BASTECH DIGESTER AIDS

Quality Fiber & More Efficient Pulping Process

The Bastech Advantage:

Improves liquor penetration and impregnation into chips

.

Significantly removes extractives and other materials from the fiber

Prevents re-deposition of extracted compounds

.

Delivery agent to improve the efficacy of AQ

Bastech 4000 Series	Bastech 3000 Series	Bastech 5000 Series
Improved Chip Penetration Extractives Reduction and Pitch Control Lower Bleaching Cost	Features of Bastech 4000 PLUS: Improved AQ Delivery AQ Dose Reduction Fewer Rejects, higher yield Low Residual AQ in fiber	Novel Chip Penetrant Improved Pulp Production Cost-Effectiveness Pre-Commercial Lower Bleaching Cost
Demanding Applications • Chemical Cellulose • Eucalyptus • Mixed N Hardwood	Application • With AQ	Application • Softwood

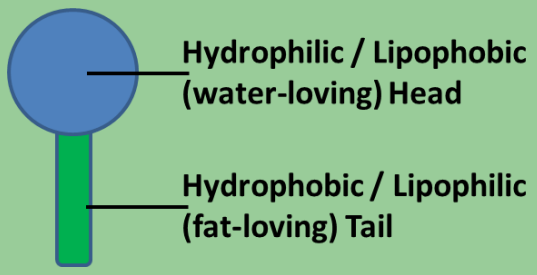
BASTECH
INNOVATIVE CHEMICAL SOLUTIONS

Products 2014-2015

THE TECHNOLOGY

Chemistry and Physics of Digestion

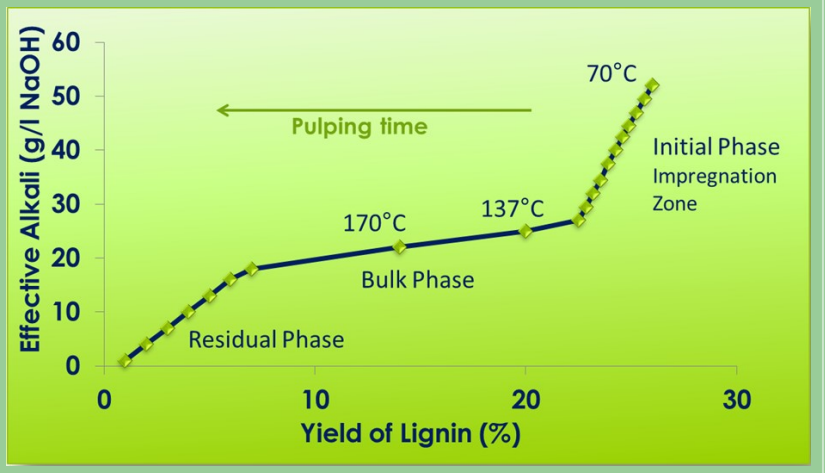
The Bastech 4000 and 3000 technologies are based on our amphiphilic complex ester compound.



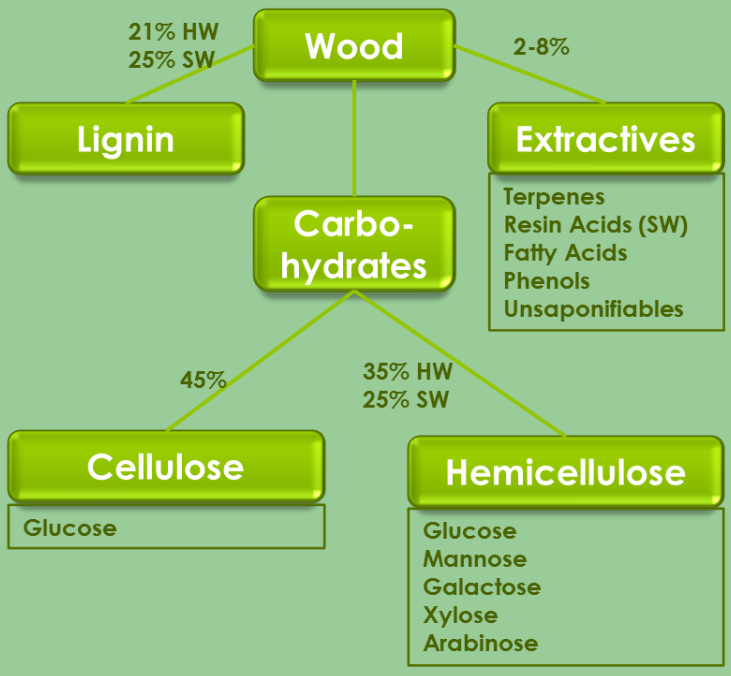
Sketch of amphiphilic unit

The polar ester segment (hydrophilic) contains charged monomeric-to-oligomeric groups that interact in aqueous systems and alkaline media. With the lipophilic a-polar segment from renewable feed stocks chain length and functionality are adjustable, and interactions with wood and liquor constituents can so be optimized.

Our products then work very well with a full range of "fatty" and lipid type extractives, as well as other organics in pulping liquors.



Reaction Phases of Lignin Removal



Extractives in Wood (Source of data: Handbook for Pulp & Paper Technologists, Smook, 1982)

Benefit	Bastech Technology	Competing Surfactant	Competing Detergent
Liquor penetration & impregnation	++	++	+/-
Extractives removal	+++	+	+/-
Re-Depostion prevention	+++	+/-	+++
AQ delivery agent	+++	+/-	+/-
Heat resistant	++	-	-
Allows stronger charges	++	+/-	N/A
Works in alkaline environment	++	+/-	+/-

Digester aid comparison

Wetting agents, surfactants and de-resinating additives, commonly used, are not as cost-effective, have limited performance, and contaminate the pulp resulting in down-stream issues.

The Bastech Advantage

Our Role in Pulpmaking

The production of pulp and paper involves a dynamic and complex series of processes. Each of these is variable in nature.

Factors impacting operations and production:

- Absorption and uptake of pulping liquors and additives into the wood chip structure
- Removal/extraction of lignin decomposition products and other extraneous materials
- The preservation of valuable cellulosic constituents of the fiber cell wall structure

The sequence of the pulping process:

- Efficient wetting and penetration of pulping liquors into wood
- Its transport in the wood structure
- Swelling of fibrous components
- Selective attack of lignin & extractives

Significant limitations of the liquor-wood interaction stem from the large variability both within and among wood species, at times hindering the effective removal of extraneous materials, especially in hardwood species.

Bastech's unique high performance delivery system cost-effectively addresses the issues.

Pulping additives & cooking systems achieve that

- liquors more rapidly reach lignin target sites
- delignification is extended.

Bastech's Digester Additives positively address the following factors:

- They impact the conversion efficiency of wood into fiber and final product.
- Facilitates the absorption & the uptake of pulping liquors and additives into wood chips
- Delivers to the active sites for delignification
- Extracts and removes lignin decomposition products and other materials
- Preserves cellulosic constituents
- Eliminates contaminations in the pulp

Facilitates the Removal of Extraneous Materials from the Fiber Matrix for the Cleanest Pulp

Average extractives reduction is 30%

Typical doses lower extractives significantly

Bastech 4000 in kg/od ton	Extractives in final pulp in %
0.5…1	0.1
1…2	0.05
2…4	0.005

Bastech 4000 and 3000 Series

Bastech 4000

4000 and 3000 series products feature multi-functional amphiphilic compounds based on complex ester technology and

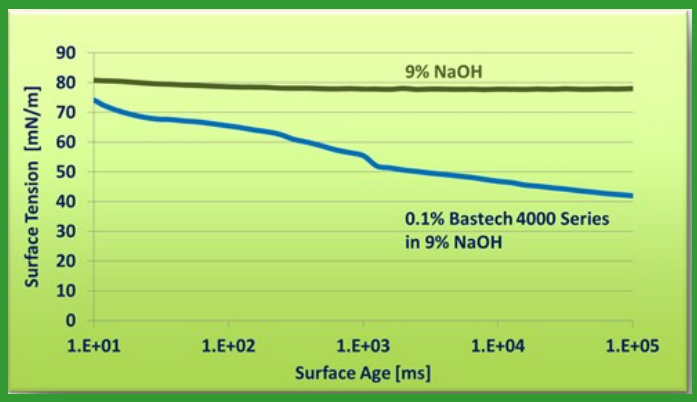
- Improve liquor penetration and impregnation into chips
- Facilitate the removal of extraneous materials from the fiber matrix
- Prevent re-deposition of extracted compounds on the fibers and other surfaces
- Behave as a delivery agent to improve the efficacy of AQ (Anthraquinone)

Bastech 3000

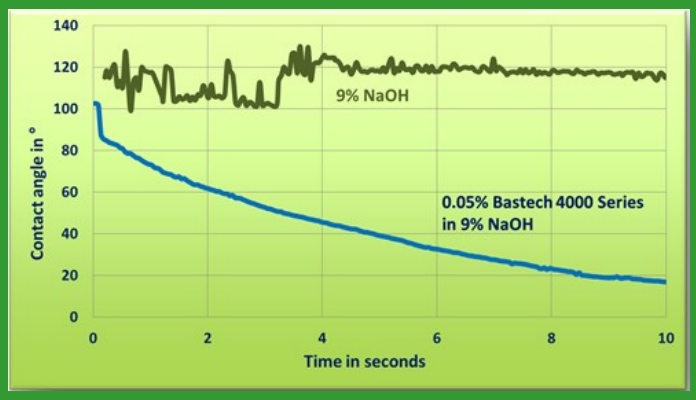
Bastech technology enables the removal of extractives and improves on the delivery and performance of AQ. Bastech's team has decades of combined experience including pilot trials at industry-recognized facilities, commercial trials and steady manufacturing and sales.

The benefits to the customer include:

- Reduction of fiber extractive levels by 30-50%, depending on furnish type and mill operating conditions
- Significant improvement of wetting and penetration of pulping liquors into chips
- Improvement of production yield through higher number of cooks
- Better efficacy of AQ, resulting in dosage reductions of up to 50%
- Reduction of brown stock reject levels by ~30% (mill and furnish dependent)
- Decrease of bleaching costs by 15-25% (mill and furnish dependent)



Bastech 4000 Series significantly lowers



Contact Angle is significantly lowered by Bastech 4000

BASTECH INNOVATIVE CHEMICAL SOLUTIONS

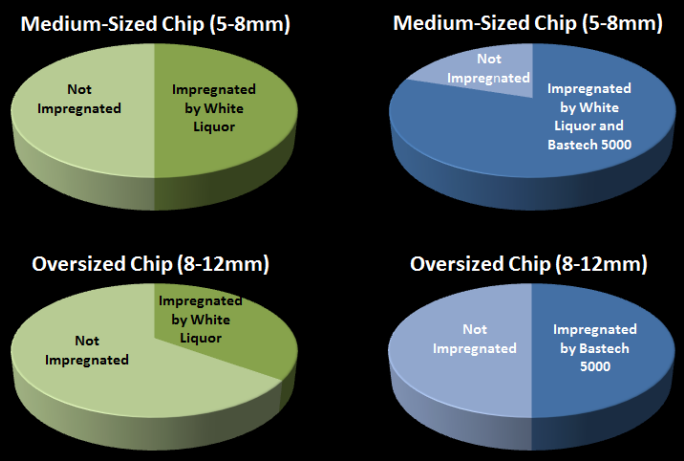
BASTECH 5000 SERIES

Process and product advantages in Soft-wood

Bastech 5000 series digester additives promote rapid penetration and impregnation of pulping chemicals into softwood chips and improve overall digester productivity:

Process Impact:

- Increased wetting and uptake of cooking liquors into wood chips



Enhancement of wetting and liquor uptake

- Better uniformity of chip impregnation
- Reduced process variability
- Shorter digester cycle time (this means higher productivity)
- Diminished over- and under-cooking
- Ability to use different concentrations

Product Impact:

- Improved delignification of pine furnishes
- Higher production rates and same high quality

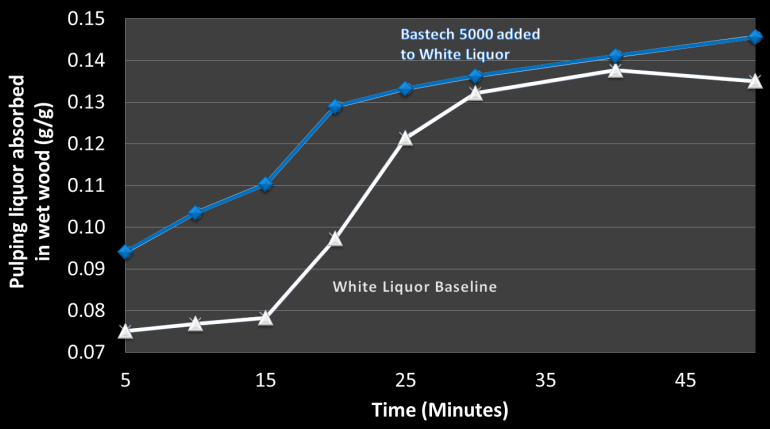
Providing Rapid Chip Penetration and Impregnation

The core elements of pulping are efficient wetting, absorption and penetration of pulping liquors into wood, followed by its transport throughout the structure. Deep inside, it swells fibrous components and selectively attacks and extracts lignin and other unwanted constituents.

The key in the Kraft pulping process is the effective penetration and impregnation of chips by pulping liquors. This is enabled by the rapid wetting and penetration along the liquid transport system throughout the chip, which has to be completed before the temperature is raised to delignification temperature.

As the chip fibers swell, liquor ions migrate to active sites in the cell walls and middle lamella through the swollen micro-capillary network in the wood structure. The application of heat in the digester in the absence of fully impregnated wood chips can cause the decomposition of cellulose and certain carbohydrate fractions to organic acids that further attack the hemicellulose components of the fibers, thus reducing yields.

Poor liquor penetration increases heterogeneous inconsistencies in delignification across the chips, resulting in a kappa reduction on the surfaces much greater than that on the interior portions of the chip. This situation leads to the creation of knots and shives which must be separately managed to reduce rejects and improve overall pulp yields.



Fast initial impregnation when adding Bastech 5000 Series products

Working with Bastech

Bastech—the Company

Headquarters are in Jacksonville, FL, with North American Production in Jacksonville, FL and Natchez, MS

Core Customer Base: Pulp Mills and Phosphate Mining

In continuous operation since 1961

26 of Top 50 fastest growing privately held companies in North FL (2011)

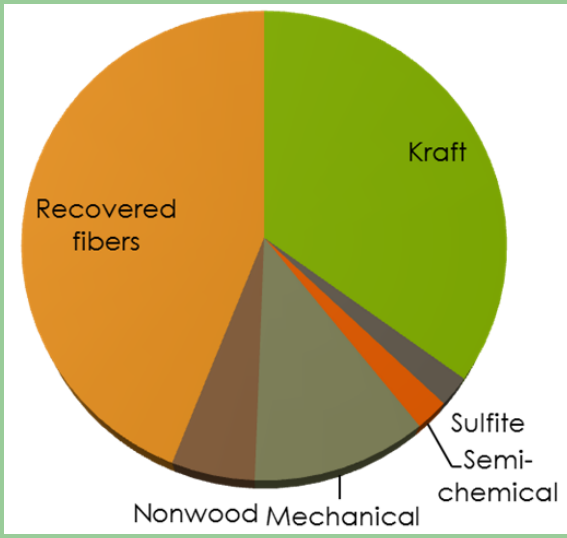
Digester Additives for the pulp & paper industry since 1986

Over 10MM pounds sold in 2013

Active R&D with Pilot Digester

Pulp & Paper Division

Our products work well with the kraft process and modifications of it, such as when customers are using anthroquinone to stop the peeling reaction. According to wiki data, the sources of fibers in paper products are denoted in the following pie chart:



Kraft process dominates the source of non-recovered fiber

Plant Trials

Throughout the process we are here for your questions.

In cases where we have supplied our products to very similar sites (in raw materials inputs and processing), we might discuss and agree on metrics and then go directly to a plant trial. In other cases, further development with highly specified outcomes corresponding to your needs, occurs first.

2-5 mm Wood Chips **5-8mm Wood Chips** **8-12 mm Wood Chips**

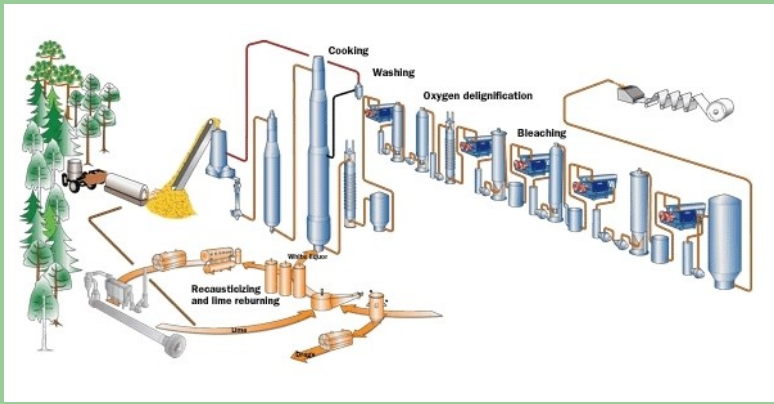
SW cooking @ 170°C for 20 min (Bastech 5000 Series)

With Bastech 5000 Series addition to NaOH:

- **Thin chips (2-5 mm) again fully penetrated by cooking liquor**
- **Medium chips (5-8 mm) penetrated at 90%**
- **Oversized chips (8-12 mm) penetrated at 50%**

Commercial Supply

We manufacture in compliance with FDA regulations. Our product is tested for performance and specifications before the trailer leaves the premises.



Kraft process (Wikipedia)

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Products and Services

Bastech 4000 Series

Significantly Improves Liquor Penetration & Impregnation
Facilitates the Removal of Extractives & Prevents Re-deposition
Tailored to a Wide Range of Pulping Conditions
Typically added to the White Liquor prior to the Digester

Store at 125-150°F, Product becomes viscous <120°F
Manufactured in Compliance with FDA 21 CFR 178.3400
Commercial: Bulk - Trial: Tote Bins at 2200lbs. net

Properties:
Clear colorless liquid
Density at 150°F: 8.6 ppg
Viscosity at 125°F: <500 cps

Bastech 3000 Series

All the good features AMP 4000 offers
Transports AQ to target sites more quickly
Reduces AQ usage by 40-50%
Typically increases fiber yield by 1.2-3.0%

Store at 70-120°F, agitate every 3-5 Days
Compliant with FDA 21 CFR 176.170 &178.3400
Commercial: Bulk - Trial: Tote Bins at 2200lbs. net

Properties:
Tan opaque liquid
Density at 100°F: 8.9-9.7 ppg

Bastech 5000 Series

Increase Production while maintaining high Quality
Compact addition System leading to improved Solubility
More soluble, more readily available reagent: use at lower rates
Range of concentrations offered (standard 15% to up to 50%)

Manufactured in Compliance with FDA 21 CFR 178.3400
Commercial: Bulk - Trial: Tote Bins at 2200lbs. net

Properties:
Clear colorless liquid
Density at 80°F: 8.5 ppg
Viscosity at 80°F: <500 cps
Solubility in Water: complete

Testing the reagent at your site

We fully support our trials at the customer site:
In-person by our field service and sales personnel
Our highly experienced & educated members of the technical center
Manufacturing, transportation, customer service and administration

Having our Knowledgeable People on Your Side is truly Priceless

Technology Center in Jacksonville, FL

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STAMP
HERE

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Bastech LLC produces in both Jacksonville, FL and Natchez, MS. In 2012 the Company opened its technology center in Jacksonville and commissioned a pilot facility at its Natchez production facility.

Digester Aids
Pilot Trials
Commercial Trials
Global Support

Bastech 4000 Series
Bastech 3000 Series
Bastech 5000 Series