BATCH DIGESTER ANALYZER

Monitoring Black Liquor Composition to Control the Pulping Process

THE BATCH DIGESTER LIQUOR ANALYZER SOLUTION monitors black liquor composition in a batch digester. This provides a means for implementing advanced control schemes in the batch pulping process. The residual effective alkali (EA) profile is an indicator of exiting kappa number. The residual active alkali (AA) profile, lignin profile and total Dissolved solids (TDS) profiles are indicators of exiting pulp yield.

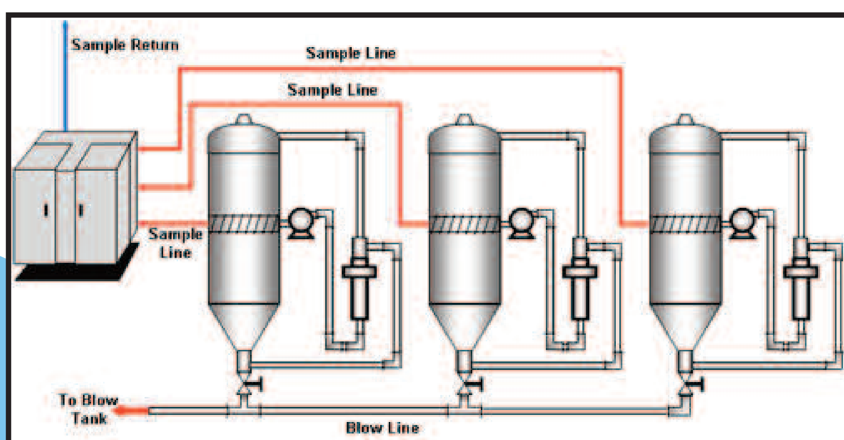
These time varying profiles can be correlated to the average kappa and yield of the exiting pulp or a mass balance model can be used to directly calculate kappa and yield during the course of the cooking process. Monitoring of the EA profile during temperature ramp up allows the alkali to wood ratio to be trimmed prior to sealing the digester. This results in a more consistent charge of cooking chemicals for each cook. Black liquor composition contains a wealth of information relating to various pulp properties.

The DURALYZER-NIR analyzer captures this information in the spectral signature of the black liquor sample. So in addition to providing the previously mentioned measurements, a variety of pulp properties (e.g. kappa number, relative yield and viscosity) can be directly correlated to the liquor spectral signature. Whatever advanced batch digester control scheme is implemented requires reliable and accurate measurements. The DURALYZER-NIR analyzer solution easily provides these measurements in a timely and reliable manner.

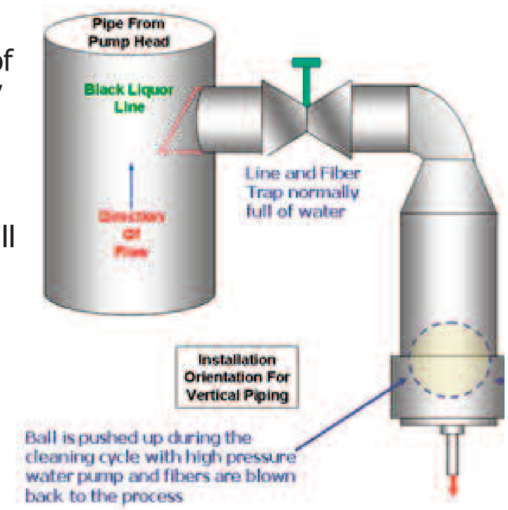
APPLICATION TECHNOLOGY

The graph below shows how the DURALYZER-NIR digester analyzer is implemented on batch digesters running a standard kraft cook. Each digester has a dedicated sample line supplying the analyzer. All samples flow from the process through the analyzer and directly back into the process. One analyzer can support up to eight different digesters.

Proprietary filters, combined with a high pressure backflush system, ensure that line plugging due to chip debris does not interfere with sample collection. Proprietary high cycle life valves ensure that valve maintenance is not required for two or more years. Black liquor REA, RAA, lignin & TDS are provided for each connected digester.



DURALYZER-NIR .VS. CURRENT SOLUTIONS



Current sensors for this application are the same as for the continuous digester case and include hybrid systems composed of some arrangement of a refractometer, conductivity meter and UV absorption meter. Online titraters are another option for this application. Titraters are limited to measuring only residual EA, however. A major drawback to these hybrid systems is that each meter has to be calibrated for the particular component that it will be measuring. Additionally, since this sensor is a collection of single point measurements, it is susceptible to the same drift issues as conductivity meters are for white liquor analysis.

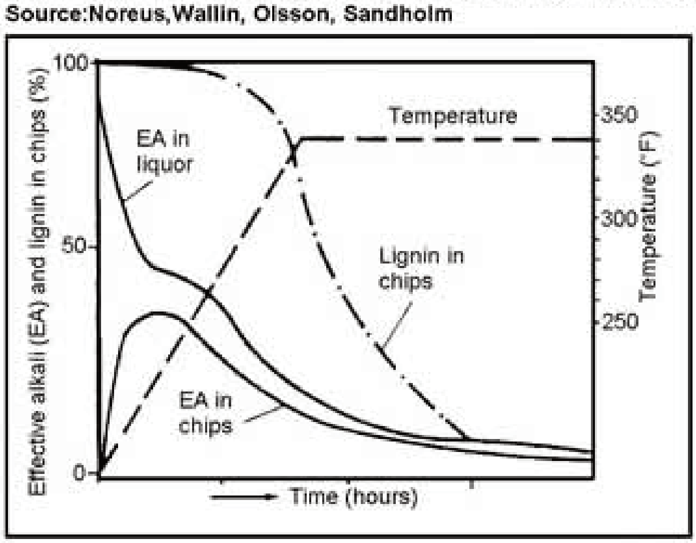
Online titraters can measure residual EA using an automated version of the manual residual EA, however, this is usually the only measurement that is available. There are also high maintenance requirements for an online titrater. The combination of limited measurements and excessive maintenance requirements make it difficult to justify the capital investment for a titration based solution. The DURALYZER-NIR digester analyzer solution provides the collection of measurements that the hybrid sensor provides in one low maintenance, cost effective instrument.

BATCH DIGESTER APPLICATION:

Monitoring black liquor provides a means for implementing advanced control schemes. NIR analysis is well suited for measuring these properties in the BL as well as the residual active alkali (RAA) and total Dissolved solids (TDS). The graph below shows typical sample collection points. In the first step of the control, the EA slope is measured and compared to the current calculated H-factor.

When the cooking temperature is stabilized, the EA measurement is compared to the corresponding final calculated H-factor. Using those two comparisons values, a new blow H-factor is calculated and the blow time is rescheduled based on this corrected H-factor target. Lignin measurements are used to fine tune the final H-factor model. This H-factor modeling improves kappa variability and stabilizes pulp quality which results in:

Alkali contration in cooking liquor and chips during a kraft cook
Source:Noreus,Wallin, Olsson, Sandholm



- Kappa variability reduction
- Energy savings
- Minimized emissions
- Maximized production
- Better quality fibers
- Less shives produced

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