Biomass energy usage in the world, Europe and in the Czech Republic

Ščerba Eduard

Faculty of electrical engineering, Department of electrical power engineering and ecology, University of west Bohemia Pilsen, Czech Republic

Author of the paper focuses his works on education and applied research in area of renewable resources and biomass energy usage

ABSTRACT

Introduction

This paper concerns the present state, efficiency and perspectives of biomass usage**.**

Importance of the biomass usage in energetics

Biomass it the oldest used fuel of the mankind (approximately 40 000 years) and still today it is important worldwide source of the energy. Its proportion on the world energetic balance according to up to date source is around 16 %.

The highest proportion of the biomass usage shows for example: Africa 50 %, Indonesia 40%, Asia 33%, South America 28% and China 21%.

Sources of the biomass

Biomass is any organic material which has stored sunlight in the form of chemical energy.

As a fuel it may include wood, wood waste, straw, manure, sugar cane, and many other by-products from a variety of agricultural processes.

Biomass is material derived from recently living organisms, which includes plants, animals and their by-products. Manure, garden waste and crop residues are all sources of biomass.

It is a renewable energy source based on the carbon cycle, unlike other natural resources such as petroleum, coal, and nuclear fuels.

There is a slight tendency for the word bio energy to be favoured in Europe compared with bio fuel in North America.

Animal waste is a persistent and unavoidable pollutant produced primarily by the animals housed in industrial - sized farms. There are also agricultural products being grown for bio fuel production. These include corn, switch grass, and soybeans, primarily in the United States; rapeseed, wheat and sugar beet primarily in Europe; sugar cane in Brazil; palm oil and miscanthus in Southeast Asia; sorghum and cassava in China; and jatropha in India. Hemp has also been proven to work as a bio fuel.

Biodegradable outputs from industry, agriculture, forestry and households can be used for bio fuel production, using e.g. anaerobic digestion to produce biogas, gasification to produce syngas or by direct combustion. Examples of biodegradable wastes include straw, timber, manure, rice husks, sewage, and food waste. The use of biomass fuels can therefore contribute to waste management as well as fuel security and help to prevent or slow down climate change, although alone they are not a comprehensive solution to these problems.

Energy from the biomass as a renewable resource of the energy

Bio energy is renewable energy made available from materials derived from biological sources. In its most narrow sense it is a synonym to bio fuel, which is fuel derived from biological sources. In its broader sense it includes biomass, the biological material used as a bio fuel, as well as the social, economic, scientific and technical fields associated with using biological sources for energy. This is a common misconception, as bio energy is the energy extracted from the biomass, as the biomass is the fuel and the bio energy is the energy contained in the fuel.

Renewable resources and biomass especially are basis of energetic sources for the future. Except of energetic contribution the biomass significantly contributes to the stabilization and gradual decrease of the changes on the climate by the human activity.

Biomass in European Union (EU)

Biomass represents approximately 2/3 of the all renewable resources in the whole Europe and is the fastest growing branch of “ renewable energetic”. Gross usage of the renewable resources reached 109,5 million tons of oil equivalent (Mtoe) in the year 2004. 66% of it (72,4 Mtoe) comes from biomass. From the point of view of total energy usage in year 2004 (1 747,2 Mtoe) biomass forms 4,13 %. These numbers underline important role of biomass in the sector of renewable resources.

Purpose of biomass usage

From the total amount of the biomass energy 72,4 Mtoe was used: 66,8 % for the production of the heating, 30,5 % for the production of the electricity, 2,7 % for the production of bio fuels in the transport. The same way we can distinguish different sources of biomass: 61,5 Mtoe from forestry, 3,5 Mtoe from agriculture and 7,3 Mtoe from waste biomass.

Action plan for biomass in EU

Europe action plan for biomass from 2005 made definition for the aim of 2010 year - 75 Mtoe heating from biomass, 55 Mtoe electricity from biomass and 19 Mtoe liquid bio fuels in transport. Totally there should be produced in 2010 from biomass 149 Mtoe. This requires 1,5 times higher grows of total usage of biomass, doubled production of electric energy and nine times higher usage of biomass in the transport. Production of bio fuels for transport nearly tripled in last two years, still the aim is still in high distance.

Biomass usage potential

Usage of biomass is limited most of all by the availability of the ground. For keeping the food needs is required 0,16ha per one person in EU. Whole area of arable land in Europe is 108,75 mil. ha, which can give enough food for 489,4 mil inhabitants. It means that there are 30 mil. ha left for possible usage for growing energetic plants. According to the study of Europe agency of environment the potential of the biomass will be in 2020 in EU 236 Mtoe.

Biomass in Czech Republic

The Czech Republic is located in the heart of Europe, close to most major Western European economic centres, and shares borders with Austria, Germany, Poland and Slovakia. The Republic consists of three distinct regions: Bohemia in the west, Moravia and part of Silesia in the east. Its area is 78,866 km2 and 10.3 million inhabitants, three quarters of which live in urban areas.

In 2004 Czech Republic became a member state of European Union. The agricultural area of the Czech Republic (54.2 % of total area) is 4.3 million hectares in total, of which 3.1 million hectares are arable land. About one half of the total agricultural area is located on less favourable land, and about one eighth is located in conservation areas (protecting water resources, landscapes and nature).
The forest areas (38.5 % of total area) cover an area of almost 2.7 million hectares where 52% of the total area belongs to the state, 5% are forests owned by the military, another 5% are divided between 4 national parks and the rest is privately owned. Large area of country has specific restriction due to the environmental protection (8.4 % agricultural land and 16,0 % of total area of Czech Republic).
State energetic policy of the Czech Republic regards biomass as an important source of energy and it assumes that it will participate on the total balance of usage of renewable resources by 80% in 2020 and by 85% in 2030.

Result

Perspective ways of biomass usage

Usage of the biomass energy is very variable. In the future biomass should be however used by the most efficient ways. The highest efficiency is reached within the production of the heat – more then 90%. Combined production of the electricity and heat has got the efficiency from 50% to 90% depending on used technologies. These technologies are high quality and evolving rapidly. The production of the liquid bio fuels of the first generation (most of all bio ethanol and methyl ester of vegetable oils) has got the efficiency from 55 to 60% (when the optimal conditions are kept). It is to a great extent influenced by yields per acre of the crop and by the way of growing.

Author address:

Mgr. Eduard Ščerba, Ph.D.
Faculty of electrical engineering, Department of electrical power engineering and ecology, University of west Bohemia Pilsen, Czech Republic
Establishment: Univerzitní 8, 306 14 Plzeň, Czech Republic
Tel:+42037763311
E-mail: scerba@kee.zcu.cz