

BIO-ORGANIC CATALYST
THE POWER IN NATURE®

Using biocatalysts in the production of tissue paper to reduce electricity usage by 27% and significantly accelerate disintegration of raw materials

A 30-month study at a large paper mill in Chile, using Fiber-Cat, a biocatalyst produced by Bio-Organic Catalyst, Inc.

www.bio-organic.com



Summary

An industrial test was carried out in a tissue plant of 110,000 tons / year, where Fiber-Cat was dosed for the disintegration of rejected jumbos with a high Wet Strength (high polyamine-epichloridrine resin content).

A one-month test was run in April 2017. Since the test, the mill has been using Fiber-Cat continuously to this day. This report covers the first 30 months.

The plant belongs to a major multinational paper company (name available under a Confidentiality Agreement).

Key findings:

- Fiber-Cat greatly improved the ability to disintegrate raw material.
- This reduced the time in the pulper.
- This generated average electrical energy savings of 27% over the 30 months.
- Before Fiber-Cat, the high wet-strength jumbos could not all be processed. Therefore they accumulated in warehouses and needed to be treated for disposal.
- With Fiber-Cat, this material could be processed without any modification to the equipment. This saved warehouse space and disposal/remediation costs.
- In general, Fiber-Cat produced material savings of USD 80 per ton.

About Bio-Organic Catalyst, Inc.

Bio-Organic Catalyst, Inc., headquartered in California, has developed a breakthrough water treatment, currently being used in over ten countries, which helps solve major environmental problems in waste/water (nitrogen, organic pollution, H₂S, odors), agriculture (water demand, soil health, crop yields) and industry (effluent, emissions, fouling) in a simple and profitable way.

Our Bio-Organic Catalysts (“BOCs”) are highly concentrated liquid biocatalytic agents that immediately increase oxygen transfer, increase dissolved oxygen and break down biofilm and FOGs.

This triggers beneficial effects wherever water is present, so there are surprisingly many useful applications, including pulp & paper, cooling towers, agriculture, anaerobic digestion, aquaculture, fire control, hydrocarbon remediation, commercial cleaning and many others.

BOCs are made from plant and mineral extracts, yeast fermentation by-products and a non-ionic surfactant.

BOCs are easy to use (just add to water), cost-effective (just 1 - 4 parts per million), increase operating profits (important for rapid large-scale adoption) and are completely safe and green.





Description Of Plant

This is a tissue manufacturing plant, located in Chile, producing toilet paper, kitchen towels, napkins, handkerchiefs etc..

Production capacity of 110,000 tons per year.

It has areas for converting rolls, folding and manufacturing. It has three tissue paper machines. It produces 100% cellulose papers and papers with up to 100% recycled content.

It has two single width paper machines and one double width paper machine, speeds from 1650 to 2000 meters / minute. With grammages from 14.5 grams /meter² to 21 grams / meter².

To supply fiber to these 3 paper machines, there are 2 low consistency 5% rotor / sieve pulpers for cellulose and 2 high consistency 15% helical pulpers for recycling and rejecting papers with high resin content and wet resistance.

Scope Of Test

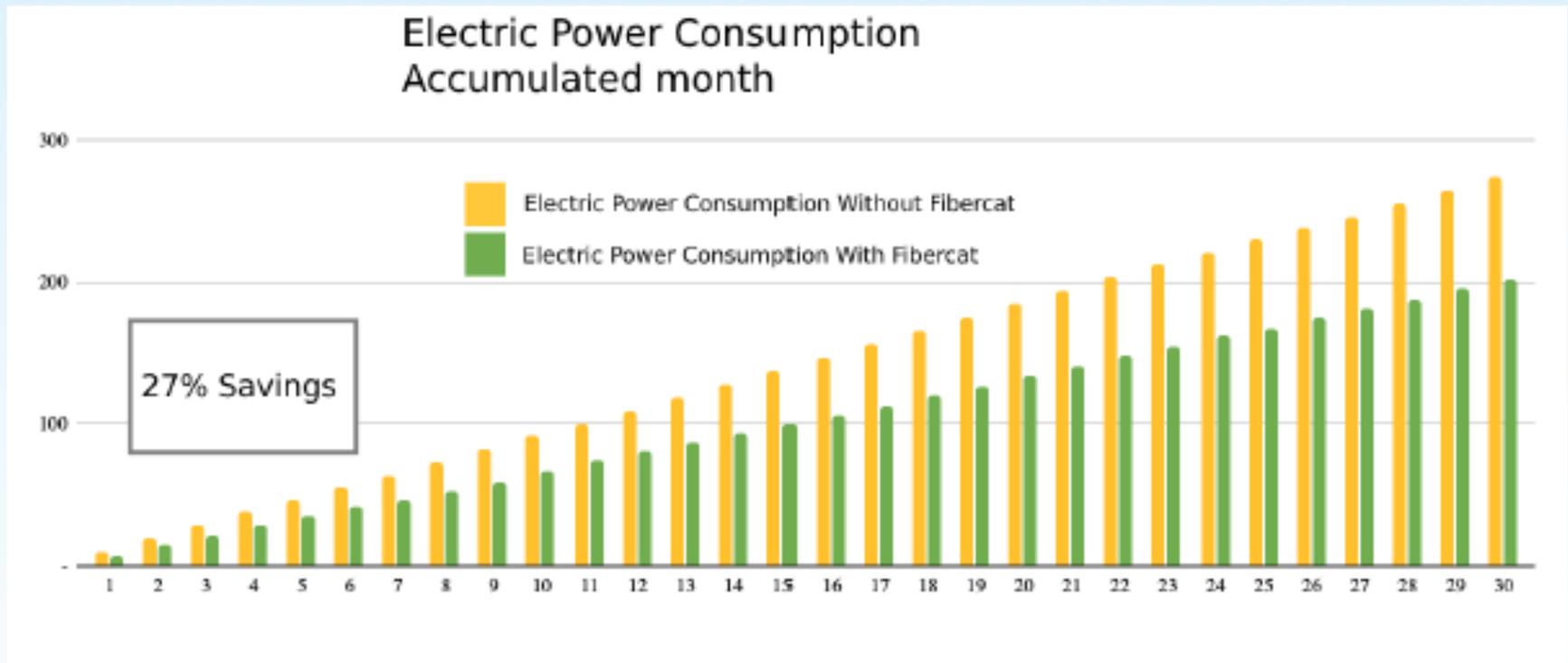
The area tested was the paste preparation area, line #1 helical pulper. This pulper disintegrates bales of raw material with 18% consistency.

The dosage was in batch form with 28 grams / ton (28 ppm) per load of 3500 kilos raw material.

The test started on 30 March 2017 and ended on 2 May 2017. Fiber-Cat has been used continuously since then to the present day.



Total Electricity Savings Over 30 Months



We see real savings of 27% equivalent to 70 MWh / month at 60 USD per MWh. From April to December 2017, savings vary from 26 to 32%, according to the production program. Digital equipment was installed in the Distributed Control System to measure specific motor consumption.

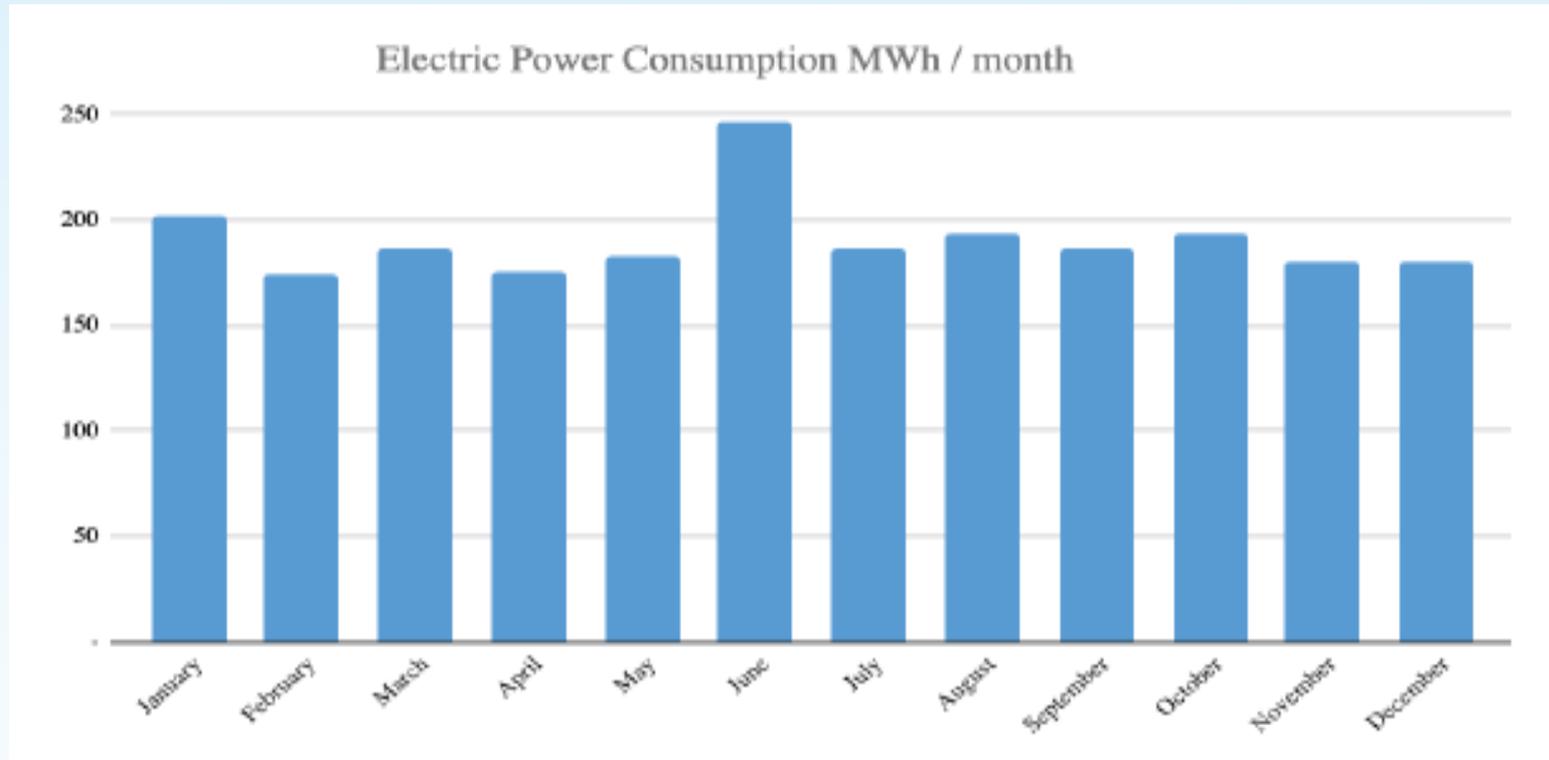
Total Savings 2108

The biggest savings was to be able to consume rejected jumbos with a high RH (Resistencia en Humedo / Wet Strength) content in absorbent towels, thanks to improved disaggregation with Fiber-Cat. 2400 tons were processed, with a savings of \$80/ton. During this year, Fiber-Cat was implemented as a line product in Recycled paste and Cellulose from two production lines. Fiber-Cat dosage was connected to the Distributed Control System.

Electric Power Consumption

Electric Power Base Line	274,047	KWh/month
Electric Power With Fiber Cat	201,845	KWh/month
Lower Electricity Consumption	866	MWh/Year
Electric Power Price	60	USD/MWh
Energy saving	51,985	USD/Year
High RH Raw Material Savings	192,000	USD/Year
Chemical Savings	70,730	USD/Year
Total Savings Year 2018 Pulper N ° 1	314,715	USD/Year

Electricity Savings 2019



During 2019, a soft starter was installed in the pulper motor, so that the baseline electric consumption of the helical pulper decreased from 274 MWh / month to 252 MWh / month. In June 2019, Fiber-Cat application was left out of service due to Fiber-Cat tests in machine #2. In July, Fiber-Cat application was resumed, to ensure continued high disaggregation.

Conclusion

Fiber Cat was able to disintegrate raw material in the pulper (rejected jumbos with high Wet Strength content) at a much lower cost compared to the previous supplier. Fiber-Cat generated 27% savings in electrical energy.

Savings in 2017: 150,304 USD (Estimated)

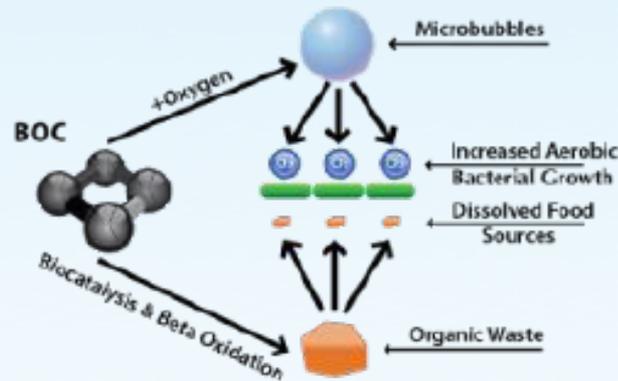
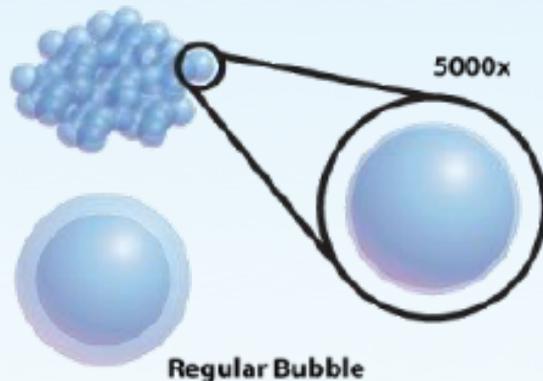
Savings in 2018: 314,715 USD (Measured)

Savings in 2019: 229,293 USD (Measured)

Note: In 2019, there was a lower volume of raw material to process, hence the lower savings compared with 2018.

The Technology: Bio-Catalysis Of Organic Waste Elements

Microbubbles



BOCs form micro-bubbles within the water. Unlike normal bubbles, which have shells that are “hard” and very difficult for gas to penetrate, BOC micro-bubbles have loose “porous” shells. This allows for very rapid oxygen transfer into the water, thereby increasing the dissolved oxygen (DO).

The micro-bubbles attach to long molecular chains in biofilm and FOGs and break the ester bonds. This breaks down the long molecular chains into smaller pieces, which are now small enough for the local microbiology to consume.

BOCs enhance microbiological reactions.

The Technology: Bio-Catalytic Oxidation



Works through an immediate and rapid oxygen transfer into the water column.

Oxidizes noxious gases on contact.

Drives greater aerobic biological reactions in solid wastes and wastewater.

Facilitates a more rapid conversion of waste compounds (beta-oxidation).

Clarifies the entire water column of dissolved organic solids.



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