Table 2
ASH MINERAL COMPOSITION

	Tissue Line	Newsprint Line	Virgin Fiber
Mineral Analysis			
Silicon Dioxide	18.02	48.46	53.7
Aluminum Oxide	10.36	31.57	34.2
Ferric Oxide	0.90	1.51	1.9
Titanium Dioxide	8.51	3.64	3.3
Phosphorous Pentoxide	0.42	0.32	0.25
Calcium Oxide	50.70	8.91	3.41
Magnesium Oxide	1.05	1.82	2.78
Sodium Oxide	0.09	0.34	1.44
Potassium Oxide	0.31	0.79	0.67
Sulfur Trioxide	0.45	1.09	1.62

FEATURES OF FLUIDIZED BED TECHNOLOGY

The gas-solid flow behavior or hydrodynamics plays an important role in determining the performance of a fluidized bed combustor. Figure 1 illustrates the flow behavior occurring in the bubbling fluidized bed. The sized bed solids are transformed into a state resembling a boiling fluid by a uniform flow of gas upwards through the bed of particles. The gas velocity is sufficiently high so that the drag forces on the solid particles due to the relative motion between the gas and solids balance the force of gravity acting on the particles. In the bubbling fluidized bed, gas bubbles rise up through the bed to produce a natural circulation pattern that results in excellent solids mixing.

As a result of the gas-solid flow behavior described above, fluidized bed combustion technology offers several features that are ideally suited to combustion of paper mill residual fibers. These features are identified and discussed in the following paragraphs.

Rapid Drying, Heating, and Combustion of High-moisture, High-Ash Fuels

The unburned fuel accounts for less than 3% of the large solid inventory (1-2 m bed height), and the balance is comprised of non-combustibles such as sand, fuel ash, and sorbent. The excellent mixing allows the solid fuel to be quickly dispersed in the bed and causes the temperature of the solids and the gas to be fairly uniform. The incoming fluidization (primary) air is heated to the bed temperature within penetrating a short distance from the distributor plate. The high temperature bed solids rapidly dry and heat the fuel particles above the ignition point, causing both the fuel char and the volatiles driven off of the fuel to burn in the bed. Combustion of residual fibers with insufficient heat content to raise the flue gas temperature above the autoignition point can be achieved by adding supplemental heat by preheating the incoming air or by co-firing with a supplemental fuel such as natural gas.

Combust Fuels with Low Ash Fusion Temperature

The relatively low and uniform bed temperature helps to minimize the potential for ash agglomeration due to local ash temperatures exceeding the ash fusion temperature. If agglomeration of the ash takes place, which would eventually lead to defluidization of the bed,