RESEARCH ARTICLE **(Open Access)**

Advanced technology of energy use of biomass. The study case: the burning of the distilled waste of sage in Albania.

ADI SHAMKU[1], ANDONAQ LONDO LAMANI[2],

[1]Agriculture University of Tirana; Tel: +355692096777;

[2]Polytechnic University of Tirana

Corresponding author e-mail: shamkua@yahoo.it

Abstract

Biomass waste management systems with low environmental impact, which are able to protect the health and safety of inhabitants, are now gaining global attention. There is currently an increasing interest in new renewable energy generation methods, where its production from biomass is constantly growing. Burning or incineration is a known method for disposal of biomass residues. One of the main objectives of the National Energy Strategy for 2018-2030 for Albania is to provide incentives for implementing the necessary climate change policies, such as achieving renewable energy (RES) and efficiency energy targets and reduce negative environmental impacts. According to a study by the Ministry of Agriculture in the field of renewable energies and specifically in assessing the potential of biomass in our country, the conclusion is reached that biomass represents a considerable source which has not yet been fully exploited.

In this paper, there is going to be presented the most advanced technology that is used in our days, to burn the waste after the distillation of sage. Like we know, the practice methods for the burning of biomass and waste that are used for electric uses, for example to produce heat and electricity, they are

- Burning in grilling boilers
- Burning in boilers with food from below
- Fluidized base technology

This article treats arguments that technology with dusty base the most appropriate and is one efficient technology for the cremation of biomass, secondary fuels and coal, as well as for combustion of other combustible waste.

There are two essential factors that give impetus to the application of this technology in the energy industry:

First, the use of this technology is possible to burn with efficient fuel efficiency with low calorific power such as household waste or other combustible waste.

Second, an avand of this is that it gives the possibilty of a low chance of pollution from the cermation, without the need of the expensive machines of cleaning of the gaseous current.

Keywords: Biomass, electrical energy, renewable energy source.

1. Introduction

Problem Spreading

The Energetic Situation in Albania

In 2014, 2015, 2016 total primary energy production in Albania was respectively 2.014 ktoe, 2117 ktoe, 2013 ktoe. The domestic consumption of RES in 2014, 2015, 2016 was respectively 2,342 ktoe, 2219 ktoe, 2309 ktoe, while net imports were 1888 ktoe. The primary energy supply in Albania is dominated by oil, hydro power plants and imported electricity. Figure 1 shows which imports of petroleum products, electricity and a small amount of coal account for over 56% of all primary energy consumption. Figure 2 shows that the transport sector consumes the largest amount of energy, followed by the residential sector and the industry sector, and the three most important fuels are petroleum products, electricity and firewood.

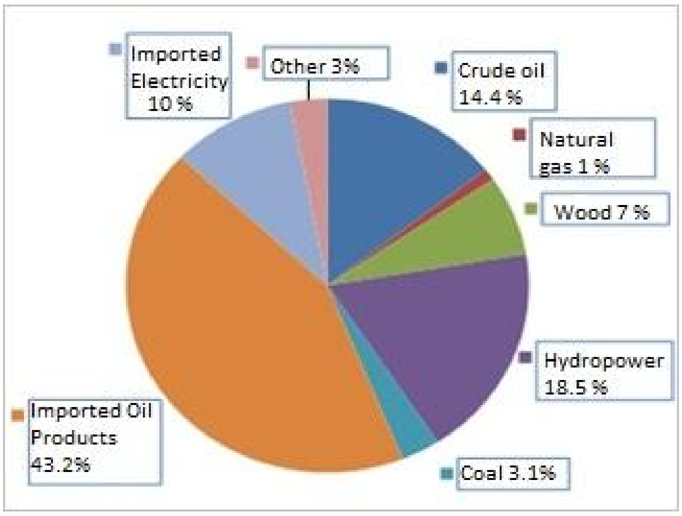

Figure 1: Type of energy used

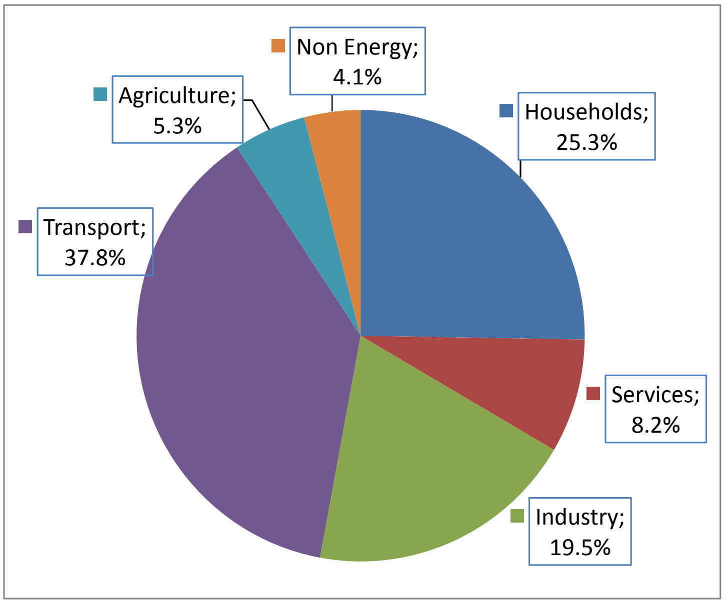

Figure 2: Energy consumers

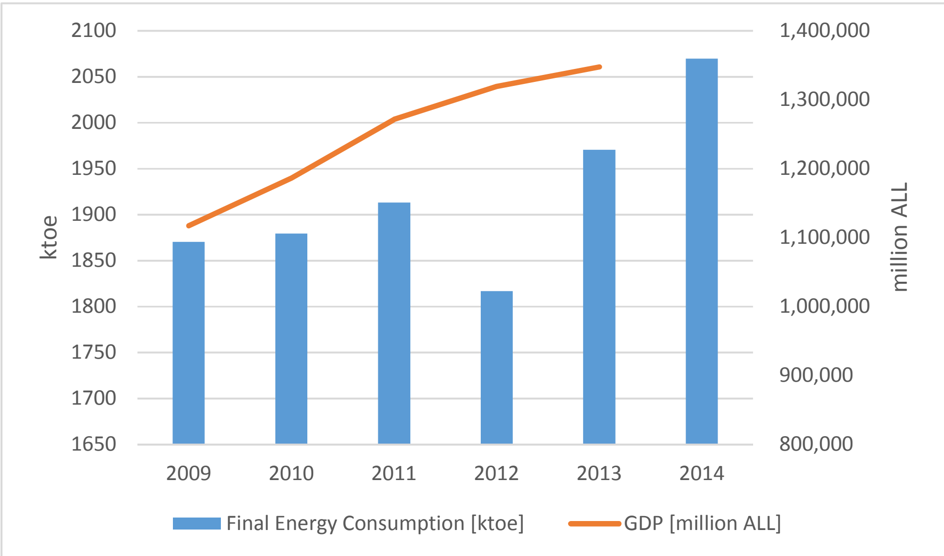

Figure 3: Final energy consumption data (Source: Albanian Energy Balance Sheet 2009-2014, AKBN; INSTAT)

From 2009-2016, final energy consumption in Albania increased from 1871 ktoe to 2060 ktoe, an increase of around 10,13%, but growth was not stable over the years. As shown in Figure 3, the final energy consumption in Albania grew gradually between 2009 and 2011, before falling in 2012, coinciding with a slowdown in the Albanian economy. This was mainly due to rising demand for housing. Power consumption rose sharply in 2014, driven mainly by the iron and steel industry sectors

2. Materials and Methods

2.1 Basic concepts in the field of renewable energy.

Renewable energies are energies that are derived from resources that do not have the basis of burning fossilized processed matter. This kind of energy aims to be as clean and less harmful to the environment as a whole. Alternative sources from which this type of energy can be generated are wind, solar radiation, water, etc.

In the technical context of the range of renewable energies are classified:

- Hydropower
- The Aeolian Parks
- Photovoltaic Parks
- Geothermal Resources
- Biomass

2.2 Challenges of the energy sector in Albania

Fulfilment of economic developments in different sectors and the increasing level of energy consumption per capita;

Improving the energy intensity trend;

Increasing the security of energy supply by improving energy efficiency, increasing the share of renewable energy sources and other conventional energy sources, and enhancing regional cooperation and integration.

In addition to the above challenges, three future challenges for the Albanian energy system are the achievement of the RES objective in 2020 and beyond, the EE target for reducing the final energy use and the target for reducing GHG emissions.

2.3 Energy Policy Scenarios related to the use of renewable energies

Renewable Energy Resources (RES): This scenario guarantees that Albania fulfils the commitments of the Energy Community Treaty by reaching the target of 45.03% of the renewable energy contribution versus the total in 2020 by implementing the National Renewable Energy Action Plan.

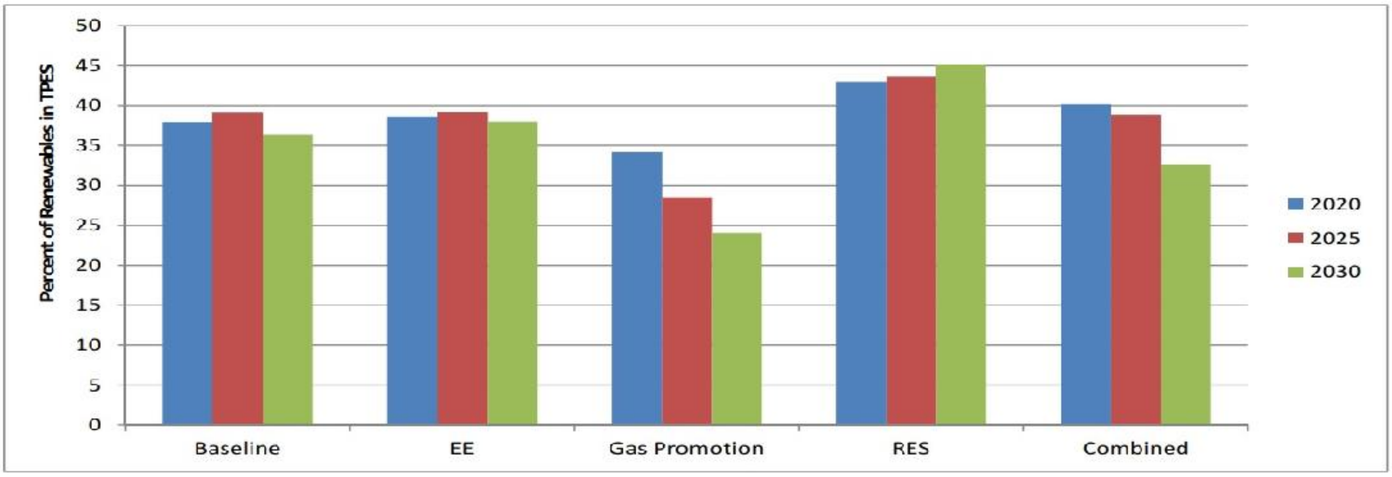

Figure 4: The volume of RES that is going to have until year 2030

Table 1:. The share of renewable energy sources in primary energy supply. (Source: National Energy Strategy 2017-2030)

Year/% Scenarios	Percentage		
	2020	2025	2030
Base	37.98	39.09	36.33
EE	38.65	39.16	38.00
Gas Promotion	34.20	28.54	24.04
RES	42.95	43.64	45.03
Combined	26.35	28.97	26.87

2.4 Renewable energy

Table 2: The energy provided by renewable energy sources that cover the thermal energy demand (ktoe)

Viti/kToe	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Fire wood	195	217	233	249	265	280	296	295	295	294	295	295	295	298	300	303	306
Solar Energy	12	17	20	24	28	33	38	40	43	46	49	53	56	60	64	69	74
Biodiesel	29	66	75	83	92	100	108	117	125	133	142	150	159	167	175	184	192
Biomass / pellet	-	2	5	8	11	15	19	22	26	30	34	38	42	46	50	54	59
Residues of agricultural crops	-	3	6	9	12	15	17	20	22	23	25	26	27	28	28	29	29

2.5 Biomass sources that can be used for energy purposes

Table 3: Biomass sources (Source: International Renewable Energy Agency 2017)

Rural Resources	Urban Resources
Forest waste, wood	Urban wastes, wood packaging etc.
Agricultural residues from corn crops, grain harvest residues	Solid waste from sewage purification
Barriers and trees	Gas landfill
Biogas from animal extracts	Solid urban waste

2.6 Some data related to the cost of biomass use plants for energy purposes

The total cost of biomass-generating energy technologies depends on the type of technology used and is different from one country to another.

- The total cost of boiler installations is between 1880 USD/kW ÷ 4260 USD/kW
- With fluidized base is 2170 USD/kW and 4500 USD/kW.

- The anaerobic cost systems are in the amounts of 2570 USD/kW and 6100 USD/kW.
- Gasification technologies, such as fixed and fluidized base rockers, cost 2140 USD/kW ÷ 5700 USD/kW.
- Gas production from the landfill cost 1920 USD/kW - 2440 USD/kW.
- The cost of CHP plants is much higher than that of plants built only for electricity.

(Source : International Renewable Energy Agency 2017)

3. Results and Discussion

3.1 The processes of transformation of the sage biomass

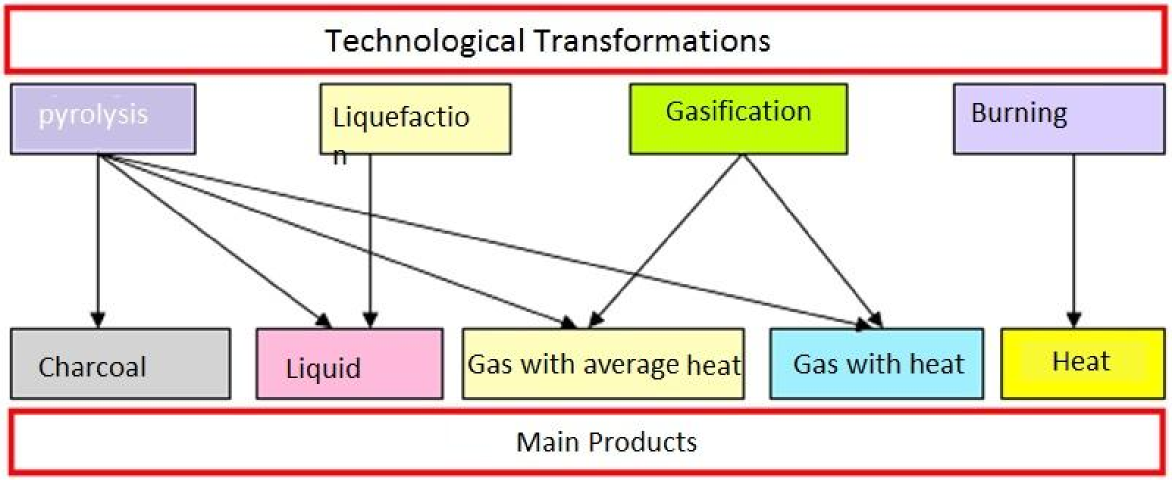

Figure 5: Thermochemical transformation processes and main products. (Bridgwater, 1993)

3.2 Advanced biomass energy utilization technologies

Direct biomass burning for energy production is a mature and available technology in the market and can be applied in a wide range of several MW to 100 MW or more and is the most common form of biomass energy production.

There are two main ways of using biomass for energy purposes: 1) Biomass burning to produce technological steam; and 2) Use of steam on a steam turbine, which is then used for generating electricity.

The two most common forms of boilers are 1) skis that can be fixed or movable and 2) with fluidized base. The fuel can be completely biomass or combine biomass with coal or other solid fuels (EPA, 2008).

3.3 Boilers with fixed conveyors

Fixed scales can be used in boliers with manual operation. They are suitable for small combustion systems (<1.0 MWh). Between staircases, flat planks are most usable. Plane planks, have larger surface area and air distribution more uniformly.

These types of boilers are suitable for combustion of high volatility fuels. The maximum temperature of the area is very close to the grid surface. Air combustion is partly utilized inside the base and partly in the combustion chamber to burn volatile matter. Burning in a griddle can lead to different dispersions of flying ash from fuel. (Nussbaumer, 1998).

3.4 Mobile Grill Boliers

Mobile grills, such as fixed grids, are suitable for high humidity biomass, ranging in size and high ash content. Wood mixtures can be used, while mixing of wood with straw, cereals and herbs can not be due to various behaviors during combustion, low humidity and low melting point. (Obernberger, 1998)

Transport of the object on the grill should be as homogeneous and light as possible in order to keep the coat of grass as smooth and homogeneous as possible to avoid the formation of "cavities", the formation of unburned particles.

Table 4: Biochemical and thermochemical process of biomass

Thermo chemical processes	
Burning	Burning is the complete oxidation of CO2 and H2O fuels.
Gasification	The gasification process can be defined as the thermal decomposition of the biomass substance (partial combustion in an environment with low oxygen content).
Pyrolysis	Pyrolysis is the thermal degradation of carbonate materials in the absence of an external oxidizing agent and occurs at temperatures of 400-800 ° C. Pyrolysis products include gases, juices and solid charcoal
Bio Chemical Processes	
Anaerobic process	It is a process of decomposition of biological materials and favored by the conditions of relatively high temperatures, moisture and lack of air. Products are mainly methane gas and carbon dioxide

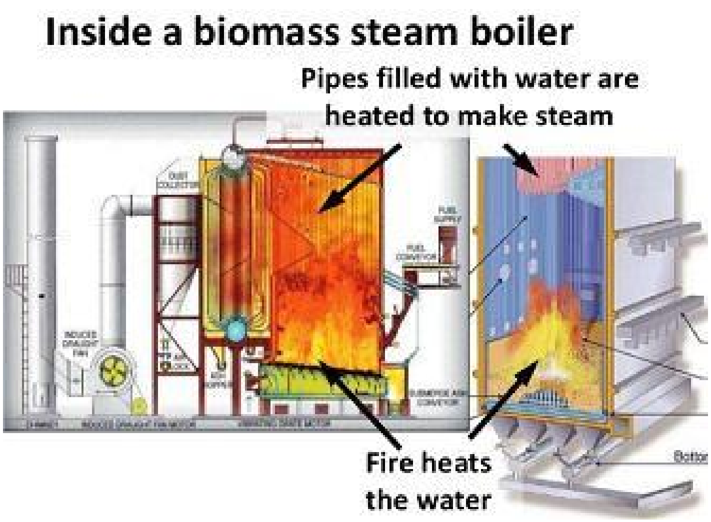

Figure 6: Boilers with fixed conveyors (Source: Holtham, 2013)

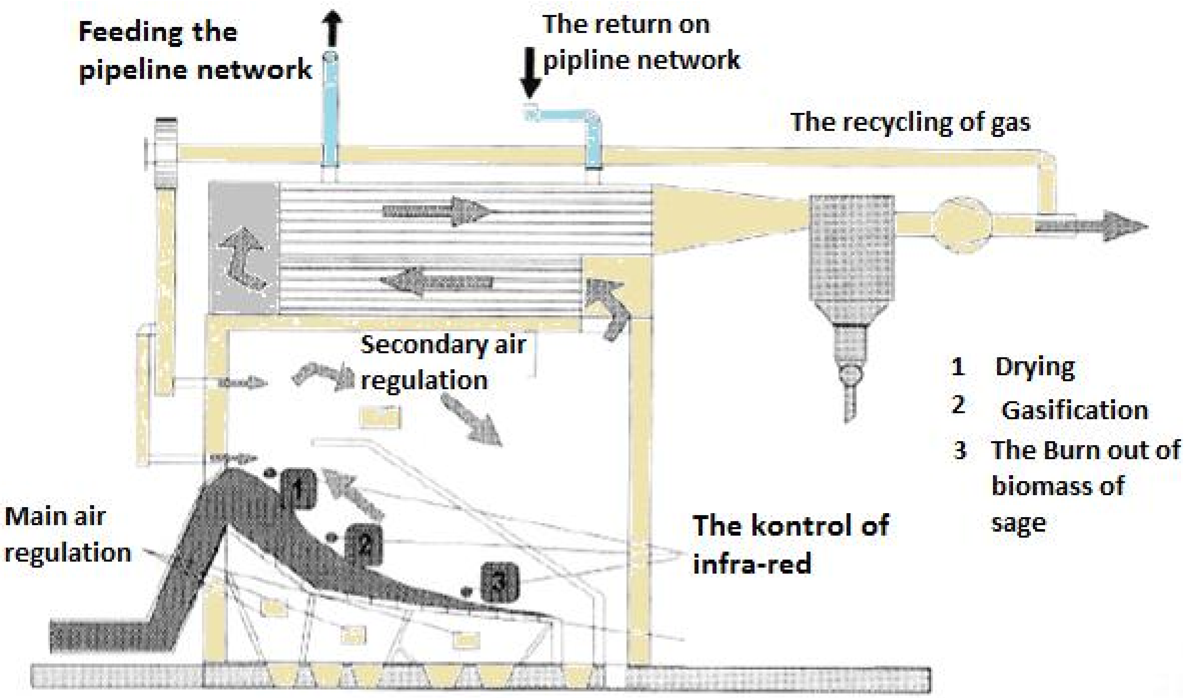

Figure 7: The schematic presentation of the mobile grill with moving forward. (Obernberger, 1998)

3.5 Boliers with food from below

This type of bolier has the combustion zone in the upper part of the base and the first material, such as biomass, is supplied below:

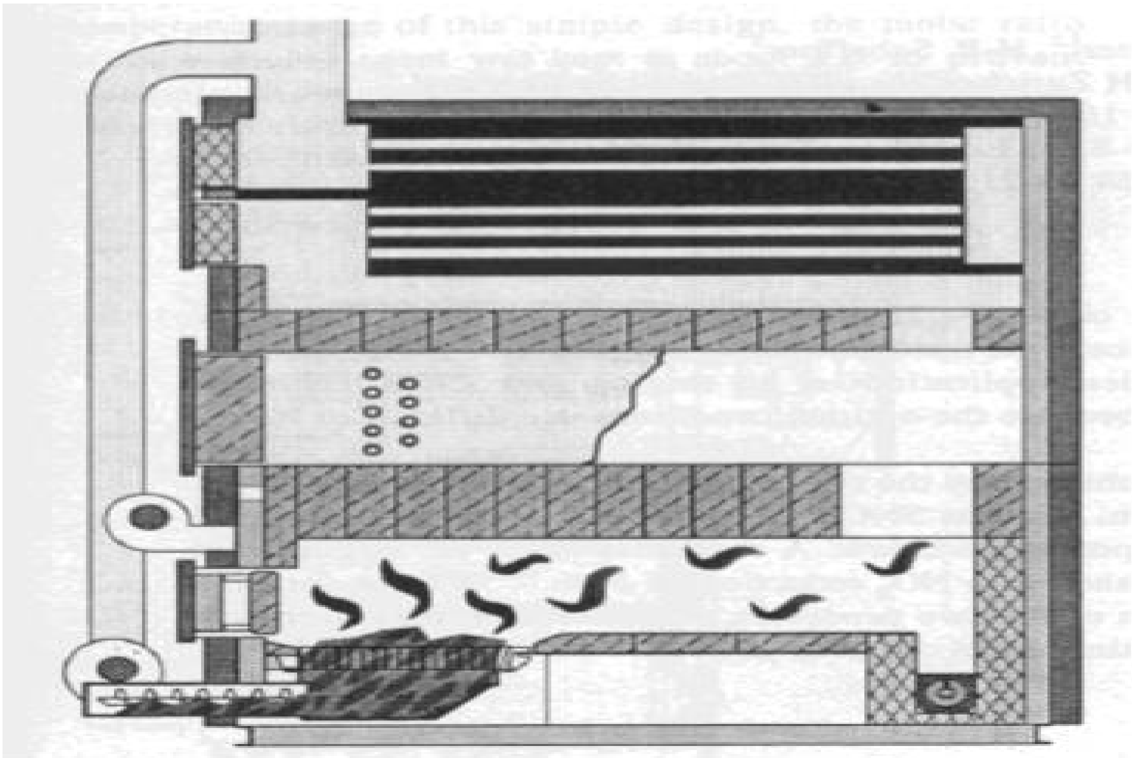

Figure 8: Schematic representation of a new boiler with food from below. (Obernberger, 1997)

These bolier are suitable only for small systems (over a nominal capacity of 6 MWh) and for low-ash biomass fuels. High percentage of grain biomass requires efficient ash removal systems. *(Obernberger,1997)*

3.6 Fluidized base technology

Depending on the velocity of the air flow through the fluid base, this technology can be divided into the following two categories:

1. With fluctuating fluid slow.
2. With circulating fluidic.

- Fluctuating fluid slow

The air velocity in the dusty base is lower, since the bolier size is in inverse ratio with the air velocity passing through the base, the grille surface and a high power bolier will be high.

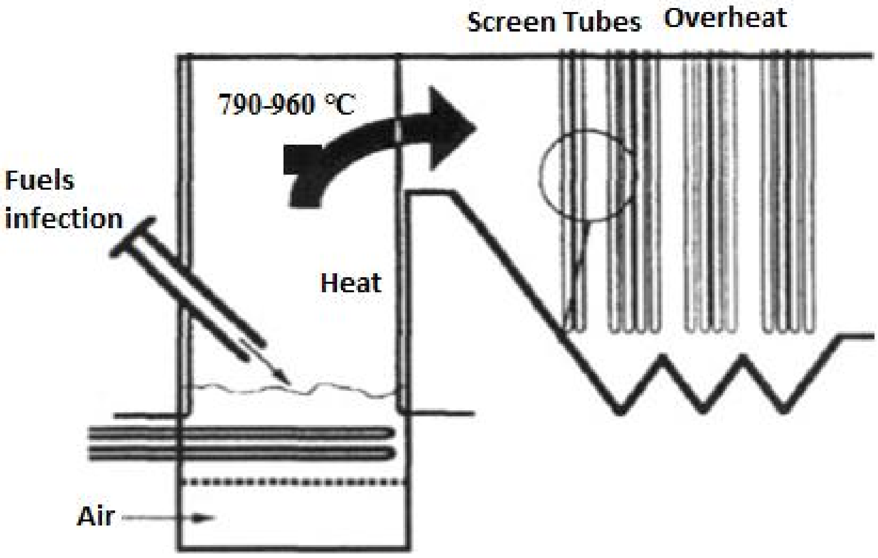

Figure 9: Schematic representation of fluid based boiler. (Obernberger, 1997)

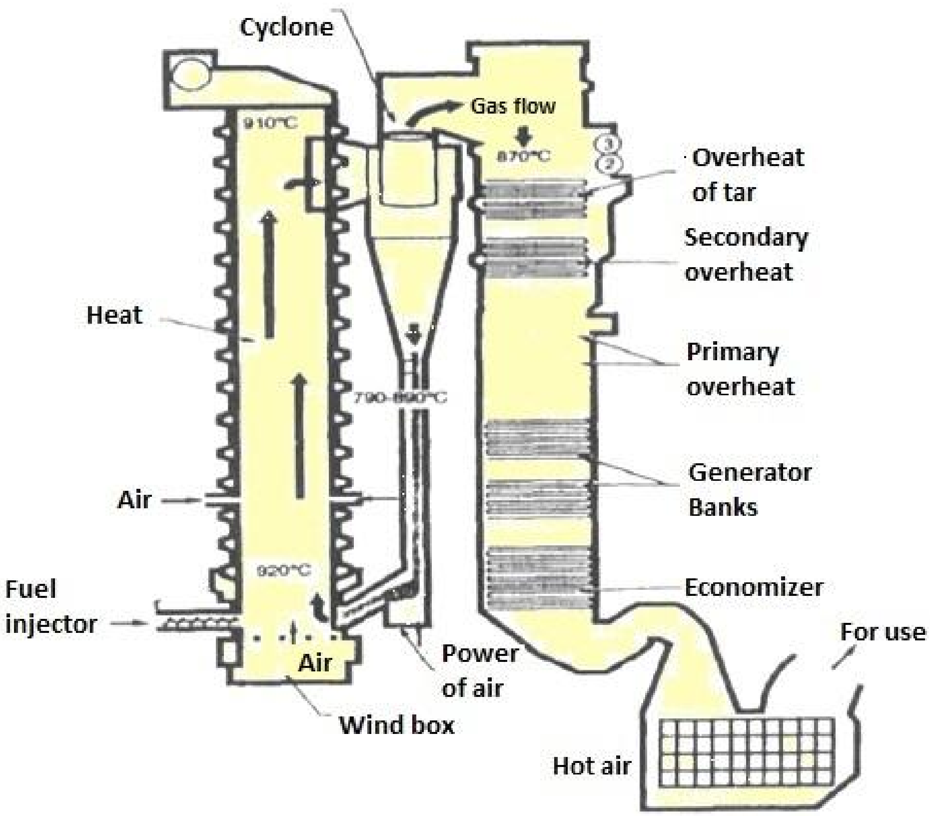

Figure 10: Schematic representation of circulating fluidic Source: (Basu,1991)

This technology is used for plants with a nominal capacity greater than 10 MW. The mainly sandy base is located in the final part of the bolier. The sand is about 1.0 mm in diameter, the air velocity fluctuates between 1.0 m/s and 2.5 m/s. Secondary air is inserted between holes in the shape of horizontal sprays constructed in such a way as to ensure a high efficiency of combustion of combustion during the combustion process.

In this technology, some combustible particles are burned at the reactor base while the rest is burned in the fluid base to keep the temperature at the desired limits of 800°C to 900°C. In most cases it is necessary to place the heat transfer surface on the reactor base.

One of the advantages of this technology is that the amount of ash removed directly from the boiler is bigger than the circulating base boiler. Another advantage of this furnace is their flexibility in terms of particle size and humidity content in biomass. (Obernberger, 1997).

- Circulating fluidic

This combustion technology is widely accepted as an advanced technology for the combustion of various biomass substances in an environmentally acceptable way. (Basu, 1991)

Powder speed 5 m/s - 10 m/s.

Particle size 0.2 mm - 0.4 mm.

The base temperature is around 800-900°C and is controlled by an external heat exchanger by cooling the recycled sand or from the water-cooled walls.

High turbulence of the system leads to transmission

better heat which is the advantage

with regard to the stable conditions of the combustion process

4. Conclusions

Technologies that are used to produce energy from sage biomass are of great interest. Biomass has a number of environmental benefits compared to fossil fuels.

Reducing the temperature in the combustion chamber is necessary to ensure continuous combustion.3. Both of these impacts reduce the temperature in the combustion chamber under the permissible limit, which is necessary to ensure a continuing combustion.

The liquefied base technology is the most appropriate technology in the case of sage biomass.

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