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The project of organizing a pilot industrial production of diesel fuel by bacterial synthesis of atmospheric gases and human and animal waste

The technological process is adapted to industrial operation.

Project description

The project is based on its own development of the technology for producing the bacterial environment and the technology of its operation for producing renewable diesel fuel from atmospheric gases (including CO₂) and while maintaining the bacterial environment with flushing pig farms, animal and human waste products. The technological process is non-waste. This technology is known over 20 years. Over the past year, in laboratory conditions, we have developed a technology for the continuous production of diesel fuel at 1 m³ reactors. The bacterial environment is stable in operation (with an estimated life of about 3 years), is prone to volume growth, and synthesizes a stable quality of diesel fuel. The obtained diesel fuel is renewable (alternative, biofuel of 3 generations or, a new concept - "synthesized"), has characteristics higher than oil diesel fuel. When operating on production vehicles, it was noted: a 20% reduction in consumption, a 10% increase in power, and a softer internal combustion engine (ICE) operation.

Technology assessment

This technology allows to obtain liquid hydrocarbons of a given quality and, with further improvement, an increase in hourly productivity from 1 m³ of reactor volume.

Earlier in laboratory conditions were obtained: motor fuels (diesel fuel, gasoline, aviation kerosene), alcohols, vegetable oils, animal feed (obtained from wheat pellets).

Technical description of the project

It is necessary to manufacture a typical reactor (followed by serial production) providing the most efficient synthesis of diesel fuel with a bacterial medium.

Characteristics of the reactor: cylindrical stainless steel, size: diameter 0.5 m., height 1.6 m., volume 250 liters.

Body kit: additional equipment that will provide a constant temperature regime of 36-38 °C, smooth mixing, gas bubbling, process automation, technological bends, etc.

The number of reactors in operation determines the productivity of the entire production.

The diesel fuel obtained from the reactors is pasteurized and filtered, then sent to storage tanks with subsequent shipment to the final consumer.

The development of the reactor, manufacture, purchase of components, construction and commissioning of pilot production is carried out by our company and contractors.



Expected project performance

From the beginning of the project to the production of diesel fuel in the amount of 50-100 kg per hour, it takes 2 months. It will take several months to increase productivity to the planned 2 tons per hour. The implementation of the project will allow the production and sale of commercial products of diesel fuel, which will allow economically independently:

to improve the characteristics of the bacterial environment and to improve the technological process in order to increase productivity per unit reactor volume;

get expert opinions on the effectiveness of technology;

carry out further research work;

to develop technologies for producing other liquid hydrocarbon compounds (analogues of oil and gas products);

to make samples of autonomous modular complexes in the size of sea containers.

Ecological profile of the project

This technology is non-waste. Allows the production of renewable diesel fuel while disposing of waste and consuming greenhouse gases from the atmosphere. Industrial consumption of this fuel will allow replacing petroleum diesel fuel, and as a result, it will have a positive effect on the decarbonization of industry. The technology is positioned as the most effective for utilizing carbon dioxide emissions after burning all types of energy carriers (gas, coal, oil) of fossil and alternative fuels. The developing area of technologies for the capture of carbon dioxide from the atmosphere does not solve the issue of its disposal. This technology, when carbon dioxide is supplied to the reactor, demonstrates an increase in productivity.

Key economic and financial indicators of the project

To implement this project, financing in the form of a grant or an unsecured loan from 100,000 EUR to 500,000 EUR is required.

The cost of diesel fuel by this technology will be an order of magnitude lower than that of oil and will include labor costs, conditionally fixed costs for renting production facilities and premises, as well as the cost of several tens of kW of electricity (for drives and transfer pumps) per one ton of produced diesel fuel. The required electricity can be obtained using your own diesel generator.

Thus, monthly production costs will be averaged constant at a capacity of 100 kg to 2 tons.

The volume of primary investments will affect the payback period and the achievement of planned performance.

Investments in the amount of 100,000 euros provide a productivity of 50-100 kg of diesel fuel per hour; 500,000 euros - 0.5 tons per hour.

Production launch term - from 2 months. Reaching design capacity of up to 2 tons per hour will be about 4 months.

The expected income (after tax) from the sale of products is about 500 euros per ton of diesel fuel.

Annual income for different equipment performance may be:

0.1 ton per hour x 8000 hours x 500 euros = 400,000 euros (800 tons);

0.2 x 8000 x 500 = 800,000 euros (1,600 tons);

0.3 x 8000 x 500 = 1,200,000 euros (2,400 tons);

0.4 x 8000 x 500 = 1,600,000 euros (3,200 tons);

0.5 ton per hour x 8000 hours x 500 euros = 2,000,000 euros (4,000 tons).



The production of diesel fuel using this technology has the following economic advantages: preferential taxation and lending, the prospect of generating additional income through waste management, the implementation of quotas under the Paris Agreement (the former Kyoto Protocol).

Project development stage

At this time, we have 3 m³ of bacterial fluid for refueling the reactors.

This bacterial fluid synthesizes diesel fuel Euro 3. A new generation of bacterial fluid synthesizing diesel fuel Euro 5 was developed (it is necessary to produce 1 m³ of fuel for refueling in reactors).

In laboratory conditions, we carry out the synthesis of diesel fuel in an open distillation tank (through the surface we lose some of the hydrocarbon gases necessary for the synthesis of diesel fuel). There is no temperature, stirring and bubbling.

Pseudo activation is carried out manually by draining the diesel fuel and bacterial fluid, followed by pouring it through an open surface. An hourly increase in fuel of 10 or more liters while maintaining the level in the tank.

Obtained diesel fuel, by natural discharge through a tap in the upper layer of the tank, settles, is filtered by an automobile fuel filter and poured into the tanks of a dozen cars to receive feedback. Reviews are extremely positive.

Prospects for the project

Implementation of the developed concept of design layout and serial production, followed by the operation of modular production in the amount of a shipping container.

For the implementation of such a project, including the installation and subsequent operation of a module with a capacity of 1 ton per hour, 2,000,000 EUR investments are needed.

The ultimate goal of the project is the creation of a vertically integrated structure that includes production facilities for serial production of modules, a factory for the production of bacterial media for refueling reactors, a research center, an installation and service unit for the synthesis of diesel fuel with subsequent sale to the end user.

Appendix 1 - the operation of the demonstration laboratory installation.

Appendix 2 - demonstration of the technological process.

Appendix 3 - demonstration of pilot production.