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Implementation of Standards for Solid Fuels

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Abstract
The method of calculating heat costs for heating private and domestic premises is substantiated; the volumes and qualitative composition of bio-raw materials suitable for processing into biofuels for farms of different regions of Ukraine are determined; a model for calculating the calorific value of fuel pellets is proposed; using the method of integrated assessment of approach to the target, the feasibility of creating a mobile line of granulation of biofuels for domestic and industrial premises is substantiated; the structure of the mobile line of granulation of biofuel is developed; a regression model of energy consumption of granules from the composition of components is proposed.

Keywords*: Renewable Energy, Solid Biofuel Supplies, the Potential of Bioenergy Raw Materials, The Mobile Unit, Fuel Granules.*

INTRODUCTION

The topic of fuel briquettes from biomass is extremely relevant for Ukraine. The country began a significant increase in natural gas prices for households, as a result of which the population began to actively switch to biomass. A large number of domestic solid fuel boilers were installed, in which mainly firewood is currently burned. A significant amount of firewood is harvested by the population independently (so-called "self-harvesting") from protective and other forest belts, which actually leads to their destruction. Such firewood has high humidity, low quality and not meet the passport requirements of energy equipment. The consequence of their use in domestic solid fuel boilers is the low efficiency of the equipment and the high level of emissions of harmful substances. The way out of this negative situation may be the transition from firewood to the use of biomass briquettes, mainly agro biomass (cereal and rapeseed straw, corn/sunflower stalks, etc.) given its great potential in Ukraine, available for energy use - about 8, 3 million tons AD/year. Briquettes are improved biofuels with predictable quality, so they are often called “Eurofirewood”.

LITERATURE REVIEW

The authors analyze the legislation, regulatory aspects, tax policy and provide recommendations on the necessary changes in current legislation to facilitate the implementation of projects for the production of thermal energy from biomass. Harmonization of Ukrainian regulations with European production standards and justification of the feasibility of the transition of boilers to solid biofuels is also considered in the works of Ukrainian authors: G.G. Geletuha, T.A. Jelezna, O.B. Triboy. In their works, analyzes the mechanisms of stimulating the cultivation of energy crops in the countries of the European Union, conducts an environmental analysis of bioenergy technologies. In the work of such authors as V.M. Кюрчев, B.A. Didur,

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L.I. Grachova studied the implementation of the Kyoto Protocol in Ukraine and the legal framework for limiting greenhouse gas emissions. Consideration of the regulatory framework, incentives and environmental logical safety of solid biofuel production carried out by such scientists as G.M. Kaletnik, V.M. Pryshlyak, I.P. Soloviy, S.V. Perebora, A.Yu. Yakimchuk, Abhishek Sharma & others, Ram Gopal & others etc.

RESEARCH METHODOLOGY

In Sweden, the use of the potential of fast-growing willow subspecies as was studied vegetative filters for partial utilization of wastewater. Studies have shown the high efficiency of such plantings, in particular for nitrogen utilization and phosphorus, which are the main biogenic pollutants in water bodies. The potential of willow plantings was analyzed in order to dispose of manure and mud precipitation from filtration fields, treatment plants and biological ponds. Possibility of growing willow on areas contaminated with heavy metals as well confirmed in the course of research.

In Canada and the United States, experiments were conducted using willow plantations for the rehabilitation of peatlands. As a result, it was found that willow plantations can be successfully grown in such areas. According to Swedish researchers, the potential for growing willow is confirmed on radionuclide-contaminated lands.

However, the question of incentive mechanisms production of energy crops in Ukraine should be considered in more detail, in order to identify ways to successfully implement such projects, and provided that the ecological balance, reducing the harmful effects on the environment.

RESULTS

Analysis of data from the State Statistics Committee shows that today about 80% of solid biofuels produced by enterprises in Ukraine are exported. Therefore, in this area of commercial relations, the question of standardization of products supplied for export clearly arises. Strict compliance with EU legislation (and the export of solid biofuels from Ukraine is directed primarily to the European Union) forces foreign contractors to look for such partners in Ukraine who are guaranteed to ensure compliance with European or domestic standards. Therefore, domestic producers, counting on the sale of products abroad, on the one hand, must be guided by national standards in force in the country, and on the other – to meet the requirements of foreign standards required by the buyer. Moreover, obtaining documentary evidence of compliance with these standards is virtually impossible or difficult. Therefore, today the enterprises engaged in the production of some types of solid biofuels (charcoal, fuel pellets) operate in extremely uncertain conditions, which hinder the transparent contractual terms of cooperation and make it difficult to enter international markets.

According to the Register of Alternative Fuels [1], as of December 1, 2015, 61 certificates of solid fuel belonging to the alternative are valid in Ukraine, of which only 17 valid certificates confirm the belonging of fuel produced from agricultural raw materials to the alternative. It includes solid biofuel from sunflower husk, corn pellets, fuel pellets and briquettes from crop waste, pellets from crop straw, fuel cod from willow and others.

In fact, the certificate performs a confirmatory function, confirming the conformity of the fact that biofuels are produced from renewable sources and do not have a negative impact on the environment. However, in addition to obtaining a Certificate of Fuel Alternative, biofuel producers are required to comply with the requirements for certification and standardization of biofuels.

It should be noted that in European countries the process of standardization of solid biofuels began in the 90s of the twentieth century [2, p.90]. As a result of this process, standards were developed and adopted: DIN 51731 - in Germany, ONORM M7135 – in Austria, in Great Britain – The British Bio Gen Code of Practice for biofuel (pellets), in Switzerland – SN 166000, in Sweden – SS 187120. And since August 2015 in European countries, the EN plus standard is used for solid wood biofuels. At the same time, the EU does not have a single standard for the certification of pellets and agricultural briquettes, however, most countries that are actively engaged in the production or consumption of these products use the relevant standards adopted in other EU countries. These are, first of all, the standards AGRO +, AGRO (France) [3, p.35].

In May 2014, the International Standard ISO EN 17225, developed on the basis of European standards for solid biofuels, came into force. It defines fuel quality classes and specifications for solid biofuels from raw materials and treated materials of the following origins: forestry and forestry, agriculture and horticulture, aquaculture. The international standard ISO EN 17225 is recognized by the EU member states as the main

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and prevailing over the standards of the group EN 14961. It is considered that the introduced international standard has introduced a new stage of development of the solid biofuel market as it defines quality characteristics and classes for all types of biomass.

The production of solid biofuels in Ukraine is completely export-oriented, as more than 90% of fuel pellets and briquettes produced are exported to EU countries [4, p.171]. In order to reorient the sale of solid biofuels to Ukrainian consumers, experts propose to carry out mass standardization of the Ukrainian biofuel industry, for which to conduct: 1) modernization of the Ukrainian solid biofuels market, in order to prepare it for the adoption of EU standards; 2) harmonize European standards of solid biofuels on the territory of Ukraine; 3) to adapt the national system of certification of solid biofuels to the EN plus the system by the accreditation of national certification bodies, inspections and laboratories, as well as registration of the national certification body in the EN plus system.

Ratification of the Association Agreement between Ukraine, of the one part, and the European Union, the European Atomic Energy Community and their Member States, of the other part [5] provides, inter alia, for the development of cooperation in the fields of energy, in particular, development and support renewable energy, taking into account the principles of economic feasibility and environmental protection, as well as alternative fuels, including sustainable biofuel production and cooperation in the field of regulatory issues, certification and standardization, as well as technological and commercial development.

In Ukraine, the following national standards in the field of biofuels are in force, on which business entities can rely when concluding foreign economic contracts:

1) DSTU CEN / TS 15149-1: 2009. Solid biofuels. Methods for determining the particle size distribution;

2) DSTU-P CEN / TS 15210-2: 2009. Specifications. Fuel from wood waste crops granulated and briquette;

3) DSTU 7123: 2009 Sunflower husk. Specifications;

4) DSTU 7124: 2009 Pressed granulated sunflower husk. Specifications;

5) DSTU 7166: 2010 Bioethanol. Technical conditions. [6].

As already mentioned, in Ukraine, biofuels intended for sale as marketable products are subject to mandatory certification [7].

Despite this, control over compliance with the requirements described in Article 6 of Law №1391-XIV, is virtually absent. It should be noted that the lack of monitoring of mandatory certification is one of the main reasons for the inability of the regulatory staff in this area. In fact, working in the current national standards (often inconsistent with European or international), companies have long been uninterested in the certification procedure, justifying it: export orientation and work through European intermediaries; lack of economic feasibility in undergoing a high-cost certification procedure; low consumer awareness of the requirements for the quality of solid biofuels [8, p.57].

These standards relate to research methods and are not based on basic standards that provide technical, physical and environmental requirements for the quality of solid biofuels.

There is an urgent need to implement another 36 European standards for solid biofuel equipment, which are necessary for the implementation of modern certification systems for solid biofuels (eg EN plus), protection of consumer rights of solid biofuels, compliance with environmental standards, sustainability criteria and increase the export component of the solid biofuels market. in general.

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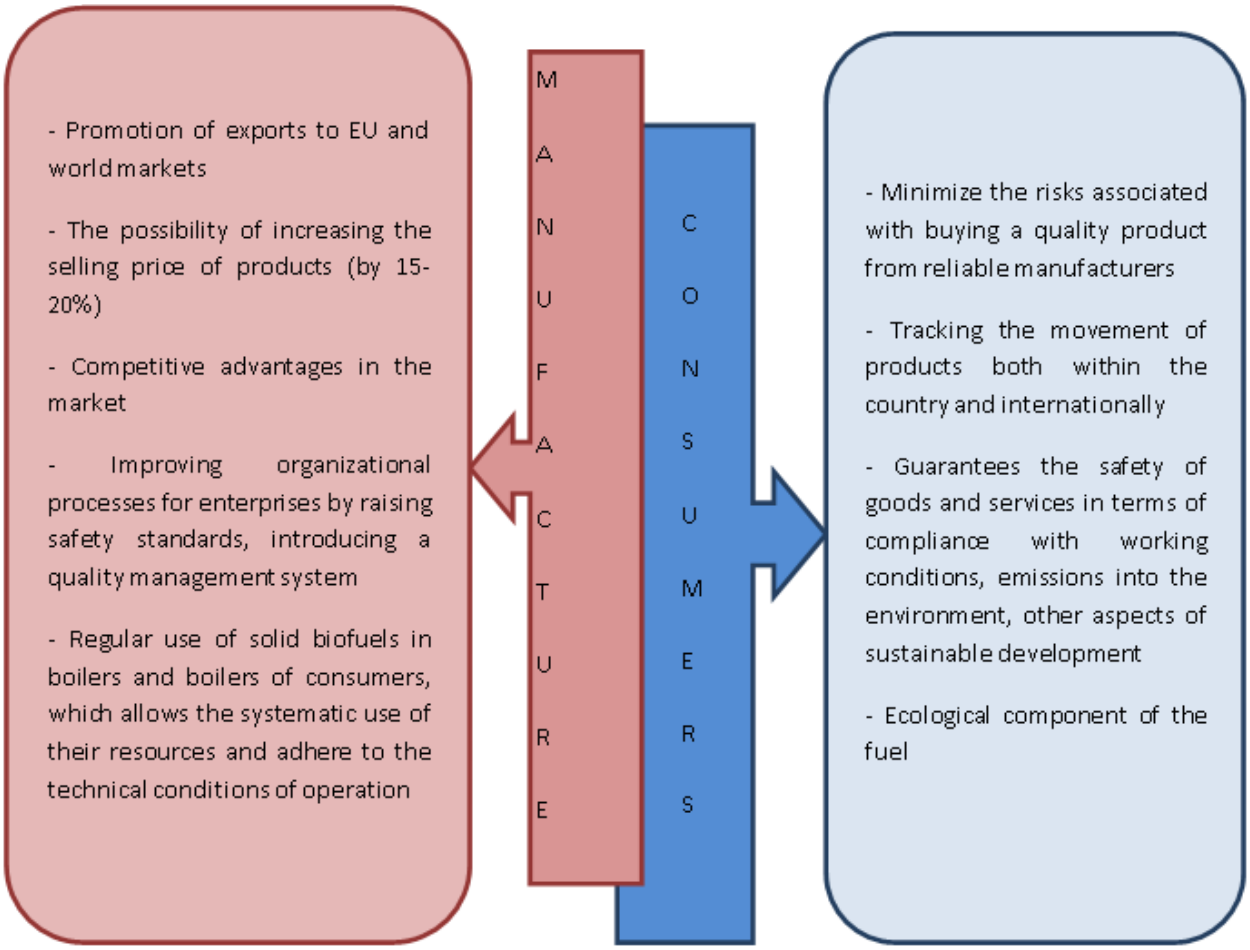

Fig. 1. Advantages of using solid biofuels for consumers and producers [8, p.59]

In addition, the lack of implemented standards does not allow Ukrainian certification bodies to carry out certification according to EU standards. These are the main requirements for certification bodies that intend to be accredited by European accreditation bodies. Today in Ukraine there is no certification body or inspection body that would have the authority to conduct certification according to modern European standards.

The cost of certification under modern certification systems, such as ENplus, which is based on the modern standard EN ISO 17225 and covers all types of solid biofuels, is:

- for producers of pellets and briquettes - about 4000 euros;

- for traders - about 3500 euros.

Contrary to the fact that the high cost of the certification procedure inhibits the development of this activity and limits the opportunities of domestic enterprises, here are the main benefits that can be obtained by both consumers and producers of solid biofuels as a result of certification.

Certification is a procedure to confirm the stable quality of products, which involves appropriately accredited certification, audit and laboratory bodies. It provides for constant quality control in production and careful compliance with the rules of manufacture, storage and transportation of solid biofuels [10]. Certification is closely related to standardization issues. According to experts, Ukraine needs to introduce certification according to ENplus standards, which meets the best global quality standards for solid biofuels – EN 14961 and ISO EN 17225. The ENplus certification system is based on a number of European standards, primarily improved solid wood biofuels. There is no single standard in the EU for the certification of pellets and briquettes from agricultural raw materials, so in order to ensure the quality of agricultural pellets and briquettes, European countries use standards adopted in other EU countries. For example, in France the standards AGRO +, AGRO operate. The international standard ISO EN 17225 is used as a single standard for

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different types of solid biofuels in world practice. It came into force in 2014 and defines fuel quality classes and specifications for solid biofuels from raw materials and processed materials originating from forestry and breeding. forests, agriculture and horticulture, aquaculture [10]. For a long time in Ukraine, there was only one state standard for solid fuel from biomass, namely - from sunflower husk: DSTU 7124: 2009 "Granulated sunflower husk. Technical conditions" [11] (entered into force on 01.01.2012, amended in 2014). Also in Ukraine, there are technological regulations for the production of briquettes and fuel pellets from sunflower husk [3]. According to the Law of Ukraine "On Technical Regulations and Conformity Assessment" [12, 23], a technical regulation is a legal act that defines the characteristics of products or related processes and methods of production, including the relevant procedural provisions, compliance with which is mandatory. In 2015, DSTU 8358: 2015 "Briquettes and fuel pellets from wood raw materials. Technical conditions", which entered into force on July 1, 2017 [13, 21]. There are no state standards for briquettes from other types of biomass (straw and other crop residues). According to the Law of Ukraine "On Standardization" [14], national standards are applied on a voluntary basis, unless their mandatory application is established by regulations (Article 23). Currently, Ukrainian producers of biomass briquettes use mainly their own technical conditions or focus on European standards (in the case of exports to Europe). The Law on Standardization stipulates that technical conditions are a normative document that establishes the technical requirements that a product, process or service must meet, and defines the procedures by which it can be determined whether such requirements are met. Enterprises, institutions and organizations have the right in the relevant areas of activity and taking into account their economic and professional needs to organize and perform standardization work, in particular, develop, adopt, review, apply, repeal the technical conditions adopted by them, and have ownership of these specifications. Technical conditions adopted by enterprises, institutions and organizations are applied on a voluntary basis (Article 16). Currently, in Ukraine, there are several dozen technical specifications developed by enterprises producing briquettes from different types of biomass. It should be noted that Ukraine has already adopted a number of standards (harmonized with European ones), which relate to general quality issues and methods for determining the quality indicators of solid biofuels, including briquettes. These standards relate to research methods and are not based on basic standards that provide technical, physical and environmental requirements for the quality of solid biofuels. According to experts, there is an urgent need in Ukraine to implement another 36 European standards for solid biofuels and equipment, which are necessary for the implementation of modern certification systems for solid biofuels (eg EN plus), protection of consumer rights of solid biofuels, compliance with environmental standards and sustainability criteria [8, 23].

We have already noted that in Ukraine there are selective standards for fuel pellets, as well as specially developed by some companies' technical conditions (TU). It is important to note that in addition to compliance with the direct production of solid biofuels, existing Western European standards additionally include standards for their storage and transportation. This is very important to consider for those manufacturers who carry out the organization of logistics processes in their enterprises.

It should be noted that the benefits of standardization should be felt by producers who provide products to the domestic Ukrainian market because, in the case of a state program to support the solid biofuel industry and, accordingly, budget allocations for solid biofuels for heat generation, only a certificate will allow the manufacturer to take participation in public procurement programs. In addition, in our opinion, the synergistic effect on the market will be caused by the fact that the necessary guarantees to consumers will be provided by traders and other intermediaries who work with equipment and its maintenance, thus improving the quality of services and increasing the number of objects operation.

Given the growing demand for solid biofuels with the introduction of mandatory product certification, it is necessary to indicate the methods of quality control throughout the value chain of biofuels (Fig. 2). Note that in the EU this control is carried out according to standard EN 15234.

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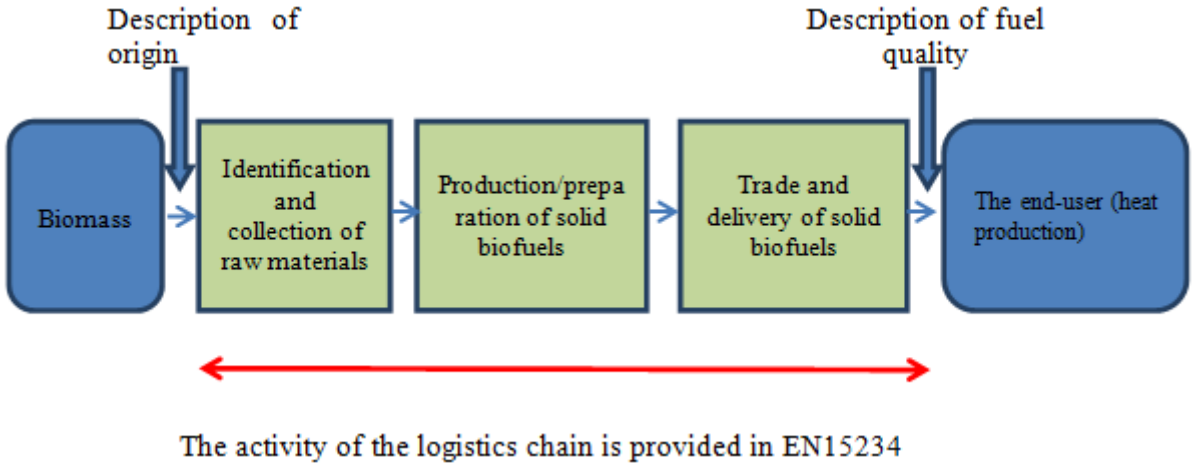

Fig. 2. Quality control of solid biofuels along the value chain [20]

The benefits of standardizing solid biofuels are obvious to both producers and consumers. Note that with the transition to the procedure of mandatory certification will also be significant changes in the structural hierarchy of the industry market – the market of solid biofuels. The need for standardization, and hence certification, fuels will "weed out" uncompetitive and small-scale production, will force them to integrate into more powerful industrial units, capable of incurring additional costs for obtaining all supporting documents, as well as scale production with increasing demand for certified goods case of export). From the point of view of the domestic market. It should be noted that the certification will significantly affect the use of equipment for solid biofuels, as on the one hand will lead to more economical heat generation for consumers, and on the other – will extend the safe operation of boilers, provided fuel manufacturers meet the technical characteristics that affect durability operation of equipment.

CONCLUSIONS

1. Technological reorientation of Ukrainian producers to produce better products, which will increase the efficiency of solid fuel boilers and the calorific value of solid biofuels. In the EU, heating systems have been able to partially switch to solid biofuels thanks to standardization: only knowing that you are buying a product of appropriate quality, you can implement investment projects to re-equip boilers that will pay off. This process requires minimal investment costs but is able to launch a mechanism of lobbying for standardization by manufacturers because there will be a need for a system that uncompromisingly and internationally certifies the quality of products that are now really high quality.

2. The orientation of sales not only to exports but also to the domestic market. The creation of regional logistics programs to provide consumers with solid biofuels will bring the Ukrainian biofuel market closer to EU standards. The growing number of generating capacities using solid biofuels in industry and agriculture, the social sphere will be able to help producers increase profitability, which fell dramatically due to the export crisis in 2013. This will allow players in the biofuel industry to find new markets without stopping production. However, as the only undemanding market for biofuels - Poland - is no longer promising, the new impetus for exports will encourage producers to standardize their products in order to take a competitive position in European markets.

3. The solution of raw material supply by organizing and introducing into the production cycle of the procurement scheme. Location of solid biofuel production only in places of constant accumulation of raw materials. Having access to quality raw materials that will meet EU standards, as in the previous case, will lead to the desire of producers to certify the quality of their raw materials and increase the credibility of products, and, consequently, its price.

4. Formation of a comprehensive (multimodal) transport infrastructure, which reduces the cost of transportation of solid biofuels both within the country and for export.

5. Comprehensive state support of the industry by creating favourable conditions for access to raw materials, stimulating the transition of generating capacity in housing and social sphere to the use of solid biofuels, implementation of the European model of bioenergy development in the overall energy balance of Ukraine.

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Ukraine has experience in directly harmonizing EU standards. In the case of biofuels, the procedure should be similar, involving the purchase of technical documentation, examinations, translation of documentation into the national language and approval at the state level.

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