„Alternative raw material and pulping”

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Introduction

This study is focus to found new chip and easy method to separate fiber from raw material. Chemical pulping has high investment and exploitation cost. They are need easier method to adaptation TMP to separation grass fibers.

Preparation grass to researches, at the beginning grass was cutting and mixing with water and hitting. Next step was beating grass with water in kitchen blender. Hitting grass in water to boiling make this material more plastic and easier to separation fibers. If this method will be enough interesting the next step in this study would be test with 14 different kind of grass samples from Austria, onion peelings and Champost.

In this investigation we also check how can be influence apple pulp additive for paper strength properties. Apple pulp to include many hemicelluloses an this can improve paper strength properties but also increase ° SR degree.

Samples preparation and tests

1. Grass casting at parts 2,5 cm in length.
2. Hitting grass with water to boiling temperature.
3. Beating hot grass with water in kitchen blender by 3 min.
Steps 2 and 3 was repeat three times.
5. Make hand sheet at 100% recycled pulp,100% grass pulp and next mixed this two pulps 25% grass and 75% recycled pulp.
6. Strength properties tests and compares results.
7. Preparation grass pulp from Austria, onion peelings, Champost.
8. Microscope pictures of this pulps.
9. Compares pictures.
10. Make hand sheet at 100% recycled pulp and hand sheet at mixed pulps 5% apple pulp with 95% recycled pulp.
11. Strength properties tests and compares results.
Dates and results

Microscope picture of Grass after three times hitting with water and beating in kitchen.

[Pic. 1]

[Pic. 2]
Microscope picture of *Champost* after three times hitting with water and beating in kitchen.
Microscope picture of Onion Peelings after three times hitting with water and beating in kitchen.

[Pic. 5]

[Pic. 6]
Microscope picture of Grass Samples from Austria after three times hitting with water and beating in kitchen.

Sample name “1”  
[Pic. 7]

Sample name “2”  
[Pic. 8]
Sample name “3” 
[Pic. 8]

Sample name “4” 
[Pic. 9]
Sample name “5”  [Pic. 10]

Sample name “6”  [Pic. 11]
Sample name “7”  
[Pic. 12]

Sample name “8”  
[Pic. 13]
Sample name “9”  
[Pic. 14]

Sample name “10”  
[Pic. 15]
Sample name “GRAINED”
[Pic. 16]

Sample name “GGE2”
[Pic. 17]
Sample name “GGEE 3”
[Pic. 18]

Sample name “S”
[Pic. 19]
Microscope picture of “Apple peervezel reststroom”  
[Pic. 20]

Microscope picture of “Apple pulp”  
[Pic. 21]
Microscope picture of “Citrus vummm”
[Pic. 22]
## Paper properties tests results

<table>
<thead>
<tr>
<th>Sample name</th>
<th>Recycled Pulp I</th>
<th>Rec. Pul. I 75% + Grass 25%</th>
<th>Grass</th>
<th>Recycled Pulp II</th>
<th>Rec. P. II + 5% Apple Pulp (peerervel/reststroom)</th>
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<tbody>
<tr>
<td>Bursting strength</td>
<td>172</td>
<td>139</td>
<td>-</td>
<td>165</td>
<td>194</td>
</tr>
<tr>
<td>[kPa]</td>
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<tr>
<td>Burst factor</td>
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<td>211</td>
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<tr>
<td>[kPa]</td>
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<tr>
<td>Breaking length</td>
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<td>2311</td>
<td>-</td>
<td>2816</td>
<td>3298</td>
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<tr>
<td>[m]</td>
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<td>-</td>
<td>2,652</td>
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<tr>
<td>Stiffness</td>
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<td>405</td>
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<td>1,45</td>
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<tr>
<td>[%]</td>
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<tr>
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<td>[kN/m]</td>
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<tr>
<td>Porosity</td>
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<tr>
<td>[ml/min]</td>
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**[Tab. 1] Breaking strength**

![Breaking strength chart](image)
Conclusion

Paper made for 100% grass was too weak, and we can’t see any strength properties results probably next time the paper should be made with higher grammage approximately 120 g/m². Mixing recycled pulp 75% with grass pulps 25% was to drop paper strength properties. This was probably results of do not enough fiber separation at/in grass pulps. We can see at the pictures [Pic. 1, 2] big piece fibers joints, pulp should be treatment in refiner.

Champost pulp which was made this same method has very high freeness and it was impossible to made hand sheet. We can see at the pictures [Pic. 3, 4] shred and dirty fibers we can screaming this pulp to improve pulp properties but the yield probably would be decries.

Mixing recycled pulp 95% with “Apple peervezel reststroom” 5% was improve paper properties. This is very interesting, because we can see at the picture [Pic. 20] only very small parts of fibers – cellulose (cellulose in to polarization light is shining). “Apple peervezel reststroom” has only small parts it is prove because hand sheet made for mixed recycled pulp 95% with “Apple peervezel reststroom” 5% has very lower porosity. Reason on improve strength properties is that “Apple peervezel reststroom” has many hemicelluloses which has good influence at paper strength properties. Give to recycled pulp more and more “Apple peervezel reststroom” increasing freeness. Freeness recycled pulp had 40 ° SR but with 5% “Apple peervezel reststroom” was increase to 61° SR and with 10% “Apple peervezel reststroom” get freeness at 68 ° SR.

Discussion

Looked to inside onion peelings “pulp” is difficult to find good fibers see at the pictures [Pic. 5,6]. The paper is which made for this material is very weak and fragile.

Pulps from Grass Samples from Austria had similar consistence to normal grass, but was exceptionality. Samples GRAINDED, GGE 2, GGE 3 had many small pieces of grass after hitting and biting has many small parts of fibber look at the pictures [Pic. 16,17,18]. Grass no. 8 and 10
has problem with crease after drying. The paper made for sample “S” give yellow color similar to dry straw. Samples 7 and 9 have the most big piece grass after beating. Grass no. 3 gives paper with one side very irregularly structure. The most uniform structure have papers made from samples no. 1, 2, 4, 5, 6. Problems with not enough separation fibers with samples from Austria was similar to problems with first sample of grass. This method what was use to make pulp is not satisfied we should probably repeat beating process several more time or use equipment with deferent knifes.