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ENERGY SAVING, NEW, AND RENEWABLE ENERGY SOURCES

Prospects for the Use of Municipal Solid Wastes as Secondary Energy Resources in Russia

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Abstract—An analysis is made of both domestic and world experience in the field of energy recovery from municipal solid wastes (MSWs). The results are presented of an investigation of solid residues being formed in the process of thermal treatment of MSWs at the garbage-burning plants located in Moscow. The feasibility of utilization of ash and slag at thermal power plants incinerating MSW is shown.

Keywords: municipal solid wastes, energy recovery, ash and slag residues, incineration, mechanical grate, swirl fluidized bed

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The experience gained in the world shows that municipal solid wastes (MSWs) incinerated at thermal power plants (waste-to-energy power plants) are the most widely available and one of the most economically advisable renewable energy sources (see the figure). MSWs are a type of fuel comparable to peat and some ranks of brown coal in its heating value. This fuel is formed just where electrical energy is in highest demand, i.e., in big cities, and it will be subject to guaranteed foreseeable renewal as long as the human race exists.

Operation of a thermal power plant firing MSWs does not depend on natural conditions (as opposed, for example, to solar or wind power plants), geographic location (as compared to geothermal and tidal power plants), and, as a result of its operation, apart from power generation, an important social problem is solved—household waste materials generated in the course of human activities are utilized.

It is worth noting that abroad a considerable part of waste incineration facilities belongs to energy companies, and interest of power engineers to this energy source continues to increase. An example is provided by the largest energy company E.ON that in Germany alone has 16 plants for thermal utilization of MSWs. At these plants, with the total electric capacity of above 300 MW, about 4.0 million tons of MSWs per year are processed, and about 2100 GWh of electric energy (of which 1701 GWh were supplied to grids in 2011), and 2800 GWh of thermal energy, are generated.

All in all, in Europe alone, as a result of energy recovery from MSWs, even nowadays more than 28 TWh of electric energy and about 70 TWh of thermal energy are produced annually. This makes it possible to save from 7 to 38 million tons of organic fuel and, besides, to prevent emissions of greenhouse gases in the amount of 37 million tons/year (in terms of CO_2), which could be emitted in the form of methane in the case of landfill site disposal of wastes.

In the USA, at 89 facilities, about 33.5 million tons of MSWs are incinerated annually, with the generation of more than 17 TWh of electric power, and the total installed generating capacity of these facilities is about 2.7 GW.

At the present time throughout the world the number of waste incineration facilities under construction continues to increase, including China, South Korea, India, and other countries where in the past, the method of thermal utilization of MSWs has not been implemented widely. For example, in China, up until 2000 there were practically no plants for MSW incineration whatsoever, and now in 2010 already more than 24 million tons of MSWs per year have been utilized, and the annual addition of about 4 million tons is planned [3]. Even in such countries as Vietnam the priorities in the field of thermal treatment of MSWs have been defined.

In the former Soviet republics construction of new thermal power plants firing MSWs was carried out with a considerable share of investments made by energy companies. In late 2012 in Baku (Azerbaijan) the plant for thermal utilization of MSWs with the capacity of 500 thousand tons per year, and with installed electrical capacity of about 30 MW, was commissioned. In 2013 in Tallinn (Estonia) it is planned to complete the construction of the plant for thermal utilization of 220 thousand tons of MSW per year, with combined heat and power production (the electrical capacity of the steam turbines is 17 MW.) The customer of this plant is the national energy company Eesti Energia. The Finnish company Fortum plans to construct in Klaipeda (Lithuania) a thermal power plant for which the main type of fuel will be MSWs. Modernization of the plant Energiya in Kyiv (Ukraine), which is affili-