

INDUSTRIAL HEMP ALLOWS FOREST TO HAVE A BREATHER

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Since U.S Department of Agriculture (USDA) has carried out extensive researches on kenaf as a potential source of raw material for papermaking in 1960S, It has identified that Kenaf is a suitable substitute for the wood and woodchip for papermaking.

Trials on chemi-mechanical pulping of kenaf on a mills scale were undertaken in the United States in the 1987, it has been demonstrated that blends of 80% kenaf chemi-thermomechanical pulp (CTMP) with 20% kraft pulp can produce commercial grade newsprint, in which it is made by 80% CTMP pulp and 20% KP softwood pulp, printing out 72000 pieces of newspaper by the Press of Baker-field Californian in U.S.A. These products were completely acceptable, which had high brightness (64°), with less ink coverage and less linting. The results of trial have shown that the printing-writing paper and tissue paper produced from softwood and hardwood, which is suitable to be replaced by the whole kenaf stalks. The Phoenic Paper Mill with a capacity of 70000T/yr, was set up in Thailand producing kenaf market pulp. Some kenaf mills of papermaking also were built in China such as in Yuanjiang county of Hunan, Wuzhi county of Henan, Miquan of Xinjiang, Yucheng and Jining of Shandong provinces, pengshui of Chongqing city in the past years. They used kenaf as raw material for papermaking with a capacity of over 10000T/yr, nevertheless, their production scale is not so large, output is not so much, why is it so? In China kenaf is currently used on a limited scale in pulp and papermaking by pulping the whole stalk generally with other fibers raw materials.

(1) Kenaf is highly desirable as a raw material for pulping and paper because of its low lignin content and high cellulose content. But, the most suitable planting conditions for kenaf is limited, which grows well in the suitable temperature and climatic conditions at 22~30°C at day, 18~23°C at night, frost-free period at least 150 day, average relative humidity 68~82%, rainfall distribution well at growth phase, the smooth of land, deep-level discharge of water, fat sandy soils.

(2) The growing method for kenaf is that the seeds of kenaf is bred in the South of China and cultivated in the North of China, they are often not seeded with harvests, the economic profits of kenaf's seeds seeded also is lower and the income of kenaf stem is too less than that of planting corn crops in China, growing cassava in Thailand. In addition, kenaf contains a great amount of pith, its moisture content is too high to dry and therefore it is too difficult to storage compared to general straw material, causing the kenaf stem to deteriorate easily, when the bast fiber and stem are separated, the outside epidermis become black, which brings some troubles for cutting and bleaching, it will affect the quality of products, after the kenaf crop is harvested for 25 day and put on the fields for 7 day (about 17°C).

Although some achievements has been obtained to replace wood for papermaking by kenaf, but the development is too slow to be able to make considerable progress.

The industrial hemp is a suitable raw material for papermaking. It is used for papermaking to have a high economic value and possibility comparing to kenaf.

Shenyang Chengjian-Tongxin Intelligent Engineering Co. Ltd that grew plant industrial hemp about 1000 Mu in Liaoning province in 1999, whole kenaf stalks became black and mildewed while the whole kenaf stem and whole hemp stem were put into the room at the same time for seven day at 17°C, and the whole hemp stalks had no mildew. The seed output of per Mu 30~70kg, which is over that of kenaf, the THC contents of hemp seeds 0.00027%, conforming to the demand of international market. The price of seed exporting was 1~1.5U.S dollar \$/Per kg. It only correspond to the income of growing corn crop, the output of whole hemp stem/Per Mu was 700~1100kg. The selling price of it was 45 U.S dollars/Per Ton, which may be sold to paper mill.

The farmers of growing hemp would increase their income of economy. It is more important to suitable for papermaking in morphology of hemp fiber. Average fiber from the bast portion of the stem are about 16mm long, the size of softwood fiber only 3mm, while those from the core fiber are shorter, about 0.54mm long and resemble hardwood fibers, the whole hemp stalks are correspond to proper proportion of long and short fiber, suitable to papermaking.

The quality of pulp made from the bast of hemp is superior to the softwood pulp, the core pulp is similar to hardwood pulp, the whole hemp pulp is close to the mixtures of softwood and hardwood pulp, which is suitable for papermaking.

The chemical components of hemp are more suitable to papermaking, its cellulose contents for hemp 51.32% (softwood 50.86%), which has a high yields of pulp and low contents of lignin 14.97% (softwood 27.85), so that it is easy to cooking and bleaching with lowest content of dioxins produced when lignin reacts with chlorine in bleaching. Pentosan content of hemp 18.29%, which is high than that of 11.12% of softwood, low to than below 24.25% of hardwood, 25.56% of wheat straw, 22.46% of reed. It is suitable to beat for fiber due to be easy of swollen cellulose, ash content 2.24% is far below 6.04% of wheat straw, 15.5% of rice straw, low ash which is suitable to alkaline recovery like softwood red pine, facilitating the implement of environment protection engineering and wastewater discharge.

Shenyang Tonxin Intelligent Engineering Co. Ltd, grew the variety of Dabaipi of Hebei for three years, the average output of seeds per Mu was 45kg while the average output of its whole stem per Mu were 800kg, it allowed the hemp farmers to increase income for over 100 Yuan RMB/Per Mu, comparing to grow corn.

After the harvesting of hemp, which was put on the land for over a month, its content of water may be decreased to below 20%, without mildewing as that of kenaf, this is helpful to produce white paper.

All experiments including the bast, core and whole hemp stem were carried out separately in cooking, bleaching, beating and papermaking, by the Shenyang Natural Fiber Research Institute. The test of paper was finished by the Paper Quality Supervising and Testing Station of Shenyang of China State Light Industry Bureau, the results show that, the quality of pulp made from bast is superior to wood pulp.

The water pollution of pulp and paper mills is serious and it was considered that spent cooking liquors are causing severe pollution. The pollution load amounts to 85% of COD, BOD and SS. The research and actual measurements in recent years indicated that we must understand clearly that spent bleaching liquor has more harmfulness than black liquor and it's toxicity is very high.

In the end of 80s, the developed countries such as SWEDEN, FINLAND, NORWAY, USA, CANADA, etc, which discovered and measured dioxins from bleach plant effluent and sludge which caused cancer, break and monster characteristics, having procreation and incretion

toxicity and restraining immunity function affecting hormone secretion, making man female, affecting children's growth and development, and causing cerebral nerve pathological changes and acute toxicity disease.

Dioxins (TCDD) have most severe toxicity, which corresponds to 1000 times of Potassium cyanide or over 500 times of strychnine.

During the period of June 1999 in Belgium and other countries, dioxins pollution event took place in succession from the products of domestic animal and birds and dairy products. The results shocked the whole world making consumers panic to some extent, because of the high content of dioxins.

The dioxin is severe toxicity matter, which is difficult to degrade. Its half-life is 7 years and remaining time in soil is 10 years. As biologic narcotics continue the accumulation in circumstance, aquatic organism and body, it is possible that it causes cancer as time bomb. When it accumulates to certain degree, it makes people panic to oppose utmost the use of bleaching agent-contained chlorine.

Some newspapers condemned paper mills as title "why are you making paper so white", forming environment pollution and harming aquatic organism and human health.

At present, incidence of cancer, cardiovascular and cerebrovascular disease, diabetes, deficiency of kidney-qi, children dysplasia, deformity is high and it is difficult to determine the mechanism of happening cancer. The chlorine containing bleaching at paper mills has become the focus of public opinion by numerous people.

In addition, paper is closely related to people's life. Especially packaging foodstuff and drinks, for example, milk to paper box was examined in U.S.A and it contained 0.04ppt dioxins. It was discovered that dioxins dissolved from bleached pulp, which exceeded safety standards (The content of dioxins of pure water standard must be under 0.000013ppt by U.S.A Environmental Protection Bureau.) The demand of sanitation in the products of bleached filter paper and filter board, which filtrate blood, water, drinks, alcohol and oil is very strict. This is why we must produce pulp, paper and paperboard without dioxins.

World papermaking raw materials amount to 92% of wood, in which a vast majority is made by sulfate process. The bleaching sequence is (4-7) stage, using chlorine as bleaching agent, because it is more difficult to bleach without chlorine.

According to a report of Mr. Yangmao Xian, Vice Director of China Paper Technical Association, ECF (Elemental Chlorine Free) and TCF (Total Chlorine Free) bleached pulp and paper have been welcomed universally in Europe.

Another article states that world pulp market has a tendency of requirement for pulp without any chlorine containing bleaching agent.

Although the discharge amount of spent bleaching liquor AOX in which Cl_2 is replaced by ClO_2 by 100%, descends to lower, Especially countries which imported bleached pulp like Germany, Switzerland, Austria, and Holland, are claiming that their requirements for the imported pulp is more strict (stringent).

Today, with regulatory issues in the U.S., Europe and Asia settled, the competition between pulp bleaching methods has moved to building markets for various products. Some environmental groups and other advocates claim that TCF bleaching is environmentally superior to ECF and are encouraging consumers who use bleached paper and board to purchase products made from TCF pulp.

TCF bleached pulp and paper are green products of environmental protection, which are favoured all over the world. In recent years, many companies at home and abroad have been carrying out TCF bleaching research work. Many publication have made related reporting.

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Another technical publication "Paper and Papermaking" on page 7, No.2, 1994. It is stated that world pulp market had a tendency of requirement for pulp without any containing chlorine bleaching agent. Although the discharge amount of spent bleaching liquor AOX in which Cl_2 is replaced by 100% chlorine dioxide substitution, descends to lower.

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It was reported that Japan papermaking industry is planning to use chemicals without containing chlorine for 13 paper mill in 2005, because the chlorine compounds will produce dioxins and other harmful substances.

According to a report of "The Chem Engineer" No.7, 2000. It was said that a great challenge of the early 1990s impelled the papermaking industry to rethinking for stimulating development of TCF bleaching sequence. The development of process has changed greatly the appearance of chemical pulp mills and it was also economic without environmental impacts until 2003, the production of ECF and TCF bleached pulp will be 75% of all pulp production.

With the increasing of awareness of environmental protection, the market prospect is very wide more and more.

China's Pulp and Paper Industry is basically grounded on non-wood fiber plant, using 86% non-wood fibers. Non-wood fibers are high in ash content, rich in pentosan compared to coniferous wood. In addition, due to its low-lignin content, the brown pulp of cooking is light color, which is easy to carry out TCF bleaching, unbleached chemical pulps are too dark in color for use in the manufacture of high-grade white papers, the dark color is derived mainly from the lignin in the pulp.

In modern mills, oxygen is normally used in the first stage of bleaching, the trend is to avoid the use of any kind of chlorine chemicals and employ total chlorine free bleaching (TCF), TCF processes allow the bleaching effluents to be fed to the recovery boiler for steam generation, bleaching wastewater and products have no dioxins.

China was the earliest country to grow hemp in the world, the bast fiber plants (hemp) had been planted in vast areas in China for a very long time and much experience has been accumulated in China.

The THC content of industrial hemp is 0.00027 percent, conforming the quality requirement of international markets according to the report of test by the world hemp centre.

We think that the pulping of non-wood and TCF bleaching also will have a bright future in international markets.

According to fifth national inventory of forest resources, present forest area of China is 1.589 (100 million hectares), (The forest area of per kapita) is 1/6 of world mean number, the forest growing stock is 112.7 (100 million cubic metre), the stock volume of the forest of per kapita (1/8 of world average number) the forest-coverage rate increased from 12.7% to 16.55%, through many years efforts of the whole nation from the leadship to the masses, which correspondents only to 61.3% of world forest coverage rate for average number. China is a less forest country, which has not enough total amount of forest, un-uniform distribution of forest and the mature stand, over mature forest only accounts for 14%, forest growing stock account for 38% and most forest constitute of nature forests, which is located in important regions of ecological position, which can not be harvested and used (exploited), the consumption of forest resources for all national average over restrained limit cutting comparing to the same category of forest limit cutting approved by the State Council, which has reached 86.00 million cu meter. Due to nature forests to be deforested, it lead to serious flood catastrophe in North and South of China in 1998. So that, the State Council published an order, calling for strictly forbidding cutting nature forest in the future some years therefore it is necessary to import wood years from other countries.

At present, the annual demands of commercial wood in China is about 100 million cu meter, actual supply was 50 million cu meter, shortage of wood reached a half of them. The annual mean imports of wood was 45.80 million cu meter, only the expenditure of foreign exchange in 1998 had reached 6.34 billion U.S. dollar \$, so appealing for the nation to supply sufficient wood and wood chip to the paper industry. It is limited to expand the proportion of wood, due to the shortage of wood resources, in order to expand use of wood, there are needs of implementing a policy of integration between forestry and paper, the large scale-size paper mills must set up raw materials base for papermaking. But, today even if paper industry has had its raw material base for papermaking, the southern eucalyptus and Acacia of China in the breeding rotation of it and other hardwood that need 6 years, Caribbean pine, Masson's pine and other softwood need 12 years, hardwood such as Daqing poplar、 Tian poplar、 poplar need 15 years in North of China, Xingan larch, Korean larch, Japanese larch etc, softwood which

need 25 years. The triploid white poplar in middle and lower regions of Huang river, need 8 years and even if fast growing forest also need around 5 years, the consumption of paper of China and output of paper increased year by year, it is impossible to wait trees to grow up, but by large cutting Young-middle aged forest, the reserve resources will be destructed and make it to have serious consequences.

So that, if the paper enterprises in China is to live and develop, it must undergo self-imposed hardship so as to strengthen one's resolve to wipe out a national humiliation, implementing the integration of forestry and paper, building forestry bases.

From 2005, China's paper industry will speed up the integration between forestation and papermaking and that between capital operation and industrial operation through these integrations, the fittest would survive and the competitions of China's paper industry would be elevated.