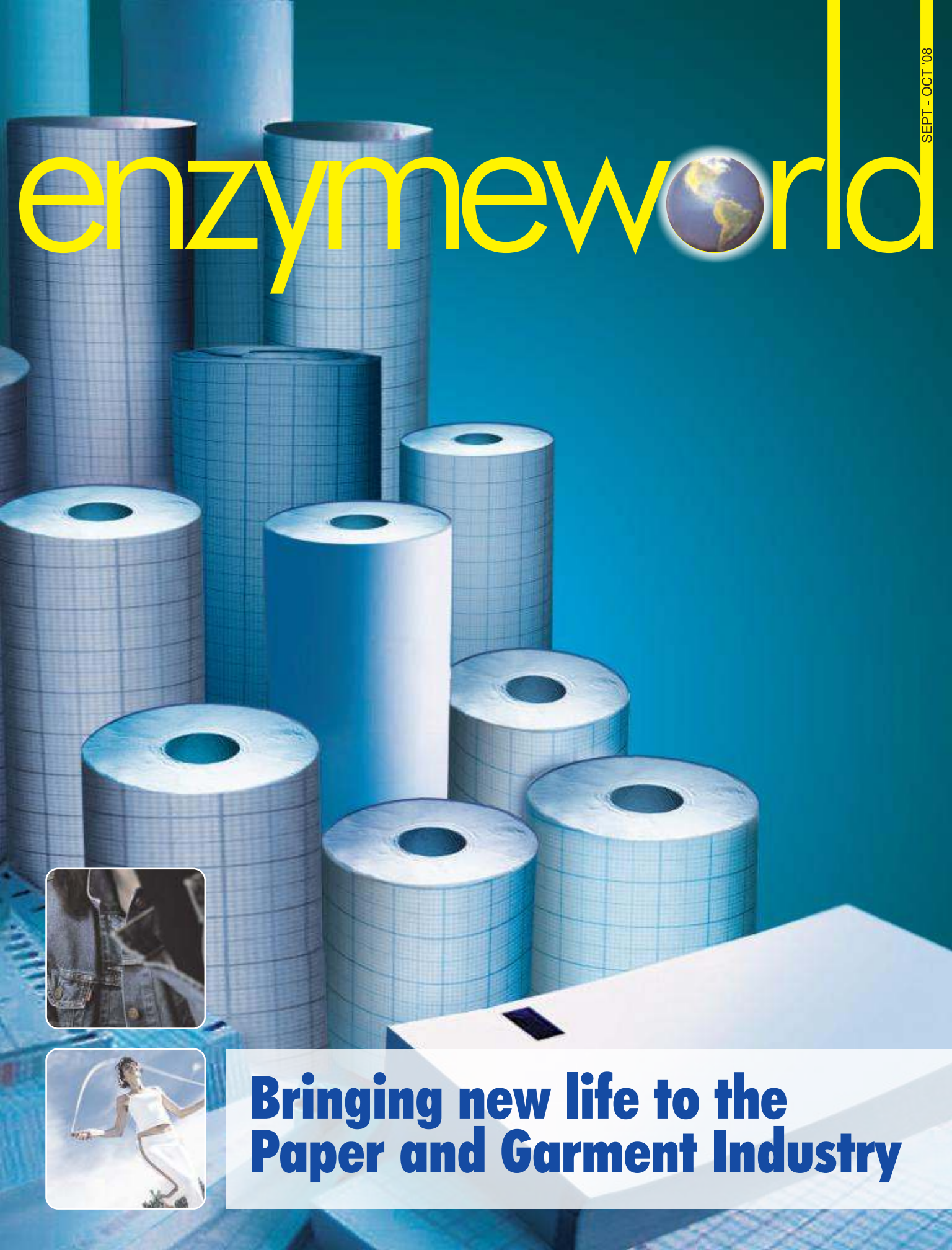


enzymeworld



**Bringing new life to the
Paper and Garment Industry**

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EDITORIAL

Dear friends,

Welcome to the September/October issue of Enzyme World. It is our editorial goal to provide our readers with articles that have practical value for the industries in which they work. In addition, we hope to keep you informed of significant happenings in the world economic and political scene as it affects these various industries. We hope also to be a resource for your questions relating to enzyme use in a new section called "Ask the Enzyme Experts." Here we offer the expertise of our experts in many different fields. Simply forward your question to ew@enzymeindia.com and we will get back to you and possibly even print the answer in the next issue of Enzyme World.

In this issue of Enzyme World, we will cover the innovative applications of enzymes in such diverse topics as pulp processing to paper; adding real value to garments with an enzyme solution and doing this while reducing pollution of the environment. Finally, we provide an article on Weight Loss and the use of enzymes as part of a weight loss solution. In future issues, we will continue to provide a diverse range of applications where enzymes provide a solution. We hope each issue of Enzyme World will provide useful enzyme solutions for you.

SEBrite Bleach and Pulp Processing

Two articles in this issue address the eco-friendly aspect of enzyme use in industry. The first deals with processing pulp into paper. Processing pulp produces huge amounts of pollution in the form of chlorinated compounds used in bleaching the pulp. The resulting contaminated wash water cannot be reused. Advanced Enzymes offers an enzyme solution in the form of SEBrite Bleach, which can significantly reduce the need for chlorinated compounds compared to traditional pulping. Considering annual estimates for world pulp production run as high as 185 million tons, reducing chlorinated compounds should be an imperative.

GARMENT VALUE ADDITION

The second article concerns ways to add value to

a finished Garment at every processing step, from desizing to finishing. Again, traditional processing involves harsh processing chemicals that weaken fabric or produce colors that are uneven or fade. Further, the end result is higher energy cost and a polluted environment. Advanced Enzymes offers an entire range of enzyme solutions for every step, such as Rapidez Cool, which saves energy, doesn't damage the fabric and provides a more durable garment. You can avoid harsh chemicals and produce a more comfortable, better looking finished garment.

WEIGHT LOSS AND SEBTRIM

Worldwide, there are more than 1 billion overweight adults and at least 300 million of these are clinically obese. Excessive weight is a significant risk factor for chronic diseases, such as type 2 diabetes, cardiovascular disease, hypertension, stroke and certain forms of cancer. Fad diets don't work and really there are no substitutes for a lifelong change in lifestyle. To make a positive lifestyle change, each of us should exercise regularly, eat reasonable portion sizes and eat healthy food in general. There is, however, a role for enzymes. When endogenous digestive enzymes are insufficient, the effective conversion of fats, carbohydrates and proteins into energy is greatly reduced. This results in excess calories, which are then stored as fat, usually on the abdomen, thighs and buttocks. SEBTrim is an enzyme solution that can improve digestion and utilization of food to produce energy. It can be part of a positive change that helps people achieve a healthy weight that is appropriate for their height and build.

The SEB Companies, Advanced Enzymes and Specialty Enzymes, have as part of our mission statement, a responsibility to provide industry with enzyme solutions that are not only effective, but help, not harm the environment. Our company continues to look for novel product solutions that reduce or eliminate pollution of the environment. In essence, we strive to provide a value added product line that is an eco-friendly solution as well.

Be well,

Mike Smith



SEBRITE BLEACH– A “GREEN” SOLUTION FOR THE PULP AND PAPER INDUSTRY

INTRODUCTION TO PAPER PROCESSING AND NEED OF SEBRITE BLEACH:

Annual estimates for world pulp production run as high as 185 million tons. Annual increases are expected to be around 2.5 million tons. The U.S. consumes 30% of world’s wood pulp, though much of the raw material is imported from Canada and South America. In the face of this demand, there are very real concerns about pulp production and the environment.

India is a good example of the ecological issues in pulp production. India produces 3 million tons of paper from virgin pulp each year. The pulp and paper industry is the third most polluting Industry after iron and steel and cement. The main source of pollution in the paper industry comes from the bleaching plant where harmful chlorinated compounds are used. The resulting contaminated wash water cannot be reused.

The government of India had made it mandatory for paper mills to reduce Available- Organic-Halides (AOX) in the wastewater effluent from 1.5 kg to 1.0 kg/ton of paper produced in total of effluent. The average water consumption per MT of water is 100 m³. This action has forced the industry to adopt procedures to reduce the use of elemental chlorine and look for alternatives to halides.

In this quest for a newer, “GREEN” technology, enzyme based pre-bleaching is clearly more cost-effective and easier to use. Further, this technology is easily incorporated in existing systems without any investment in new equipment or a change in procedures. Advanced Enzymes and Specialty Enzymes have just the solution with SEBrite Bleach.

TRADITIONAL PULP PRODUCTION

Paper mills produced pulp from many different raw materials. The most common raw materials are softwood, hardwood, bamboo, sugar cane waste



(baggase) and agro residues like rice straw, wheat straw and sarkanda grass. To make quality pulp, the first step is to extract lignin. To accomplish this, wood chips or other raw material is cooked in a digester with caustic soda and sodium sulphate at 180°C for 4 hours. This process is known as Kraft Pulping. The cooked pulp is then stored in a heat sealed vessel called a blow tank at 150°C. The residual lignin content, alkali and solids in the cooked pulp are measured by the Kappa number test.

The pulp from the blow tank goes to the washing plant where the pulp is washed by a three-stage countercurrent washing system. The goal at this stage is to remove spent liquor from the pulp.

The pulp is then sent to the bleaching plant where it undergoes either a three or a four stage bleaching sequence. Typically, mills use either C-EP-H (Chlorine, Alkali-Peroxide-Hypochlorite) or CEHH (Chlorine-Extraction - Hypochlorite - Hypochlorite), depending upon the mill. The amount of Chlorine needed in the bleaching sequence is directly related to the Kappa Number of the pulp. A high Kappa number indicates high lignin content remaining in the pulp, requiring an increase in chlorine for bleaching. A low Kappa number indicates a loss of pulp strength, brightness and yield. If the Kappa number is too low, the pulp may be unusable for paper.

The total chlorine used in the bleaching process is normally in the range of 0.4 - 0.6 of the Kappa number in % terms. The total chlorine is distributed into two parts, normally 60.0 % as elemental chlorine and rest 40.0 % in Hypo.

The cooked pulp contains a lot of re-precipitated xylans. These xylans are dissolved in cooking liquor, but are precipitated again on the fiber surface when the temperature of the pulp is reduced to 150°C. This re-precipitated xylan also consumes chlorine during bleaching and, therefore, increases the chlorine

demand for pulp.

SEBRITE BLEACH APPLICATION:

SEBrite Bleach is normally added after the final wash where the temperature of pulp is in the range of 55-60°C and the pH is 8.5 to 10. The pulp is then stored and finally taken to bleaching plant. SEBrite Bleach effectively removes the re-precipitated xylan from the pulp, as well as residual xylan and increases the availability of lignin to the pulp.

Typical Enzyme dosing point for Sebrite Bleach:

CASE STUDY OF LAB TRIALS CONDUCTED IN CPPRI:

Unbleached wood pulp with a Kappa number of 20 was collected from Star Paper Mills. The mill uses about 6.7% total chlorine, 4.1% of which is elemental chlorine and 2.5% is in the form of hypochlorite. This results in a final brightness of 81.0%.

The aim of the Lab trial was to see if we could either improve the final brightness of pulp or decrease the chlorine on pulp.

In the first set of experiments the pulp was adjusted to 9.5 pH using caustic soda to simulate mill conditions.

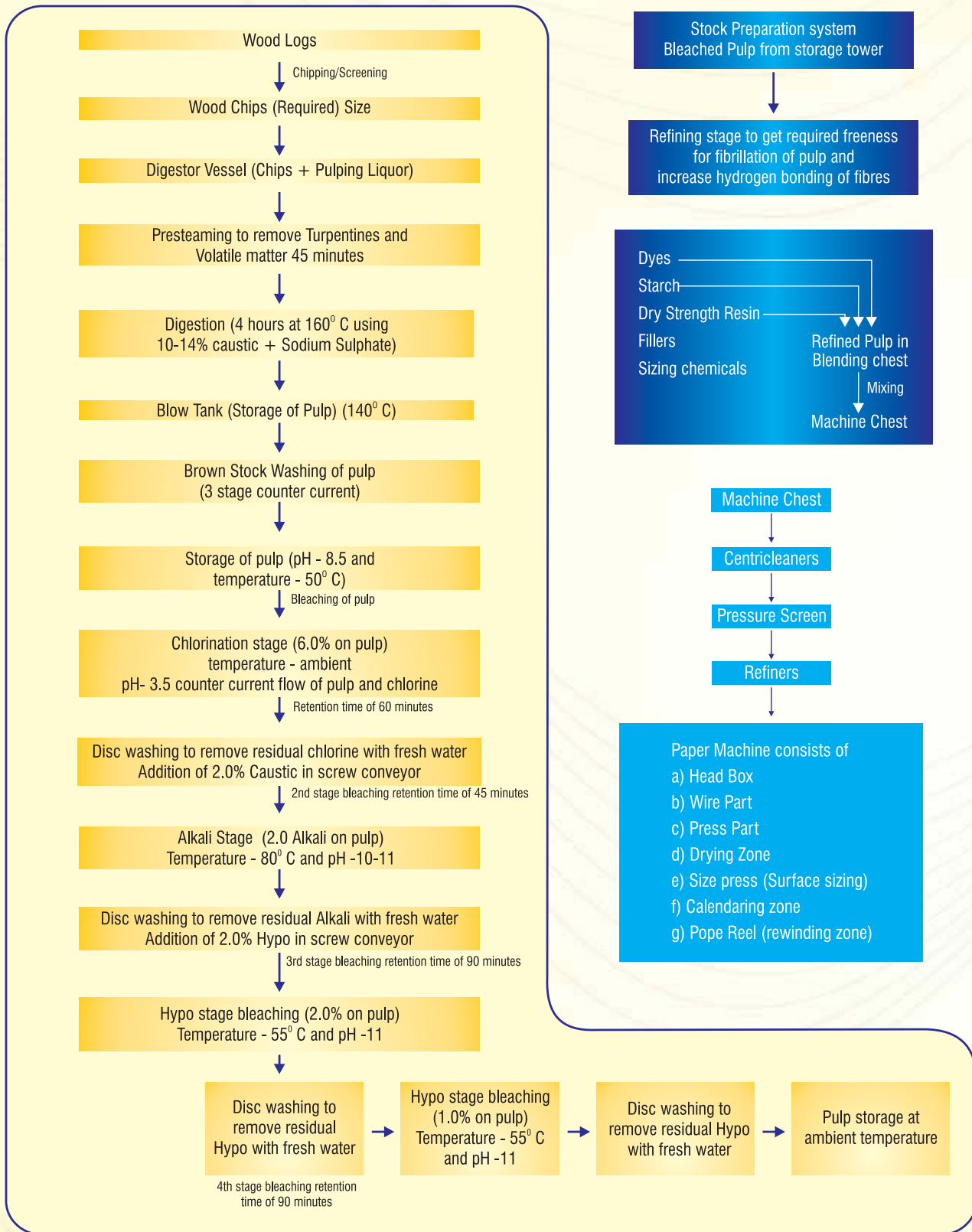
Using a dosage of 500 grams of SEBrite Bleach per ton of pulp was added, mixed and kept in a water bath at 60°C for 60 minutes. A control of pulp with no added enzyme was kept for comparison.

The enzyme treated pulp was divided into two sections:

- 1) In one of the fractions the bleaching chemicals were dosed as blank to observe changes



FLOW SHEET OF PAPER MAKING PROCESS (VIRGIN PAPER)



- 2) In the second fraction, the chlorine dosing was reduced from 4.1% to 3.4% and the hypo dosing was reduced from 2.5% to 2.1%. This resulted in a total chlorine change from 6.6% to 5.6%, or a total chlorine reduction of 15.0%

Results:

- 1) There was a brightness gain of 2.6 % after enzyme treatment followed by conventional bleaching sequence.
- 2) In the second set when the chlorine was reduced by 15.0% there was a brightness gain was 0.6%
- 3) There was a gain in Burst factor by 15.0% and the breaking Length by 18.0%, which is very beneficial to mills.

SEBRITE BLEACH IN WASTE PAPER:

Another application for SEBrite Bleach is to increase the brightness of waste paper. A paper mill in Vapi manufactures about 150 tons of Duplex board / day. Duplex board is a composite of many types of paper bound together in layers. The mill uses 25 liters of Sodium Hypochlorite per ton of paper to increase the brightness of the Paper. The increase in brightness from Pulp to Paper is in the range of 5-6% points.

In our plant trials, we were able to eliminate Sodium Hypochlorite entirely by substituting a combination

of 100 grams of SEBrite DI and 100 grams of SEBrite Bleach.

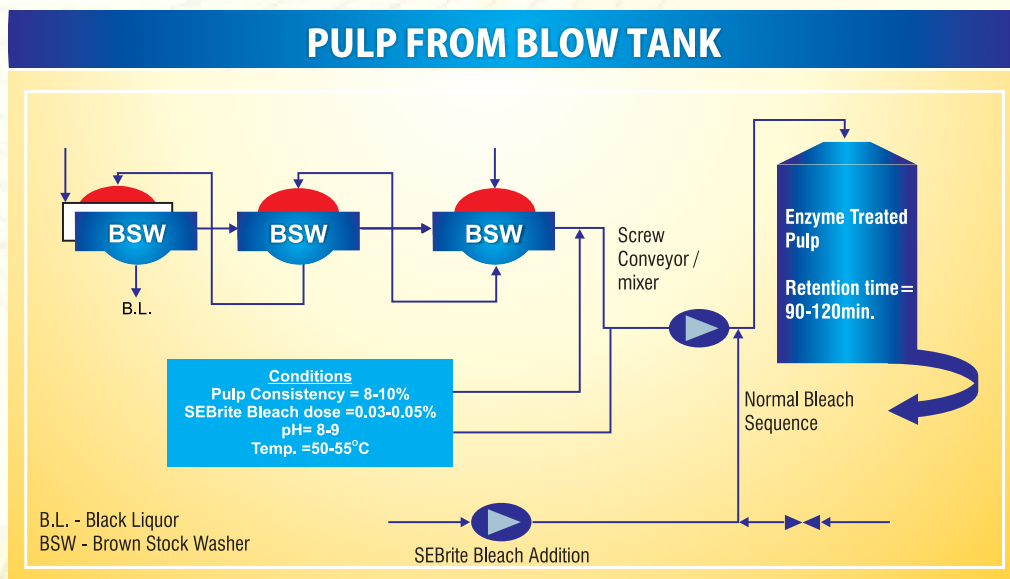
The enzyme process offers a significant benefit since Hypo actually reduces the strength of paper. Based on the trial results, the mill has agreed to longer trials to establish the benefits.

DISCUSSIONS:

Advance Enzymes is actively focusing on providing a BIO PACKAGE to the Pulp and Paper Industry without capital investment. SEBrite Bleach is part of this BIO PACKAGE developed by R&D Department. Advanced Enzymes has developed a range of products from the correct grade of BIO-SURFACTANT to a BIO-COLOR REMOVAL product, covering the process from end to end. This set of products can be used for both Virgin and Recycled Paper. SEBrite Bleach benefits can be summarized as follows:

- a. Improvement in Paper Quality
- b. Reduction in Paper Processing cost
- c. Eco Friendly Process
- d. Easy to handle

Further research and development are underway to help bring cost benefits to the Pulp and Paper Industry.





SEBTRIM® AND WEIGHT LOSS

THE OVERWEIGHT EPIDEMIC

Worldwide, there are more than 1 billion overweight adults and at least 300 million of these are obese. Excessive weight is a significant risk factor for chronic diseases, such as type 2 diabetes, cardiovascular disease, hypertension, stroke and certain forms of cancer. Key factors that lead to overweight include reduced physical activity and excessive consumption of foods that are high in saturated fats and carbohydrates.¹

While there is no substitute for regular exercise and eating reasonable proportions of healthy food, enzymes can be an important part of a healthy weight management program. Enzymes direct, accelerate and modify all body functions. When digestive enzymes are insufficient, the effective conversion of fats, carbohydrates and proteins into energy is greatly reduced. This results in excess calories, which are then stored as fat, usually on the abdomen, thighs and buttocks. As we age, our natural digestive enzymes tend to decline at about the same time as our metabolism slows. This is the proverbial double-edged sword that results in increases of 5 to 10 pounds a year in adults in many industrialized countries.

SEBTRIM®

Think of the body as an engine that processes food to produce energy for work. The body is always trying to maintain a balance, called homeostasis. So, if digestion is inefficient, the body interprets this as a signal to store fat against the possible threat of starvation. It then sends a signal to the satiety center of the hypothalamus increasing the sensation of hunger. The result is a vicious cycle of eating more and feeling hungry more often. A digestive enzyme formula, like that in SEBtrim®,

can help stop this kind of negative feedback loop and help restore more efficient digestive process.

SEBTrim® is a proprietary blend of enzymes derived entirely from natural sources. SEBTrim® contains proteases to digest the proteins, carbohydrases to digest the carbohydrates and two very active lipases to burn the fat in the body.

In addition, there are antioxidant enzymes to take care of free radicals. Specifically, SEBTrim® contains Peptizyme SP® EN, Bromelain, Catalase, HemiSEB®, Amylases, Fungal and Yeast Lipase and Amla.

Research with SEBTrim® has shown, not only help with weight management, but a significant lowering of cholesterol levels and especially LDL cholesterol and triglycerides.

OVERWEIGHT AND OBESITY DEFINED

Generally, overweight is defined as a body weight that is at least 10 percent over the recommended weight relative to height. Obesity, on the other hand, is generally defined as 30 percent over the ideal weight relative to height. Some authorities consider 20% above the ideal weight as the dividing line between overweight and obese. In all cases there is an excessive amount of body fat in relation to lean body mass.²

BODY MASS INDEX

Today, healthcare professionals tend to determine healthy weight and unhealthy weight using two primary tools:

- 1) Body Mass Index (BMI) which measures weight in proportion to height; and
- 2) Waist circumference, which measures abdominal fat.

$$\text{BMI} = \frac{\text{weight (lbs.)} \times 703}{\text{Height}^2 \text{ (inches)}}$$

So, in common terms, overweight refers to an

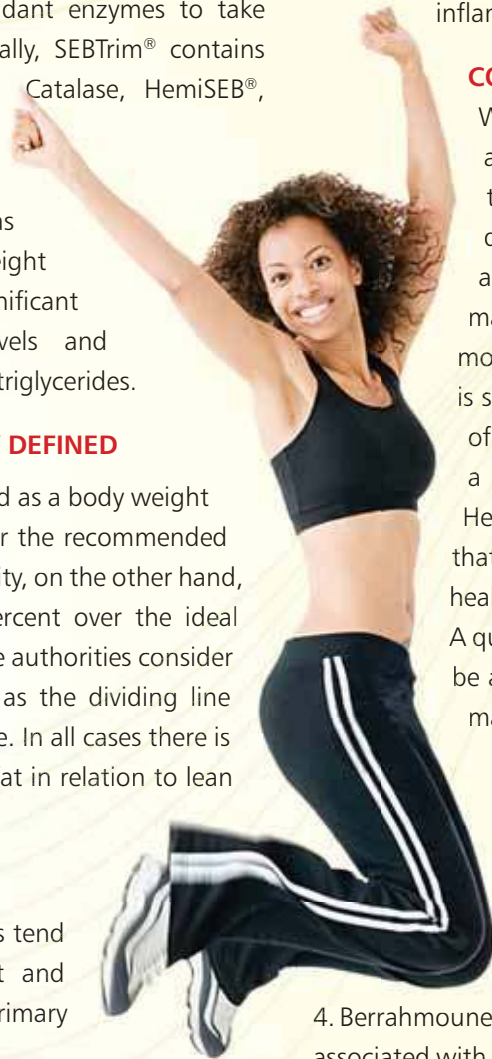
individual with a BMI > 25 and an obese individual has a BMI > 30. However, the BMI isn't perfect. For example, individuals with well developed lean muscle, like athletes, tend to have a high BMI. Thus the need for including waist size as a measure. Still, there is a strong correlation between increasing BMI and an increase in serum cholesterol and blood pressure. Indeed, there is a significant relationship between increased BMI and inflammation in Metabolic Syndrome.^{4,5}

CONCLUSION

While a predisposition to overweight and obesity can be inherited, the fact that body weight has increased so dramatically in the last few 30 years appears to discount genetics as the main cause. Essentially, if you consume more calories than you burn, the surplus is stored as fat. As an example, an excess of 100 calories a day translates into a gain of about 1 pound a month.³ Healthy weight loss is a lifestyle change that requires regular exercise and eating healthy food in reasonable portion sizes. A quality enzyme blend, like SEBTrim® can be an important part of a healthy weight management program.

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 4. Berrahmoune, H. et al. Five-year alterations in BMI are associated with clustering of changes in cardiovascular risk factors in a gender-dependant way: the Stanislas study. *Int J Obes (Lond)*, 32(8): 1279-88 2008
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GARMENT VALUE ADDITION

In order to add value to a finished Garment, every processing step, from desizing to finishing, manufacturers should use the best tools available. At the same time, they need to consider the effect of processing on the environment. If harsh processing chemicals weaken fabric or produce colors that are uneven or fade, the end result is a lower quality product and a polluted environment. Still, it is felt in many quarters that harsh chemicals are the only cost-effective way to finish their textile goods. Change is always difficult and most of us resist change.

Competition in the Garment industry is fierce. Suppliers all compete for the same customers and there is little loyalty. The customer has many choices and can switch suppliers at any time. As a result, the cost of goods may become the defining factor in the decision to purchase from one supplier or another.

This tends to create aggressive, competitive pricing where pennies may make the difference and margins get thinner and thinner. Competing in the low price market is an arduous and often bankrupting process. The only way to consistently create new business and continually grow your market share is by providing value added services and products that directly benefit the customer. This might mean producing garments that are more durable, more comfortable and better looking.

Natural fiber garments are predominantly cellulose, which is still the king of comfort. However, if garments are processed improperly, the finished garment can be stiff and uncomfortable; it may not be durable; and it could look awful after only a few washings. Processing with harsh chemicals like bleach can actually reduce the tensile strength of garments, reducing their durability significantly. At Advanced Enzymes, we want to offer processing solutions that not only save fabric, but nature as well. In a world that faces global warming,

acid rain, increased ultraviolet due to a hole in the ozone layer and industrial pollution, it is important that we in industry consider the results of our actions and the long-term costs.

Thus, Advanced Enzymes (AETL) research and development team has developed enzyme solutions and special finishing agents that can replace conventional, age-old hazardous chemicals. The benefits include a reduction in processing time, energy, water and processing cost. The garments produced will be more durable and comfortable and you will be doing your part to reduce pollution.

A. ENZYMATIC DESIZING OF COTTON FABRIC:

There are a number of enzymatic products available for desizing. Typical products on the market today remove sizing components from cotton garments at a temperature range from 50°C to 100°C. This typically results in incomplete removal of sizing components and consumes a large amount of energy.

Scientists at AETL developed Rapidenz Cool (Cool type Amylases) offering Desizing efficiency as high as 8.0 Tegewa value on cellulose fabric (Denims or Woven). For heavyweight garments, we recommend a combination of Rapidenz Cool with SEBwet CP - 0.2% owf and SEBlub L - 0.2% owf.

For single product use, Supersize XS will give the desired quality.

B. ONE BATH DESIZING AND SCOURING:

For one bath desizing and scouring, we recommend to use Sebaux ODS - 1% owf and Soda ash - 1%. Sebaux ODS is eco-friendly and biodegradable. It provides better scouring efficiency and whiteness index compared to average products available in market for similar application.

C. BIO SCOURING:

For bioscouring of woven or knit cotton fabrics, whether by batch or continuous processing,

Addscour PCLP – 1 – 1.5 % owf and Sebwet CP - 0.5 – 1.0 % owf is recommended. This will reduce or replace the need for caustic soda.

The Bioscouring package from AETL is made of only three products compared to 5 to 6 products in most conventional products. The benefits of the AETL Bioscouring package is as follows:

- a. Increases dye uptake
- b. Reduces weight loss in processed fabric
- c. Better absorbency
- d. Complete removal of impurities in cotton

D. REACTIVE DYEING LEVELING:

In 40 different case studies in India, it was observed that many companies use chelating agents for reactive leveling, which precipitates the dye. AETL has developed an enzymatic leveling agent, which will nullify the agglomeration and will retard the rate of reaction. Recommended product is Sebaux CL - 0.3% (OWF)

E. HYDROLYZED DYE SOAPING AGENT:

Sebaux RD - 0.5% owf is much more efficient and does a much better job removing hydrolyzed dye from fabric, compared to conventional products available in market.

F. CELLULASE FOR FADING / BIOPOLISHING OF COTTON GARMENT:

A core strength at AETL is our Cellulase enzymes and its



many applications in Denim and Knitted garment processing.

AETL introduced the Addcool series (Cool type Cellulase) offering high Biopolishing efficiency with Pilling rating of 4 for denims (essentially no pilling). Further Addcool provides a better fading effect with negligible back staining. The low temperature requirements for this product help to conserve energy.

AETL Product	Dosages	pH	Temperature	Time
Addcool SL (Biopolish)	0.5% - 1.0% (o.w.f)	5.5 to 6.5	35° C to 45° C	45 to 60 min
Addcool FL (Fading)	0.5% - 1.0% (o.w.f)	5.5 to 6.5	35° C to 45° C	45 to 60 min

G. ANTI BACKSTAINING AGENT:

AETL has worked extensively on the chemical processes behind back staining in an attempt to provide relief with wet garment processing. AETL now offers solutions to both prevent and remove back staining. AETL now offers STAINCLEAR (1.0% owf) and Sebox ABSN-0.1% (OWF), advanced, environmentally responsible solutions to back staining.

H. SULPHUR OXIDATION OF COTTON DENIM & KNITTED GARMENTS:

AETL launches the specialty chemical, Sebox SV for oxidation of Sulphur dyes on garments. This process significantly increases the fastness of the dye, especially on denim.

In conventional method, the Oxidation treatment is

carried out by:

Conventional Product	Dosages	pH	Temperature	Time
Potassium Dichromate	1.0 % (o.w.f)	5.5	55° C to 65° C	20 - 25 mins

or

Conventional Product	Dosages	pH	Temperature	Time
Hydrogen Peroxide (50%)	1.0 % (o.w.f)	5.5	55° C to 65° C	20 - 25 mins

In both treatments, there is a strong probability for the deposition of sodium sulphide residue on dyed fabric. Also, hot washing is required after treatment to remove the residual Dichromate / Peroxide.

This problem was overcome by AETL by launching Sebox SV, which has a buffer system for the oxidation of Sulphur dye at room temperature. No vigorous hot water washing is required after the treatment; a cold wash is sufficient.

AETL Product	Dosages	pH	Temperature	Time
Sebox SV	0.25 % (o.w.f)	5.5-6.5	40° C to 45° C	20-25 min

I. PINKY (KMNO4) NEUTRAL FOR COTTON DENIM & KNITTED GARMENTS:

AETL launches the specialty chemical, Sebox PN for the neutralization of Potassium Permanganate (Pinky) solution for garment processing.

In the conventional method, the neutralization treatment is carried out by:

Conventional Product	Dosages	pH	Temperature	Time
Hydrogen Peroxide (50%)	1.0% (o.w.f)	5.5	55° C to 65° C	20-25 min



With conventional treatment, there is the possibility of non de-colorization with Pinky (KmNO₄) treated portion on dyed fabric. Again, a hot wash is required after treatment to remove the residual peroxide.

AETL Product	Dosages	pH	Temperature	Time
Sebaux PN	1.0% (o.w.f)	5.5 - 6.5	30° C to 40° C	10-15 mins

This problem was overcome by AETL launching Sebaux PN, which is a buffer system for the Neutralization of Potassium Permanganate (Pinky) at room temperature. Again, a cold water wash after the treatment is sufficient to wash off the buffer system.

J. FINISHING OF COTTON DENIM & KNITTED GARMENTS:

AETL also developed the finishing agents Sebsoft CWS Flakes, a cationic softener with a stearic acid base and Sebsil Ultra, a silicone based softener. It is a cold water soluble softener, with application at room temperature. Sebsoft CWS Flakes imparts excellent bulkiness, a good degree of whiteness along with extra smoothness to the textiles.

AETL Product	Dosages	pH	Temperature	Time
Sebsoft CWS Flakes (10% owf paste)	1.0-2.0% (o.w.f)	5.5-6.5	35° C to 45° C	20-25 min

For more bulkiness and a smooth feel, Sebsil Ultra-0.2% owf is to be applied alone or along with Sebsoft CWS Flakes.

K. SOME PRODUCTS UNDER DEVELOPMENT:

Permanent wrinkle, Anti-microbial Finish, Moisture management finish, Cool finish, Flame retardant finish, Water/Oil repellent finish, Water proofing finish, Wrinkle free finish, UV Protection and Soil release.

CONCLUSION:

At AETL, challenges in textile processing are well understood due to research and development working closely with the industry to provide solutions that are cost effective and environmentally friendly. Using its strength in applied research, AETL has developed the above value added solutions to be ecologically responsible, reduce energy demands and to provide a superior product. AETL is committed to provide customized solutions to the many industries we serve.



CURRENT EVENTS

InBev Acquires Anheuser-Busch

July 14, 2008, Anheuser-Busch Companies (ABC) agreed to a \$70 per share bid from InBev to create the world's largest brewer. This ends what had become an acrimonious fight involving threats of lawsuits and attempts to unseat the board of directors at ABC. Belgian brewer InBev SA offered \$52 billion for the acquisition ABC, no doubt hoping to use ABC's marketing power to make Budweiser and Bud Light brands into a global powerhouses, as they are in the USA. The acquisition will give InBev, the maker of Beck's, Bass and others, half the U.S. beer market and a fifth of those in China and Russia.

InBev Chief Executive Carlos Brito, will retain his position. ABC executives are expected to remain in the new company, and marketing plans remain unchanged, so far. ABC CEO, August Busch IV will move into a non-executive role, but will be on the new company's board.

DSM Acquires Valley Research

July 11, 2008 Royal DSM N.V., headquartered in the Netherlands, announced the acquisition of Valley Research Inc. of South Bend Indiana, USA. Valley Research Inc., is a privately held biotechnology company that offers a broad range of enzymes products that are used in dietary supplements, dairy, juice and wine industries. President of Valley Research, Art Sears, will remain as an advisor in the food enzyme division. Terms of the acquisition have yet to be disclosed.

The Biofuel Controversy

Biofuel and its role in creating significant increases in food prices continues to be controversial. There is little doubt that it is, at the very least, partially true. Government policies and the demand for renewable energy have created a kind of win-lose relationship between biofuel producers and those that use corn for food and feed

The ever-increasing demand for biofuel, particularly ethanol from corn, has had a number of effects on grain supply and demand. Expanded production of ethanol from corn, in particular, has increased the demand for corn. As a result, corn production is shifting away from its use as food and feed and moved to the more profitable production of ethanol. The net result is a large increase in commodity prices for corn. Rising corn prices, in turn, are affecting other grains. For example, higher prices for corn (a significant food and feed staple) cause many consumers to buy less corn and switch to rice and wheat. On the other hand, higher corn prices make corn more profitable to grow, causing some farmers to shift from rice and wheat cultivation to corn. These demand and supply side-effects have tended to increase the price of rice and wheat and other crops. As yet, the promise of other sources of renewable energy are still taking a backseat to bioethanol production.

QUIZ

Q 1: The metal ions that stabilizes Alpha Amylase is

- Ans.** a) Heavy metals
b) Lead
c) Sodium ions
d) Calcium ions

Q 2: The enzyme that finds use in burns treatment

- Ans.** a) Amylase
b) Catalase
c) Papain
d) Lipase

Q 3: NattoSEB acts on.

- Ans.** a) Fibrin
b) Carbohydrate
c) Cellulose
d) Non of the above.

Q 4: The enzyme used in clarification of Apple Juice

- Ans.** a) Pepsin
b) Alpha Amylase
c) Pectinase
d) None of the above

Q 5: Which enzyme digests hydrogen peroxide into Oxygen bubbles and water, releasing heat in the process?

- Ans.** a) Amylase
b) Catalase
c) Lipase
d) Pepsin

Q 6: Carbohydrates can be classified as

- Ans.** a) Transferases
b) Oxidoreductases
c) Hydrolases
d) Isomerases

Q 7: Probiotic used in the treatment of travelers syndrome

- Ans.** a) Bifido Bacterium
b) Lactic Acid Bacteria
c) Saccharomyces Boulardii
d) None of Above

Q 8: Enzyme work by lowering

- Ans.** a) Chemical energy
b) Free energy
c) Bond energy
d) Solvent energy

Q 9: Deseizing of the fabric is done by enzyme

- Ans.** a) Amylase
b) Protease
c) Phytase
d) None of Above

Q 10: Peptizyme SP is

- Ans.** a) Enteric Coated Granules
b) Film Coated granules
c) Fine Powder
d) Plain Granules




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advanced enzymes
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