Bio-based, Bio-degradable or Sustainable?

EC Technology Forum / Biobased Coatings
Gun Lundsten
October 22\textsuperscript{nd} 2019
Agenda

• CH-Polymers Oy shortly
• Some definitions
• Sustainability at CH-Polymers
• Bio-degradable solutions
• Bio-based binders for paints
• Summary
Roots in Finnish chemical industry

1972 PVAc-binder production by Raisio Chemicals

2004 Raisio Chemicals sold to CIBA

2009 Acquisition of acrylate business as precondition to Ciba/BASF deal → **CH-Polymers founded, Family owned**

2010 Entering the paint binder business

2013 Start of the CHP BAR development work
Innovating together
CHP facilities

Raisio, Finland
- Research & Innovation
- Sales & Administration

Member of Smart Chemistry Park

Kouvola, Finland
Manufacturing & Logistics
Bio-based, Bio-degradable or Sustainable?
The weight fraction of the bio-based content or the bio-based carbon content. If the product is partly bio-based it should be accompanied by a quantification of the bio-based content.

Meeting the needs of the present without compromising the ability of future generations to meet their needs.

Susceptible to decomposition to CO₂, water, and biomass by organisms. Compostable: > 90% within six months.

We have solutions for Paper and NW!
Please consider...

• Is a bio-based solution really sustainable?

• Bio-based doesn’t necessarily mean that the product is bio-degradable!

• A sustainable solution doesn’t have to be bio-based!

• A product can be all of the three!
Sustainability focus at CHP

• Elimination of toxic/harmful ingredients
  – APEO-free since 20 years
  – Formaldehyde free since 10 years

• Reduction of VOC & S-VOC in the products
  – VOC < 100 ppm
  – S-VOC < 300 ppm

• Development of long lasting products
  – Easy-to-clean binders
  – Low dirt pick-up binders
  – Barrier-binders

• Optimizations in the production!
Waste Water per Produced Amount
Used Electricity per Produced Amount

<table>
<thead>
<tr>
<th>Year</th>
<th>Electricity (MWh/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0.110</td>
</tr>
<tr>
<td>2017</td>
<td>0.100</td>
</tr>
<tr>
<td>2018</td>
<td>0.090</td>
</tr>
<tr>
<td>2019</td>
<td>0.080</td>
</tr>
</tbody>
</table>
Two Bio-based Concepts

1. Bio-based monomers
   - Mass fraction concept
   - "Really" bio-based, bio fatty acid based
   - Usually not bio-degradable

2. Use of bio-components
   - Can be bio-degradable
• Sister company of ours
• Has developed and patented an efficient method to extract clean components from side streams of wood industry
• Can be grafted onto acrylates
Bio-based CHP Barriers and Binders

CHP BAR series

Environmentally friendly and sustainable solutions

Replacing

- PE
- Wax
- Fluorochemicals
Bio-based CHP Barriers and Binders

continued...

Replacing binders in
• Shopping bags
• Agricultural bags
• Cleaning tissues
Our solutions are meeting the increasing environmental requirements:

• Suitable for **food contact** (BfR XXXVI, FDA §176.170, GB 9685)
• The indicative **migrations** at acceptable levels (European Standard EN 14338, RISE, Sweden)
• **Re-pulpable** and **recyclable** (PTS Method PTS-RH: 021/97, 2018)
• 100% **bio-degradation** in controlled composting test with up to 20 % barrier coating (ISO 14855-1 ; 45 days, OWS, Belgium)

Bio-based and contain pigments
Biodegradation of CHP BAR 3000

Figure 4. Evolution of biodegradation of replicates of CHP BAR 3000 LCW (until 45 days)
Bio-based binders for paints

• Color an issue in the beginning
• By optimizing the polymerization process no discoloration

• Scrub resistance of paints an issue in the beginning
• By optimizing the polymerization process scrub was improved
Bio-based binders for paints, continued...

- Tinting strength an issue in the beginning
- By optimizing the polymer composition tinting strength OK

Properties today

- Weight fraction of bio content 25% - 50%
- MIT-free
- pH ~ 3.5
# PVC 50 paint

## Raw Materials:

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC 50</td>
<td>-28</td>
</tr>
<tr>
<td>Pigment grind:</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>36,0</td>
</tr>
<tr>
<td>Natrosol 250 HR</td>
<td>0,6</td>
</tr>
<tr>
<td>CHP 804</td>
<td>1,4</td>
</tr>
<tr>
<td>Dispex Ultra FA 4480 (ent. Hydropalat 1080)</td>
<td>0,3</td>
</tr>
<tr>
<td>BYK 022</td>
<td>0,3</td>
</tr>
<tr>
<td>Ammonia 25% (aq)</td>
<td>0,3</td>
</tr>
<tr>
<td>FP-460</td>
<td>24,0</td>
</tr>
<tr>
<td>Kronos 2190</td>
<td>36,0</td>
</tr>
<tr>
<td>Omyacarb 2 GU</td>
<td>45,0</td>
</tr>
<tr>
<td>Omyacarb 5 GU</td>
<td>24,0</td>
</tr>
<tr>
<td>Let down:</td>
<td></td>
</tr>
<tr>
<td>Acticide MV 14 (1:10)</td>
<td>0,5</td>
</tr>
<tr>
<td>CHP 5128.4 EP</td>
<td>0,39</td>
</tr>
<tr>
<td>Ammonia 25% (aq)</td>
<td>1,6</td>
</tr>
<tr>
<td>BYK 022</td>
<td>0,3</td>
</tr>
<tr>
<td>Acrysol RM-2020</td>
<td>2,1</td>
</tr>
<tr>
<td>Acrysol TT-935: Water 1:2</td>
<td>1,8</td>
</tr>
<tr>
<td>Water</td>
<td>4,5</td>
</tr>
<tr>
<td>Total</td>
<td>301,6</td>
</tr>
</tbody>
</table>

## Solid Content

- **weight-%**: 59,4
- **PVC %**: 49,7
- **pH**: 7,7
- **Opacity %**: 96,4
- **Gloss 20°/ 60°/ 85° GU**: 1/3/7
- **MFFT °C**: < 0
- **Scrub Resistance**: ISO 11998 µm 13, EN 13300 Class 2
Summary

• We have today
  – Binders with 25% - 50% bio-based content
  – Binders not yellowing over time
  – Bio-degradable solutions for paper and non-woven applications
  – Bio-based binders meeting requirements of IWP

• In the future
  – Increase of bio-based content in the paint binders
  – Guide-line formulations with bio-based raw materials
Thank You!