



Azeus Machinery Co.ltd

Email: info@biopelletmachine.com

Website: www.biopelletmachine.com

Add: SOKEYUFA Building, NO.26 Jingliu Road,Zhengzhou,CHINA



Analysis of Thailand Biomass Resources and Biomass Pellet Market

Catalogue

I. General Situation of Thailand Energy Sources

- Sugarcane
- Cassava
- Rise Husks and Rice Straws
- Giant king grass

II. Varieties of Thailand Biomass Resources

III. Production of Thailand Biomass Pellet

IV. Market and Prospect of Thailand Biomass Pellet

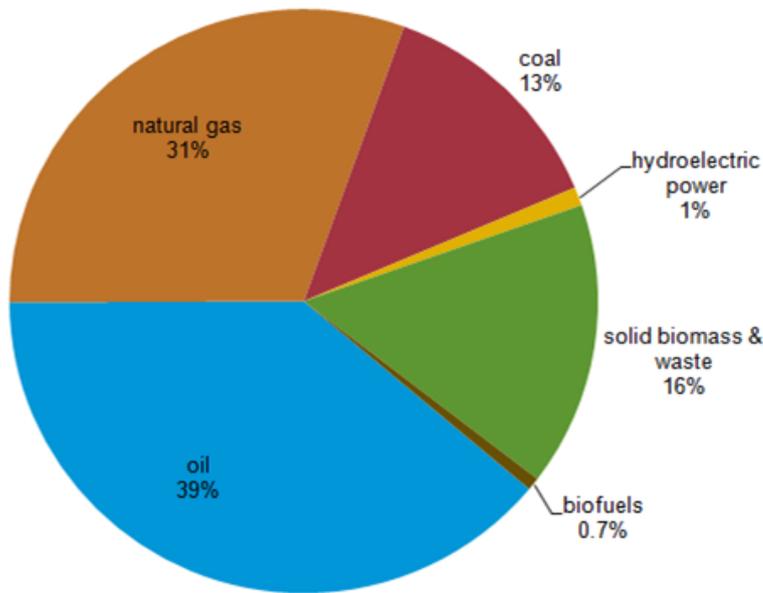
- Global wood pellet consumption forecast
- Adequate raw materials supply
- National policies support

V. Summary

General Situation of Thailand Energy Sources

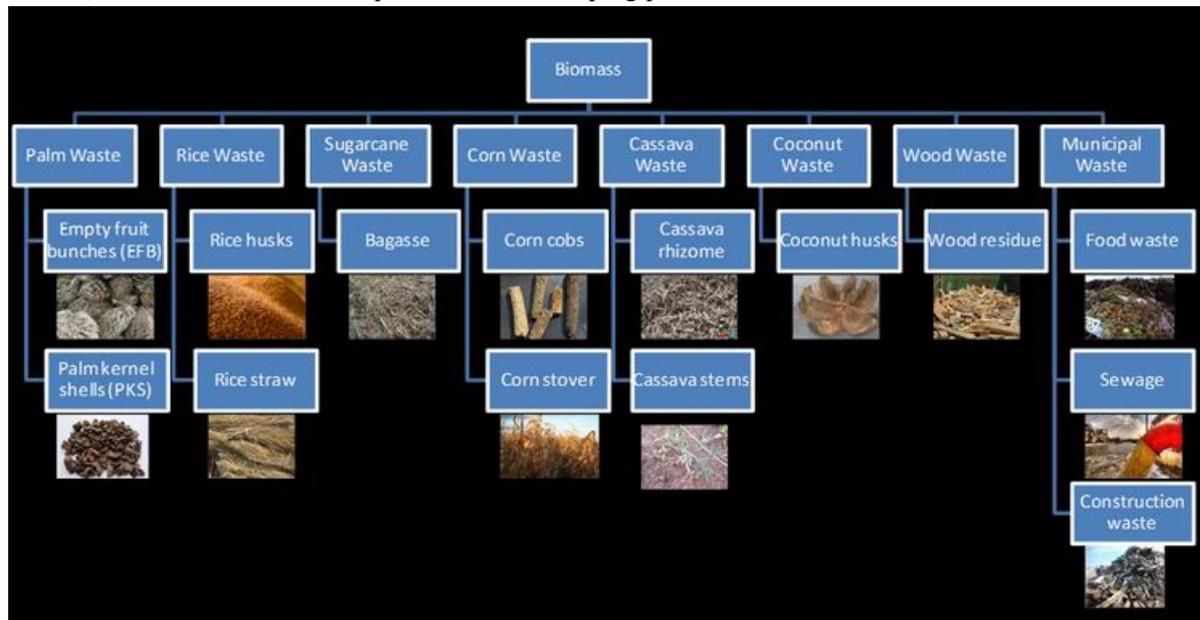
Thailand has abundant forest resources and crop resources, which is an advantage for Thailand to produce and use wood pellet as a kind of green energy, and makes it possible to develop Thailand as the biomass pellet trade center in ASEAN.

Total energy consumption in Thailand, by type (2010)



Varieties of Thailand Biomass Resources

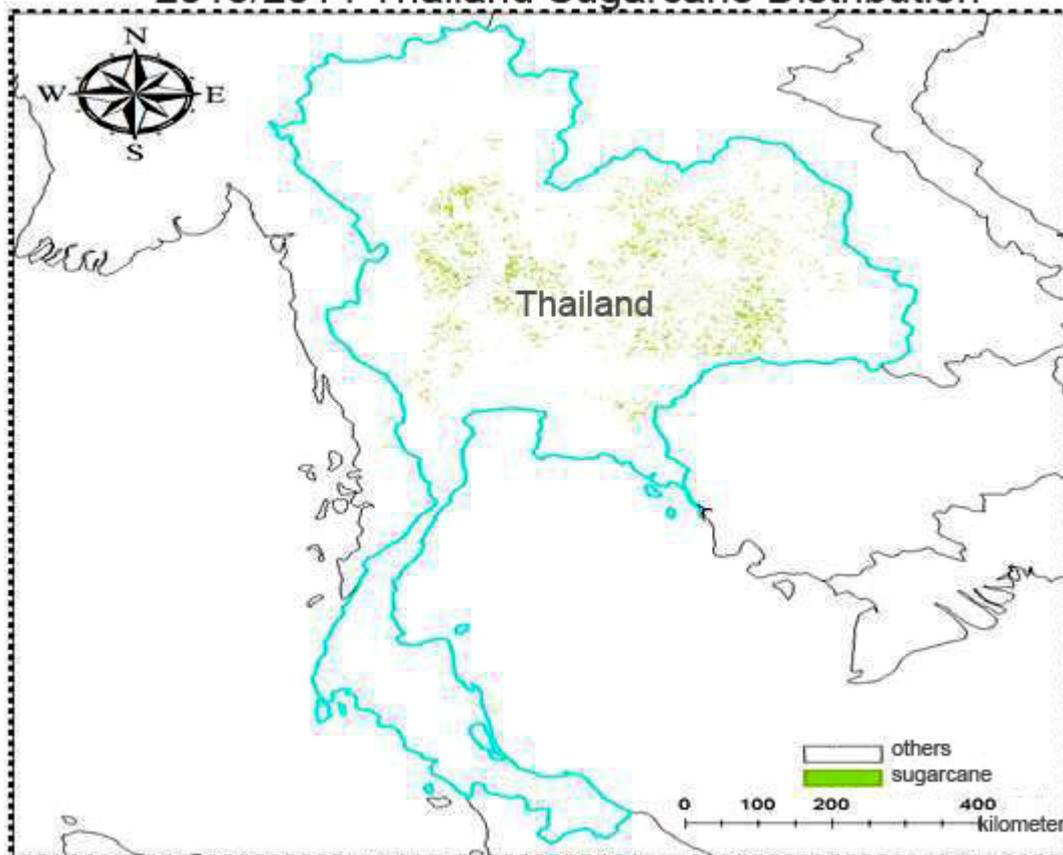
Thailand is a major country of agricultural products producing and exporting, and the government attaches great importance to bio-industry. By setting senior management institutions, presenting preferential policies, enacting development projects, Thailand has achieved good progress in bio-agriculture, bio-pharmaceutical, bio-energy, etc. The main raw materials for making bio-pellets in Thailand are sugarcane, cassava and rice. Thailand is cultivating the giant king grass as a new material for bio-energy. Abundant natural resources, cheap labor cost and wide domestic-foreign market, all these factors make it possible for developing pellet fuel.



--Sugarcane

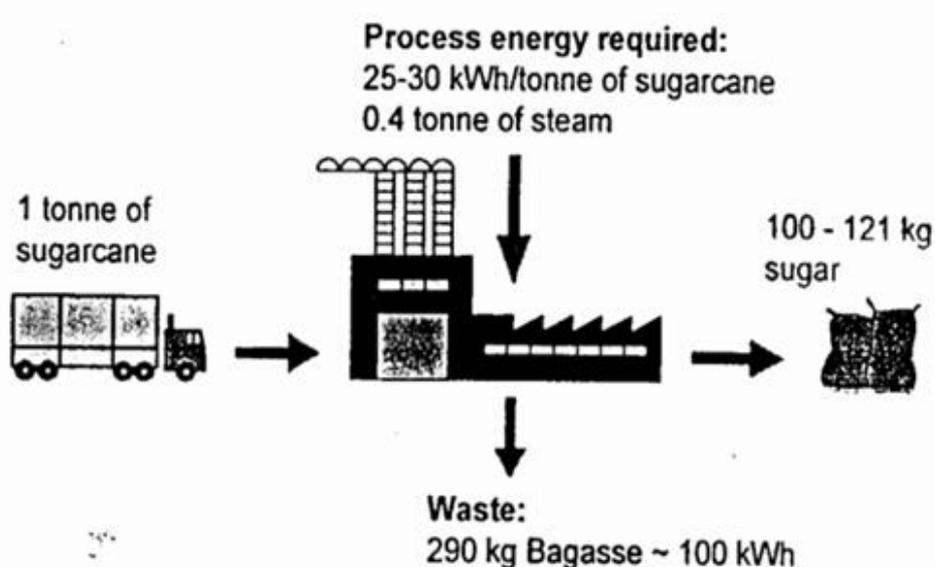
Thailand is the main sugarcane producer and cane-sugar exporter country in the world, locating in the moist tropical-region of Southeast Asia. In 2013, Thailand cane-sugar exports ranked 2nd in the world, following Brazil. Cane-sugar industry has a great contribution to Thailand economy as one of the main economic sectors in Thailand. During 2013-2014, the military and government has proposed a plan of expanding sugarcane plantation to increase the production of cane-sugar, which will promote a further development of the cane-sugar industry. And what comes with the cane-sugar industry is the cane wastes, of which the outstanding one is the bagasse.

2013/2014 Thailand Sugarcane Distribution



Thailand plantation of sugarcane are mainly distributed in the northeast, the middle, and the north areas where are the main distribution ranges of sugar refineries. The bagasse is the key material for making cane-sugar, and it is expected to have a production of 11 million tons in 2014; the predictable bagasse amount is 22.9 million tons. The huge amount of bagasse provides ample raw materials for growing bio-pellet fuel.

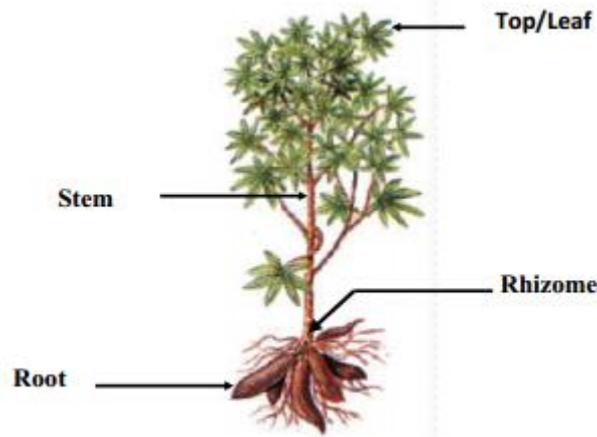
There is an obvious amount of bagasse in cane-sugar process (probably 1 ton sugarcane can produce 290kg bagasse). With the development of sugar industry, the bagasse amount is rising year by year.



	Production (tonne)	Residue	Production (tonne)	Energy Content (MJ/kg)	Energy Potential	
					(TJ)	(ktoe)
Sugarcane	66,816,446	Bagasse	4,190,794.31	14.4	60,347.44	1,428.54

---Cassava

Thailand is the third large producer country, the first large exporter country of cassava around the world. As one of the four dominating crops (the other three are rice, rubber and sugarcane), the cassava has a strong support form the government, wide planting areas and high productivity. In the 76 provinces of Thailand, there are 46 provinces are planting cassava now, and its main production are located in the northeast, the north, and the middle areas, including the east area.



Developing cassava waste has many advantages, and there are three reasons:

1. Cassava is the crop that can be planted full-year, and this property is crucial under the situation of intense land competition.
2. The agriculture ministry sets the special nation project whose purpose is to increase the average production of fresh cassava root to 30 ton/ha. by cultivating the cassava of high production, improving irrigation system and fertilizing condition.
3. The investment and energy cost that the cassava planting and harvesting need is small.

Cassava has huge yield, producing a large number of biomass raw materials, and the cassava stem is the primary materials of making bio-pellet fuel, having a lot of research and development prospects.

Because of the cassava agriculture development, Thailand has a huge production cassava stems and wastes. Now, most thais just simply smash a small amount of root-stocks and return them to the farmland, and part of the wastes is taken as feed, as food fungus culture medium or as fuel of chipboard processing. However, most of the wastes is abandoned directly, which not only causes the waste of resources, but also pollutes the environment, so the exploitation for cassava stems has to step forward.

By the preliminary forecasting, it shows that cassava stems can have an output of 7.5t/hm², yearly output of 4.27 million tons. As the one-third of the stem needs to be used for regrowth for next season, the actual amount for making biomass stuff is around 2.56 million tons, equaling every year generating capacity of 12098GW.H.

Most of the cassava earthnut is used for producing starch and alcohol, and the waste left after collecting starch and alcohol is rich of fiber, and it can be used to make biomass fuel after processing; it is a good resource for pelletizing and powdering. At present, the waste is widely used to make feed pellet, but it has a certain prospect as a kind of raw material for fuel pellet.

	Production (tonne)	Residue	Production (tonne)	Energy Content (MJ/kg)	Energy Potential	
					(TJ)	(ktoe)
Cassava	30088025	stem	2439236.19	18.42	44,930.73	1,063.60
		rhizome	1,834,466.88	18.42	33,790.88	799.89

Cassava stem energy utilization and pelletization requirements

Overall, cassava stem is a promising material for manufacturing pellet fuel. Although its average calorific value is a little lower than the cork fuel, it still has considerable combustion value. Cassava stem has high ash melting point and it means the stem has low risk of combustion and slagging, beneficial to further utilization. If the stacking time of the stem is prolonged, its combustion characteristic will be improved. The moisture content of the stem is an important parameter of pelletizing, so it has to control the moisture content properly, and generally if the moisture content is controlled at a level of 10% or 12% or 14%, the pellet produced has high durability and density-mass.

Under the basic situation of no changing the pellet equipment, cassava stem pelletizing needs lower energy cost than biomass pelletizing. If optimize the pellet machine, more energy will be saved.

Developing the cassava stem pellet is of great goodness and great profits. Rich sources, good combustibility and high pelletizing quality make cassava stem and waste the excellent solid biomass fuel.

---Rise Husks and Straws



Thailand is of superior conditions for planting rice: wide plain area, fertile soil; enough sunlight, large temp difference between day and night; tropical monsoon climate, same period of rain and heat; high-level agricultural mechanization; great market demand, convenient transport, etc. According to the data analysis, the annual rice output in Thailand can be around 20 million tons, and the rice plantation mainly sites in the northeast area where there are large plant area, and in the middle area where there are many irrigation systems. Superior geographical environment and enhanced production technology contribute to Thailand's the 6th ranking of rice yield in the world. The rice plantation in Thailand has 3 times harvest in one year with stable yield, supplying rich rice husks and stalks as the raw materials for bio-pellet fuel.

There are no enough knowledge about the rice husks and stalks as the raw materials for biomass fuel, so the biomass fuel output has not reached the actual one as expected in Thailand. The rice husk has 23% of rice production, about 4.6 million tons per year, and it is widely used to make feed pellet, as fuel for machines, and to make charcoal products. The rice stalk has a higher production than rice husks, and it is also widely used to make feed pellets as well as crafts. One ton rices can produce 290kg rice stalks and 220kg rice husks, equaling 100kw and 410-570kw

energy respectively.

	Production (tonne)	Residue	Production (tonne)	Energy Content (MJ/kg)	Energy Potential	
					(TJ)	(ktoe)
Rice	31,508,364	Husk	3,510,598.90	14.27	50,096.25	1,185.87
		Straw	25,646,547.96	10.24	262,620.65	6,216.73

As the crude materials for making bio-pellet fuel, rice husks and stalks have great advantages:

1. Huge raw materials supply is an obvious advantage that other countries that develop pellet fuel do not have. Three times harvest per year and serried areal distribution definitely will promote pellet fuel industry.
2. Rice husks and rice stalks are the reasonable raw stuff to make bio-pellet compared with other materials for its cheap price, small size and low moisture content.
3. The policies of SPPs and VSPs is an enormous motivation for Thailand developing bio-pellet. With the national policies's promotion, the rice husks and stalks production for pellet will be increased by 0.6 million tons every year, and the advantages of developing the biomass pellet industry are gradually highlighted.

Rice is the main food crop in Thailand, and its large amount of planting and harvesting can bring a good deal of crop waste. Under the social environment of environment protection and economic benefit having priority, how to deal with the waste is a new problem for Thailand government and the industry development. At present, a large amount of rice husks are dumped, leading to problems of garbage management and methane emission; due to the low density of rice husks, it will cause dust and smoke, bringing about the problem of respiratory tract; burning rice stalks results in air pollution. Processing rice husks and stalks to make bio-pellet fuel can ease the influences from these problems upon society and environment.

1. Facilitate environment protection: rice husk-stalk pellet fuel industry reduces waste dumping, relieves greenhouse effect.
2. Produce economic benefits: Thailand is already a country highly depending on energy sources which mainly are imported. Pellet fuel industry can decrease the fuel imports and the power system loss. At the same time, the industry helps rice industry and economic progresses.
3. Solve the social issues.

--Giant

king

grass



Giant king grass is a new-type energy crop with high producing, belonging to perennial herbs (it has 2 years of cultivation period before harvest), planted in tropical and subtropical areas,

especially the areas of rich sunlight and rain; having low requirements on the soil condition, growing well in the areas without crops, so it can be planted around power station, easy to plant and manage. It has the same shape of sugarcane; fast growth cycle, its height can be 4 meters every 45-60 days, and one hectare can produce 100 tons of grass per year; one giant king grass has 20-35 seeds every year, the crop is of high yield with low investment.

Low CO² emission when burning makes the grass has a wide application for producing biochemical and biological products (like bio-methane, etc), bio-fuel, densified bio-fuel, green cellulose, biological cellulosic ethanol, and for biomass power generation. It is estimated that if there were 30 million hectares of giant king grass worldwide, the coal can be totally replaced. In the terms of production cost, the grass is higher than the charcoal, but it is much lower than other energy explorations (like solar energy). This renewable biomass energy has great development potentials.

Currently, the giant king grass pellet has been put into production. With the practice of VSPs policy, American Viaspace company and Thailand Seema Energy company have a cooperation in grass pellet project, and the grass pellet production can reach 930, 000 tons per year by 2014, helping to solve the energy problem facing Thailand. Viaspace company also supply NASA with a part of high-quality pellet to put into use as a new aviation energy.

Production of Thailand Biomass Pellet

Biomass pellet producing procedures:

raw materials collecting --- drying--- crushing--- pelletizing--- cooling--- packing and shipping--- storing.

The leading machines are crushing machine, drying machine, pellet machine, cooling machine, conveying equipment and packing equipment. The major materials for wood pellet in Thailand are timber and the leftover when making furniture, but the rice husks and stalks, sugarcane waste and cassava stem are becoming the major crude stuff. Because of the differences of raw materials, there should be different production equipment and processes.

Sugarcane waste pellet process: raw materials collecting---drying---pelletizing---bagging and selling. Store enough raw stuff timely according to different harvest time, then dry the material and make pellets. The moisture content of sugarcane waste is about 20%-25%. The heat value of cane waste pellet can be 3400-4200 calories.

Rice husk pellet only needs pelletizing, cooling and packing these steps. But the rice husk has the in-compact property, so it is better to add sawdust into the rice husk to make pellet.

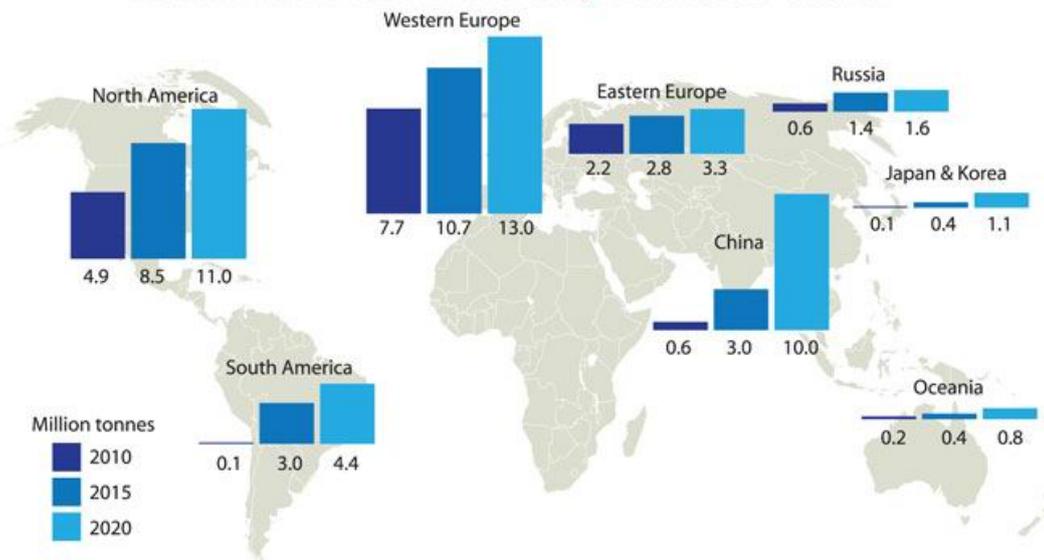
Cassava stem pellet has the same pelletizing procedure of usual wood pellet, but the stem moisture content is an importance in pelletizing, and cassava stem pellets will be of high durability and density mass if the stem moisture content is 10% or 12% or 14%.

Market and Prospect of Thailand Biomass Pellet

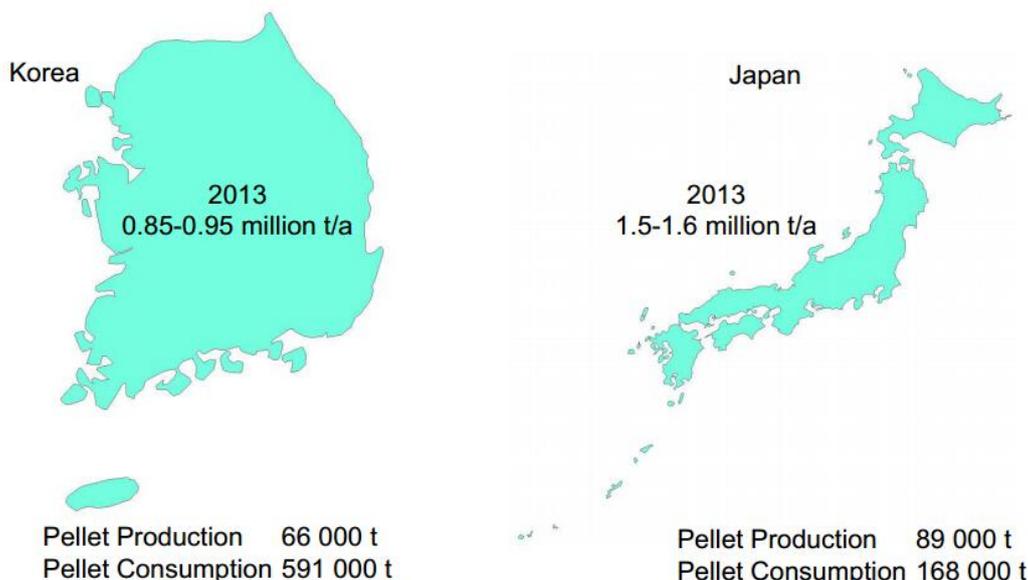
Wood pellet is being known and accepted by most people as a kind of new bio-energy with economic and eco-friendly qualities. The lack and rising price of mineral energy makes bio-energy more and more popular. Thailand locates in tropic area, it has quite rich biomass resources, which is the extraordinary advantage for Thailand wood pellet market. Abundant raw materials supply, convenient traffic, domestic market requests, national policies support and extensive foreign market make it possible for Thailand to grow wood pellet industry.

---Global wood pellet consumption forecast

GLOBAL PELLET PRODUCTION: 2010, 2015 and 2020 Outlook



The global wood pellet consumption is estimated that it will have a billion-dollar stepping forward by 2020, and based on the regional demands, wood pellet market will increase by 200%, the quantity demanded will increase from 16 million tons to 40-50 million tons. With the global wood pellet production constantly increasing, the low-cost production areas will be the leading export markets, and Thailand has the qualifications for being the export market: raw materials & pelletizing cost, and shipping cost. The southeast countries are the places of strategic importance for the Occident to develop pellet industry.



The Asia market demands for bio-fuel is keeping rising, especially the market of China, South Korea and Japan. South Korea and Japan are in urgent need for exploring new energy for their resources shortage and industrial demand for electricity, and now these two countries focus on Southeast Asia market of bio-pellet fuel, such as Indonesia, Thailand, etc, to develop bio-pellet fuel through investment or cooperation, which has an escalating trend. China has abundant natural resources, but it still has inadequate supply of pellet fuel; China is capable of investing capital and technology to develop pellet fuel to meet domestic requests, because it has the relatively advanced machinery manufacturing in Asia. Bio-pellet fuel is still in a period of fast growing worldwide, so Thailand industries should seize the opportunity to get into the bio-pellet business.

---Adequate raw materials supply

Type I : from processing industry

- Rice husk
- Sugarcane bagasse
- Palm shell and fiber
- Coconut shell
- Corn cob

Type II : Agricultural residues

- Sugarcane tops and leaves
- Rice straw
- Corn tops, leaves and stalks
- Soybean stalk
- Cassava stalk
- Oil palm residues

Thailand has plenty of forest and crop resources. There are strict requirements on wood use, but crops plantation and crops waste provide raw stock base for pellet producing. And the crops waste comes from: 1. Crops waste in industrial production, including the rice husk, bagasse, palm shell, cacao husk and corn cob; 2. The rice stalk, sugarcane leaf, corn stalk, cassava stem, etc left in agricultural activities. These potential crude stuff is supporting Thailand wood pellet production.

--- National policies support

Due to the rising demand for energy resources, Thai royal family, the military and the government are committed to the development of new biomass energy. Thailand has successively issued the SPPs and VSPs these two policies, enacted measures of feed-in tariff, technical assistance, and soft loan, etc to ensure and lead all professions and trades to develop new bio-energy. The SPPs is first applied to develop and utilize the rice-husk new energy, greatly accelerate the process of the new rice-husk bio-energy. The VSPs fully promotes the domestic pellet fuel development in Thailand, making the pellet market full of vitality.

Summary

The favorable climate, low labor cost, national policy support, capital income and awakened awareness, etc are the potentials and advantages for Thailand developing bio-energy. Thailand pellet market has an early development, but the constantly increasing demand for pellet fuel, the shortage of new technology, new-type pellet machine and new-type pellet fuel force Thailand to seek cooperation, and China has the superiority to be the cooperative partner.