Case study

Spectris Advance Pulp and Paper – increasing Kappa number and yield

**Challenge**
To compensate for Kappa number variations while reducing time delays and increasing pulp yield in a fully integrated pulp and containerboard mill.

**Solution**
A BTG Single Point Kappa Analyser (SPK-5500) was installed directly in the process flow to provide a single-point online measurement.

**Results**
The Kappa level has increased and stabilised, while the pulp yield has also increased. Machine runnability has improved, with fewer web breaks.

BTG’s online Kappa analyser at Green Bay Packaging’s Arkansas Kraft Division permits Kappa number and pulp yield increases plus improved runnability on the containerboard machines.
Background

Green Bay Packaging is a manufacturer of high-quality packaging products, with 31 locations across the USA and Mexico.

The company’s Kraft Division operates an integrated kraft pulp and containerboard mill in Morrilton, Arkansas, using a combination of virgin and recycled fibre to produce kraft linerboard and medium.

The mill’s average daily production of unbleached kraft linerboard and medium is between 1,100 and 1,250 tons.

The challenge

Papermakers in an integrated kraft containerboard mill know very well they have to adapt their papermaking operations to compensate for incoming variations in Kappa number.

Usually, with manual Kappa testing, they adjust refining levels and machine speeds to react to changes in drainage and drying rates to avoid web breaks and to maintain strength tests.

However, with some inherent human variability in testing and time delays of over two hours, machine tenders are always playing catch-up and reacting to old tests with some extra testing variability that is built in. Machine runnability can suffer.
The solution

Green Bay Packaging’s Arkansas mill found a solution to this dilemma by investing in a BTG Single Point Kappa (SPK) Analyser (SPK-5500). This analyser serves a unique function since both pulp mill and paper mill operators value it, relying on it to stabilise their operations and quality. It is difficult to think of another measurement that has that double impact.

Unlike multi-point Kappa analysers that are used typically in bleached kraft pulp mills, the SPK-5500 is purposely designed for a single-point online measurement that is particularly suited to unbleached kraft pulp mills. The analyser provides an accurate on-the-spot reading in a few minutes, with no need for the additional delays and complexity of remote sampling devices, valves and sample transport lines to a central analysis unit.

The SPK is mounted directly in the process flow and performs all the necessary operations for sample measurement including screening, washing and measurement of the pulp fibre lignin content using absorption of ultra-violet light. It is a simple and direct measurement with an improved sampling frequency of 10 to 12 samples per hour with the SPK, compared to two or three samples per hour with the multi-point analyser.

Figure 2 shows how the SPK analyser is installed at the inlet of the screen accepts tank, after the hot refining and screening. At this location the analyser shows trends in the blow Kappa numbers from the digesters.

With the frequent sampling, it is possible for the operators to determine which digester the pulp is coming from since the interval between blows of the five digesters averages 2.25 hours.

The first signs of an incoming blow are recognized by the meter after about 15 to 20 minutes process delay, and the blow progress is followed thereafter.

The SPK measurement was evaluated over a five-month period in 2014. The advantages of a quick measurement update are shown in Figure 3, which clearly indicates that the SPK has avoided the two-hour delay with the manual tests.

At that point in time the operators were making downward machine speed adjustments for lower Kappa numbers but the data was two hours old. The same is true for the speed resumption period.

Figure 4 shows how the manual and the online Kappa number variation (sigma) decreased over time as the pulp mill operators became more familiar with the measurement and how to control the cooking process.

The variation of data in Figure 4 shows a consistent gap between manual tests and online measurements although both decreased as the pulp uniformity improved. That gap between manual and online tests implies that the extra human testing variability was inherent in the manual tests.

Since the operators now use the online measurement the extra variability of the manual tests is no longer a factor.

The results

As a result, pulp mill operators have become better at controlling Kappa and have stabilised and increased its level and the pulp yield. Moreover, the papermakers have adapted the operation of their machines based on real-time information. The result is a good return on investment on both sides of the mill. The fibre line with five batch digesters feeds two board machines that currently produce 1331 tons per day of linerboard and corrugating medium.

Key results:

• Operators adjust cooking conditions to reduce Kappa variations by more than 50%, allowing an increase in target Kappa number
• Pulp yield increase of 1% means $300,000/y in wood and energy savings
• Board machine operators rely on real-time readings to adjust speed and refining, while maintaining strength tests
• Reduced web breaks on board machines have been documented