

ECOLOGY-ECONOMIC ANALYSIS OF THE CONSTRUCTION OF INCINERATOR IN KALININGRAD

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ABSTRACT

The aim of this paper is the appraisal of the ecology-economic estimation of the construction of the incinerator in Kaliningrad. The objectives of the investigations are: the estimation of the ecological aspects of waste incineration in the case of the construction of the incinerator; and the economic efficiency estimation of the construction of the incinerator.

During the investigations it was proved that the volume of waste will increase during 10 years at an average of up to 9,000 tons. By burning the waste in the incinerator, waste volume reduction may reach 90 %. This will reduce the charge of the firing ground; the economy of ground resources at the construction of incinerator will average in comparison with dumps borrowed in Kaliningrad (that is on the average 56-71 %); this will prevent the pollution of water; this will sanitize the waste; at thermal neutralization the production of wastes will be formed such as ashes (13,300 tons a year) and slag (26,600 tons a year).

By subjecting the waste into the incinerator, electricity production will be 89 million kWh a year. The investment from the construction will be 2,410 million rubles. The benefit from the realization of electricity is 51.3 million rubles, of slag is 8 million rubles, and of secondary raw materials is 138,103.6 rubles. The pay back will be achieved in 40 years. To provide the repayment of the investments for the construction of the incinerator in 9 years, it is necessary to increase the tariffs by 25% for the population and budget subsidies should be increased by 90%. Also, this study considers a social factor with 70 citizens of Kaliningrad being interviewed. The survey helped to reveal the public opinion the population towards the construction of the incinerator. 96% interviewed people regards the question about of the incinerator positively.

KEYWORDS

Incinerator; Household solid waste; Environmental aspects; Economic efficiency.

5 INTRODUCTION

At present the quantity of firm household waste worldwide increases in all countries of the world but the problem of absolute recycling of dust is not solved completely anywhere. Currently, in Kaliningrad there is an acute problem with recycling firm household waste and the basic method of recycling of firm household waste are dumps.

Almost 132,000 tons (1002450.4 m³) of the waste is in Kaliningrad and it is 44.5% of all waste generated in the Kaliningrad region [3]. The system of the render harmless of the waste is based on the bury of the waste the dump, which is in settlement Kosmodemjansky. The area

was bounded in 1978 and is in territory of the Coast Massif. At first the firing ground was planned to use temporarily before another area will be found for constant placing of the firing ground for the waste. But the search of another area was delayed and the firing ground is used at present. The plot of land used as a firing ground area of which is 13.5 ha, was appointed to the Municipal Unitary Enterprise by the decision of the major of Kaliningrad on the 22.05.98. The volume of the dump has accumulated to an average of 22 million m³ of firm household waste, the placing of the waste is 1404 000 m³ in a year, 2,360 m³ for 24 hours [1]. The opportunities of the broadening of the Kosmodemjanski dump are very limited and the admissible period of the dump is elapsed.

The construction of incinerator in Kaliningrad is considered to be a solution to solve the present problem of household waste.

6 ENVIRONMENTAL ASPECTS OF WASTE INCINERATION

According to the results of the waste volumes and by using the factors of annual gain of waste formation, this study attempts to calculate the possible quantity of waste in 5, 10 years in Kaliningrad under formulas offered in the design documentation of the magazine (Tasis) [2]. So, according to preliminary prognosis the quantity formed the firm household waste in Kaliningrad will make 133,000 tons (1013477.4 m³) in 2007; 137,000 tons in 2012 (so it will be 5 years) and 142,000 tons (1130643.28 m³) in 2017 (so it will be 10 years). According to the calculations, the average volume of waste will increase by 9,000 tons for 10 years. Considering growing rate of the formation of firm household waste and the deficiency of the free areas for their warehousing, the decision of these problems can be the construction of the incinerator. Taking into consideration the quantity of the processed waste in a year the capacity of the factory should be 160,000 tons counting upon 30 years forward.

Estimation of the possible ecological aspects of the burning of waste by incineration in Kaliningrad has shown that:

- during the controllable high-temperature processing of waste the significant reduction of the volume up to 90% from initial is reached;
- at the thermal method, 100% disinfection of waste from pathogenic microorganisms can be achieved;
- at burning planned 133,000 tons of waste in a year the production of electricity will be 89 million kWh a year. It will substitute 33,000 tons of black oil;
- burning the waste at incinerator there is no hit of pollution in soil and superficial water sources;
- the economy of ground resources at the construction of incinerator will average from 77 400 m² (7.74 ha) up to 97400 m² (9.74 ha) in comparison with dumps borrowed in Kaliningrad, that is on the average 56-71 %;
- at thermal neutralization the production of wastes will be formed: ashes and slag, an output will average for slag of 20%, ashes of 10%, that is at planned receipt 133,000 tons in a year of slag will be formed 26,600 tons, ashes – 13,300 tons;
- burning of waste at the incinerator is accompanied by formation of some harmful substances: oxides of nitrogen and sulfur, oxides of carbon, hydrochloric acid, hydrofluoric acid, dioxins and furans.

According to the researches carried out by the laboratory of hygiene of the ground and of the waste named after A.N. Sisin were estimated the opportunity of use of ashes and slag of an operating Moscow incinerate № 2 in structure of asphalt and betony mixtures. As a result it

waste established - that it is possible to recommend with addition of 14% of slag and 2% of ashes as ecologically safe material for road construction [4].

Dioxins, allocated at burning of the rubbish are the strongest carcinogenic substances, that is why the incineration installations should be equipped with the effective systems of dust and gases catchments [5]. The author offers the investments in construction of the incinerator on the average of 575 US dollars on 1 tons of capacity on reception of firm household waste [6], 30% of expenses should be made on the creation of an effective system of gas purification and ash removal.

7 THE ECONOMIC EFFICIENCY OF THE INCINERATOR CONSTRUCTION

The calculations of the authors at an estimation of the economic efficiency of the construction of the incinerator have shown (for calculations of a commodity output the tariffs presented in (the Concept of the reference with firm household waste in the Kaliningrad region) [7]:

- the power of the factory in Kaliningrad by quantity of processed waste in a year should make 160,000 tons and in construction of the incinerator it is necessary to enclose 2410 million rbl.;
- burning the waste at the incinerator the production of electricity will be 89 million kWh a year from which 20% of energy will be spent for the own needs of the factory, that is 17.8 million kWh in a year. The electric power directed to a network of the power supply system will make – 71.2 million kWh in a year. The benefit from the realization of electricity will be 51.3 million rbl.;
- the commodity weight of slag will make – 26,600 tons, that is 20% from total amount of acting waste on burning. A commodity output from realization of slag is 8 million rbl.;
- the waste acting on a factory should pass shop of sorting where the selective selection of fractions of dust classified as secondary raw material is carried out. The commodity output from realization of secondary raw material will make 138103.6 thousand rbl.;
- the income of the realization of all commodity output will make 59.4 million rbl., the expenses will be justified in 40 years;
- the grant for work of the incinerator will make 208 million of the budget rbl. a year. To provide the repayment of the investments for the construction of the incinerator in 9 years it is necessary to increase the tariff by 25% for the population and budget subsidies should be increased by 90%.

This study also considers the social factor in the researches. 70 citizens of Kaliningrad in the age from 18 to 60 years were interviewed. The survey helped to reveal the public opinion the population towards the construction of the incinerator. 96% interviewed people regards the question about the incinerator positively, 41% from 96% agree that the construction of the incinerator will not harm the environment and will not entail deterioration to the health of population, the others of 55% do not reflect on ecology.

As have shown the lead calculations during the economic analysis of efficiency of the construction of the incinerator in Kaliningrad that there was a recouplement in shorter term, that is 9 years, one of the conditions should be increased in the tariff for gathering of firm household waste on 25%. During the lead poll (about readiness to pay) on 25% only 25.7% more have agreed.

8 CONCLUSIONS

The construction of the incinerator in Kaliningrad will allow in achieving a significant reduction of the volumes of waste that will essentially lower the loading of the firing ground, will reduce a number of spontaneous dumps, and will conduct to economy of raw materials. However, it is necessary to raise the knowledge of the population about the possible consequences (to the environment and to human health) of the construction of the incinerator, to create effective system of clearing, to come to naught possible risk of occurrence of negative consequences. But, as have shown from the lead calculations made, a high investment expenses is necessary on the realization of the civil – engineering design of the incinerator. Also it is necessary to increase budgetary grant on 90%; to increase the tariff for gathering of waste from the population on 25% that is why the construction of the incinerator in Kaliningrad is poorly realized at present.

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