STICKIES AND PITCH CONTROL WITH SUPERIOR ENZYMATIC FORMULATIONS

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Agenda

➢ Introduction
➢ Stickies Problem
➢ Solution of Problem
➢ The Road to solve the Stickies Problem
➢ Case History
➢ Conclusion / Take always!
As any papermaker using recycled fibers knows all too well (De-Inking and Brown)

- Recycled fibers are ripe with STICKIES coming from glues and coatings
- Virgin fibers contribute to the problem with tacky natural wood pitch

- Stickies are:
  - Tacky
  - Hydrophobic
  - Pliable Organic materials with a broad range of melting points and different degrees of tackiness depending upon the specific composition of the stickies

That cause all sorts of problems for the papermaker
The STICKIES Problem

➢ All sorts of papermaking mayhem:
  • Reduced quality from spots or holes in the paper or board
  • Increased downtime from
    ▪ Sheet breaks
    ▪ Constant cleaning/changing of dryer doctor blades
    ▪ Cleaning of dryer fabrics
  • Also causes problems in the converting process
    ▪ Quality issues
    ▪ Runnability issues
The key to solving this nagging problem is to understand the chemistry involved and the right combination of chemistries to free the paper and board mills from stickies once and for all.

The road to finally controlling the problem of stickies is paved with a host of exciting technologies new and old.

No surprise that enzymatic formulations will lead the way to solve this problem, as they

• Are very fast reacting biocatalyst proteins
• Are extremely specific so as to only interact with the targeted ester bonds of the stickies
• Offer significant ROI
The Road to Solving STICKIES

**CONDITION OF THE STICKIES**
- Sort away Stickies containing material
- Break Stickies particles down to smallest possible size
- Disperse to Prevent Re-agglomeration
- Remove Tackiness of Stickies surface to Prevent deposition and Re-agglomeration
- Anchor Stickies onto the Fibers

**SOLUTION**
- Manually
- Mechanically
- Before pulper
- Shear Hot Disperger After Refiner / Deflaker
- Penetrant Enzymatic formulations
- Busperse®
- BRD®
- Optimize®
- Shear
- Penetrant
- Dispersant
- Busperse®
- Detakifier
- Busperse® Optimyze®
- Coagulant
- Fixative
- Bufloc®
- Retention System
- Wire, Press Section, Dryers
- Passivation Technology
- Busperse® Optimyze®

**APPLICATION - PRODUCTS**

**Purge** problem from system in outgoing sheet

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1. The first chemical action on the road to solving stickies is to break them down into smaller (hopefully non-visible) globules
   • The **Patented Optimyze® Plus 727** is a specifically designed enzymatic formulation aimed towards satisfying the unique requirements of each mill stickies scenario.

2. Then the rest of the road focuses on keeping the **Stickies Dispersed** and **Non-tacky**
   • Dispersants, Surfactants, Detackifiers, Adsorbents…

3. and finally retained in the sheet to be purged (via the paper) from the paper machine system
   • Flocculants, Coagulants, Microparticles, Micropolymers…
The **Optimyze®** Plus 727 formulation takes care of this problem in two ways:

1. **Cleaves Ester Bonds** to reduce the size of the stickies
2. **Converts The Surfaces Of The Stickies And Pitch Into Alcohol Groups** to make them less tacky
The Enzymatic Reaction

polyvinyl acetate
\(-{(CH_2CH_\text{-})_n\text{-OOCCH}_3}\)

with Optimize

\(\text{polyvinyl alcohol + acetic acid}\)
\(-{(CH_2CH_\text{-})_n\text{-OH + CH}_3\text{COOH}}\)

Hydrophobic
Surface

without Optimize

Agglomerates of PVAc

Hydrophilic

Polyvinyl alcohol
Cutting Down the Problem

Smoothing Out the Surfaces

Stickies Samples Untreated  Stickies Sample Treated with Optimize
The Enzymatic Reaction

- Less tacky means less likely to stick to surfaces
  - less downtime

- Alcohol groups are also polar, which allows for better
  - polymer fixation (retention) in the sheet or
  - removal in DAFs (flotation) and washing

- and it further prevents agglomeration of any hydrophobic particles
STICKIES Case Study Process

PULPER 3 → RECYCLE PLANT → KAMYR DIGESTOR REJECT

TOWER 13
3500 m³

TOWER 14
3500 m³

TOWER 2
2000 m³

TOWER 1

TOWER 04
800 m³
4.5%

TOWER 06
4.5%

Optimyte® Plus 727

Tower 13/14 Short Fiber, SF
Tower 4: SF, Recycle, Broke
Tower 1: Long Fiber, LF

PMA, B and C

PMA, B and C
## STICKIES Case Study Data

<table>
<thead>
<tr>
<th>Paper machine:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>Kraft liner (recycled content)</td>
</tr>
<tr>
<td>Furnish</td>
<td>60% mix of SF + recycle (variation of 20-80% from each) and 40% mix 75% SF + 25% LF</td>
</tr>
<tr>
<td>Former</td>
<td>Fourdrinier with top former</td>
</tr>
<tr>
<td>Production rate</td>
<td>1372 tpd</td>
</tr>
<tr>
<td>Application point pH</td>
<td>9.2</td>
</tr>
<tr>
<td>Headbox pH</td>
<td>6.3</td>
</tr>
<tr>
<td>Headbox temperature</td>
<td>50°C</td>
</tr>
</tbody>
</table>

### Additives:

<table>
<thead>
<tr>
<th>Additive</th>
<th>Amount</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diatomaceous earth</td>
<td>2.0 kg/ton, to stock tower</td>
<td>Replaced</td>
</tr>
<tr>
<td>Coagulant cationic</td>
<td>1.7 kg/ton, blend chest outlet</td>
<td></td>
</tr>
<tr>
<td>Cationic starch</td>
<td>4.5 kg/ton, blend chest inlet</td>
<td></td>
</tr>
<tr>
<td>PAC</td>
<td>2.0 kg/ton, fan pump suction</td>
<td></td>
</tr>
<tr>
<td>Rosin emulsified size</td>
<td>2.0 kg/ton, before screen</td>
<td></td>
</tr>
<tr>
<td>Silica</td>
<td>4.0 kg/ton, after screen</td>
<td></td>
</tr>
<tr>
<td>Alum</td>
<td>9.0 kg/ton, white water</td>
<td></td>
</tr>
<tr>
<td>MB control (Busperse 2454)</td>
<td>0.6 kg/ton, water system</td>
<td></td>
</tr>
<tr>
<td>Optimize® Plus 727</td>
<td>0.4 kg/ton, to stock tower (tower 4 inlet)</td>
<td>Added</td>
</tr>
</tbody>
</table>
Reducing the Stickies

• Reduced Hemocytometer Measurements by 61.3%
Reducing the Stickies

• Reduced hemocytometer measurements by 61.3% indicates
  • A cleaner system
  • Fewer agglomerates large enough to be picked up by the instrument
  • Less likelihood of being perceived in the sheet
  • Less likelihood to come out at dryers and dryer clothing (felts, screens)
    ▪ Less downtime for cleaning
    ▪ Higher production rates
• lead to an 11% increase in production
Return on Investment

➢ The savings and cost avoidance always returns a great ROI from the cost of the enzymatic formulation used in this treatment

➢ The following are several of the key areas that were considered when calculating the potential ROI in this paper mill case study being reviewed here

✓ Improved Machine Efficiency → Fewer Breaks
✓ Improved Sheet Quality → Fewer Holes/Picking
✓ Reduced Wash-up Time → Less Downtime
✓ Reduction in Overall Chemical Treatment Spend → Less Cost
✓ Eliminated Chemical Makedown → Less Cost
### RETURN ON INVESTMENT CALCULATION

<table>
<thead>
<tr>
<th>item</th>
<th>Diatomaceous cost ($/month)</th>
<th>Increased production after Optimyze® Plus 727 ($/month)</th>
<th>Optimyze® Plus 727 cost ($/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM#A</td>
<td>29,789.62</td>
<td>12,533.12</td>
<td>17,429.76</td>
</tr>
<tr>
<td>PM#B</td>
<td>10,888.06</td>
<td>4,047.36</td>
<td>6,301.15</td>
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<tr>
<td>PM#C</td>
<td>85,936.72</td>
<td>0.00</td>
<td>45,276.58</td>
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<tr>
<td>TOTAL</td>
<td>126,614.40</td>
<td>16,580.48</td>
<td>69,007.49</td>
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<tr>
<td>ROI $/month</td>
<td></td>
<td>74,187</td>
<td></td>
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<tr>
<td>ROI $/year</td>
<td></td>
<td>890,249</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

➢ The road to solving STICKIES is by making them very small, non-tacky, and purging them from the paper machine system in the outgoing sheet of paper or board

➢ Optimyze® Plus 727 (specifically designed enzymatic formulation) solves this problem by cutting down the size of the STICKIES and rendering them non-tacky

➢ Reviewed a case study where Optimyze® Plus 727 replaced diatomaceous earth gave huge benefits:
  ✓ 61% reduction in STICKIES count (Hemocytometer)
  ✓ 11% increased production
  ✓ $890,000 per year in ROI

▪ 53 similar successful applications of this type of formulation worldwide, and many other similar yet uniquely different formulations have been equally successful all over the world and are ready to help solve your stickies dilemma