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**FORECASTING THE INVESTMENT CHARACTERISTICS
OF A SMART OBJECT ECOSYSTEM.
(Innovative Transformation of Processes for Forecasting
Investment Volume Characteristics in the Ecosystem and
Infrastructure of a Smart Object and Its Advanced Combined
Supersystem with Interconnected Subsystems)**

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Abstract

The article examines the innovative selection of parameters for transforming the processes of forecasting investment characteristics in the infrastructure of a smart object that, in terms of its elements and novelty features, meets the required attributes and criteria of an invention. Particular attention is paid to the possibility of its comprehensive and detailed integration into an advanced combined supersystem with interconnected subsystems as an essential component of preparing a startup project aimed at the development of innovative technology.

The article analyzes modern techniques and algorithms for developing integrated innovative technical solutions based on the application of distinctive features of known inventions in a new capacity and within newly emerging smart technology domains, including the integration of basic distinctive features. This approach is considered an important factor in achieving technological success through timely, targeted, and dynamically coordinated investment throughout the development of the project.

Since the entire range of activities related to the development of project elements is primarily aimed at ensuring the achievement of the ideal final result, the article emphasizes the need to coordinate all stages and phases of the project with the timing and periodicity of the investment process. Particular attention is given to linking investment forecasting and technological development processes with the active application of artificial intelligence and artificial neural networks.

Keywords: *Investment Characteristics Forecasting; Investment Volume Forecasting Processes; Smart Investment Object Ecosystem; Smart Investment Object Infrastructure; Innovative Selection of Parameters for the Transformation of Forecasting Processes; Novelty Features; Advanced Combined Supersystem with Interconnected Subsystems; Analysis of Modern Techniques and Algorithms; Distinctive Features of Known Inventions Applied*

in a New Capacity; Integration of Basic Distinctive Features; Manufacturing of Original Components; Active Application of Artificial Intelligence and Artificial Neural Network Elements

Introduction

Innovative Selection of Parameters for the Transformation of Investment Characteristics Forecasting Processes in the Infrastructure of a Smart Object.

The innovative selection of parameters for transforming the processes of forecasting in-

vestment characteristics in the infrastructure of a smart object, which meets all the required attributes and criteria of an invention in terms of its elements and novelty features, provides the basis for its comprehensive and detailed integration into an advanced combined super-system with interconnected subsystems.

Figure 1. *Activating Dynamic Device: Scale Factor – Working Diameters of 20, 35, and 60 mm with the Same Application and Connection Concept*

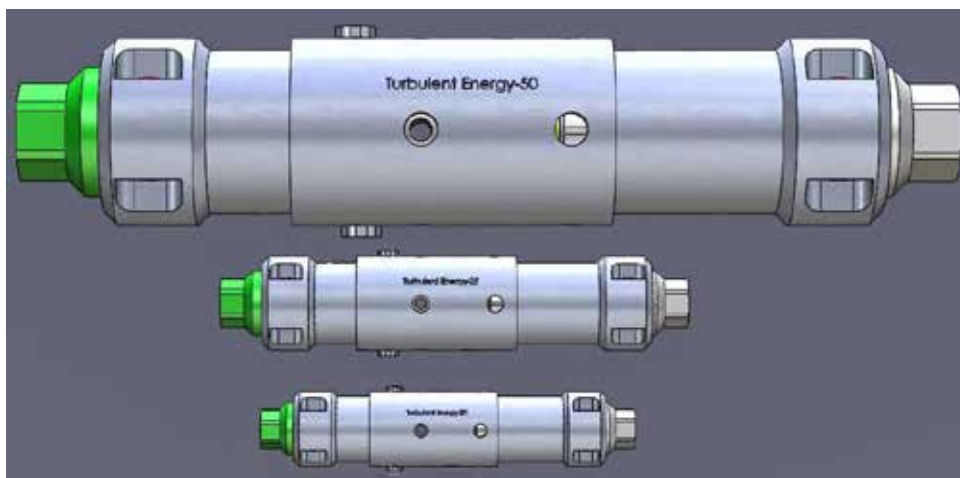


Figure 2. *Cross-Sectional View of the Activating Device*



Analysis of Modern Techniques and Algorithms for the Development of Integrated Innovative Technical Solutions Aimed at Applying the Distinctive Features of Known Inventions in a New Capacity and in Newly Emerging Smart Technology Domains (Integration of Basic Distinctive Features)

Technological Instruction

As an example, the processes for manufacturing original components of the Inte-

grated Device for Activating Fuel Mixtures, protected by 14 patents, are considered.

This technological instruction covers the manufacturing of original components, as well as the selection of standard parts, materials, and components required for the production of prototypes of the Integrated Device for Activating Fuel Mixtures designed for use in internal combustion engines, including conventional gasoline-powered engines and compression-ignition

(diesel) engines, primarily intended for use in vehicles.

1. Technical Requirements for the Manufacture of Original Components

1. All original components shall be manufactured in full compliance with the working drawings.
2. All conical surfaces of the components shall be experimentally verified using aluminum mock-ups. The mock-ups of mat-

ing components shall be used as reference templates and gauges.

3. Electrochemical polishing of the components after machining shall be performed only after all components included in the device have been checked for proper assembly and compatibility.
4. Heat treatment of the components shall be carried out at the workpiece stage in accordance with the requirements of the technical documentation.

Figure 3. *Components of the Activating Device*



Figure 4. *Components of the Activating Device*



2. Technical Requirements for Device Assembly

1. All sections of the device shall fit into the opening of the outer housing with a sliding fit.
2. During assembly, the manifold housing, which contains eight independent channels, four of which are intended for sup-

plying compressed air, shall be aligned with the openings in the outer housing through which compressed air is supplied from the compressor.

3. After alignment, the retaining elements shall be screwed into the openings of the outer housing, after which the outer housing nut shall be tightened. Once tightened,

the retaining elements shall be unscrewed one at a time and replaced individually with fittings securing the compressed-air pipeline.

4. The assembly procedure shall be as follows:

- A nipple shall be fitted onto the fuel pipeline;
- The nipple shall be secured to the pipeline;
- The resulting connection shall be joined to the outer housing nut and, together with the nut, fitted onto the hydraulic section housing;

- The entire assembled connection shall be inserted into the opening of the outer housing and secured by means of the nut;
- From the opposite open side of the outer housing, the conical interface of the hydraulic section shall then be inserted. The interface of the pneumatic section shall be press-fitted into its central opening. The pneumatic section housing shall be mounted onto its splined portion, after which the manifold housing seat shall be installed inside it.

Figure 5. *Exploded View of the Activating Device*



2.5. The manifold housing shall be oriented in accordance with Section 2.3.

3. Technical Requirements for Standard Fuel Pipeline Components

1. The standard components of the device include fittings for securing four pipelines supplying compressed air from the

compressor; four metal tubes selected in accordance with the dimensions of the fittings; and two tubes for the sections of the fuel pipeline located upstream and downstream of the device. The dimensions of the two nipples shall be calibrated according to these tubes, and the nipples shall be securely and leak-tight attached to them.

Figure 6. *System for Parallel Connection of the Activating Device*



4. Technical Requirements for Compressed-air Pipelines From the Compressor

1. The pipelines used to supply compressed air from the compressor to the fuel-mixture activating device shall comply with the requirements specified in Section 3.1.

5. Technical Requirements for The Compressor

1. For the initial stages of testing, the specific type of compressor is not of critical importance.
2. The compressor shall provide a nominal operating pressure of at least 20 atmospheres.
3. An air filter with a liquid buffer shall be installed at the compressor air inlet.
4. The compressor shall have at least four compressed-air outlets or be equipped with a system ensuring uniform distribution of the compressed-air flow at the compressor outlet.
5. The pressure level shall be adjustable throughout the entire operating range of the compressor, from minimum to maximum.
6. The compressed-air flow rate at the compressor outlet shall be adjustable from maximum to minimum.
7. All connections between the outlet pipelines and the compressor shall use standard fittings and connections.

Figure 7. *System for Vortex Tube Formation*



6. Program and Procedure for Preliminary Testing at the Device Manufacturer's Facility

1. Each component shall be accompanied by a quality certificate.
2. Each component shall be accompanied by a conformity report confirming that its linear dimensions correspond to the dimensions specified in the engineering drawing.
3. All components shall be selectively matched for each individual assembly.
4. A separate inspection report shall be prepared for each assembly, confirming its assemblability and compliance with the general technical requirements for the product.
5. All connections of the device's hydraulic lines, both at the inlet and outlet, shall be tested for leak-tightness at a pressure **25% above the nominal operating pressure.**
6. All connections of the device's pneumatic lines shall be tested for leak-tightness at a pneumatic-system pressure **25% above the nominal operating pressure.**
7. The fully assembled device shall be tested for leak-tightness of both the hydraulic and pneumatic sections while operating simultaneously at a pressure **25% above the nominal operating pressure.**
8. A manufacturer's technical passport shall be prepared for each device, specifying the results of all preliminary tests performed.

Figure 8. *Stabilization Device*



7. Technical requirements for the air filter installed at the inlet of the compressor connected to the fuel-mixture activating device

1. The compressor shall provide an operating pressure of at least 20 atmospheres.
2. The pressure shall be adjustable within the range from the minimum to the maximum value.
3. The air purification filter shall be capable of operating under the specified parameters.
4. The filter shall incorporate a system for directing the airflow through a liquid medium, such as light mineral oil or industrial alcohol.
5. Air shall be introduced into the filter through tangential inlet channels.

Figure 9. *Example of the Scale Factor*



Considering the relatively compact design of our device and its ease of integration into the fuel system of a modern engine, it is important to protect the formulated concept and its structural implementation as soon as possible, since it is expected to enter the intellectual property market simultaneously with the basic product – various types of biological fuel mixtures.

The scope of claims that may be declared includes:

- A mixer integrated into a pipeline and utilizing pressure differentials arising or generated in different sections of the pipeline due to differences in the linear flow velocities of liquids moving through the pipeline;
- A hydrodynamic mixer;

- A hydrodynamic mixer integrated with a foam generator;
- A sequential mixing and foaming unit;
- A sequential mixing and foaming unit integrated into a pipeline and utilizing the kinetic energy of liquid flows moving through the pipeline to perform its technological functions;
- A hydrodynamic mixer designed to increase the level of turbulence;
- A hydrodynamic turbulence-enhancing mixer integrated with an aerodynamic turbulence-enhancing foam generator;
- A hydrodynamic generator designed to increase the turbulence level of liquid flows moving through a pipeline;
- Sequential hydrodynamic and aerodynamic turbulence-enhancing flow converters integrated into a pipeline for processing liquid flows moving through the pipeline;
- An aerodynamic foam generator;
- A compact aerodynamic foam generator designed for integration into a fuel pipeline;
- A hydrodynamic mixer for liquids with different viscosities and physicochemical properties;
- A compact hydrodynamic mixer integrated into a fuel pipeline, designed for mixing liquids with different viscosities and physicochemical properties without requiring additional energy consumption for the performance of its functional operations;
- An integrated hydrodynamic-aerodynamic compact unit designed for installation in a fuel pipeline and for preparing fuel mixtures prior to their injection into the combustion chambers of combined engines operating according to the Otto cycle.

Analysis of Modern Techniques and Algorithms for Developing Innovative Technical Solutions Based on the Application of Distinctive Features of Known Inventions in a New Capacity and in Newly Emerging Fields of Technology
(Use of Basic Distinctive Features in a New Capacity)

First, we will briefly consider the technology proposed as an example, as well as its specific features and elements of novelty:

Figure 10. *Cross-Section of the Fuel-Mixture Homogenization Device*



The device shall consist of an accelerating hydrodynamic section transitioning into a coaxially arranged second hydrodynamic section with an integrated vortex generator, which in turn transitions into a hydrodynamic turbulence-enhancing

unit connected to the inlet of a high-pressure pump.

All milk to be homogenized in the proposed device is divided into two streams. The first stream, representing **60% of the total flow**, enters the accelerating hydrodynamic

ic section at a pressure of **3 bar (45 psi)**, where acceleration occurs in accordance with **Bernoulli's principle**. The second stream, representing **40% of the total flow**, enters the second hydrodynamic section, arranged coaxially with the first section, at a pressure of **3 bar (45 psi)**.

The device provides a dynamic process of sequential milk-flow homogenization. During the first stage, homogenization is achieved by controlling the level of turbulence within the pipeline. This process is presented as the principal element of novelty and is described in the relevant intellectual property protection documents.

The homogenized milk flow is then transformed into a vortex flow by means of the integrated vortex generator and directed to a high-pressure pump operating at a pressure of **2,000–3,000 bar (29,000–43,500 psi)**. The second stage of dynamic in-flow homogenization takes place under these conditions, resulting in a reduction in the particle size of the emulsion – milk being an emulsion – to less than one micron, thereby producing a nanoemulsion.

The homogenization process takes less than one second and is designed to preserve the natural and biological relationships among the components of the milk. The process takes place at a stable temperature or, under certain operating conditions, with a reduction in milk temperature.

The entire dynamic homogenization process is based on the creation of specific turbulent hydrodynamic conditions within the milk flow without disrupting the biological equilibrium among its components.

Advantages of the Proposed Process Compared with Existing Technology

- Existing technology does not include a stage of dynamic homogenization based on the turbulence level and therefore does not provide for homogenization directly within the pipeline;

- In the proposed process, the second homogenization stage is performed at a pressure that is at least twice as high;
- The resulting fat particles (globules) are stated to have a uniform size within the range of **70–120 nm** and to show no tendency to agglomerate, whereas existing technology is described as producing a particle-size variation of more than tenfold, from **0.2 to 2 μm** ;
- All homogenization processes can be performed directly within the pipeline, for example, during milk transfer from a tanker to the processing equipment of a dairy plant, without requiring dedicated production areas;
- The milk temperature does not increase during the proposed process;
- The device enables additional components, such as multivitamins or lysozyme, to be introduced into the milk during homogenization, including for the purpose of extending shelf life;
- The device has compact overall dimensions, is convenient to operate, and provides favorable conditions for sterilization;
- The device can also be used to perform fermentation either during or after homogenization without altering the parameters of the homogenized milk;
- The proposed device is described as significantly less expensive than existing equipment;
- The device can be used for technological homogenization before milk enters processing equipment for the manufacture of dairy products.

Based on the principles and methods of the Theory of Inventive Problem Solving (TRIZ) and the Algorithm for Inventive Problem Solving (ARIZ), a structural analysis of currently available milk homogenization technologies was performed.

The most probable systemic contradiction appears to be associated specifically with the application of high-pressure treatment to milk during the homogenization process.

References and patent literature

- Heath, Jeffrey Abramson, et al. **Method and Apparatus for the Detection of Distortion or Corruption of Cellular Communication Signals.** United States Patent Application No. **US 2022/0200699 A1**, June 23, 2022.
- Zhang, Wen, et al. **Autonomous Failure Recovery Method and System for Fiber-Optic Communication System.** United States Patent Application No. **US 2021/0028856 A1**, January 28, 2021.
- Nicas, Nicholas, et al. **System and Method for Providing Single Fiber 4K Video.** United States Patent Application No. **US 2020/0162183 A1**, May 21, 2020.
- Goodman, Igor, et al. **Method and Apparatus for Mitigating Interference in CPRI Uplink Paths.** United States Patent Application No. **US 2020/0059258 A1**, February 20, 2020.
- Goodman, Igor, et al. **Method and Apparatus for Mitigating Interference in CPRI Uplink Paths.** United States Patent Application No. **US 2018/0295632 A1**, October 11, 2018.
- Hartman, Mickey (Michael). **Electro-Optical Optic Sight.** United States Patent Application No. **US 2017/0059278 A1**, March 2, 2017.
- Heath, Jeffrey Abramson, et al. **Method and Apparatus for the Detection of Distortion or Corruption of Cellular Communication Signals.** United States Patent Application No. **US 2019/0123820 A1**, April 25, 2019.
- Nicas, Nicholas, et al. **System and Method for Providing Single Fiber 4K Video.** United States Patent Application No. **US 2018/0351682 A1**, December 6, 2018.
- Rubinchik, Valery, et al. **Photodynamic Therapy Laser.** United States Patent Application No. **US 2016/0074222 A1**, March 17, 2016.
- Tran, Thanh T., et al. **Scalable Communication System for Hydrocarbon Wells.** United States Patent Application No. **US 2018/0156031 A1**, June 7, 2018.
- Heath, Jeffrey Abramson, et al. **Method and Apparatus for the Detection of Distortion or Corruption of Cellular Communication Signals.** United States Patent Application No. **US 2017/0237484 A1**, August 17, 2017.

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