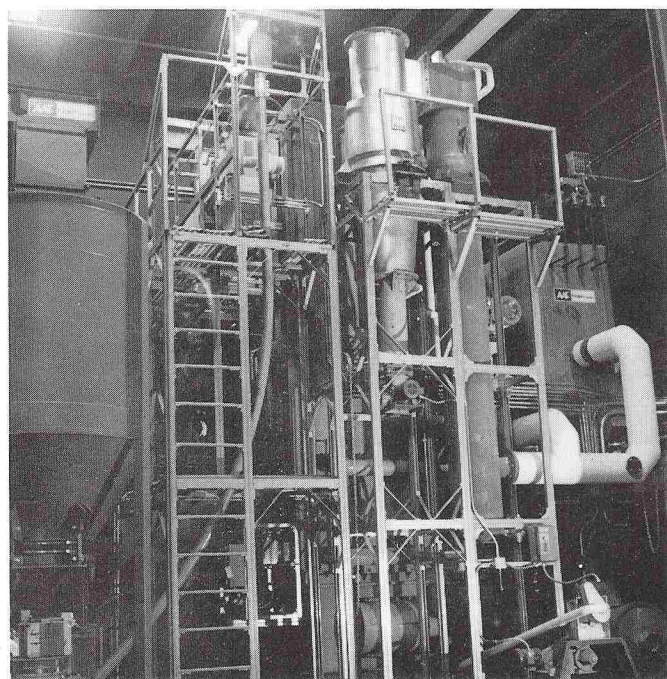
### Solution

Two Vibra Screw Live Bottom Bins, LBB 6-200, carbon steel construction, 3-ft. diameter Bin Activators, 200 cu. ft. capacity.

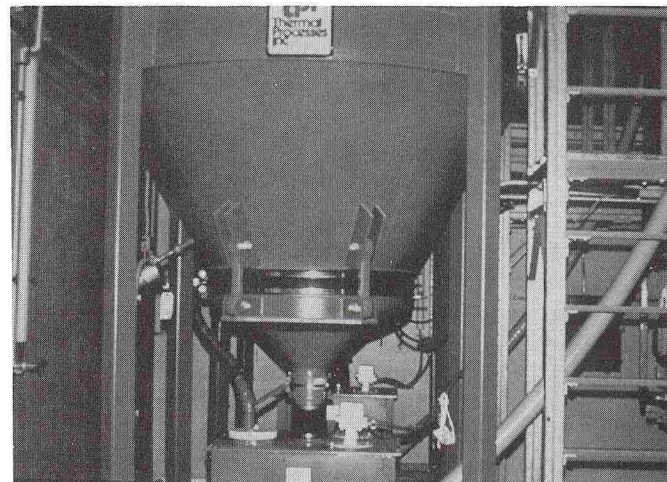
Thermal Processes Division, Dedert Corporation, Olympia Fields, Ill., built this AFBC system and specified these Live Bottom Bins to facilitate smooth transport of the coal and limestone from the storage bins to the combustor. Each Live Bottom Bin consists of a static cylindrical bin and a live bottom which is activated by controlled vibration. An integral baffle, located directly above the outlet, transmits vibration into the stored material; this prevents packing in the outlet and bridging above it. Coal flows from the Live Bottom Bin at a rate of 300 lbs. per hour. Both materials flow from the Live Bottom Bins into flexible screw conveyors which lift them up to weigh belt feeders. Then the materials are dropped by gravity into the combustor feed injectors.

### Results

Kentucky's pilot plant has been in operation for about 250 hours as of December 1982. It has already demonstrated its ability to burn high-sulfur coals with up to 80% sulfur capture. Live Bottom Bins have contributed to the system's overall reliability by their demonstrated ability to keep the feedstock materials flowing smoothly from the storage bins to the combustor.



Vibra Screw's Live Bottom Bin, on the left, is an integral part of IMMR's coal and limestone transport system.



This Live Bottom Bin provides a smooth flow of crushed coal and limestone from storage bin to combustor, without packing or bridging.