BIO-ORGANIC CATALYST

THE POWER IN NATURE®

PAPER & PULP INDUSTRY

PRESENTATIONS

Part I:

An Approach to Be Reliable Cleaner Production &
Sustainable Productivity Paper Industry in 3 Successful Cases

Paper II:

Application of BOC Paper-Catalyst for Broad
Spectrum Microbiological Control in Pulp and Paper Operations

PART I:

Biotechnology: A Reliable Approach: Clean Sustainable Production and Productivity in Paper Industry – Three (3) Successful Cases

ACOTEPAC PAPER CONFERENCE – CALI, COLOMBIA
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2016

ENVIRONMENTAL IMPACTS OF PAPER INDUSTRY

EL NIÑO

CLIMATE CHANGE

Natural Resources

Occupation of Area Landfills

Energy Consumption

Water consumption and pollution of tributaries.

Pollution and odors

BIOTECHNOLOGY

New technologies that allow processes friendlier to the environment.

Papermakers processes in the application of biotechnology has revealed important results that reduce environmental impact and costs.

Requirement for a change of technology:

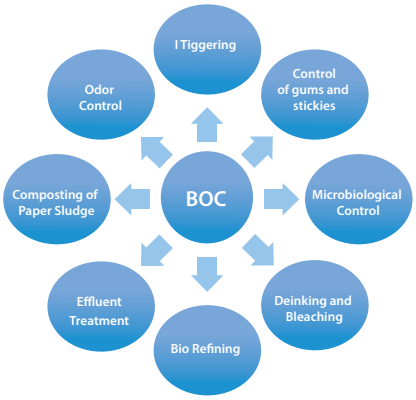
1. Improvements in products and processes.
2. Quality improvements
3. Costs reduction
4. Reducing environmental impact (lower energy requirements, water and chemicals)

Organic Biocatalysts

A valuable new biotechnology to address major production targets, reflecting gains in product quality achieving economic compensation through these improvements (refining, chemical reduction, increased productivity, etc.).

The different objectives of quality and processing characteristics fits.

BOC Application in the Paper Industry

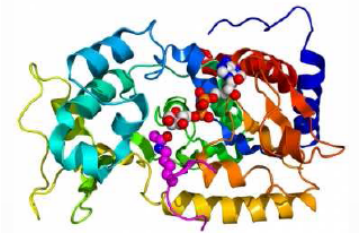


Biocatalysts Organic in the Paper Industry

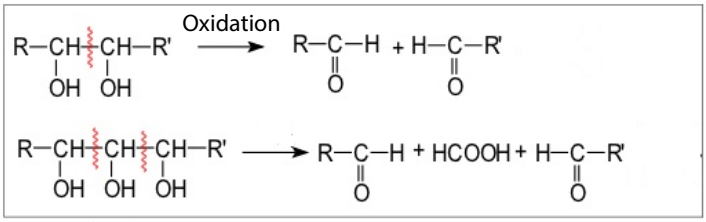
Organic biocatalysts are a new technology, created by Bio-Organic Catalyst, Inc.

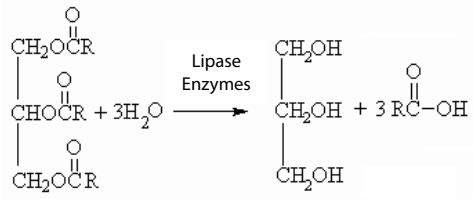
They consist of a complex mixture of biologically derived substances, classified as catalysts, because accelerate and improve the efficiency of chemical and biochemical reactions.

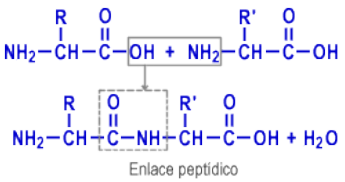
They are ***complex functional protein*** broad spectrum of highly purified vegetable sources, ***cofactors and nonionic bio-surfactants*** that act through different mechanisms, modifying the surface of the substrates, solubilizing and degrading organic matter.



The key attribute of the BOCs is its ability to cause immediate catalytic decomposition of the molecular structures of organic and / or contaminating compounds.







Biocatalysts Organic in the Paper Industry

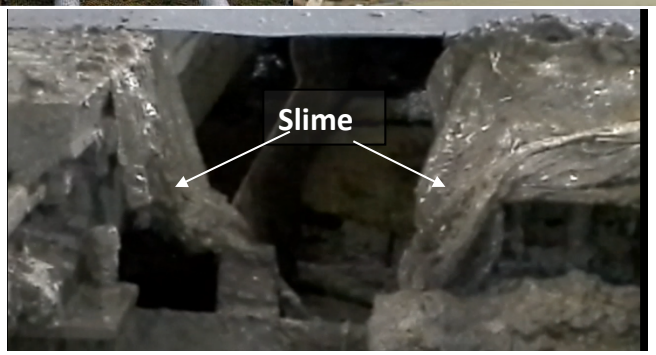
The BOC are also notable for its unique ability to increase transfer rates of oxygen gas and raise the level of dissolved oxygen in the water, thereby facilitating the mechanisms of nature give vital quality water, and support requirements critical for advanced debugging wastewater.

Microbiological Control in Paper Factories

The raw material to be manipulated is contaminated and acquires different types of microorganisms (bacteria, fungi, etc.).

Microbiological Control in Paper Factories

The process water circulates for a long time throughout the system, greatly enriched with substances that are a source of nutrients for microorganisms, so the tendency to proliferation of the microbial population is very strong.



Because of this problem for the papermaker and / or cardboard arise because deposits biofilm generates Slime adhering on all wetted parts of the machine and to grow and detach leaves with the pulp occur, ***causing black stains, odors, paper breaks, poor quality and of course causing machine downtimes, resulting in low productivity.***

Microbiological Control in Paper Factories

Acting as the BOC

BOCs used in microbiological control, ***degrade proteins and exopolysaccharides within the structural network of biofilm*** formed by harmful microorganisms during and after the colonization of surfaces, being exposed to the hostile aerobic and reducing its ability to form the Slime.

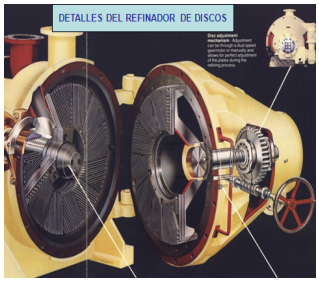
Microbiological control in the BOCs are applied in dilution from the pulper or in recirculation circuits process water.

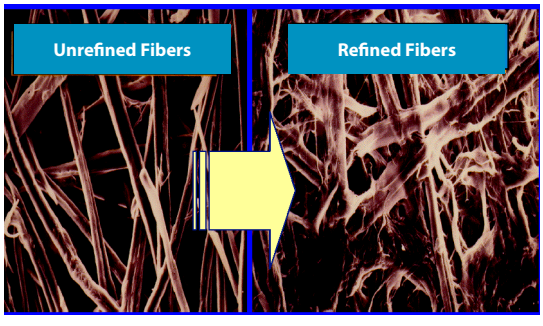
Organic Biocatalysts, Biorefining Paper and Cardboard

Refining Process

The main objective of the refining operation is to prepare the fibers to achieve desirable strength properties in the final product.

The refiner is the most important in the process equipment, as with the effect provoke internal and external fibrillation on the fiber surface, to increase its surface area and its ability to form interfiber and intrafiber bonds.





Morphological Changes in Fiber

The primary effects as external fibrillation and fiber shortening fines formation can be observed with the increase in refining energy. The modification of the external walls of the fiber involves the release of fibrils and microfibrils production on the surface of the fiber, causing a noticeable increase in surface area; other effects are related to the structural deterioration of the fiber with the formation of cracks, dislocations and sprains.

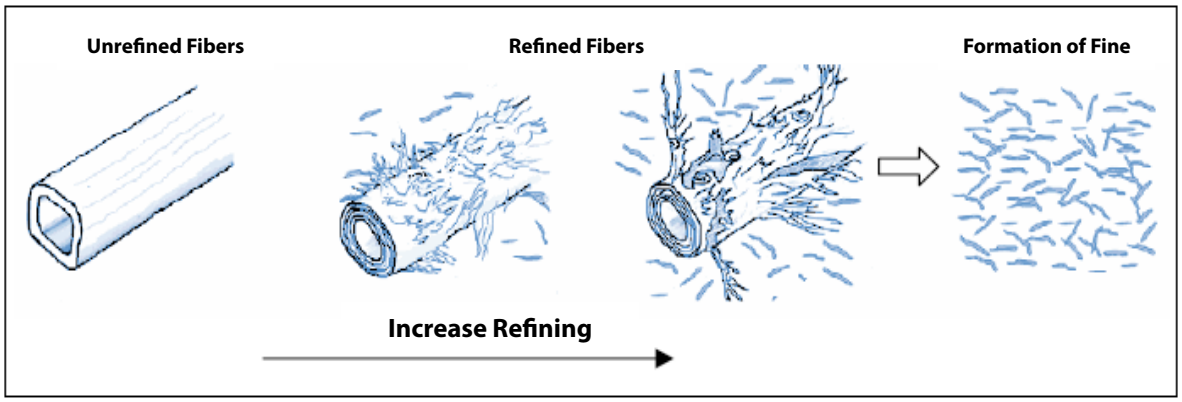


Figure 3-1 General scheme of the morphological transformation of the fibers in the refined.

Organic Biocatalysts, Biorefining Paper and Cardboard

The fiber undergoes a physical-structural modification, which determines the physicochemical properties of paper and largely are determined by the type and quality of the fibers and by chemical and mechanical treatments that are communicated to them in the process for papermaking.

Bagazze
Semi-bleached virgin pulp
Bleached virgin pulp
Kraft virgin pulp
DKL recycling
OCC recycling
Recycled white SI
Recycled white Imp.

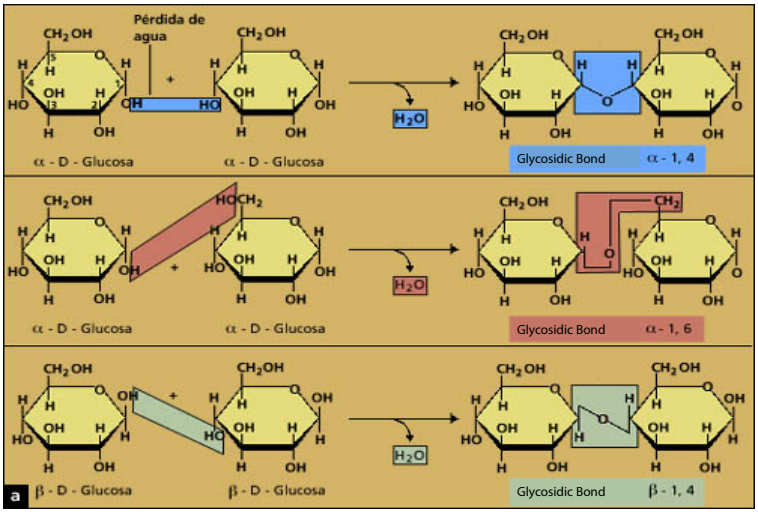
PROCESS TYPE

PHYSICO-MECHANICAL PROPERTIES

Organic Biocatalysts, Biorefining Paper and Cardboard

Biorefining Process

In biorefining process are organic biocatalysts (enzymes) responsible to accelerate (catalyze) degradation reactions where there breaking a series of intra and interfiber bonds of the cellulosic components, hemicellulosic and lignicos housed in the different layers of the fiber cell walls.



Organic biocatalysts by its composition, has a ***penetrability, causing the water inlet into the amorphous zones and consequently hydration***, which break hydrogen bonds and is presenting swellings and delamination of the layers producing a fiber more flexible and soft.

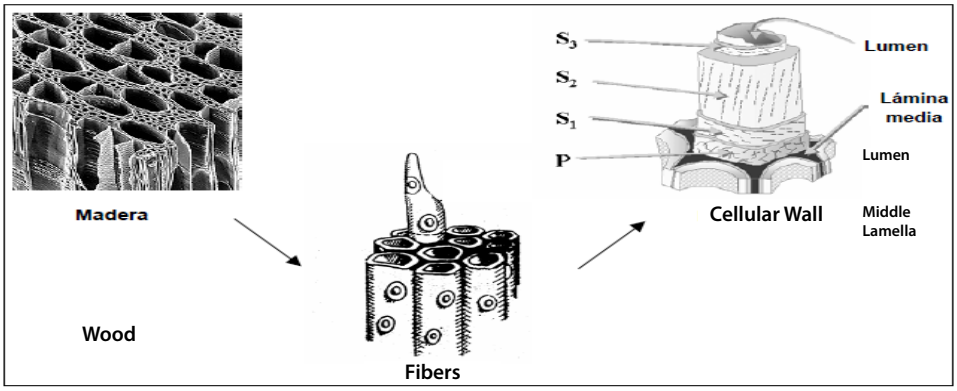


Figure 1.1. Wood structure and cell wall of plant fibers, P: Primary Wall, S1: External Wall secondary, S2: average mid secondary, S3: inner secondary wall and LM: Lamina Media (Kirk and Cullen, 1998).

Biorefinery

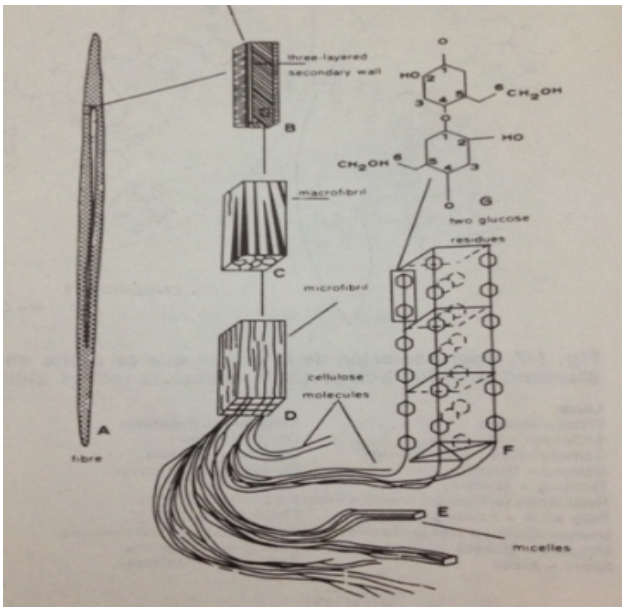
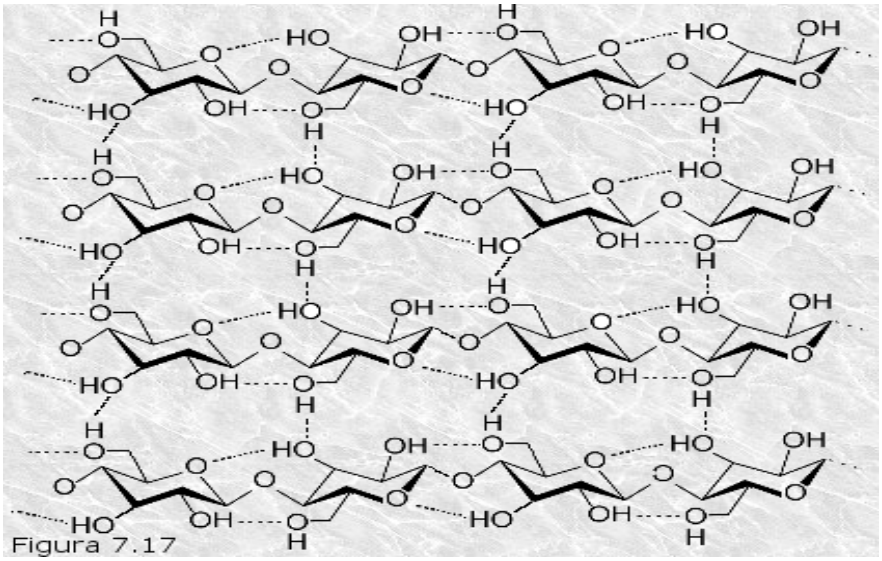


Fig. 1-6 Structures microscopic and macroscopic cellulose. (Bruley)

Links of Hydrogen Bridges

These links are responsible for the insolubility of the fiber, the crystallinity and order of their areas and ultimately the strength thereof.



Unions Fiber-Water-Fiber

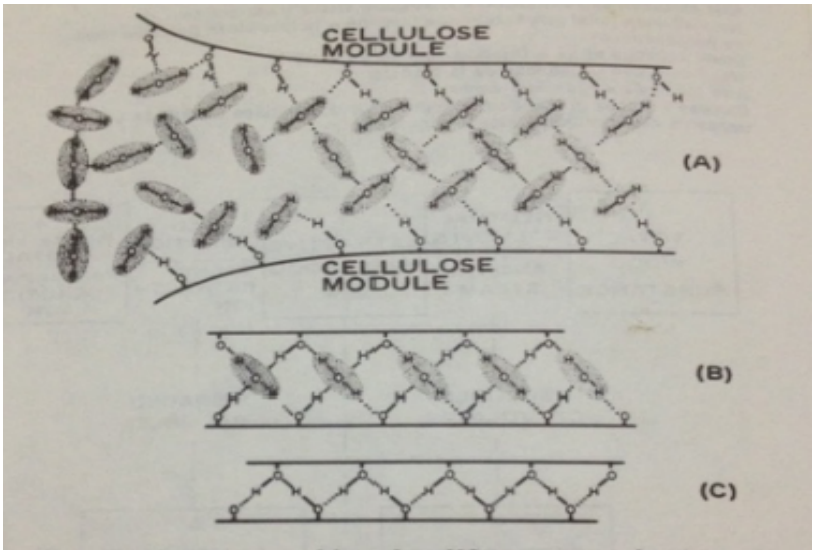


Fig. 1-11 Illustration of different levels of hydrogen bonds: a) weak through water molecules; b) stronger through a layer of water molecules c) directly.

With the action of organic biocatalysts on the fiber coupled to the mechanical action of refining, a substantial modification of the fiber surface (morphological changes) being increased its surface area occurs, which generates greater ability of the fiber to form bonds intra and interfibrillary, resulting in this increased physicomechanical properties of paper (flexibility, strength, Scoreboard, torn, increased water retention (increase in the degree of drainage), greater densification and reduction in airflow passage).

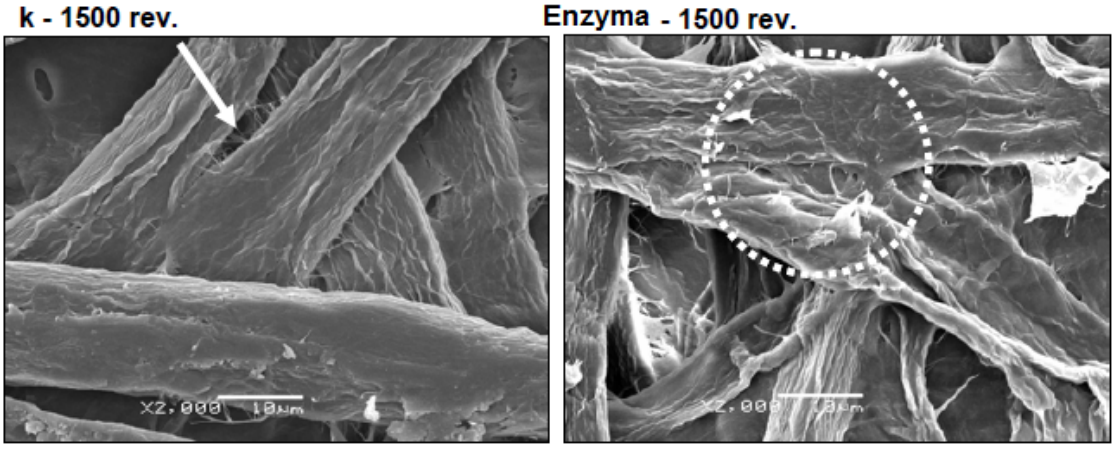


Figure 6-10. Evolution of the morphology of the fibers with the application of the enzyme-refined at 1500 rev.

Catalytic Action

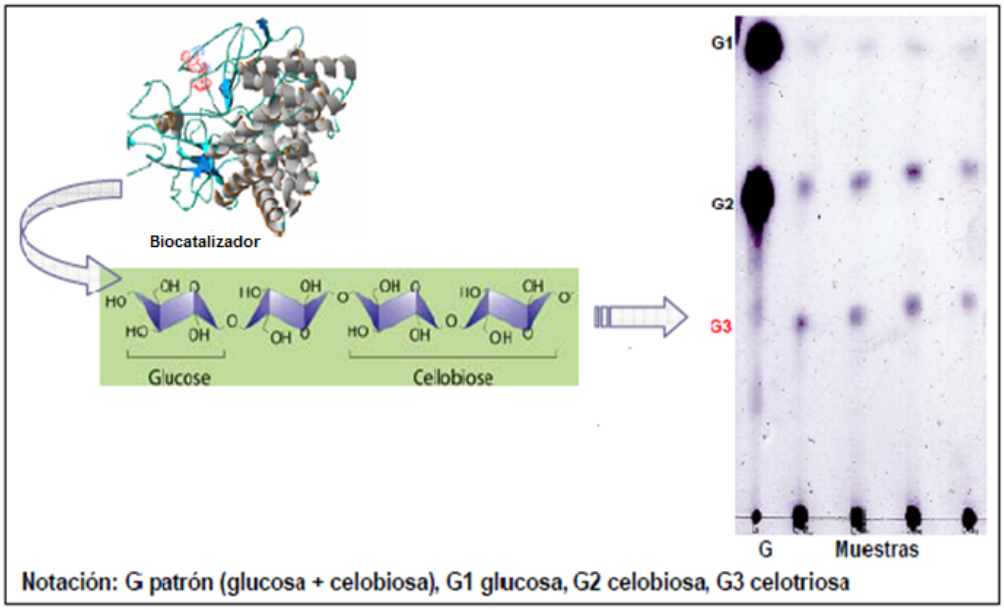


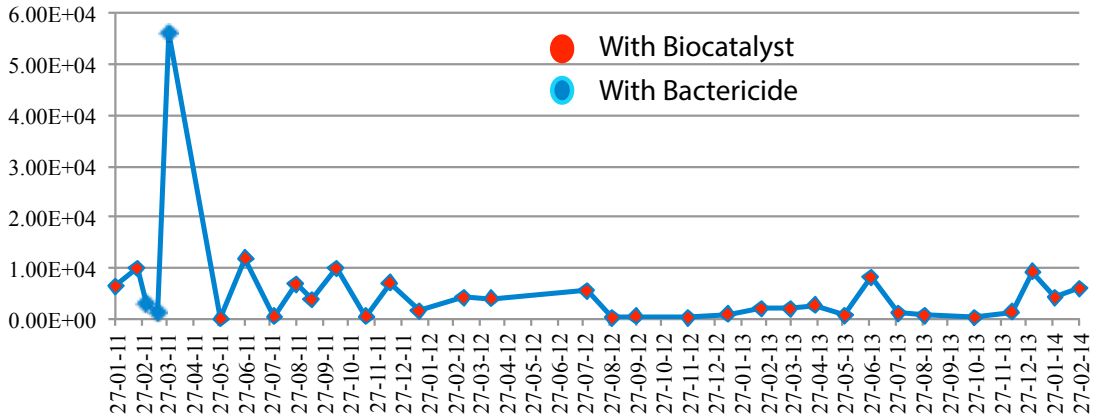
Figure 4-13 Analysis of thin layer chromatography.

Successful Cases

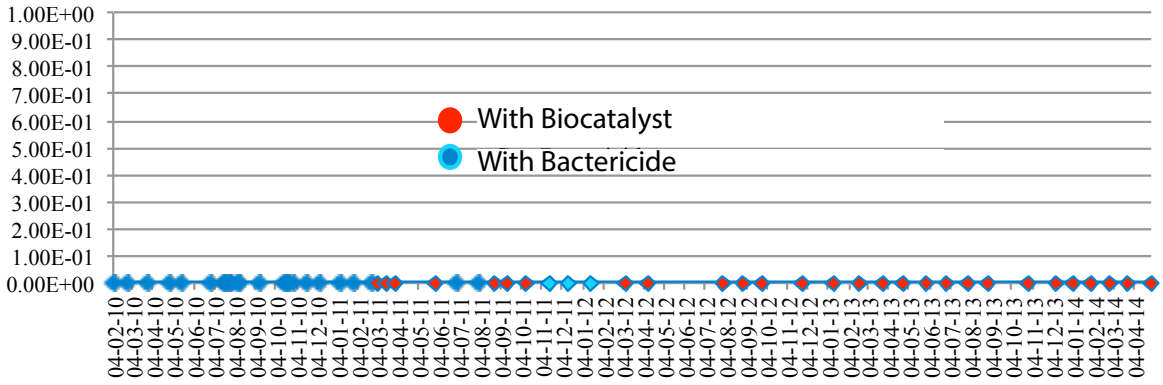
Case #1: Microbiological Control

- Cartons Bin Brown
- Two mills in operation
- Total production 450 tons
- Online Application organic biocatalyst
- Duration of application 5 consecutive years
- Application rate from the pulper gr/ton
- Excellent microbiological control

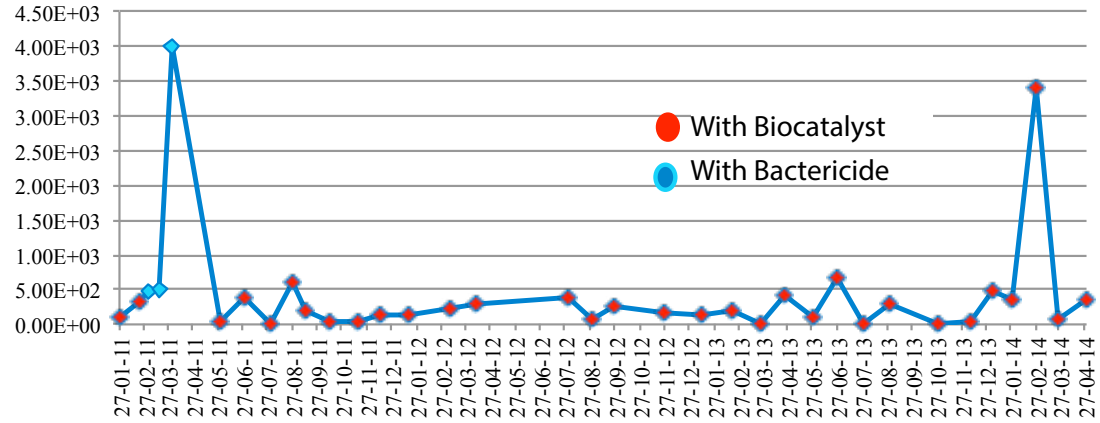
Total Coliform - Water Machine M #2



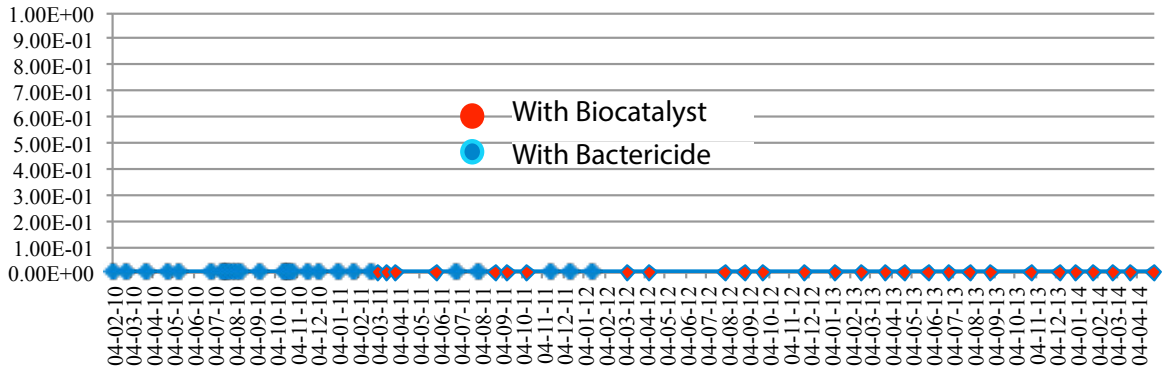
Total Coliform- Finished Product M #2



E.Coli - Water machine M#2



E.Coli - Finished Product M#2



Successful Cases

Case #1: Biorefining

- Cartons Bin Brown
- Two mills in operation
- Production M #1 150 tonnes and M #2 300
- Online Application organic biocatalyst
- Duration of one-year continuous application
- Refining tank dose application gr/ton
- Excellent results

Case #1: Benefits

1. Reduction in refining energy 8-10% in both corrugating medium and Test Liner
2. Steam reduction of 6.8 to 7.2% CM and TL
3. Increased production of 2 to 5%
4. Cost reduction by decreased dose of AKD, starch and Raw Materials

Case #2: Microbiological Control, Decay and Biorefinery

- Bin Tissue Paper
- A mill in operation
- Production M #1 45Tm
- Online Application organic biocatalyst
- Duration 3 Continuous application year
- Application rate g/t
- Excellent results

Case #2: Benefits

- Excellent microbiological control
- Slime control problems in pipelines and machine
- Best disintegration of raw materials
- Replacing the chemicals for controlling stickies gums
- Total replacement of biocides
- Elimination of human and environmental risks
- No involvement of the chemistry of the machine

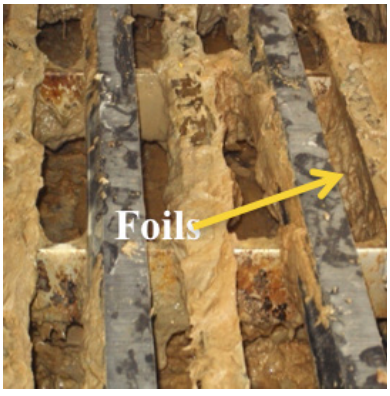
PART II:
Application of BOC Paper-Catalyst for broad spectrum microbiological control in pulp and paper operations

Application of BOC Paper-Catalyst:

- Reduced slime deposits in tanks, machines, and pipe cleaners.
- Control, and hydrolysis, in the accumulation of pitch, waxes, oils, resins, and starches.
- Increase efficiency in the pulping, especially with high wet strength.
- Improve refining times.
- Improve whiteness processing.
- Help strongly in the processes of closing circuits.
- Helps keep waters with better characteristics of oxygen.
- Cleaning and prevention of slime deposits, that are highly damaging to the papermaking process.
- Reducing breakage and blowouts on paper.
- Optimize the chemicals applied in the process without affecting the " runnability " of the machine. Improve production conditions, safety, and hygiene.
- Improves water discharge quality.
- Ensures the reduction of characteristic odors, in paper support systems closed water circuits.
- Increases the dissolved oxygen in the system.
- A bio-dispersant enhances cleaning of the fiber of inks, waxes, resins, and starches.
- Preserves the machine and equipment by reducing deposits.

Slime: a mass of filamentary material, pasty, gelatinous, Consisting of microbial bodies, deposits of chemicals, lumps of pulp, muddy deposits, impurities, and scaling.

- Slimes are responsible for fouling.
- It plugs felts, plastic nets, metal, and tarps dryers.
- Contributes to corrosion of all metallic parts of the machine structure below.



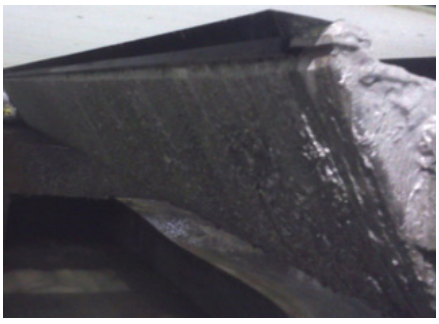
Cracks and imperfections in Paper

- Detachment from slimes causes blemishes, unsightly stains and holes in the paper.
- These amounts of slime cause breaks in the paper machine.
- Causes slow speed of the machine.
- Loss of production.
- Higher costs of operation.

BOC Microbiological Control Testing Programs:

Picture below of BOC in the box.

Picture below before addition of BOC.



The product presents an efficient cleaning action, removing slime deposits that may be generated in boxes and piping process

Strong action on gums

Avoid accumulation and involvement in the process. Disperses and disappears gums its tacky consistency which prevents it from sticking to the paper.

Before BOC.

After BOC.

Before Application with BOC.

After application of BOC.

1st week of BOC application.

3rd week of application.

4 weeks of application.

6 Months using BOC.

Principal Objective:

Increase efficiency in the pulping process by applying the biocatalyst BOC.
Specific goal: Check the impact of the biocatalyst BOC on the formation and freeness .

Method

The trial was conducted in a laboratory mini-pulper Kadant. It was used a fournist type of pulping presenting problems for its high content of resin and rubber wet strength was used . Industrial limpión and Canutos .

The trial was conducted in 4 Batch's:
1 Batch for the White
3 Batchs with product

Data Validation:

These parameters were considered :
Pulping times
Canadian Standard Freeness
Training by preparing sheets

First batch white:

Test point , with the comparative efficiency BOC was performed . Preparation Process : Play the same conditions that maintains the pulper . Working with a consistency of 17% Take water from the machine in the Pit Wire For 45 minutes Pulper Concluded the pulping: fiber sample, perform freeness and leaves.

Results batch white:

There was no disintegration of the raw material , so it was not possible to sample or make measurements.

Fournist

Pulping during 45 min

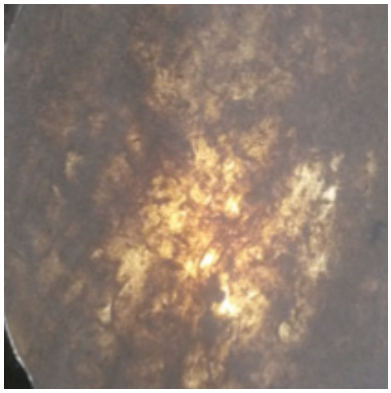
After the 45 minutes

With the addition of the biocatalyst BOC, we expect better results.

Application with Biocatalyst BOC
We worked with a consistency of 17% The dose I was used is the same proposal for applications in plant : 300 ml / ton of biocatalyst, or a dose of 0.75 g equivalent to 300 g / ton in plant added. It pulping for 30 minutes, except the 3rd batch that was extended to 45 minutes. Finished pulping, fiber sample was taken, freeness was made and leaves were made. To simulate a saturation of the system, it was decided to use the waters of each batch to perform the following. The corresponding dose of BOC was added and increasingly progressive improvement which " increases " the dose. The waters were not recovered in full, since its effect wetting and penetration, there is a part of the water that remains in the fiber (about 75%).

To make ESP pulpeos with the same conditions that had to do was preserved white. The raw material was prepared. It was added 0.1 grams of BOC It pulping for 30 min CSF was analyzed and was obtained in 550.

First Batch with BOC.



According to visual analysis we can see that although there were tiggering still need more contact time to achieve better homogenization of fiber

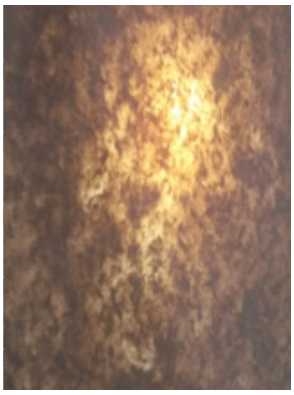
Second batch with BOC.

After removing the fiber from the first batch, leftover about 25 % water. the water was completed missing the raw material is added. 0.1 grams of T 60 is placed . It pulping for 30 min and samples were extracted at 10 min , 20 min and 30 min . In each sample was freeness obtaining different values. Leaves were made to contrast the freness with visual analysis

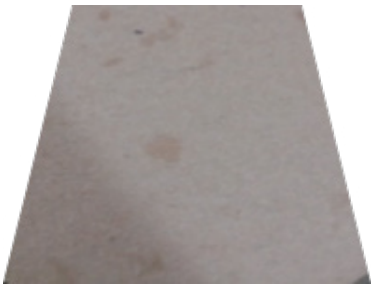
1st SAMPLE 10 min Pulping CSF 520
**It presents tiggering similar to the first sample batch of 30 min pulping.*

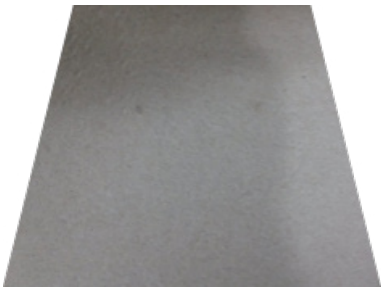
2nd SAMPLE 20 min Pulping CSF 500.

3rd SAMPLE 30 min Pulping CSF 480 improving freeness Denotes increase in tiggering.



3rd batch with BOC





X The water of the first batch's reused.

X The raw material was added. the missing water is added.

X It was added 0.1 grams of BOC.

X 60 samples at 30 min and 45 min were extracted pulping.

X In each sample it was freeness, obtaining different degrees in each sample.

X They leave to contrast the freness with visual analyzes were performed.

Conclusions:
BOC is an excellent ecological and economical option to apply in the paper processes.
BOC offers a broad spectrum of benefits that can be applied to optimize the entire manufacturing of paper.

First: Microbiological Control

Second: Cleaning and Reduction of Maintenance of Equipment

Third: Enhancing Fiber Cleaning

Fourth: Improve Water Usage and Discharges to Environment

Fifth: Reduce Chemical Usage

BOC is a product that has numerous advantages in papermaking processing. Microbiological control, helping in the deinking process, as well as improving pulping time, with increased efficiency pulping process .

The data obtained show that the product not only has a direct action on the pulping, but serves as a caodyuvante in the refining process. The laboratory testing was carried out with reused water for the purpose of presenting a "saturation" in the system, and thus demonstrate the action of the product on a complete life-cycle model.

Supporting applications have been made in different factories, including tissue and cardboard, throughout Latin America .

Application of BOC will increase efficiency in the pulping process, offering a great contribution to the penetration and wetting of the fiber, allowing the product to be introduced into the fiber and start the process of degradation of various pollutants we found in the raw material : waxes, resins, hydrocarbons, inks, and other contaminants.

Allowing the pulping process more efficient. It is important to consider that BOC has been designed to target the contaminants that prevent getting a good pulping without adversely affecting the fiber.

Application of Bio Organic Catalyst (BOC) to generate improvements in papermaking processes. Improved test bleaching processes Bio-Organic Catalyst (BOC)

Method

- 4 samples for this test were performed .
- 1 White that will serve as a witness to the efficiency of the product.
- 3 assays were performed with BOC application of different doses .
- The aim of the trial BOC in the laboratory confirmed the effects of which are evident in full scale plants, in actual operations.

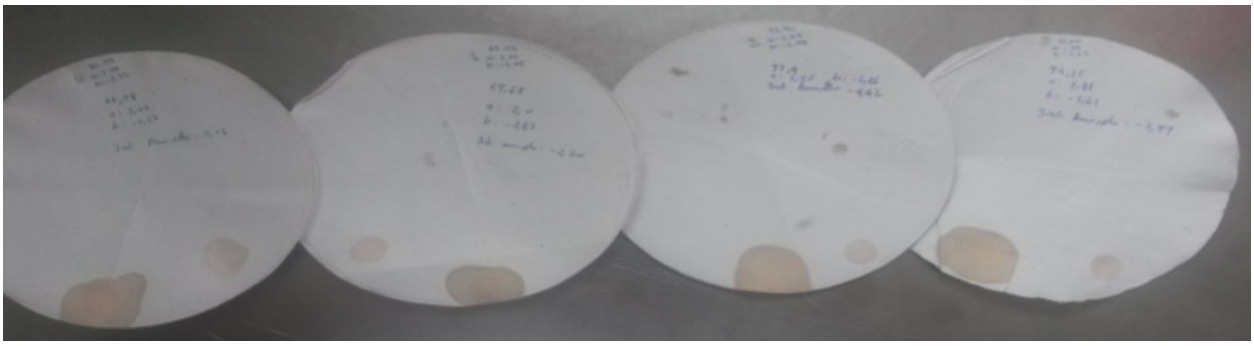
Dosage

Dosage rates at which the tests were conducted: 320, 550 and 700 g/t .
Note: these doses were chosen as they previously have been used in different papermaking processes with excellent results.

Results after 1 day

Application in the laboratory of BOC resulted in an increase of almost 2 points of whiteness between the target, and the sample dosed at 700gr/t.

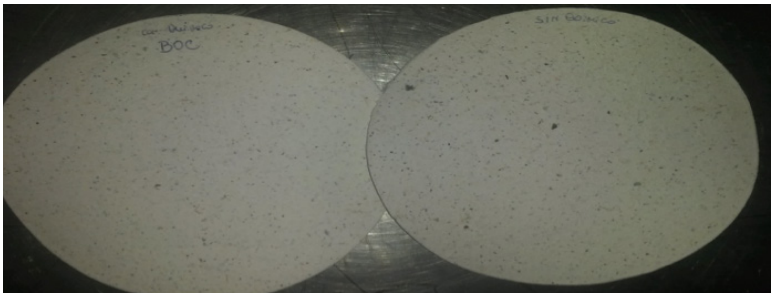
6 Days after the test



6 days after laboratory testing was conducted, action on the retarding yellowness of the fiber was observed. By applying the reagent to test for the presence of ligning , we see even traces of polymer are preserved. Taking the White an index of yellowing -0.01, samples with ESP presented indices of: -2.20 / -4.42 / -3.99 Respectively.

Although the polymer still preserved in a fiber does not have such a quick action on the road, which leads us to conclude that ESP has a strong action on the leaf yellowing. Reduce leaf yellowing means that we will have a white paper, which can be stored for longer without losing its qualities. Increased whiteness using BOC represents significant savings on chemicals.

ESP Action on Stickies



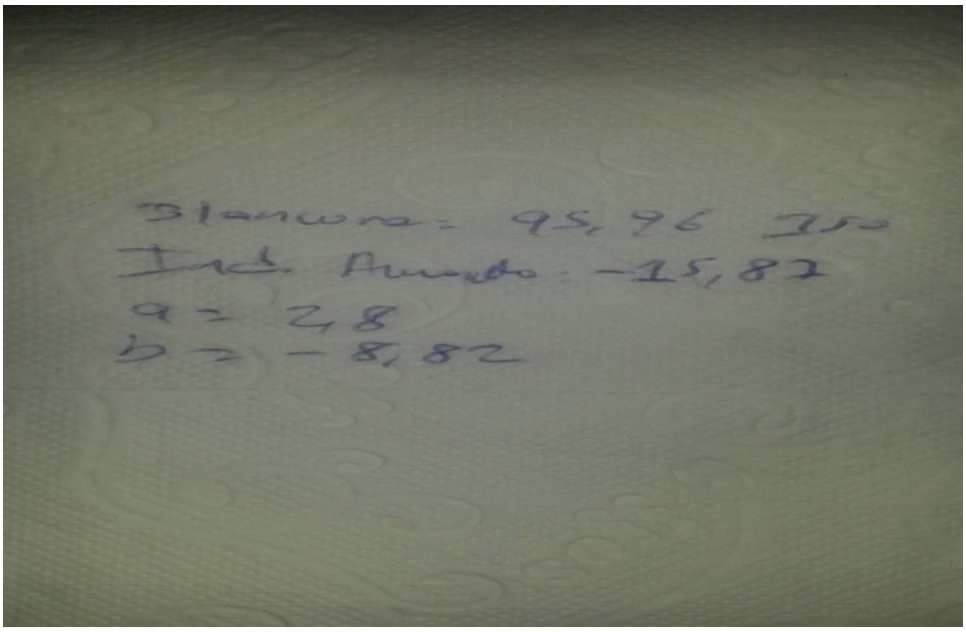
BOC has a strong remediation action on gums, stickies, and oil pitchs. Resulting in a cleaner machine in the water and fiber pulper. Action arising from the start of the process by helping to remove and avoiding harm in the process of formation. Paper produced with the BOC additive has a whiter appearance and improvement in its quality.

Without ESP

Fast and efficient action inks, oil and oil. It contains biosurfactants which together with soap increases the efficiency of the deinking cells . Traclean contains biosurfactants that do not harm the process , make the use of soap can diminish , avoids the use of defoamer.

Experiences from ESP applications in inks treatment plant.

Successful Case in the Implementation of ESP.



Hiteness103 Pints in Quality Toilet Paper

109 Points of Tissue Paper Brightness High Quality

BOC comparative trial with enzymes for biorefining.

Objective of the trial

This paper aims to present the power of penetration and wetting of BOC on different types of raw material. Comparing BOC is more effective in different processes than other products currently used in the papermaking process. Demonstrate how BOC presents shredding action and how this action can improve the refining process

Method Used

The test is performed by comparing the BOC with an enzyme for refining. The test is performed using different raw materials: cardboard, bond paper, and industrial towel. Compare the action of the two products using high doses to observe best effect.

Optimization of the refining process.

In plants applying enzymes to biorefining, accompanied with BOC, denotes an increase in the efficiency of these enzymes. Initially an increase is evident in the action of enzymes for refining; after the simultaneous application, the paste is displayed once passed through the refiner loses mechanical characteristics in the finished product, as it has an excess of refining. Refining enzyme retirement continuum with the application of BOC and we find improvements in the characteristics of the finished product, resulting in a decrease in production costs by adding the advantages of BOC.

Unlike other products, BOC does not need specific conditions for their operation and their application will have different benefits which does not generate an additional expense in its application and does a more efficient process.

Preparation Fournist

For assay was used:
- Industrial Towel
- Cardboard
- Bond Paper


ERWIN
LLIAMS
ENZINA
BIO REF
RECOMEN
DEL FAB
UWE
SEW
SEW-EDX
MODE
OFF
TARE
ON
E LINE
E LA LÍNEA

Dose


DETALQUIMICOS
MATERIAS PRIMAS
TRACLEAN 60
UWE
SEW
SEW-EDX
OFF


TRACLEAN 60
ANGEL
ANGEL

The chosen raw material was immersed in 10 liters of water . A submerged once was added BOC both 100cc and Enzyme.

Once the mixture exposed him constant mixing at low speed, this in order to have better contact and analyze defibration.

After exposing the fiber to mix with enzyme specific for biorefining , water is removed, fiber and water is weighed.

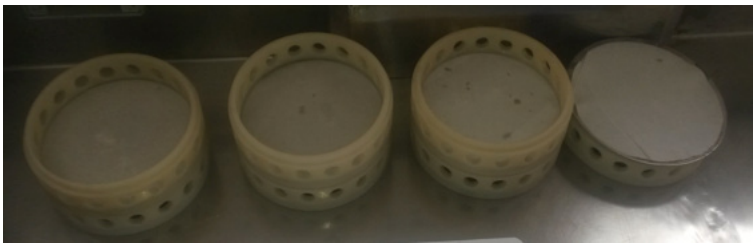
Results Obtained with BOC

Once the mixing time is finished, separate the fiber from the water. BOC is an excellent wetting fiber agent. As you can see it presents good tiggering. It is noted that the fiber retained 30% of water.

Application of BOC to generate improvements in papermaking processes

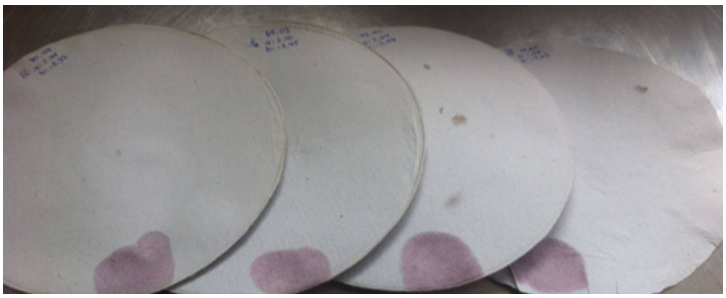
Improved test bleaching processes:
4 samples for this test were performed . 1 White that will serve as a witness to the efficiency of the product. 3 assays were performed with Boc application of different doses. The aim of the laboratory test is to show the effects of BOC seen in plant.

Dose



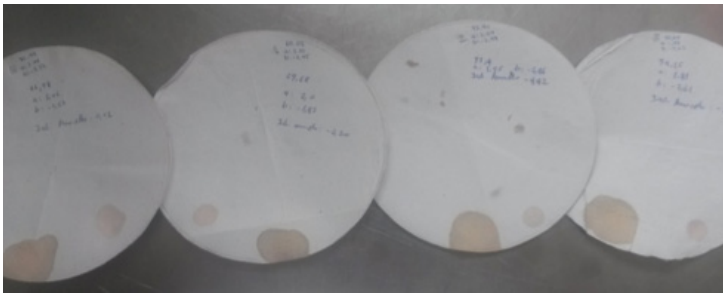
The doses at which the test was conducted were 320 , 550 and 700 g/t . We worked with these doses because they have been used in different papermaking processes with excellent results.

Results after 1 day



With the application, laboratory tests showed that with BOC, an improvement of almost 2 points of whiteness between the target and the sample that was applied 700gr/t.

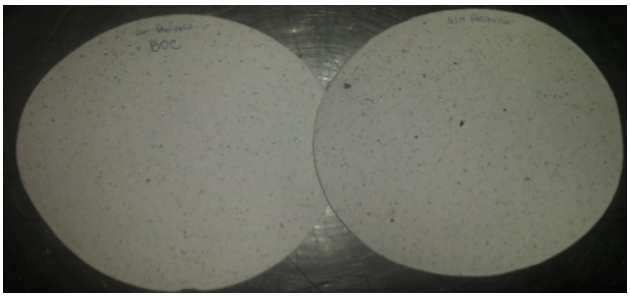
6 days after



6 days after laboratory testing conducted , the action on the retarding BOC in yellowness of the fiber was observed. By applying the reagent to test for the presence of lignin, we see even traces of polymer are preserved.

Although the polymer still preserved in a fiber does not have such a quick action on the road, which leads us to conclude that BOC has a strong action on the leaf yellowing . Reduce leaf yellowing means that we will have a white paper, which can be stored for longer without losing its qualities. Winning whiteness using BOC represents significant savings on chemicals .

Action of BOC over Stickies



BOC has a strong action on gums and stickies, oils, pitch which generates a cleaning machine from its point of application (pulper). Action arising from the start of the process by helping to remove and avoiding harm the process of formation. A paper with less pollution has a whiter appearance and improves its quality

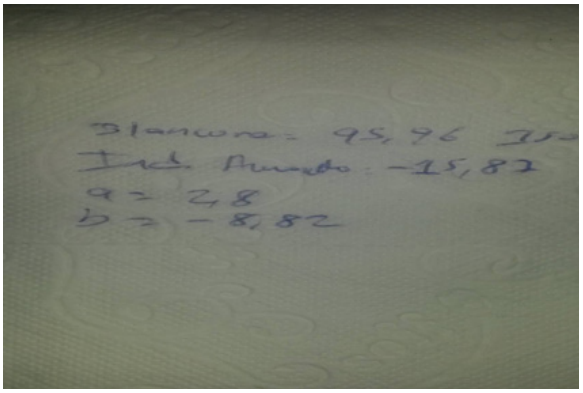
With BOC

Without BOC

Fast and efficient action inks, oil and oil. It contains biosurfactants which together with soap increases the efficiency of the deinking cells . BOC contains biosurfactants that do not harm the process, make the use of soap can reduce, or completely eliminate the use of defoamers.

Experiences from BOC applications in inks treatment plant.

Successful Case in the Implementation of BOC



Whiteness 103 Point in Toilet Paper

Simplify the process chemistry, eliminates the use of bactericides and biocides, which leave corrosive to the machine and the environment toxic waste. BOC offers a broad spectrum microbiological control, reducing and eliminating the microbiology process that affects the water and therefore the microbiological characteristics of the finished product. Do not contain toxic substances, or generate toxic reaction by products which could harm the environment or the machine, they are considered safe because they come from natural extracts. In various tests that have been conducted , has optimized the different products applied for processes without affecting in any aspect, the operations. Currently used chemical products have been reduced, while others eliminated, from the pulping and paper manufacturing processes, based on the functionality of the biocatalysts of Bio-Organic Catalyst.