WOOD BIOMASS, A FORM OF RENEWABLE ENERGY AND ECOLOGICAL

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Abstract

This paper aims to present the need and potential of wood biomass in energy production. The benefits of using solid fuel made of wood biomass for energy purposes than traditional fuels.

Key words: biomass, wood biomass, renewable energy, green energy

INTRODUCTION

One of the main problems is the planet of global warming. With the high cost of refined oil products, it is important to find less costly alternatives. It is also desirable to reduce fossil fuel consumption to alleviate the harmful effects of global warming (Zerbe, J.I., 2006). One way to mitigate this problem is achieved by substituting fossil fuel energy with renewable energy.

Biomass is considered one of the futures based on renewable resources. It can also be used to produce electricity and heat to obtain. The term covers a wide range of biomass products and waste products from forestry, agriculture, including those from livestock, and municipal and industrial waste. Under European Union law, "biomass is biodegradable fraction of waste products and residues from agriculture (including vegetable and the animal substances), forestry and related industries, as well as the biodegradable fraction of municipal and industrial waste" (European Commission, 2005) .

Energy production from biomass is a promising option, with greater impact in developing countries, where current levels of energy services are low or nonexistent. Biomass currently accounts for approximately one third of the total energy consumed in developing countries as a whole, and almost 90 percent in some of the least developed countries. Over two billion people depend on biomass energy for cooking and heating (Kartha S., Eric L., 2000).

There is a desire of the EU and its Member States to allow the widening energy production and use of biomass products in the future. The objective of the proposed European Commission's White Paper for a Community Strategy "Energy for the Future: Renewable sources of energy" implies that the contribution of renewable energy European Union member countries to reach 12% of total primary energy consumption by 2010.

MATERIAL AND METHODS

All fossil fuels-coal, oil and natural gas is a very old biomass. They are not considered renewable because they require a very long time to form, while biomass energy is renewable and can be used year after year.

One means of comparing the energy content of biomass and fossil fuels based on their reports A: C and H: C, known as Van Krevlen diagram (*Fig. 1)*. As these reports are small, the greater the energy content of that material.

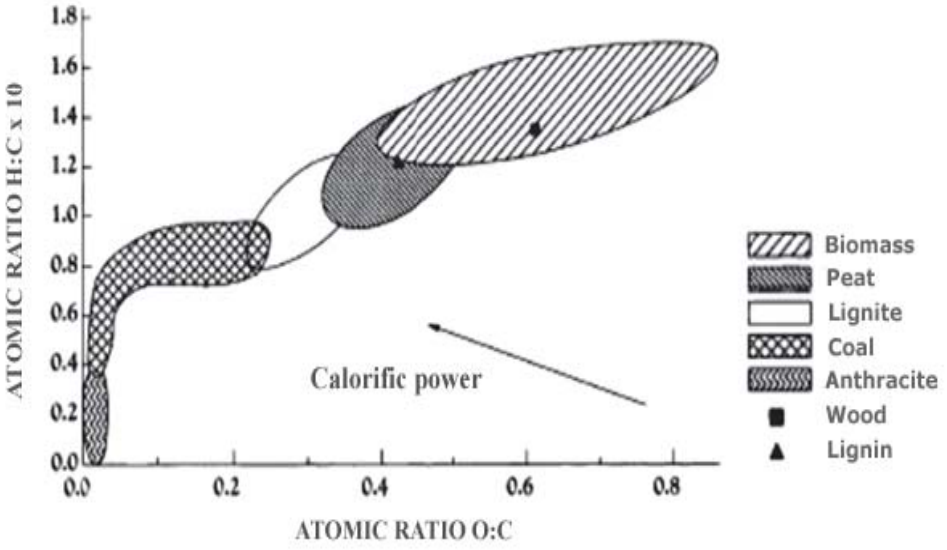

Fig.1 Diagram Van Krevlen

Biomass is different in terms of carbon content of organic and inorganic materials, physical properties and the calorific power. Unlike coal, biomass generally has less carbon, aluminum and iron, and more oxygen, silica and potassium, is lower calorie, higher water content, lower density and low friability.

Understanding the structure and composition of woody biomass is vital to efficient utilization. Wood is one of the most abundant resources in the bio-based industry and yet it is also one of the most complex materials, composed of polymers of lignin and carbohydrates that are physically and chemically bound together. Considerable amounts of energy are required to separate the polymers from each other (Committee on Biobased Industrial Products, 2000).

Woody biomass is represented by forests and forest plantations (logs, stumps, stems, leaves and needles) waste products of woodworking industry (bark, sawdust, wood shavings and chips) and wood products that are obsolete (the wood recovered from construction).

Forestry waste includes waste that can not be used, imperfect trees from the point of view, dry trees and other trees that can not be sold and must be cut to clean the forest. The cutting of forest trees result not only by healing but also this produce waste that can be used to produce energy.

The potential energy value of biomass materials is determined by its chemical composition and is measured as Joules of energy in 1 g of fuel (J/g). For convenience this measure is usually expressed as MJ/kg or GJ/t. However, for practical matters the volume-related energy density is a much more important parameter considering the packaging of energy materials, meaning chips vs. sawdust vs. logs.

While the energy value of solid biomass has relatively low variation, the volume of a single unit of fuel equivalent can easily vary by a factor of ten, depending on the method of harvesting or processing. In the case of chipped forest and agricultural biomass,

the application of densification technologies can considerably reduce the volume of space required for storage, thus increasing the energy density of the materials.

The total amount of energy released from fuel is called the heating value. Due to differences in chemical composition, softwoods have higher heating values than hardwoods, branches have higher heating values than stem wood, and bark and foliage have higher heating values than wood in general despite the higher ash and heavy metal content (Nurmi, J., 1993)

RESULTS AND DISCUSSIONS

Require processing raw biomass into solid, liquid or gaseous fuels that can be used to produce heat, electricity and fuel for vehicles. Technologies that use renewable wood biomass for energy production are:

- combustion, direct combustion of biomass ligno, generating electricity and thermal
- pyrolysys, heating at high temperatures of wood waste in a controlled environment without oxygen, resulting in chemical decomposition of biomass and produces quantities of oil, gas and coal
- gasification, biomass heating in a controlled environment with a low oxygen content leads to the transformation of wood into gas
- pellet, biomass compaction at high pressure generates solid fuels: pellets and briquettes

It is recommended that solid bio-fuels to be used in installations for domestic, commercial and industrial processes to be subjected to pretreatment such as washing, drying, size reduction and compaction in order to achieve greater uniformity, to make handling easier and reduce humidity to an acceptable level. Combustion, gasification and pyrolysis processes are examples of heat. They produce either heat or a gas or liquid.

Mechanical process (pressing) does not change the nature of biomass (pellet).

One alternative form of wood energy that is gaining momentum is wood pellets. Pellets and briquettes are more fully processed and refined than chips, sawdust, chunk wood, and other forms of particulate solid wood. Pellets and briquettes are more uniform in size, MC, and other physical properties such as ash content. Pellets are made by hammer-milling wood into sawdust. If necessary, some drying may be done at the same time as milling.

The sawdust is fed into a pellet machine where it is subjected to high pressure and extruded through a die. Wood chips do not possess the good free-flowing characteristics of wood pellets. Wood pellets are readily combustible and well suited for use with sophisticated and automatically controllable appliances.

Briquettes are rectangular or cylindrical shape and are obtained by pressing together, chips, tree bark shavings or a piston or screw press. Fuel briquettes are produced from sawdust and have equal density (900 kg/cm) and close to the calorific power hardwood: beech, oak, hornbeam.

Pellets are made by grinding sawdust, chips, tree bark or shavings and dust obtained by pressing a mold. The heat resulting from friction is enough to soften the lignin ($C_{40}H_{44}O_6$). By cooling, the lignin becomes rigid material and links. The pellets were cylindrical or spherical with a diameter less than 25 mm. Pellets are compressed to about twice the initial density of green biomass. The increased density of the pellets have a higher calorific. Main characteristics of pellets (7): density - min. 640 kg/m^3; dimensions - length: 38 mm max diameter: 6.4 mm, 7.9 mm, ash content: - $\leq$ 3%.

Energy content of pellets and briquettes is about 17 GJ/tone with a moisture content of 10% and a density of about 600-700 kg/mc. Knowing the density (physical

characteristics) and compression (mechanical characteristic) are important because they provide data on the degree of compaction and consistency of briquettes and pellets, respectively on their quality, and their calorific.

Energy density is relatively low in biomass chips. The space required for transporting and storing chips is 11 to 15 times greater than the space needed for oil, and 3 to 4 times greater than that required for coal. These differences result in higher utilization costs and the biomass material being utilized closer to the source. A commonly used conversion factor shows that a solid cubic meter of wood will produce roughly 2.5 cubic meters of loose chips.

Comparisons of fuel sources often examine the energy balance ratio or the output energy versus the input to create energy. The energy balance ratio of chips from logging residues and thinning has been shown to be high compared with other energy crops such as alfalfa, rapeseed, canary reed, and potato (Richard L. Bain, Ralp P. Overend, 2002). Thus, as long as forest fuel is a by-product of other operations and transportation is kept to a minimum, forest residuals make an excellent energy source.

Biomass can be burned in conventional combustion systems and its use for these purposes do not require major infrastructure investment, energy unlike water, sun and wind (Richard L. Bain, Ralp P. Overend, 2002).

Although fossil fuels contain the same constituents, hydrogen and carbon biomass as they are not considered renewable because they require a very long time to form. Fossil fuels are stored deep in the earth's atmosphere affects the earth and not only if they are burned.

Ecological arguments are related to the fact that they use recycled wood waste from a solid fuel that burns with a carbon emission neutral.

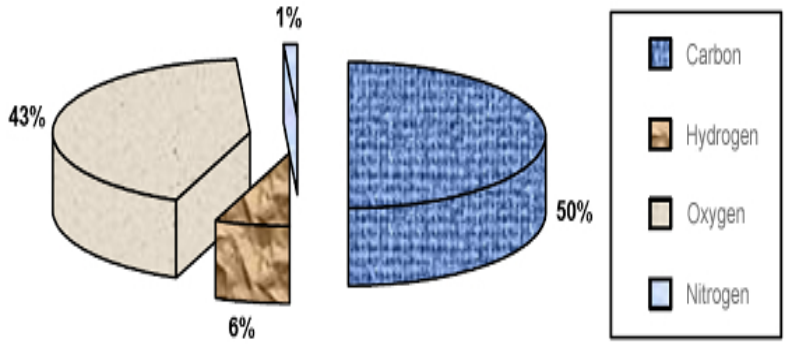

Fig. 2.The average composition of the wood fuel supply

Carbon dioxide is the atmosphere, but the trees absorb the same amount of carbon dioxide during growth. Therefore not increase the amount of pollutants discharged into the atmosphere.

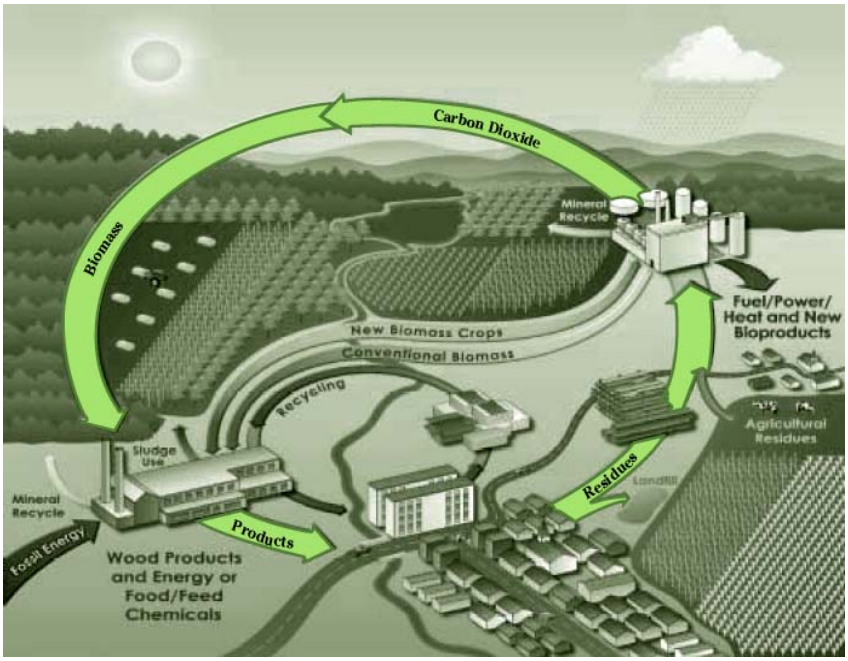

Fig.3. The carbon cycle in nature.

Another environmental benefit is that no new trees will be cut for commercial biomass briquettes, because these fuels are produced from wood residues and forest industry.

The ash is not harmful to the environment. Small quantity of briquettes like 100 kg produce 0.5 kg of ashes. Also, the resulting ash can used as fertilizer due to high potassium content, double the usefulness.

Another advantage over traditional fuel (wood) is to use portable manufacturing facilities that can be used to make wood pellets. Pellets are then easier to handle and transport than the original raw material. There is no risk of contamination during transport. Storage in a fair manner is not a risk to soil or water contamination.

CONCLUSIONS

It clearly requires more legislative and organizational measures to reduce pollution, emission of greenhouse gases and dependence on imported oil, more expensive and uncertain, oil is on its way to exhaustion. One solution is to use biomass resources to produce solid bio-fuels (firewood, pellets and chips).

Solution using pellets / briquettes for energy production has the great advantage that the raw material is renewable and not limited to current fuels. It also presents further advantages over fossil fuels: the resulting ash is small quantity, no odor, high calorie, long burning period, combustion without spark, fuel economy, gas burning without harmful in large quantities. Woody biomass is considered a relatively clean fuel and reducing CO2 emissions. It has low sulfur content and the amount of nitrogen and particulate emission, lower than fossil fuels. Solutions based on biomass energy production are better than those resulting from the exploitation of solar energy or aeolian and virtually no geographical limitations. Biomass energy potential exceeds eight times the overall needs of the planet.

Using biomass for energy purposes can bring significant social and economic benefits for rural and for urban areas. The pellets are used to produce heat and hot water in furnaces and power plants with between 7 and 500 kW. In recent years the transition to the use of pellets has risen steeply in recent years. Pellets/briquettes market has now a solution to be applied and promoted worldwide with efficiency and an unparalleled scope. Heating with pellets/briquettes is one of the most effective solutions for individual heating of renewable energy.

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