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## TECHNOLOGY FOR THE PRODUCTION OF COMPOSITE FUEL FROM MUNICIPAL AND AGRICULTURAL WASTE

## ТЕХНОЛОГІЯ ВИГОТОВЛЕННЯ КОМПОЗИТНОГО ПАЛИВА З ПОБУТОВИХ ТА СІЛЬСЬКОГОСПОДАРСЬКИХ ВІДХОДІВ

**Korinchevska T. V.**

*Candidate of Technical Sciences, Senior  
Researcher  
Institute of Engineering Thermophysics  
of the National Academy of Sciences  
of Ukraine  
Kyiv, Ukraine*

**Корінчевська Т. В.**

*кандидат технічних наук, старший  
науковий співробітник,  
Інститут технічної теплофізики  
Національної академії наук України  
м. Київ, Україна*

**Mykhailyk V. A.**

*Candidate of Technical Sciences, Senior  
Research Scientist,  
Leading Researcher,  
Institute of Engineering Thermophysics  
of the National Academy of Sciences  
of Ukraine  
Kyiv, Ukraine*

**Михайлик В. А.**

*кандидат технічних наук, старший  
науковий співробітник,  
провідний науковий співробітник  
Інститут технічної теплофізики  
Національної академії наук України  
м. Київ, Україна*

**Snieszkin Yu. F.**

*Doctor of Technical Sciences, Professor,  
Academician of the National Academy  
of Sciences of Ukraine, Head  
Institute of Engineering Thermophysics  
of the National Academy of Sciences  
of Ukraine  
Kyiv, Ukraine*

**Снєжкін Ю. Ф.**

*доктор технічних наук, професор,  
академік Національної академії наук  
України, директор  
Інститут технічної теплофізики  
Національної академії наук України  
м. Київ, Україна*

The problem of reducing waste disposal is relevant and requires finding effective ways to solve it. One of the directions for implementing waste management solutions is their use for fuel production.

In accordance with the Association Agreement with the EU, regulatory documents were adopted to ensure compliance with the requirements of the EU Waste Framework Directive 2008/98/EC [1]. In particular, the Law of Ukraine “On Waste Management” [2] and the National Waste Management Strategy in Ukraine [3] provide for a transition from waste disposal to landfills to a system of integrated waste management.

One of the objectives of the Strategy is to increase the level of recycling of municipal solid waste (MSW), namely the commissioning of waste

processing plants and the creation of facilities for the production of refuse derived fuel (RDF). It also provides for the creation of conditions for the proper management of agricultural waste of plant origin, namely the use of biomass waste for energy production.

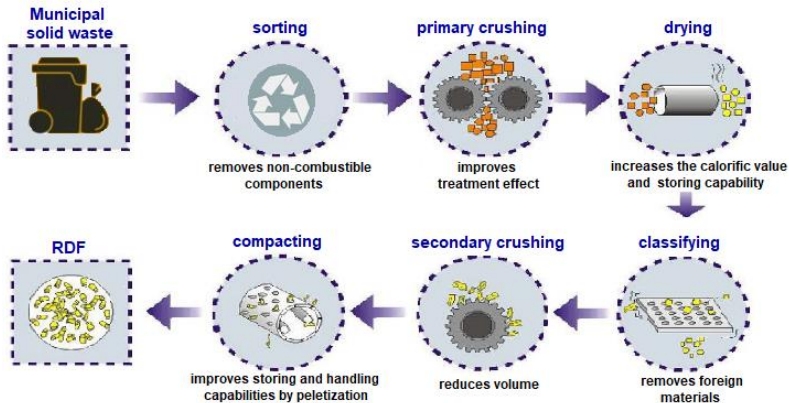
Refuse-derived fuel is an alternative solid fuel containing the combustible portion of municipal or industrial non-hazardous waste remaining after separation of secondary raw materials. These are mainly non-recyclable polymeric materials, paper, cardboard, textiles, etc. This fuel is commonly used in cement kilns, boilers and for power generation.

The thermophysical and energy characteristics of combustible components of solid municipal and agricultural waste, as well as peat and wood, were studied with the aim of making an alternative composite fuel. Based on the analysis of the obtained data, it was proposed to use cardboard, polyethylene, textiles, pine wood waste, corn and sunflower residues, and peat for the production of fuel.

Fourteen fuel samples were studied based on variations in the composition of fuel components. Rational drying conditions, characteristic temperatures of the stages of thermal destruction, ash content, calorific value, and rate of thermal decomposition of organic substances were determined. It has been established that varying the biomass content in the fuel from 10 to 40% does not cause significant differences in the nature of thermal decomposition. Increasing the polyethylene content causes an increase in the calorific value of the fuel and intensifies the kinetics of its thermal decomposition due to the release of volatile products.

The lower calorific value of experimental composite fuels ranges from 22.6 to 26.9 MJ/kg. This is 25% higher than the calorific value of wood pellets. Therefore, the determined thermal characteristics of composite fuels make it possible to recommend their composition for production. However, it is necessary to regulate the content of polyethylene and sunflower crop residues during production to ensure minimal emissions of harmful substances into the atmosphere and prevent corrosion of energy equipment.

The technology for producing composite fuel based on combustible components of solid municipal and agricultural waste has been developed based on the analysis of conducted research. The RDF production technology was taken as a basis [4, p. 19; 5, p. 746].



**Fig. 1. RDF production technology**

The technology for producing composite fuel based on combustible components of municipal solid waste and biomass includes the following sequence of stages: reception and sorting of MSW and biomass, where non-combustible components are removed; primary grinding to improve the conditions for further processing; drying, which helps to increase the calorific value of the fuel and its ability to be stored for a long time; secondary grinding to reduce the total volume of raw materials.

The developed technology of alternative composite fuel based on combustible components of solid municipal and agricultural waste ensures their effective utilization, partial replacement of fossil fuels, and preserves and improves the state of the environment.

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## EXPERIENCE IN IMPROVING THERMAL WORK OF A GAS TUNNEL FURNACE FOR FIRING CERAMIC BRICKS

## ДОСВІД УДОСКОНАЛЕННЯ ТЕПЛОВОЇ РОБОТИ ГАЗОВОЇ ТУНЕЛЬНОЇ ПЕЧІ ДЛЯ ВИПАЛУ КЕРАМІЧНОЇ ЦЕГЛИ

**Logvynenko D. M.**

*Candidate of Technical Sciences,  
Head of the Laboratory  
State Enterprise  
«All-Ukrainian state research and  
production center for standardization,  
metrology, certification and consumers'  
rights protection»  
Kyiv, Ukraine*

**Логвиненко Д. М.**

*кандидат технічних наук,  
начальник лабораторії  
Державне Підприємство  
«Всеукраїнський державний науково-  
виробничий центр стандартизації,  
метрології, сертифікації та захисту  
прав споживачів»  
м. Київ, Україна*

**Pylypenko R. A.**

*Candidate of Technical Sciences, Senior  
researcher,  
Leading researcher  
The Gas Institute of the National  
Academy of Sciences of Ukraine  
Kyiv, Ukraine*

**Пилипенко Р. А.**

*кандидат технічних наук,  
старший науковий співробітник,  
провідний науковий співробітник  
Інститут газу Національної академії  
наук України  
м. Київ, Україна*

**Pylypenko O. V.**

*Leading Engineer  
The Gas Institute of the National  
Academy of Sciences of Ukraine  
Kyiv, Ukraine*

**Пилипенко О. В.**

*провідний інженер  
Інститут газу Національної академії  
наук України  
м. Київ, Україна*

В умовах зростання дефіциту і вартості природного газу підвищення ефективності його використання в теплових промислових