

virgin paper residual fibers, deinking residual fibers contain higher amounts of ash and fine particulate matter, making them more difficult to dewater and reducing the dry heat content. This ash originates from binders and coatings in the recycled paper feed. Although mechanically dewatered, the residual fiber moisture levels are high and for these samples range from 54 to 77%. At these high moistures, a large percentage of the energy contained in the dry fuel is required to vaporize the water. To combust the wet residual fiber, it first must be dried and heated above the ignition point. The heat and ash contents of these residual fibers ranged from 3500-7500 BTU/dry lb and 18-38%, respectively. The residual fibers shown in Table 1 also indicate a relatively low sulfur content, ranging from 0.11 to 0.27%.

The mineral composition of the ashes which remain after combustion also vary considerably. Table 2 contains the results of an analysis of the ash mineral composition of the residual fibers listed in Table 1. As indicated, the ash constituents typically contain high concentrations of silica as well as salts of sodium and potassium. These alkali salts have relatively low melting points and can form eutectic mixtures which melt at even lower temperatures. Therefore, the potential for sintering/clinkering of the ash materials is a concern for the combustion of paper mill residual fibers. Fusibility analyses performed on ash samples obtained from combustion of the residual fibers shown in Tables 1 and 2 indicated initial ash softening temperatures that ranged from 2165°F to above 2700°F. The temperature at which the samples became fluid ranged from 2210°F to above 2700°F. Provided that the fluid bed operating temperature is several hundred degrees below the ash fusion point, ash sintering rates will be low.

The tissue line residual fiber contains a high percentage of calcium. Since the calcium is present in a reactive form (as CaCO₃ or CaO), there is sufficient calcium in the ash to react with and capture the sulfur contained in the fuel. If combusted in a fluid bed, this fuel has the potential to emit very little SO₂. At typical fluid bed operating temperatures of 1600°F, flue gases containing SO₂ and O₂ react with CaO to stabilize the sulfur as CaSO₄.

**TABLE 1
RESIDUAL FIBER CHARACTERISTICS**

| | Tissue Line | Newsprint Line | Virgin Fiber |
|-----------------------------|-------------|----------------|--------------|
| Proximate | | | |
| Moisture, as rec'd | 54.9 | 62.1 | 76.8 |
| Volatile Matter, % | * | 54.96 | 66.0 |
| Fixed Carbon, % | * | 6.86 | 15.62 |
| Ash, % | 36.9 | 38.18 | 18.38 |
| Ultimate | | | |
| Total Sulfur, % | 0.11 | 0.26 | 0.27 |
| Carbon, % | 25.55 | 32.12 | 44.25 |
| Hydrogen, % | 3.63 | 4.55 | 4.66 |
| Nitrogen, % | 0.18 | .31 | 0.23 |
| Oxygen, % | 33.64 | 24.59 | 32.21 |
| Higher Heating Value | | | |
| BTU/lb | 3660 | 5672 | 7342 |

All analysis on moisture-free basis

* Not measured