Control of the Extraction Stage Using the True Terminal pH

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Agenda

- Introduction
- Measuring pH
  - Manual
  - On-line
- Control Options
- Benefits
Objective

• The purpose of the extraction stage washer is two fold:
  1. solubilize and remove the organic material that was oxidized in the previous bleach stage and
  2. reactivation of the remaining lignin for further oxidation in the subsequent bleach stage

• Both functions directly impact the economics and efficiency of the subsequent bleaching stage.
Extraction Stage Layout
Measuring pH

- Where are you taking the sample?
- How do you prepare the sample?
- How are you processing the sample?
- Frequency of calibration of your pH probe
- Temperature Influences
Measuring pH

- Manual Methods
  - Highly Variable due to sample collection
  - Frequency too low for control
- In-Line Methods
  - In-line pH probes
- Semi-Automatic Methods
  - In-line filtrate extractor feeding a sample pot with pH probe
pH Probes

Glass electrode
Cutaway Wood Spool
Spool to Measuring Electrode Isolation Disk
Axial Ion Path Sealing Rings
Body to Spool Isolation disk with 10 Axial Ion Paths for Effective Plug-free Communication
Examples of Field pH Measurement

Manual sample point

Filtrate Extractor in Extraction Tower

pH sample pot
Where Should We Sample Terminal Extraction pH?
How Should We Control the Extraction Stage?

- What are the components?
  - Tonnage
  - Incoming pH
  - Caustic Dosage
  - Caustic to TEC Ratio
Eop Control

- NaOH
- Steam
- Cl₂
- ClO₂
- H₂SO₄
- H₂O₂
- O₂
Elements of Advanced Control
Preliminary Mill Trial

- Manual samples were taken in tower and vat prior to installation of filtrate extractor
- Control strategy was modified to use a feed forward Caustic to TEC ratio that was trimmed using terminal pH value
- D1 charge and brightness was recorded for comparison
## Results

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming Kappa</td>
<td>9.90</td>
<td>9.95</td>
<td></td>
</tr>
<tr>
<td>D0 % ClO2 Charge</td>
<td>0.947</td>
<td>0.950</td>
<td></td>
</tr>
<tr>
<td>Incoming Eo pH</td>
<td>10.75</td>
<td>10.77</td>
<td></td>
</tr>
<tr>
<td>Eo Caustic Charge</td>
<td>1.196</td>
<td>1.055</td>
<td>11%</td>
</tr>
<tr>
<td>% D1 ClO2 Charge</td>
<td>0.86</td>
<td>0.82</td>
<td>5%</td>
</tr>
<tr>
<td>D1 Brightness</td>
<td>86.58</td>
<td>87.60</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

- The extraction stage remains an important part of the bleaching process.
- pH can be an effective “surrogate” measure of the efficiency of the stage.
- Sample location and collection techniques are critical.
- True terminal pH control has been shown to be effective.
- Further mill studies to follow.
Acknowledgements

- Sandy Beder-Miller, BTG Americas, Inc.
- Jessica Paul SAPPI Somerset, ME
Thank you!
Merci beaucoup!