

EFFECTIVE UTILIZATION OF WASTES OF WOOD

Basic directions of decision of important ecological problem of utilization of wastes of wood of enterprises of forestry, woodworking industry and agroindustrial complex are in-process considered. Possibilities of utilization of wastes of wood are analysed, as a perspective renewable energy source. In opinion of author the most effective method of utilization of arboreal wastes is making from them of fuel preforms. The analysed properties and application of fuel preforms domain are from wood. Comparative description of different types of fuel is resulted. It is set that the production of fuel preforms allows to decide the important ecological problem of utilization of wastes of wood of enterprises of forestry, woodworking industry and agroindustrial complex, and simultaneously to get additional environmentally clean and relatively cheap energoresursi.

One to a permanent price increase of resource- and the energy carriers of energy-savings are determined to be one of priori directions of public policy of Ukraine and must be realized as long-term and the clear planned program of actions [1]. Complex decision of problem of energy-saving – one of the most reliable for Ukraine ways of the successful overcoming of economic and power crises and entrance into the family of highly developed countries of the world. The decision of this problem will allow our state to decrease sharply the dependence of its economy on the import of energoresources, to show the row of generating powers out of exploitation, to conduct the technological rearmament of energy industries structural re-erecting of economic complexes, to form optimum even energyprovision of regions and industries, create domestic industry from an issue and to introduction of competitive energykeeping equipment, substantially to limit influence of technogenic factors on an environment and provide the socially-domestic necessities of on individual.

Re-erecting of the state system of Ukraine, its entrance, into a world concord the decisions of problem of organization of permanent and reliable ways of providing, diminishing of dependence, fuel and energy resources require a full-fledged member foremost from the import of energoresources and the effective use of them [4-13]. Development and optimum functioning of fuel and energy complex (FEC) of our country is one of basic factors of providing of viability of economy and satisfaction of social necessities of on individual. Decisions of tasks, which stand before FEC, can be executed after such directions: development of traditional energy, diversification of sources of import of energy carriers, introduction of energykeepings measures, the increases of power efficiency and search of perspective new energy sources (above all things renewable). Among the different types of renewable energy sources the special place is occupied by wood. In Ukraine the receipt of heat from wood did not get the proper development, so as even on woodworking enterprises the basic source of heat is natural gas. At the same time as in the European countries the amount of energy which turns out from wood arrives at 5 %, and in some countries: Finland, Sweden, Portugal, this index is 16 %, while in the republics of the former USSR arrives at only 0.8 % [2]. As long as the treatment of wood exists, so long exist the wastes of wood as a bark, sawdusts, shaving, lump wastes which must be utilized. For example [3], at sawing of logs appears 35 % walking away from the volume of processing of wood, at the production of door and window blocks – 31 %, to the parquet – 30 %, and at the production of furnitures – 54 %. Parallell with swift growth volume of woodworking steadily grow requirement to the cleanness of treatment of details and wares, that resulted in the increase of wastes, utilization of which became a problem not only ecological but also economic.

According to statistical information, only on the woodworking enterprises of Ukraine annually appears not less 5 million m³ sawdusts and bark. In relation to an ecological aspect, concentration of harmful matters in gases, which are thrown out in air at incineration of wastes of wood, considerably below than at incineration of other types of fuel, and a cost warm is

considerably cheaper. If to take into account that prices are on traditional power mediums, for example electric power, fuel oil, diesel fuel and gas, grow constantly, becomes clear, as unsimply enterprises to survive, especially to the subjects small and middle business which in these difficult terms it is needed to remain competitive. All of it is foundation for the study of possibility of the use of wood and its wastes as ecologically clean and energycapacious fuel for the energy-savings of country. There are a few directions of effective utilization of wastes of wood. One of them is utilization of wastes from wood for the receipt of heat which considerably cuts down expenses on the purchase of power mediums. Utilization of wastes of wood on woodworking and furniture productions will be realized successfully by application of the systems of automatic incineration (SAI) and aquatic or steam caldron. Wastes of wood do not have connections of sulphur and chlorine in the composition, and content of connections of nitrogen in them in 100 – 150 times below, than in natural minerals. Therefore the concentration of harmful matters considerably below, than at incineration of other types of fuel in extrass. Thus, ecological problems are settled. At the same time with incineration of shaving and sawdusts by SAI it is possible to burn lump wastes of wood long a to 0.5-0.6 mcode directly in heating of caldron. In this case warmly from incineration used as base, that is why diminishing or stopping of serve of shaving takes place automatically, supporting the set temperature of heat medium. Incineration of lump wastes of wood in heating of caldron is recommended for maintenance of temperature at temporal absence of electric power or shaving. The use of SAI on woodworking enterprises substantially saves power mediums (gas, electric power and others like that). Alongside with utilizatorami of wastes of wood began to use pyrolysis caldrons [14]. In particular, inventor from town. Oleksandrija (Kirovohrad region.) of A.O. Loschenko, probing decomposition of biomass and molecular level, with the purpose of the completest receipt of energy from a matter, set that from 1 kg of arboreal and other wastes (biomass, garbage) it is possible to get minimum 25 kW thermal power. Effective direction of utilization of wastes of wood is producing from them the fuel preforms. Arboreal fuel preforms – it ecologically a net product, which is made from natural, untitled chemical preparations of arboreal wastes of coniferous and sheet breeds [15]. Also can be made from the husk of sunflower, rice, buckwheat, flax, wastes grain-growing, et al. In basis of process of making of fuel preforms there is a process of pressing of finely ground up biomass under high pressure and heating. A relating matter is lignin, which is contained in the cages of plants. A temperature which arises up during pressing is instrumental in the compression of surface of preforms, as a result it becomes waterproof.

The positive moment of the use of fuel preforms as a fuel is them minimum influence on an environment. At combustion of preforms appears to 1 % zoli, that in 20 times less than, than from black coal and in 40 times – from brown. In addition, an ash can be used as a fertilizer. During burning of fuel preforms (table. 1) of carbon dioxide appears in 15 times less than, than from natural gas and in 50 times less than, than from coal, and sulphurs selected less than 0.08 %. It prevents formation of dioksidu sulphur, which in an atmosphere reacts with an aquatic pair, sulphuric acid appears as a result [16]. Preforms have a closeness in 2 times more than firewoods, and consequently occupy a less place. Marked quantitative descriptions testify that it is a comfortable, net product for warehousing and transporting and in the process of incineration does not have a negative influence on an environment.

Arboreal preforms have a row of substantial advantages in comparison with such types of fuel as coal, gas, namely:

- safest, environmentally clean and modern method of receipt of heat and creation for the dwelling a of warm, comfort able atmosphere; a large heating value is in comparing to the firewoods; ecological cleanness (content of ash not more than 1 %);
- an environment is not polluted with the extrass of carbon dioxide, as in an atmosphere thrown out so much CO₂, how many a tree took in during the growth which does not give the contribution to

the hotbed effect; high energyconcentration; unpropensity is to spontaneous combustion; possibility of complete automation of serve of fuel is in the area of burning;

- a comfort is at transporting and storage; simplicity of cleaning of gas-rings, technical maintenance of caldrons and fire-places; wide application domain.

Table 1. Comparative description of different types of fuel

Type of fuel	Warmth of combustion, MDzh/kg	Sulphur, %	Ash, %	Carbon dioxide, kg/GDzh
Natural gas	35 – 38 MDzh/m ³	0	0	57
Anthracite coal	15 – 25	1 – 3	10 – 35	60
Dizeel oil	42.5	0.2	1	78
Fuel-oil	42	1.2	1.5	78
Sawdusts	10	0	2	0
Arboreal preforms	17.5	0.1	3.5	0
Peat preforms	10	0	20	70

An application of fuel preforms domain is: all types of the heated equipment are on a hard fuel (caldrons, stoves, fire-places et al) with possibility of complete automation of process of load; preforms are an ideal fuel for bath-houses and saunas; fuel preforms are a fuel which can be used around, where a high temperature is needed, proof smokeless flame and such, that after combustion does not abandon the low amount of wastes. Popularity of preforms as a «home» fuel is predefined and that warmly from wood perceived far more pleasant than warmly, got from fuel oil or natural gas. Fuel preforms are the best fuel for fire-places, bath-houses and saunas, at preparation of shashlick and barbekyu due to an ecological cleanness, long duration of burning (to 1 hour) and zharoproduktivnosti (to 1 hour), and also small area of warehousing (on the area of one evropiddona (1200 × 800 mm) four takes place tones of preforms). It is also necessary to mark that the use of preforms as gives fuel possibility do not to depend on the companies of monopolists (gas, electric power) and external terms (damage of lines of electricity transmissions, pipelines, and others like that). The use of fuel preforms as an alternative, environmentally clean and effective type of fuel is very perspective. Analysts consider that the consumption of biopropellant for the receipt of energy in Europe will grow in 2010 year from 3 to 12 mln.t, and in 2020 will attain 21 mln.t. [6]. By most countries producers and users of arboreal preforms (there is thousand of t/ies) is: The USA – 2000, Sweden – 650, Russia – 600, Denmark – 500, Austria and Canada – for 110, Germany and Finland – for 100, England – 10, Japan – 3.

In Ukraine the market of fuel preforms is very young yet. An annual production is made by 200 thousands of tons, from them 95 – 97 % exported to Europe. It is consequently possible to draw conclusion, that the production of fuel preforms allows to decide the important ecological problem of utilization of wastes of wood of enterprises of forestry, woodworking industry and agroindustrial complex, by their processing and simultaneously to get additional environmentally clean and relatively cheap energoresources. For today it is ecologically the economically justified way of resource- and energy-savings.

References

1. **Енергетична стратегія України на період до 2030 року** / Розпорядження Кабінету Міністрів України №145 (15.03.2006 р.).
2. **Дзюпин О.В.** Утилізація відходів деревини з отриманням тепла. Львів: Будмайстер. – 2000. – № 8. – С. 8-11.
3. **Головков С.И., Коперин И.Ф., Найденов В.И.** Энергетическое использование древесных отходов. – М.: Лесн. пром-сть, – 1987. – 224 с.
4. **Гайда С.В., Кшивецький Б.Я., Войтович І.Г. Прокопович Б.В.** Тлумачний словник з деревооброблення. – Львів: НЛТУ України. – 2002. – 280 р.

5. **Gayda S.V.** (2000): Матеріали для виготовлення виробів з деревини / Materials for the Production of wood Products. Lviv: BMC. – 160 p. (in Ukr.).
6. **Gayda S.V.** (2001): Раціональне конструювання виробів з деревини / Rational constructing of wood Products. Lviv: BMC. – 93 p. (in Ukr.).
7. **Gayda S.V., Kshyvetskyi B.Ya.** (1999). Техніко-економічні характеристики деревообробної фабрики майбутнього [Technical and economic characteristics of the woodworking factory of the future]. Scientific Bulletin of UNFU 9.3:83-85. (in Ukrainian).
8. **Gayda S.V., Nikityuk L.O.** (1998). До питання застосування екстрагованої деревини для плитного виробництва [On the issue of using extracted wood for slab production]. Scientific Bulletin of UNFU 8:75-77. (in Ukrainian).
9. **Gayda S.V.** The effective use of post-consumer wood is basis for diminishing of CO₂-emission // Scientific Herald. Collection of scientific and technical works. – Lviv: NUFWT of Ukraine. – 2009, pub. 19.14. – P. 72-89. (in Ukr.).
10. **Gayda S.V.** A problem of arboreal raw material is in Europe and Ukraine // Forestry, Forest, Paper and Woodworking Industry. Collection of scientific and technical works. – Lviv: NUFWT of Ukraine. – 2007, pub. 33. – P. 55-63. (in Ukr.).
11. **Gayda S.V.** Chemical compound and degree of its contamination as the basis to systematization of post-consumer wood // Forestry, Forest, Paper and Woodworking Industry. Collection of scientific and technical works. – Lviv: NUFWT of Ukraine. – 2008, pub. 34. – P. 68-80. (in Ukr.).
12. **Gayda S.V., Maksymiv V.M., Tunytsya T.YU.** Elaboration of post-consumer wood classifier // Forestry, Forest, Paper and Woodworking Industry. Collection of scientific and technical works. – Lviv: NUFWT of Ukraine. – 2008, pub. 34. – P. 55-68. (in Ukr.).
13. **Gayda S.V., Maksymiv V.M.** Analysis, features, problems and experience of the use of additional resources of raw material – wastes and of used wood // Forestry, Forest, Paper and Woodworking Industry. Collection of scientific works. – Lviv: NUFWT of Ukraine. – 2007, pub. 33. – P. 63-73. (in Ukr.).
14. <http://msd.in.ua/economkotel>.
15. <http://www.evrobriket.ru>.
16. <http://www.bioresurs.com.ua>.

**Доц. Р.І. Розум, канд. техн. наук – Тернопільський національний
економічний університет**

Ефективне використання відходів деревини

Представлено основні напрямки вирішення проблеми утилізації відходів деревини підприємств лісового господарства, деревообробної промисловості та агропромислового комплексу, шляхом їх переробки на паливні брикети.

Встановлено, що виробництво паливних брикетів дозволяє вирішити важливу екологічну проблему – проблему утилізації відходів деревини підприємств лісового господарства, деревообробної промисловості та агропромислового комплексу, шляхом їх перероблення і одночасно отримати додаткові екологічно чисті та відносно дешеві енергоресурси.

Деревні брикети мають низку суттєвих переваг перед такими видами палива як вугілля, газ, а саме: найбільш безпечний, екологічно чистий і сучасний спосіб одержання тепла та створення для житла теплої, комфортної обстановки; велика теплотворна здатність у порівнянні з дровами; екологічна чистота (вміст золи не більше 1 %); довілля не забруднюється викидами вуглекислого газу, оскільки в атмосферу викидається стільки CO₂, скільки дерево поглинуло під час свого росту, що не дає свого вкладу в парниковий ефект; висока енергоконцентрація; неохильність до самозаймання; можливість повної автоматизації подачі палива в зону горіння; зручність при транспортуванні та зберіганні; простота очищення пальників, технічного обслуговування котлів і камінів. Областю застосування паливних брикетів є: всі види опалювального обладнання на твердому паливі з можливістю повної автоматизації процесу завантаження; брикети ідеальне паливо для бань і саун; паливні брикети – це паливо яке може використовуватись кругом, де потрібна висока температура, стійке бездимне полум'я і таке, що після згорання не залишає низьку кількість відходів.
