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**THE PRINCIPLE OF CONTINUITY OF USEFUL ACTION WITHIN
THE INFRASTRUCTURE AND ECOSYSTEM OF A SMART REAL
ESTATE OBJECT. (Innovative transformation of the ecosystem
and infrastructure of a smart real estate object based on
the principle of continuity of useful action, with a transition
to an advanced integrated supersystem incorporating
interrelated real-time online monitoring subsystems)**

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Abstract

The paper examines the innovative transformation of the ecosystem and infrastructure of a smart real estate facility into an advanced integrated supersystem incorporating interconnected subsystems for real-time online monitoring and control of energy supply and water treatment modules. These solutions constitute fundamental elements of the principle of continuity of useful operation.

Special attention is given to the application of innovative design, construction, and operational principles aimed at the development of a comprehensive system for regeneration and recirculation of wastewater and other environmental resources. The equipment framework integrates innovative relaxation systems as components of autonomous ecosystems within industrial, office, and warehouse environments.

The study also addresses the specific features of existing standards, conditions, and requirements for the development of structural elements of smart infrastructure, taking into account real-time monitoring and control tasks, as well as partial energy supply through the use of solar energy. Additionally, the paper analyzes the conditions for implementing visual stabilizers of the psychological climate in startup-oriented production environments.

Keywords: *Modern trends, integrated optimization technologies, fuel systems, thermodynamics, energy equipment, secure encoding, digital data carriers, digital storage media, resonance method, information processing principles*

Introduction

Since the emergence of the theory and systems of smart real estate infrastructure, the issues of energy engineering, thermodynamic energy equipment, and energy supply with minimal costs and minimal environmental impact have become extremely acute.

As these issues are highly comprehensive, in order to determine the strategy and the most effective trends in the development of this field, the author offers the reader introductory information on this topic.

Modern Trends in the Development of Technologies for Comprehensive Optimization of Fuel Systems of Thermodynamic Energy Equipment

In recent years, specialists and industrial practitioners have carried out significant work in the search for and selection of the most practical and efficient technical solutions aimed at the comprehensive optimization of the processes of preparation and supply of fuel mixtures into the combustion chambers of thermodynamic equipment.

Experimental installations have been carried out on diesel engines, boilers, diesel generators, gas turbines, and other thermodynamic equipment.

At the same time, within the framework of systematic research, investigators and designers have mainly focused on technical solutions related to the modification of fuel preparation systems and the associated systems for supplying fuel into the combustion chambers of thermodynamic equipment.

It should be noted that at the same time, new developments have appeared in this technological field in the so-called practical aspect, when an integrative synthesis of the level of efficiency of technical ideas occurred in combination with the capabilities and interests of investment partners.

In such studies, the conclusions, recommendations, and characteristics of multidisciplinary specialists, who equally possess both technological and design approaches as well as the specifics of investment support at all stages of project implementation, are of particular interest to innovation-oriented developers.

In this regard, developments, publications, inventions, and investment strategies

created comprehensively by well-known specialists with the participation of the author of this publication are of exceptional importance for the integrated practice of design and its implementation.

In these original and, to a certain extent, unique developments, a clear logical relationship is observed between the investment strategy and the stages and phases of project development corresponding to its requirements and constraints.

From the author's perspective, in whose developments the coordination of investment criteria and design parameters is linked by a specific algorithm, the professional fundamental knowledge and experience of developers of smart technologies, both in the field of technology and in the field of targeted financing of innovative projects, play an exceptionally important role, and their proper and harmonious combination is a guarantee of the commercial success of the project.

Principle of Continuity of Useful Operation

Work should be carried out continuously (all parts of the system must operate at full load at all times);

Work should be carried out continuously (all parts of the system must operate at full load and with controlled dynamics).

For a full understanding of the importance of this principle, it should be noted the subtleties of modern process-based control, in which a pause in the operational cycle of any system is also an object of control.

That is, continuity of operation includes all parts of the working cycle, including pauses.

This principle explains the necessity and possibility of incorporating algorithms into modern inventions.

In addition, switching the direction of actions and movements, as well as changes in pulsation dynamics, require program-controlled switching of the direction of movement of control elements and tools, among which the most effective have proven to be non-contact electromagnetic resonance instruments, which, when using a flat coil, exhibit extremely high response speed.

Furthermore, the use of a multilayer flat coil makes it possible to significantly increase the accuracy and penetration depth of the

signal impulse and to significantly reduce the dependence of measurement accuracy on electronic noise.

The principle of continuity of useful operation in so-called smart developments, which are most relevant today, may be represented by the following innovative development based on two technological directions: the principles of electromagnetic resonance spectroscopy applied for high-speed and accurate measurement and reading of the thickness of a coding layer.

Cybersecurity System

At present, cybersecurity systems based on innovative methods and approaches are of particular importance.

One of the key technologies used for this purpose is comprehensive encoding and decoding technology.

Protective Encoding of Optical Discs and Digital External Storage Media General Information

All projects in this group of technical solutions are based on a single method of encoding and subsequent identification of the recording of a coding element.

The essence of the principle consists in applying a coding coating or its technological equivalent to the protected object and subsequently measuring the thickness of this coating, which determines whether the measurement results correspond to the code.

If the obtained result coincides with the established code, positive identification of the coding element occurs; if it does not coincide, negative identification occurs, resulting in stopping or blocking the operational cycle of the equipment or the information consumer, for example, a computer.

Additional Technological Features

Technologically, the issues of applying special coatings have been resolved, and this technology has been repeatedly tested in similar tasks related to the control of film thickness on solar panel surfaces and in traditional semiconductor manufacturing.

In connection with the emergence of new formats for recording and reading data on optical media using blue lasers, as well as the beginning of production of multilayer

optical discs based on the same technology, the proposed principles and technical solutions for protective encoding have become even more significant.

This is due to the increasing amount of information stored on each disc, and the absence of protection leads to increasing losses of confidential or classified data.

Additionally, it is necessary to indicate the capability of encoding each layer in multilayer discs, whereby each recording layer is encoded. This represents a significant improvement in the three-dimensional structuring of optical storage media and enables localized selective encoding of information within a single disc for highly sensitive or classified data.

Organization of Corporate Protection Systems

The proposed technology, when applied to the organization of information flow protection within a corporation, ensures protection at multiple system levels, including real-time monitoring of the status and location of each disc within the organization.

When applied to mobile external storage media, the same advantages are expected as in the case of optical media.

Resonance Method (Brief Description)

The method involves the creation of an alternating electromagnetic field in the space where the test sample is located. This field acts as an intermediary between the resonant circuit and the sample.

The resonant circuit acts both as an emitter of this field and as a receiver of changes introduced by the sample.

Under the influence of the external alternating electromagnetic field, various electrical phenomena may be induced in the sample, including conduction currents, displacement currents, and ionic currents.

According to the principle of superposition, these phenomena distort the electromagnetic field, and these distortions are detected by the resonant sensor.

The system measures the resulting impedance, which reflects the properties of the sample.

Changes in impedance affect the frequency characteristics of the resonant circuit, including resonance frequency and amplitude.

Data Processing Principle

The use of multiple sensors operating at different frequencies enables the identification of material composition based on frequency-dependent impedance behavior.

This phenomenon is widely studied in electromagnetic resonance spectroscopy, commonly referred to as Electrochemical Impedance Spectroscopy (EIS).

By solving systems of linear equations based on sensor data, it becomes possible to

determine the concentration of components within a sample.

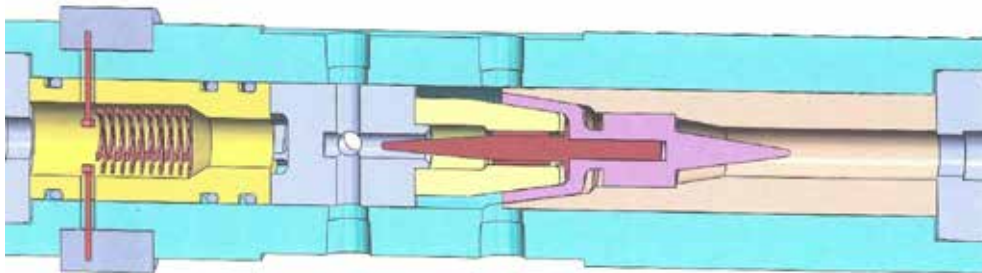
Application Example: Drip Irrigation Systems

As an example, the author proposes technical solutions for drip irrigation systems, which can be adapted for pipeline systems in agricultural facilities.

The system includes a nozzle (injector) in which water is mixed with air droplets within a vortex tube.

The structure consists of capsules with a compressed air core and a water оболочка, forming a compressible flow.

Figure 1.



The device shown in this figure presents a design in which the hydrodynamic function is combined with a coaxially arranged non-contact monitoring system based on electromagnetic resonance spectroscopy.

This enables real-time online monitoring of the parameters of the compressible fluid exiting the device.

Figure 2.

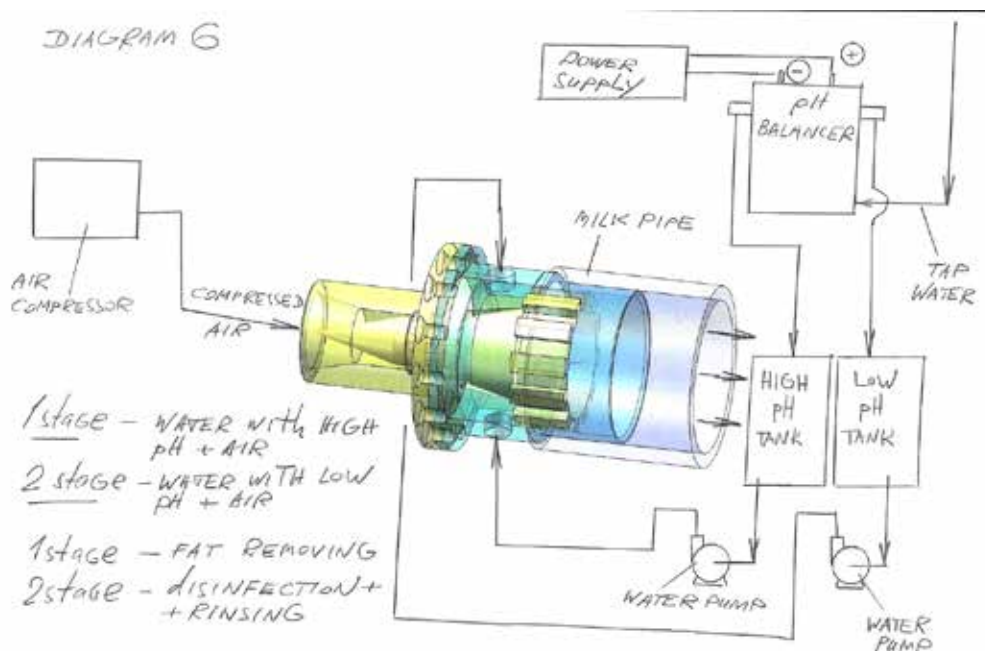


Figure 3.

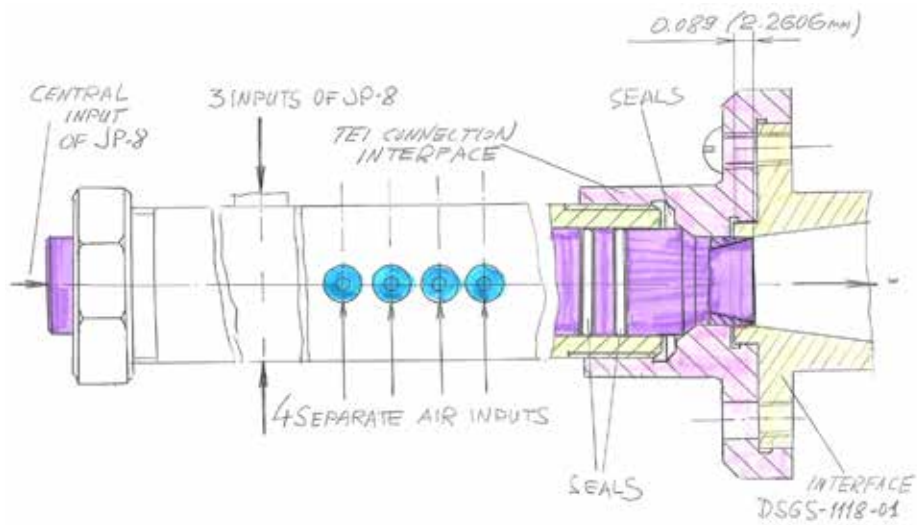


Figure 4.

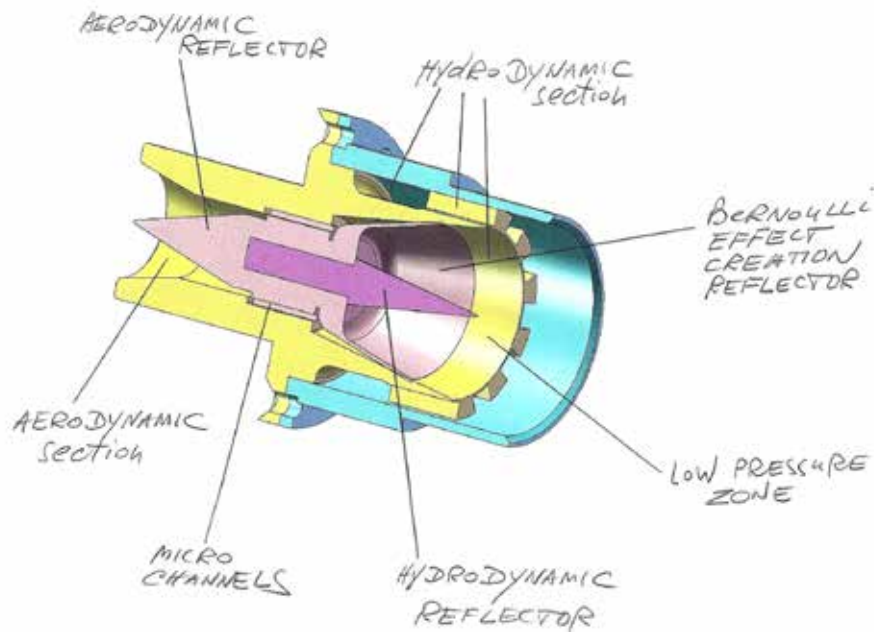


Figure 5.

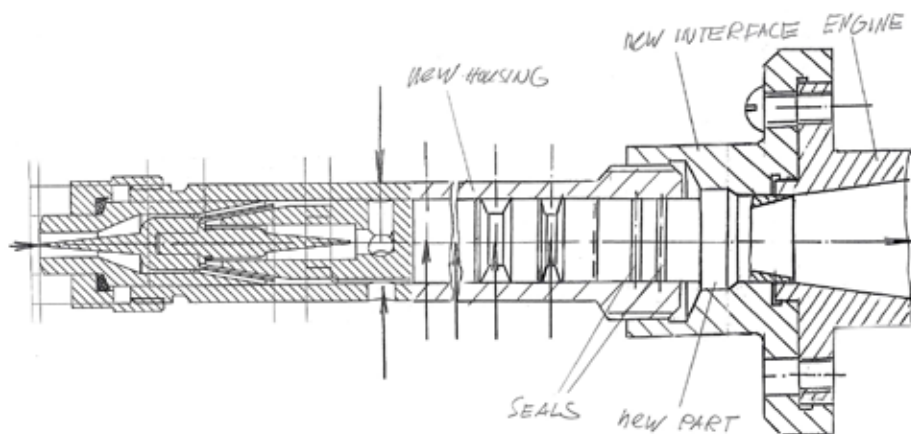


Figure 6.

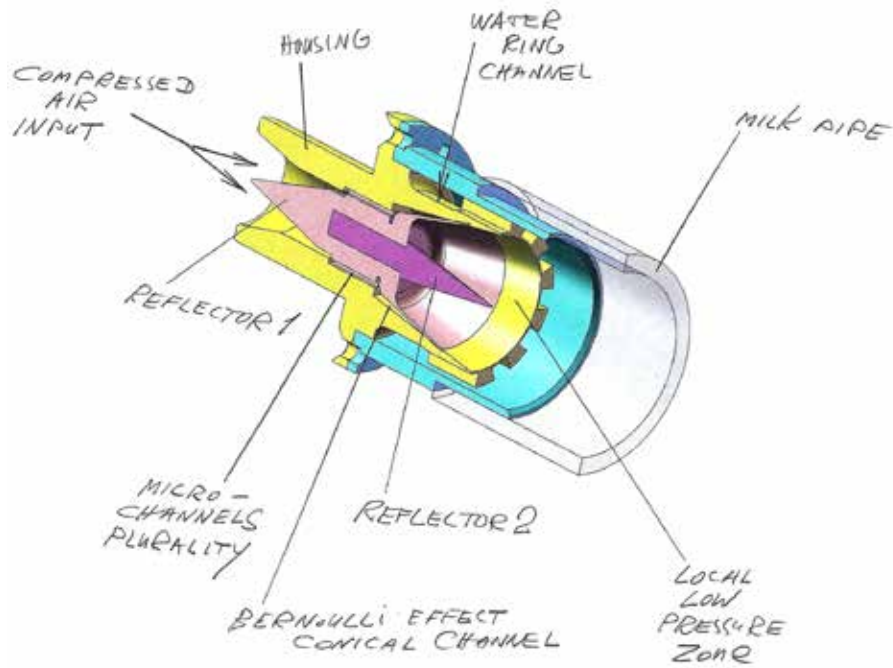


Figure 7.

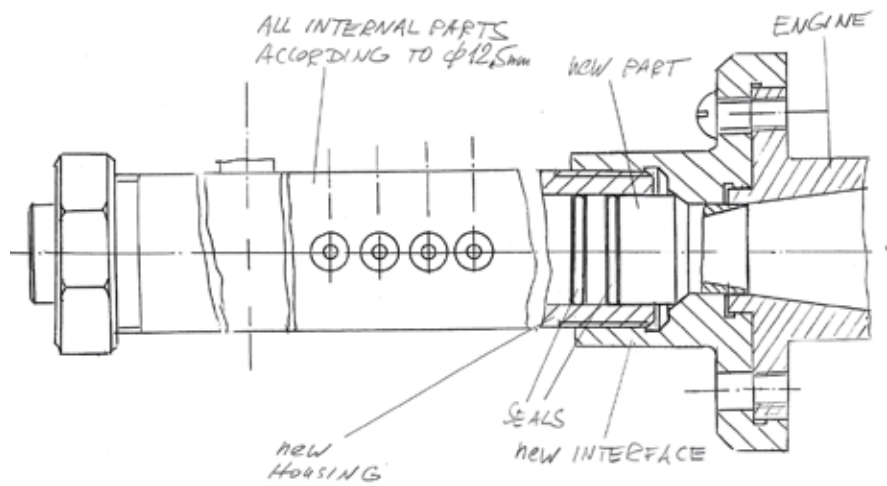


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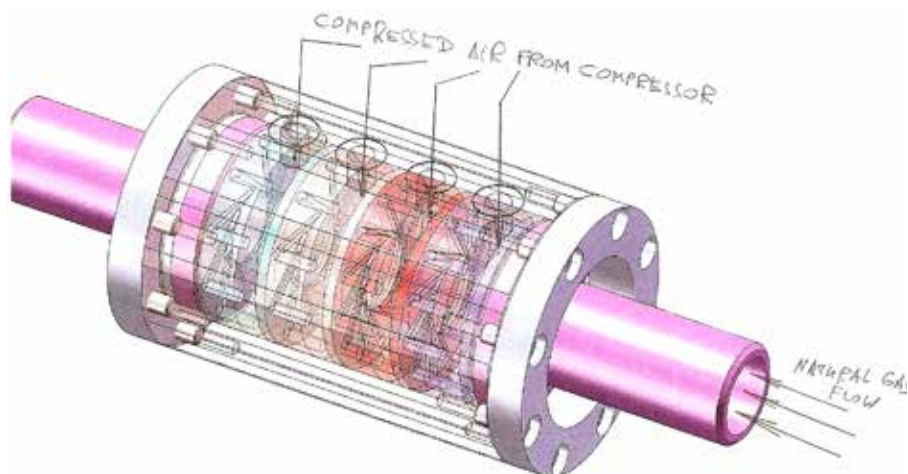


Figure 9.

The figures present three-dimensional models of the system components with labels and annotations.

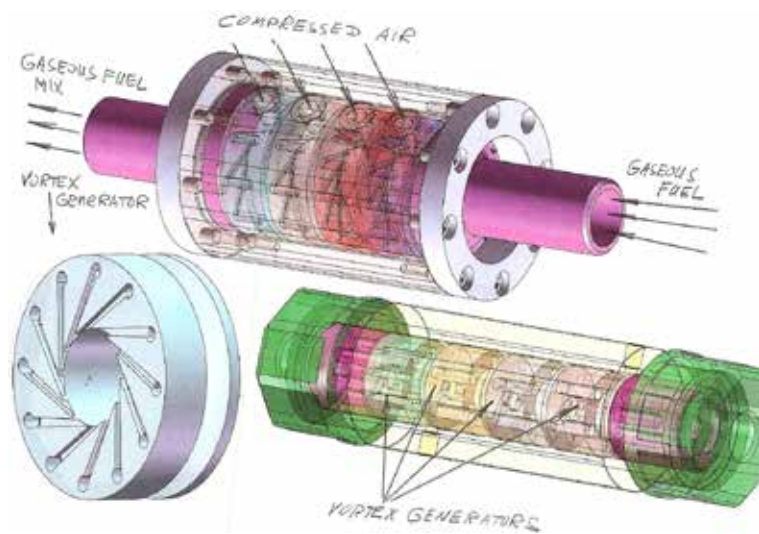


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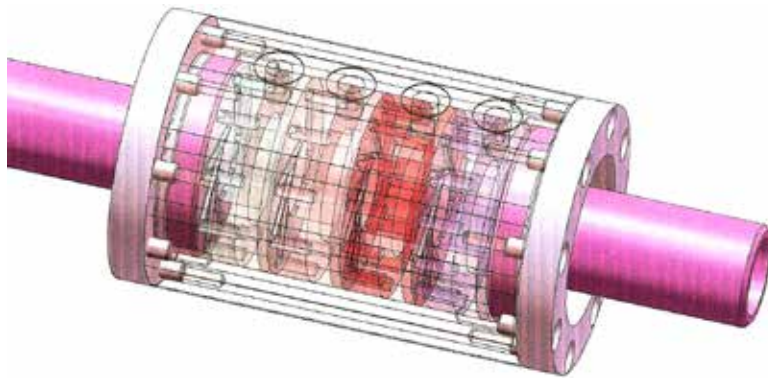


Figure 11.

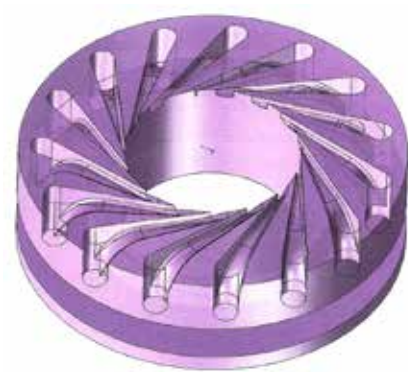
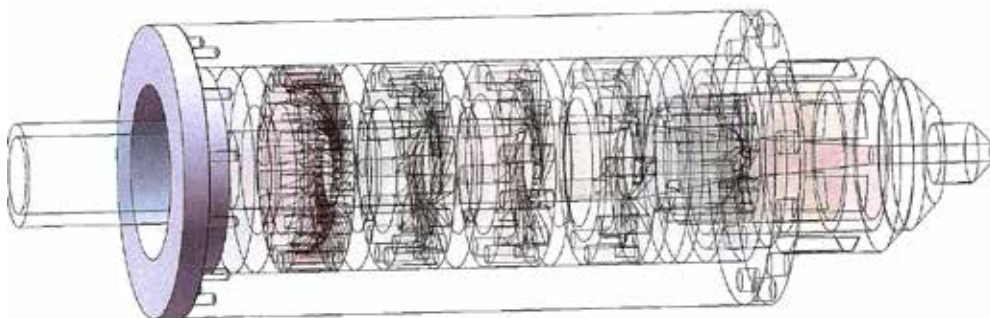


Figure 12.



The figures present three-dimensional models of the system components with labels and annotations.

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