

FIBRE-CATALYST™ CASE STUDY RESULTS

REPORT RESULTS

INDUSTRIAL TESTING IP-013

FIBRE-CATALYST™ DISINTEGRATION BIO-CATALYST
PROCESS ENGINEERING, MANUFACTURING

MARCH 30, 2017

Scope of Project:

The following report aims to present the results related to the Bio-Catalyst's (BOC's) Fibre-Catalyst™ Disintegration product test carried out on March 30, 2017 in the Pulp of Recycled Paper.

The test consisted of validating an alternative to the current disintegration (enzyme product) to reduce costs, and maintaining, or improving, the current disintegration level with enzymes.

The test met the expected success criteria; maintained product quality, and decreased the disintegration time, with dosing conditions equal to, or better, than with the competitive enzyme product.

Criteria for success of the test:

- Disaggregate paper with RH without the presence of post-dispersion tablets.
- Maintain or decrease the RH paper disintegration time (current disintegration time 25 minutes).
- Adjust dosages, seeking to reduce costs (current dispensing bio-catalyst disintegration 28 mL / Tonne paper).

Evaluation Procedure:

The test was carried out in the Pulp of Recycled Paper 1 from the day 14 to the 23 of March, while it was made in Paper 2 of the paper 753 Towel Nova Ultra second sheet and 767 Napkin Nova Abolengo.

The procedure was as follows:

- The pulper is filled with water (approximately 5% of pulper capacity) and 50 mL of BOC's Fibre-Catalyst™ Disintegration product is dispensed.
- Load 1000 kg of Atmos paper blankets with RH and mix in pulper for 2 minutes adding water until a homogeneous mixture is obtained.
- 100 mL of BOC's Fibre-Catalyst™ Disintegration product is dispensed into the pulp and kept stirring for 7 minutes, at which time a sample is extracted to observe the disintegration.
- The rest of the load is applied to the pulper: 1000 kg white cut 2 and 1500 kg white cut 3 to disassemble.
- Samples are taken every 15 minutes until disintegration is complete.

Results and Conclusions:

Quality of Disaggregation:

From the samples, it is observed that at 7 minutes the additive could disaggregate the Atmos (recycled) paper with RH with 150 mL of additive as shown in Figure 1.

Figure 1.

Disintegrated Atmos (recycled) paper sample in 7 minutes.

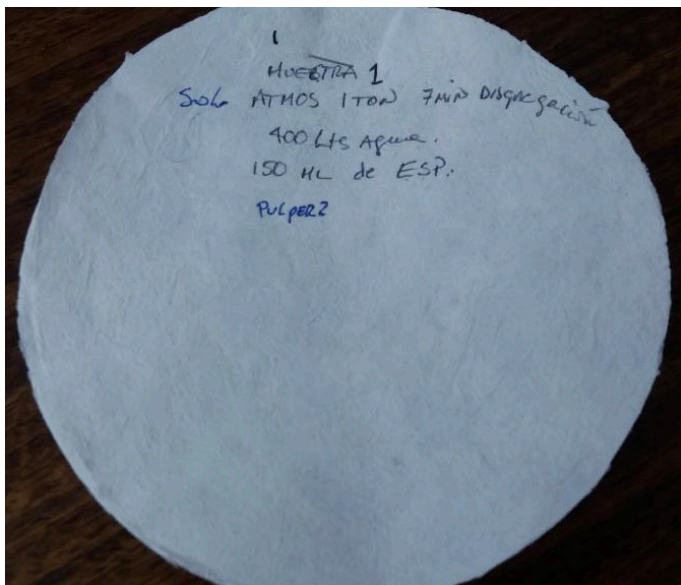
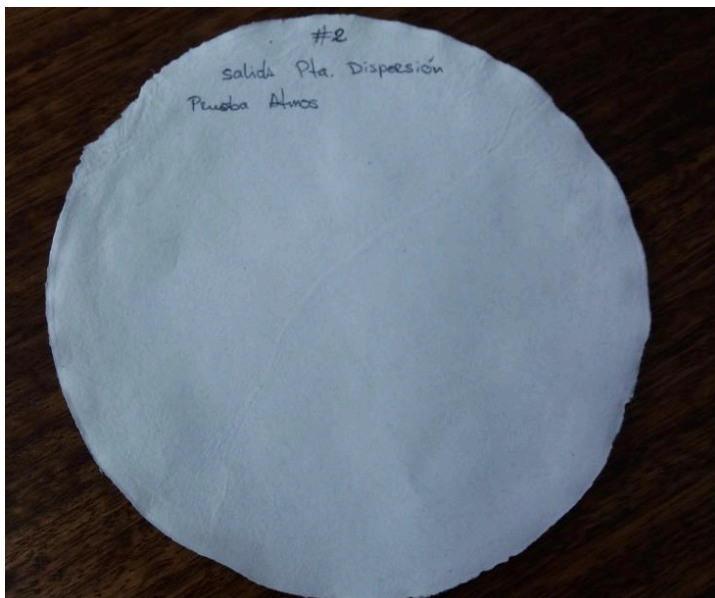


Figure 2:

It is observed that the final load after passing through the disperser does not have paste tablets maintaining the quality.

Figure 2.

Sample of fiber after passing through disperser.



Costs and Consumption:

It is observed that in the test, 150 mL of Fibre-Catalyst™ was discharged for a load of 3,500 kg to disintegrate the RH blanket, which for an annual production of 100,000 tonnes.

| Additive | Load Additive in Pulper (mL)/Tonne | Specific (grams/tonne) of paper | % of Treatment Cost Reduction over Current Cost per Tonne |
|----------------|------------------------------------|---------------------------------|---|
| Fibre-Catalyst | 150 | 13, 15 | > 80% |

5. Co-ordination of the Test:

| Area | First Name | Responsibility |
|---------------------|--|--|
| Process Engineering | Diego Soto – Process Engineer Juan Abarca - Senior Process Engineer | General Coordination of the Test |
| Preparation Staff | Carlos Salinas - Chef Preparation Pasta Fernando Núñez - Manager Prep Pasta | Ensure basic condition of the line Additive dosage and sampling |