

Paper Products from Kenaf

Presented to: Association for the Advancement of Industrial Crops
Phoenix, Arizona November 10, 1998

Presented by:
Thomas A. Rymysza
President and Founder
KP Products Inc. d.b.a. Vision Paper
Albuquerque, New Mexico

Introduction

KP Products Inc. dba Vision Paper has been producing and marketing paper products made from 100% kenaf fiber and from blends of kenaf fibers and recycled paper since 1992.

We are the first to commercially produce and sell 100% kenaf, totally chlorine free printing paper. We are also the first to commercially blend kenaf with recycled waste paper to produce printing and writing paper. And we are the first to recycle kenaf paper and blend it with wood based recycled paper to produce even more printing and writing paper.

Being first, we continually discover the challenges and opportunities.

The challenges come from how new the idea is. Using a new farm grown fiber source in an industry dominated by trees and a "tree-template" way of thinking is not simple. To begin, we must get farmers to produce the crop at an acceptable cost and in an acceptable manner. Next we must insure that the harvest prepares the raw fiber correctly for further processing, without including foreign materials like plastic or dirt. Then we must agree with the existing mill how to pulp and bleach the fiber in a way that meets the expectations of our target market. We do not have our own kenaf pulp mill yet. We hope to help to build one soon.

I will share with you today my experiences in meeting these challenges, and some thoughts about the future for kenaf.

Background Information

In the way of background, I started the company Vision Paper, in 1990, with the mission "To economically produce the most environmentally positive paper products." Vision Paper is the same company as KP Products Inc. It is a privately held corporation, registered in the state of New Mexico. It is a strategic partner with the United States Department of Agriculture's "Alternative Agricultural Research and Commercialization Corporation" (USDA/AARC). USDA/AARC is a private corporation owned by the Department of Agriculture, created by the U.S. Congress in order to promote and assist companies working to introduce new crops and new uses into industrial (non-food, non-feed) applications. My company is involved in applying government and university research to produce commercial products and processes from kenaf in partnership with USDA/AARC.

Utilizing Kenaf for High Value Paper Applications in the U.S.A.

On this subject, I will not attempt to address all of the technical issues, because that would take much more time than we have here today. But it is necessary to understand where the raw kenaf fiber comes from and how it is handled to see that the challenge of kenaf is more than just the technical issues. One big challenge is that there is not enough regular kenaf business in the U.S. Farmers do not always grow kenaf, because there is no guarantee of a market. Mills do not normally produce kenaf pulp for the same reason. Kenaf is still a specialty fiber and specialty paper product. This makes the price higher than it will be when there is more volume. In the meantime, we are faced with "the chicken and the egg" problem. The price is high until there is more volume, but the volume is small because the price is high. Solving one problem will solve the other.

Growing kenaf

Kenaf is easy to grow in many areas. The best climate offers 120-150 frost-free days, with 24-36 inches of rainfall during the growing season. Adequate soil moisture must be present to assure a good early start, and some kenaf is grown with irrigation.

I work with crop producers in areas where the climate is right and land is readily available. Individual farms are 200 acres or more in size, and the kenaf does not replace other crops that the farmers regularly grow. There are many parts of the U.S. which have under-used farmlands. In 1987 we had over 60 million (60,000,000) acres of idle farmland, with the amount projected to double by the year 2012.^[1]

In the places where we have the right farms and local support, we will advise our new partners on which type of kenaf seed to plant. This decision is based upon the climate, what fiber types are desired, and the existing soil conditions and possible pests. There are over 240 varieties of kenaf, but only about 10 are commonly grown. Something that is interesting about varieties is the leaf shape, which comes in two styles. One style, such as Tainung 2, has a familiar leaf shape, with 5 to 7 deep lobes. Some people confuse it for hemp (marijuana), but it is not related. Kenaf is *Hibiscus cannabinus*, and is related to cotton and okra. It forms white Hibiscus flowers at the end of the growing season. Each individual flower blooms for only one day. The other style leaf is not lobed, such as Everglades-41 type, and is more common.

Few chemicals are needed to grow kenaf. To insure good soil conditions, some fertilizer and a single herbicide treatment may be used to control weeds. No insecticides are used because the crop is the fibrous stalk and insects rarely cause much damage.

The key is to work in areas that offer some type of infrastructure, which can help with risk management. Generally, some level of community support and government support will exist. It is best when a farmer's cooperative or private company will take a leadership position. Local citizen awareness and involvement is good, because kenaf can produce jobs and economic benefit.

Processing Raw Kenaf Fiber

Harvesting and Storage

Once the crop has grown, it must be harvested in a way to meet the processing needs. Standard equipment is used to harvest kenaf in the Southern U.S. A forage chopper is often used. After the fiber is harvested, it is pressed into large modules, and stored until needed. The storage can be near the farms, and outdoors. A good plastic cover will protect the fiber. Kenaf has been stored for up to four (4) years this way, and we still made excellent paper from it.

Fiber Separation

Currently, the fiber is mechanically separated into bast and core portions. The bast fiber is then condensed into high-density bales. The high-density is necessary to get the full weight in a truck and to ship kenaf economically. The core fiber is being used in a number of other products such as oil absorbents.

Transportation

Either trucks or rail car transports the fiber.

Pulping kenaf

Manufacturing Constraints

Before discussing the ways I have made kenaf pulp, I will comment on another challenge. In the past twenty (20) years, the trend in the pulp and paper industry has been to build bigger and bigger mills, which demand high volumes of throughput to be profitable.

In the U.S. in 1980 there were 59 small pulp mills rated at a capacity of 50,000 tons or less and only 25 big mills rated at 500,000 tons or more. As of 1993, only 13 years later, there were only 18 small mills rated at 50,000 tons or less, and 49 big mills rated at over 500,000 tons. Those 49 big mills account for over one half of the capacity of all U.S. mills. The total number of pulp mills was 248 in 1980, and 190 in 1993.^[ii] This shift to big mills creates a barrier for expanding kenaf processing at existing mills, because big mills require big volume. Not enough kenaf business exists to produce big volumes.

We pulp kenaf at some of the remaining small mills. This results in manufacturing constraints. Getting small mills to pulp kenaf is not always easy. The reason is that smaller mills are disappearing, and must produce specialty products at high value to survive. Many small mills run at full capacity, so they command a premium price for specialty pulping. This makes the kenaf pulp expensive.

Raw Materials

The kenaf raw material for pulping is about 80% bast and 20% core and in high-density bales. The moisture of the fiber is about 10%. It is important that there are no plastic or other foreign materials in the kenaf fiber. It is very easy to get foreign material in with the fiber from the farm operation.

Pulping and Bleaching

The kraft AQ process has been used to cook kenaf fiber with good success. Batch digesters followed with a single-stage hydrogen peroxide (H₂O₂) bleach process is the most common method. This does not make bright white paper, but it does meet the needs of our market. High brightness pulp and paper can be produced to meet customer requirements.

Papermaking with kenaf pulps

Once the pulp is made, a variety of paper products can be produced. Uncoated offset printing paper using 100% kenaf pulp is the most common product. The typical technical values for this paper are brightness of 72 ISO, opacity of 95+, and surface strength (wax pick) of 14. These values are for papers we make from semi-bleached pulp that is totally chlorine-free (TCF).

Today, we are recycling kenaf wastepaper and blending with recycled wood fiber wastepaper. The wood fiber is post-consumer wastepaper (PCW) and pre-consumer wastepaper. The kenaf wastepaper is from our envelope making and other trimmings. The products we have made are 100% recycled with 20% kenaf wastepaper and 20% post-consumer wastepaper and 60% pre-consumer wastepaper. We have also made 100% recycled paper with 50% kenaf wastepaper and 50% post-consumer wastepaper. Because of a limited supply of kenaf wastepaper, we are currently working on 50% kenaf pulp blended with 50% post-consumer wastepaper. The basis weights produced so far are between 66 g/m² and 218 g/m².

Recycling the kenaf wastepaper requires no special handling. It is a high quality fiber source and it provides excellent blending properties. The kenaf fiber adds strength. The technical values of the product are equal to or better than for recycled wood fiber alone. We have not yet studied the removal of ink from printed kenaf paper.

Market Applications

Once the pulp is produced, it can be manufactured into many products of high value. My focus has been on producing high quality uncoated printing papers that are very environmentally positive. The type of products has been determined more by the manufacturing constraints than by choice.

They are text and cover grades and are used for high quality printing, including four-color process and heat-set four-color web and cold web printing. The paper has been bound for book publishing, including perfect binding and hardcover books. Some companies and organizations use kenaf paper for their identity materials, including letterhead and envelopes. We can also produce other products to meet special requirements.

1. Government printing of books
2. Non-fiction hardcover books
3. Newsletters
4. Heat-set web color printing
5. Marketing materials
6. Letterhead and envelopes for company image

Why the market pays a higher price

Our customers are aware of important environmental problems in the world such as population explosion, deforestation and clearcutting, a farming crisis of both economics and diversity loss, and global warming. Globally, cutting forests is very unpopular, and many people want it to stop.

Kenaf paper is part of the answer. It is a rapidly renewable resource, which can replace trees for papermaking. It uses less chemicals and energy to convert to pulp^[iii]. It is good for the farmers to have another crop to grow, and it is good for the farmland to use fewer chemicals to grow it. It is also good for job creation in poor farming areas.

Most potential customers agree that these benefits are important, but only a small percentage will pay more to promote them. Until the price is lower, the volume is limited. But the volume must increase to make the price lower. Again, the problem is one of "What came first, the chicken or the egg?"

So I have explained some of the many issues involved in utilizing kenaf for high value papermaking. Working in this manner, we are proving that farmers will grow it, and that it can be harvested, processed and stored effectively. We have also proven that kenaf can be pulped and bleached with various processes, and makes very good quality paper.

What does the future hold for kenaf in the U.S.?

The future for kenaf in the U.S.A. looks bright. There is a continued interest of the public in this environmentally positive product, and private industry is starting to respond. Global fiber supply, currency fluctuations, and political developments all contribute to uncertain short-range economics for pulp and paper production. A long-range view shows that the improving economics of kenaf production and the higher price trends for timber will create a positive cost advantage for kenaf at some point in the future. Current developments of kenaf in the U.S. paper industry include significant research and product development by at least two other paper companies, and another project to build a kenaf newsprint mill in south Texas. My goal is for the development of a dedicated mill in the U.S.A. for economical kenaf pulp production. Given a dedicated mill for processing, kenaf pulp can be produced competitively with wood pulp. If technical advancements in pulping chemistry and black liquor processing are incorporated, kenaf pulp can be produced for less. We are working hard to bring this project forward and I am optimistic for our chances.

Before I close, I want to inform you that the American Kenaf Society will be holding its second conference in San Antonio, Texas on February 25 - 27, 1999. The American Kenaf Society is a nonprofit, tax-exempt organization formed in 1997. Its members are leaders in scientific research and commercialization. You can fax or email for conference information, to the attention of Dr. Morris Bitzer, at the University of Kentucky. Fax (606) 257-2185 or email mbitzer@ca.uky.edu.