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Procedure of selection of equipment at the initial stages of building new processing line on production of granular biofuel

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Aim. An increase of efficiency of production of granular biopropellant is from local raw biomaterial in the conditions of rural territories. Methods. On the basis of method of integral criterion of distance to the aim efficiency of choice of stationary and mobile lines is compared from the production of granular biopropellant. Results. Attitude of area of integral index of distance toward the aim of mobile line less than in 25,8 раза (an ideal variant approaches a zero), than at a stationary line for comparison of 4th criteria : capital charges, production inputs, expenses on raw material and specific energyexpenses. Conclusions. The offered methodology gives an opportunity evidently and it is simple to determine expediency of application of that or other technical equipment from the production of granular biopropellant, to estimate efficiency of the chosen variants of technological process and find out the possible methods of her increase.

Key words: refurbishable energy, biopropellant, біомаса, granules, granulation, rural territories, line of granulation.

Refurbishable energy is a sector of economy that dinamically develops in the world. For today part of refurbishable energy sources in the general supply of primary energy in the world presents close 13%, in particular — 10% (in Ukraine of 1,2%). In the plans of European Union on 2020 it is foreseen to take part of refurbishable energy to 20%.

Thus, one of factors of efficiency of agriculture of Ukraine in future will be mastering of new level of production and use of biopropellant directly in place of location.

The questions of alternative energy sources investigated V.O. Dubrovin, V.G. Mironenko G.A. Pigeon, G.M. Kaletnik, G.G. Geletukha, Ya.B. Bloom and other.

Aim of researches — to promote efficiency of production of granular biopropellant from local raw biomaterial in the conditions of rural territories.

Methods of researches. On the basis of method of integral criterion of distance to the aim efficiency of choice of stationary and mobile lines is compared from the production of granular biopropellant by means of 4th criteria: capital charges, production inputs, expenses on raw material and specific energyexpenses.

Results of researches. For comparison of areas of integral indexes of distance to the aim stationary 4076,1 and mobile 157,9 lines mobile in 25,8 less than (an ideal variant approaches a zero), than at a stationary line.

Efficiency of the use of that or other equipment can be certain by means of one of heuristic methods, that does not give the absolute estimation of variants, but gives an opportunity to define expedient directions of approaching to the ideal variant — method of integral criterion of distance to the aim. This method gives an opportunity as diagram of indexes to estimate advantages and lacks of variants that is compared, here in the direction of center indexes get better, and to the edge — get worse [8].

Will consider efficiency of work of mobile and stationary lines of granulation of hard biopropellant by means of 4th criteria: X1 is capital charges; X2 are production inputs; X3 are expenses on raw material; X4 is specific energyexpenses.

Capital charges are charges on acquisition, creation, perfection, expansion of assets, technical retooling, reconstruction of present and acquisition of the new (that not used before) fixed assets.

For a stationary line with the productivity of 5 т/год:

- lease or purchase of lot land. Middle price 0,01 hectare lot land in the distance 100 kilometres from a regional center will present an about 10 000 hrn. For building of plant power of 5 т/год it is needed 800 м2. Thus, for today it will cost 80 000 hrn.s (80 thousand hrn.);

- building of apartment. There are not the severely regulated requirements in relation to building of plant on the production of biopropellant. Is there a price for a 1 m? taking into account doors and all build materials are 3500 hrn.s/of m? (1050,0 thousand hrn.);

- acquisition of equipment. Cost of equipment of plant год presents an about 7 million hrn. power of 5 т/, a cost of the base engineering without planning of plant is a 50 thousand and start of equipment this company hrn., establishment — yet approximately 7% of the combined charges on an equipment (7490,0 thousand hrn.).

Here, total capital expenses on creation of stationary line of production of fuel granules годpresent a 8620 thousand hrn. the productivity of 5 т/

For a mobile line with the productivity of 0,5 т/год the reference cost of equipment with a trailer presents 350 000 hrn.s (350 thousand hrn.).

Id est, if to go out the identical productivity of 5 т/од, then total capital expenses an about 8,6 million hrn. can present for a stationary line, and mobile is a 3,5 million hrn.

Production inputs are any charges for period covered, predefined by acquisition and use of different resources in the process of realization of industrial and economic activity.

For a stationary line:

- electric power. Tariffs on electric power for the consumers of 2th class taking into account VAT present 1,68 hrn.s/kW by hours As the chosen plant consumes 1200-1336 kW год for twenty-four hours, works on twenty-four hours with the productivity of 5, get electricity expended in the ton of products — 20 hrn.s/of т charges;

- water. Does a tariff on a water-supply and overflow-pipe taking into account VAT present 13,87 hrn.s after a m. Pellet of equipment consumes about 80 л of water for every ton of mine-out пелет, id est, the cost of water, ton of granules expended in a production, presents 1,1 hrn.s/of т;

- derivative materials. If term of exploitation of line 10 and she works 240 days on a year, then expenses on розхідні materials will present 3,6 hrn.s/of т;

- payment of labour. For work it is needed 4 skilled specialists (2+2 in two changing).

Possibly, that a salary presents 4470 hrn.s on a month for every worker, then expenses 8,9 hrn.s/of т can present on payment of labour.

For a mobile line:

- lease of tractor. An equipment is assembled on the tractor of МТЗ-to a 80 class 1,4. A businessman, farmer or owner, can be the proprietor of tractor or lease him. A lease takes place under the Law of Ukraine on the lease of state and communal property from 23.12.1997 № to 768/97-ВР [3]. If rent 10 hrn.s/of год, then the cost of lease on unit of products presents 20 hrn.s/of т;

- charges of fuel. At the hourly expense of fuel on the production of пелет 7 л and costs of diesel fuel 20 hrn.s/of л, the cost of fuel on unit of products will present 280 hrn.s/of т;

- payment of labour. Accept the monthly salary of 2th workers for 2500 hrn.s Then payment of labour for unit of products will present 60 hrn.s/of т.

Thus, total expenses on the production of пелетів on a stationary line present 33,6 hrn.s/of т, and for a mobile line are 360 hrn.s/of т.

Expenses are on raw material.

For a stationary line:

- purchase of raw material. For a line with the productivity of 5 т/год it is better to have plantation of own raw material. If such plantation is not, it is possible to buy in a straw embaled, arboreal bits and pieces and other raw material at price an about 1000 hrn./of т;

- cost of delivery of raw material. If to consider that volume of basket of truck a 40 m? (together with the volume of trailer)specific part of raw material of 0,3 т/м3, a rational zone of delivery of raw material is 50 kilometres, an expense of fuel is 40 л of fuel on each 100 kilometres, and a cost of 20 hrn.s/of л, then general charges on delivery will present 33,3 hrn.s/of т.

For a mobile line:

- Preparation raw material. Creation of mobile line foresees the use of her for the production of granular fuel in the personal and farmer economies, where owners use the prepared raw material mainly from wastes of own economy (bits and pieces of straw, wastes of corn and sunflower, offcutss of trees and bushes and т. д.). Will consider therefore, that at that rate raw material is free of charge;

- direct-labour is on the purveyance of raw material. For payments of work of one worker on the purveyance of 5 т raw material during a month after the first digit in size of a 1218 hrn. and at the corresponding coefficients of other digits, averaged payment will present 260 hrn.s/of t.

- building is for storage of raw material. Is a cost a 1 m? tapes 7 hrn.s If to carry out shelter of 5 т raw material awning of 50 м3 during 5, the cost of shelter will present 14 hrn.s/of т.

Thus, total expenses on raw material for a stationary line present 1033,3 hrn.s/of т, and for mobile are 274 hrn.s/of т.

Specific energyexpenses — on the basic working processes of drying of raw material and granulation :

For a stationary line:

- expenses are on drying. For our calculations accept, that specific energyexpenses on drying present 650 кДж/kg

- there are production inputs of energy. Determined as correlation of the set power of electric motors on press to the productivity machines. A plant with the productivity of 5 т/год has power 350 kW, or 1 260 000 кДж. Thus, specific energyexpenses present 252 кДж/kg

For a mobile line:

- there are production inputs of energy. Granulation of the preliminary dried up raw material by a mobile line with the productivity of 0,5 т/год and by power 50 kW has specific energyexpenses of 360 кДж/kg

Thus, total specific energyexpenses on granulation for a stationary line present 902 кДж/kg, and for mobile are 252 кДж/kg

Analysis of the obtained calculation data (table), and also comparisons of integral indexes of the considered variants of granulation of hard biopropellant (drawing) show that the mobile line of granulation has considerable advantages for the terms of the use on rural territories.

Data of production inputs are erected fuel granules on the different lines of granulation

Line of granulation

Capital charges, thousands of hrn.

There are production inputs, hrn./of t

Expenses are on raw material,

hrn./of т

Specific energyexpenses, кДж/kg

Stationary

At the same time reserve of increase of efficiency of the use of mobile line is obvious due to diminishing of production inputs granules.

Diagram of integral estimation of efficiency of stationary and mobile lines of production of fuel granules : 1 is a stationary line; 2 is a mobile line

It can be attained, say, for connecting of mobile line to the widespread electric networks 220 In.

If to compare areas that present 157,9 and a 4076,1 mind. odes., then obviously, that a mobile line has the less approaching to the aim (at an ideal variant distance equals 0) and is the best variant for Heat supply of rural territories.

Conclusions

The offered methodology gives an opportunity evidently and it is simple to determine expediency of application of that or other technical equipment from the production of granular biopropellant, to estimate efficiency of the chosen variants of technological process and determine the possible methods of her increase. Except power and economic advantages of the use of mobile line of granulation of hard biopropellant for Heat supply of productive and domestic necessities of rural consumers, it follows to mark creation of additional workplaces in rural locality, increase of quality of life of rural population and increase of level of defence of environment.

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