Removing the Unknown of Lap Pulp Colloidal Stickies to Improve Paper Machine Runnability

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Introduction of Recycle Lap Pulp

- Printing and Writing grades are seeking to increase usage of recycle fiber.
- A critical barrier to the use of recycle fiber is the inclusion of stickies.
- Stickies lead to deposition issues and runnability problems such as scratching at the coater.
- Most recycle fiber comes in as lap pulp.
- Quality Criteria can include:
  - Brightness
  - Macrostickies
  - Fiber Properties
  - Ash Content
Stickies - The Unknown of Recycle Lap Pulp

- Even with a macrostickies count paper machine can have deposit/stickies issues
- Papermakers want to know if a given lot of lap pulp will run well or have issues.
- The perception is that it is by chance, a roll of the dice, that a given run of lap pulp will go well.
- This mindset limits the desire to use recycle fiber.
What is Unknown about the Stickies in Recycle Lap Pulp

- Macrostickies - 150 μm
  - how many/can be seen/counted
- Macrostickies - 100 μm
  - 33% of Fine Screens in Lap Pulp Plants
- Macrostickies - 75 μm
  - Behavior same as larger macrostickies
- Suspended stickies – 20 to 75 μm
- Dispersed stickies – 1 to 25 μm
- Colloidal stickies – 0.5 to 5 μm
- Dissolved stickies – less than 5 nm
Testing for Invisible and Visible Impact

Fractionate

Total Organic Carbon

Invisible = Colloidal Stickies

Fractionate

Soak and Measure Tackiness

Visible = Tackiness
Relationship Between Colloidal Organics & Tackiness

High Tackiness typically seen at operations having deposit/stickies issues

Tackiness of Filtrate below 25 microns based on TOC and Sample Source

- **High Tackiness** typically seen at operations having deposit/stickies issues
- **Expected Tackiness**
- **Low Tackiness**

<table>
<thead>
<tr>
<th>Filtrate Tackiness (gf/m)</th>
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Colloidal Organics (ppm-TOC)

- Newsprint
- Office
- TMP
- GWD
- Coated Broke
- Kraft
- OCC
Shear Stress Test Analysis

- Does the amount of colloidal organics (the invisible stuff) change?

- **Increase** – shearing broke into pieces generating more
  - Caution potential to over whelm/over load the process
  - Increasing means no agglomeration

- **Same** – stable/equilibrium

- **Decrease** – where did it go? It deposited out onto fiber, fines, filler & surfaces
Shear Stress Response for Problem Lap Pulp

Lap Pulp that had been identified to cause issues saw a decrease in colloidal organics under stress.

Agglomeration of colloidal seen to result in runnability issues due to recycle pulp.
Measuring the Unknown / Unseen Stickies

Lap Pulp that is stable
- Seen to increase or remain the same under stress

Lap Pulp that has low or expected tackiness
- That has a no tackiness or low tackiness
- Tackiness on or below expected tackiness

Expected Tackiness for Lap Pulp at 4% Diluted with Tap Water

- No paper machines issues
- Sample considered to have no tackiness
- Within 10% of Good Below is Best
- Expected Tackiness

Colloidal Stickies (TOC-ppm)

Tack (g force per meter)

0 10 20 30 40 50 60

0 20 40 60 80 100
Example 1 – Unstable & No Tackiness
No Issues on Paper Machine

Detackifier Treatment

Colloidal Stickies (TOC-ppm)

Tack (g force per meter)

Diluted With Tap Water

Partially Unstable

Unstable No Tackiness

0 min of Repulping
15 min - Stressful
30 min - High Stress

0-kg 1 kg 2 kg

0 – kg Slightly above expected

Expected Tackiness
On or Below the Line is Best

No paper machine issues
Sample has no tackiness

Colloidal Stickies (TOC-ppm)
Example 2 – Stable & Tackiness Below Expected – No Issues

All Lots Stable

Expected Tackiness

All Below Expected Tackiness

No paper machine issues

Sample has no tackiness

Colloidal Stickies (TOC-ppm)

Tack (g force per meter)

Colloidal Stickies (TOC-ppm)

All Lots Treated with Detackifier

All Lots Stable

Diluted With Tap Water

0 min of Repulping

15 min - Stressful

30 min - High Stress

Lot #1

Lot #2

Lot #3

Lot #4

Lot #1

Lot #2

Lot #3

Lot #4

0 50 100 150 200

0 50 100 150 200

0 20 40 60 80 100 120

0 20 40 60 80 100 120

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Example 3 – Stable & Treatment Moves Tackiness Below Expected – No Issues
Lap Pulp is Not Always the Problem

Two Lap Pulps
Stable with Tap Water
Lap Pulp at 4% Consistency
Diluted with Tap Water

Two Lap Pulps
Unstable with Paper Machine White Water
Lap Pulp at 4% Consistency
Diluted with Paper Machine White Water

Mixing Time to Colloidal Shear Stress Test

Colloidal Stickies (ppm-TOC)

0 10 20 30 40 50 60 70
0 min Repulper 15 min Stressful 30 min High Stress

Lap Pulp X
Lap Pulp Y

Colloidal Stickies (ppm-TOC)

100 110 120 130 140 150 160 170 180
0 min Repulper 15 min Stressful 30 min High Stress

Lap Pulp X
Lap Pulp Y
PM WW

Expected to be at 190 (170+20)
50% decrease

Expected to be at 230 (170+60)
40% decrease

30% dec
45% dec

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Remove the Unknown about the Stickies in Recycle Lap Pulp

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Colloidal stickies – 0.5 to 5 μm
Dissolved stickies – less than 5 nm

Colloidal Stability & Tackiness
If Colloidal Stickies are Unknown It can be a Roll of the Dice with Recycle Lap Pulp
Remove the Unknown about the Stickies in Recycle Lap Pulp by Knowing Colloidal Behavior

Colloidal Stability & Tackiness
Thank You for your attention. Questions?