Технічні науки

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CURRENT TRENDS IN THE DEVELOPMENT OF TECHNOLOGIES FOR OPTIMIZING SHOPPING CENTER ECOSYSTEMS

Summary. *In recent years, specialists and manufacturers have made significant progress in the search and selection of the most practical and efficient technical solutions aimed at the comprehensive optimization of fuel mixture preparation and delivery processes to combustion chambers of thermodynamic equipment within the infrastructure of smart homes.*

Experimental installations have been carried out on diesel engines, boilers, diesel generators, gas turbines, and other thermodynamic equipment used to equip fuel subsystems and supersystems within the smart home infrastructure and smart manufacturing facilities.

Key words: *Technology Development Trends, Comprehensive Optimization, Technology Improvement, Experimental Installation, Thermodynamic Equipment, Smart Home Infrastructure, Shopping Center Ecosystem, Systematic Search, Logistics Principles in Management and Control Systems, Smart Manufacturing Facility, Electromagnetic Resonance Spectroscopy.*

At the same time, in the systematic search, researchers and designers have primarily focused on technical solutions for modifying fuel preparation systems and related fuel delivery systems to combustion chambers of thermodynamic equipment, ensuring their operation with the integration of artificial intelligence elements and artificial neural networks.

It should be noted that, concurrently, new developments have emerged in this technological area, particularly in the so-called practical aspect of fully automated equipment operation modes with contactless control and monitoring systems, based on electromagnetic resonance spectroscopy. This has led to the integrative synthesis of the efficiency of technical ideas, combined with the interests and capabilities of investment partners.

Introduction. Expert opinion on the importance of applying the developments, inventions, and software programs by Yulia Trofimovska in the processes of technological and logistical organizational models for constructing the infrastructure of smart homes that host shopping centers or their ecosystem equivalents.

Modern trends in the development of technologies for the comprehensive optimization of fuel systems in thermodynamic energy equipment, as part of the infrastructure elements of a smart home hosting a shopping center, reflect the conceptual integrative proposals of universal specialist Yulia Trofimovska, one of the first authors of the concept of energy modules and logistics principles in management and control systems. These systems utilize artificial intelligence elements and artificial neural networks, while control systems for parameters apply basic techniques and principles of electromagnetic resonance spectroscopy.

In recent years, specialists and manufacturers have made significant progress in searching for and selecting the most practical and effective technical solutions aimed at the comprehensive optimization of the processes involved in fuel mixture preparation and delivery to combustion chambers.

Combustion Chambers of Thermodynamic Equipment in Smart Home Infrastructure

Experimental installations have been carried out on diesel engines, boilers, diesel generators, gas turbines, and other thermodynamic equipment used to equip fuel subsystems and supersystems within the infrastructure of a smart home and smart manufacturing facilities.

In this systematic search, researchers and designers have primarily focused on technical solutions for modifying fuel preparation systems and associated fuel delivery systems to combustion chambers of thermodynamic equipment, ensuring their operation with the integration of artificial intelligence elements and artificial neural networks.

It is important to note that, concurrently, new developments have emerged in this technological field, particularly in the practical aspect of fully automated equipment operation with contactless control and monitoring systems, based on electromagnetic resonance spectroscopy. This has led to the integrative synthesis of technical ideas' efficiency, combined with the capabilities and interests of investment partners.

For technological innovators, especially in R&D, the conclusions, recommendations, and characteristics from multidisciplinary specialists who equally master both technological and design techniques as well as the specifics of investment support at all stages and phases of projects are of great interest.

In this regard, the developments, publications, inventions, and investment strategy created by the renowned expert Yulia Trofimovska play an exceptionally important role in the comprehensive practice of design and its implementation.

In her original, and to some extent unique, developments, there is a clear logical connection between the investment strategy and the corresponding project development phases that meet its requirements and constraints, combined with systemic innovative logistics.

From the perspective of the author of this document, whose developments coordinate the criteria for investment and design parameters according to a specific algorithm, the professional knowledge and experience of Yulia Trofimovska in both technology and investment strategy are crucial for the success of such integrated projects.

The Role of Targeted Financing for Innovative Projects and Its Harmonious Integration as a Key to Commercial Success

The role of targeted financing for innovative projects is of paramount importance, and its proper and harmonious integration is the key to the commercial success of the project. To illustrate this, let's consider one of the most in-demand projects in the energy sector of smart homes, particularly when a shopping center is located within it. The importance and significance of combining the stages and phases of technological development with an investment-focused strategy—tied to the stages and phases of project development and the outcomes obtained upon their completion—becomes evident.

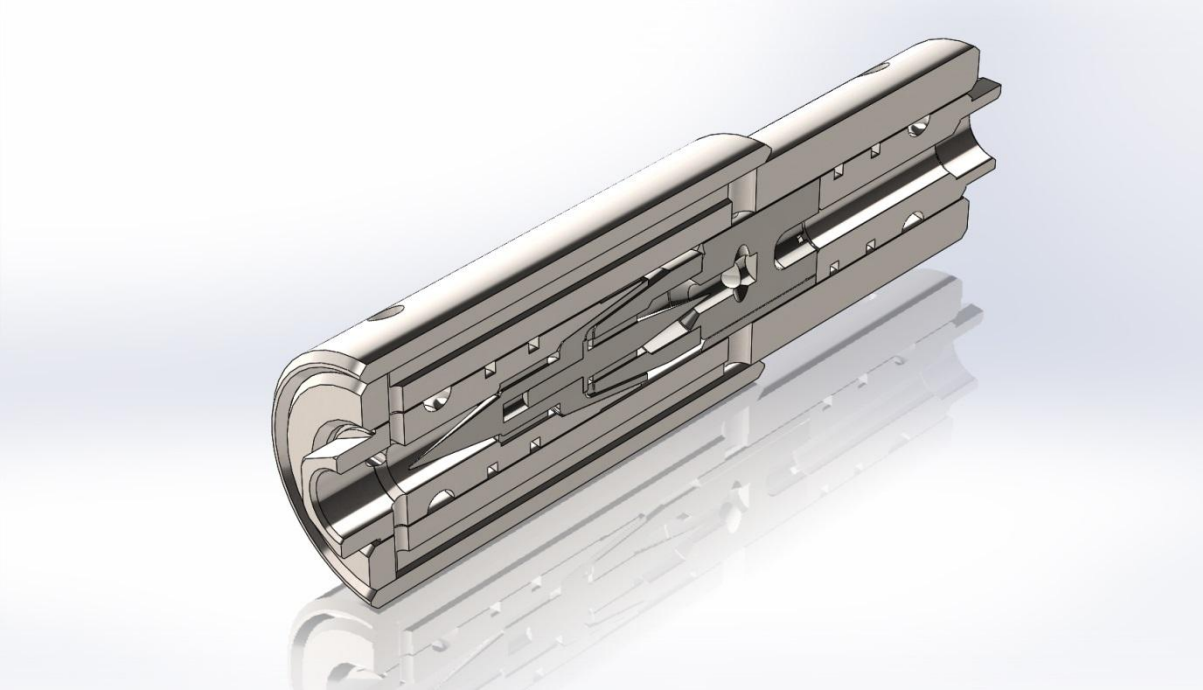

Fig. 1. A 3D model of a linear device for online stabilization of the turbulence level of the fuel mixture flow between the low-pressure fuel pump and the high-pressure fuel pump

As practice in the innovative development of projects shows, one of the most challenging questions is determining the criteria by which the newly created technology is evaluated and how its compliance with the parameters set by investors is compared by developers and investors alike.

A significant contribution by Yulia Trofimovska is the proposal to compare the achieved results with the control parameters set by investors. This comparison

should be carried out based on the patent-licensing strategy she developed and its core working algorithm.

Undoubtedly, the fact that Yulia Trofimovska, as the author of the patent-licensing strategy and its foundational algorithms, is also an active inventor—particularly in the energy and fuel sectors—greatly facilitates the understanding and enhances the level of trust in her highly effective recommendations and developments. Her dual role as both strategist and innovator provides a solid foundation for the practical application of her ideas and ensures their alignment with the real needs and challenges of the industry. This combination of theoretical knowledge and hands-on invention plays a crucial role in the success of her projects, further solidifying her authority in the field.

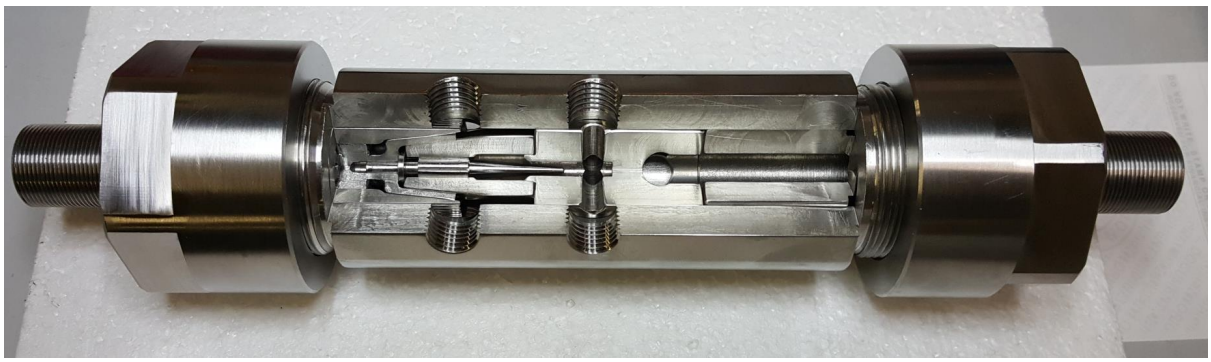

Fig. 2. Internal Structure of the System for Online Mixing, Homogenization, and Stabilization of the Turbulent Flow Mode of the Fuel Mixture

As shown in the diagram, the system consists of a minimum number of parts, most of which remain stationary during operation.

Demonstrating the Capabilities of the Device and Technology for Dynamic Mixing and Activation of Diesel Fuel with Flow Stabilization in Real-Time before it is fed into the burner, combustion chamber, or fuel injectors in the engine cylinders:

Tasks to Address During Comparative Testing of the Device (System) and Challenges in Presenting the Testing Results to Investors

The primary objective before conducting the tests is to assess the effectiveness of the fuel pre-mixing and activation technology. This includes

verifying the performance of the system in preparing the fuel mixture, emulsion, or blend before it is delivered to the standard burner.

Key aspects to evaluate include:

1. The **efficiency** of the pre-mixing and activation process for diesel fuel, ensuring it meets the desired flow characteristics.
2. The **real-time stabilization** of the fuel mixture's turbulence and its impact on combustion performance.
3. The system's **reliability** and **durability** under different operating conditions.
4. **Comparative testing** of the new technology against traditional fuel delivery systems to determine its performance advantages.

Finally, the results from these tests should be presented to investors, demonstrating the technology's commercial viability, operational efficiency, and alignment with their expected parameters and goals for the project.

The goal of such tests is to compare the results of the system with and without using the device for pre-dynamic mixing and activation of diesel fuel.

When evaluating the performance of the proposed device, the comparison base should include the main criteria that characterize the device's operation, as well as indirect criteria (aligned with the initial technical requirements, the project's technical specifications, and its phases and stages, which in turn must comply with applicable international standards).

Main Criteria for Comparison:

- **Specific fuel consumption** for achieving identical combustion parameters.
- **Concentration of nitrogen and carbon compounds** in the exhaust gases under identical combustion parameters.

Indirect Criteria for Comparison:

- **Amount of oxygen required** for the process.

- **Amount of air required** for the process.
- **Total exhaust gas volume**.

All of the above should be evaluated under **identical combustion parameters** and in full compliance with the requirements and limitations of the applicable standards.

The goal of the comparative testing also includes assessing the effectiveness of the device when working with diesel fuels of different viscosities, as well as with methanol, ethanol, and biofuels.

As noted by the author of this publication, to determine compliance with the initial technical requirements and the technical assignment, it is most practical to use the proposals and methodologies developed by Yulia Trofimovska. These take into account all the relevant nuances of investor requirements regarding intermediate testing results and their alignment with the technical assignment, which is also agreed upon with the investors.

It is also important to note that the **comprehensive evaluation system** for testing results, developed by Yulia Trofimovska, allows for the identification of problem areas at the early stages. This system enables timely adjustments to the project development plans, before reaching an irreversible point. By proactively addressing issues during testing, it ensures that potential obstacles are managed and corrected early, which significantly increases the chances of project success and minimizes the risks of costly setbacks in later stages. This approach highlights the value of continuous monitoring and adaptability in the innovation process, fostering smoother project execution and better alignment with investor expectations.

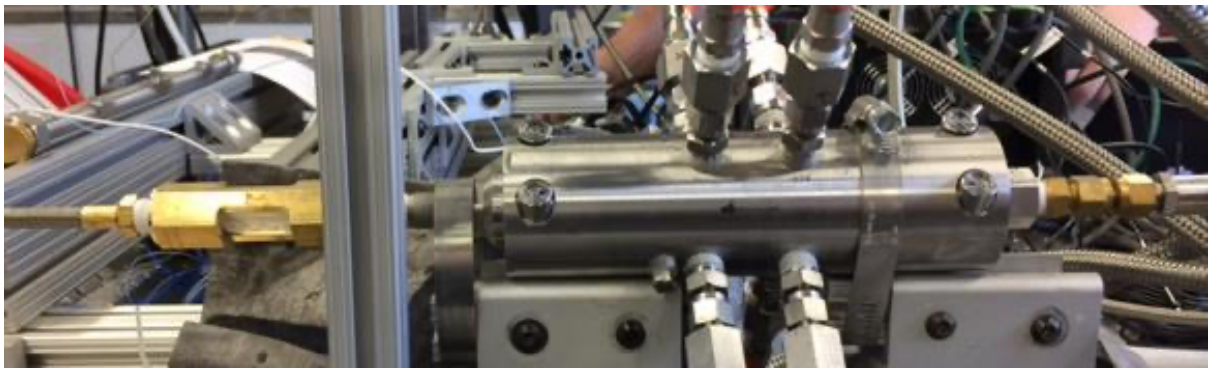

Fig. 3. The system during testing at one of the leading research centers in the United States, where it was evaluated for integration into the fuel pipeline of a gas turbine

Parameters to Control and Regulate in the Diesel Fuel and Compressed Air Supply Pipelines:

- **Pressure Control**: On all supply pipelines, it is essential to monitor and regulate the pressure within the pipelines. Special attention should be given to the **pressure drop** of the fuel mixture as it passes through the homogenization device and stabilizes the pulsation phenomena in the fuel flow.

  Developers of thermodynamic equipment consider minimizing pressure drop in the fuel mixture flow to be one of the key factors for the successful integration of the innovative system into the fuel pipeline of thermodynamic equipment.
- **Flow Control**: It is necessary to control and regulate the **flow rate** of the fuel and compressed air. This includes minimizing or completely eliminating pulsations and turbulence spikes in the fuel flow. A careful evaluation of these parameters ensures a smooth and stable operation of the system.
- **Comprehensive Evaluation Based on Flow and Pressure Data**: A full assessment must be made of the **volume and quantity** of the working medium supplied to the device, as well as the **mixing proportions**. This will ensure optimal performance of the mixing and activation system.
- **Compressed Air Requirements**:

- The system should allow for the regulation and measurement of **pressures** at 3, 4, 5, 6, 7, and 8 atmospheres.
- The system must provide for **equal flow rates** in all four supply pipelines, ranging from **0.3 liters per second to 2.5 liters per second** at 8 atmospheres of pressure. For turbines, the flow rate at **30 atmospheres** should also be accommodated.

Instrumentation Requirements for Testing the Dynamic Mixing and Activation of Diesel Fuel Before Continuous Delivery to the Burner:

The **accuracy** of the measurement instruments must meet the standards required by both **current international standards** and any **local standards** that may be more stringent than the international ones. The accuracy requirements should be aligned with the precision necessary for ensuring reliable and reproducible testing results, ensuring that any deviations from the standard do not compromise the system's functionality and performance during testing.

List of References and Patent Information:

United States Patent Application **20180321666**
Kind Code **A1**
Cella; Charles Howard; et al. **November 8, 2018**

METHODS AND SYSTEMS FOR EQUIPMENT MONITORING IN AN INTERNET OF THINGS MINING ENVIRONMENT

Abstract

An apparatus, methods, and systems for data collection in a ***production*** environment are described. The system may include a data collector communicatively coupled to a plurality of input channels, wherein a first subset of the plurality of input channels are connected to a first set of sensors measuring operational parameters from a ***production*** component, a data storage structured to store a plurality of collector routes and collected data, a data acquisition circuit structured to interpret a plurality of detection values from the collected data of the ***production*** component, and a data analysis circuit

structured to analyze the collected data and evaluate a first collection routine of the data collector based on the analyzed collected data, wherein based on the analyzed collected data the data collector makes a collection routine change.

United States Patent Application **20180284753**
Kind Code **A1**
Cella; Charles Howard; et al. **October 4, 2018**

METHODS AND SYSTEMS FOR DATA STORAGE AND COMMUNICATION IN AN INTERNET OF THINGS CHEMICAL PRODUCTION PROCESS

Abstract

A system, method and apparatus for data collection related to a chemical ***production*** process are described. The system may include a cross point switch including a plurality of inputs and a plurality of outputs, a plurality of sensors operatively coupled to at least one of a plurality of components of the chemical ***production*** process, a sensor data storage profile circuit structured to determine a data storage profile, wherein the cross point switch is responsive to the data storage profile to selectively couple at least one of the plurality of inputs to at least one of the plurality of outputs, a sensor communication circuit communicatively coupled to the plurality of outputs of the cross point switch, and a sensor data storage implementation circuit structured to store at least a portion of the plurality of sensor data values in response to the data storage profile.

United States Patent Application **20060036394**
Kind Code **A1**
Chen; Wen-Ling; et al. **February 16, 2006**

Universal and integrated ***wafer*** testing real-time monitoring software system and its open system architecture

Abstract

A ***wafer*** testing real-time monitoring software system and its unique open software architecture which achieves real-time monitoring of ***wafer*** test results and on-***line*** changing of externally hooked software to satisfy customer needs

without changing its main program. The software structure receives and processes binary files from different probers and converts these into readable ASCII files. The system consists of four software programs that can operate independently. These programs are an ***automatic*** transfer program, a program which converts ***wafer*** test results from a binary file to an ASCII file, a program which receives the ASCII files and performs ***wafer*** map editing, and an auto-ftp program which automatically scans data and sends data to remote locations. Additionally, multiple workstations can process data from probers simultaneously. The on***-line*** monitor on a ***production line*** can see ***production*** results from multiple major workstations through the network drive and drive mapping functions.

United States Patent Application **20070156272**
Kind Code **A1**
Winstead; Charles H.; et al. **July 5, 2007**

Integrated configuration, flow and execution system for ***semiconductor*** device experimental flows and production flows

Abstract

According to embodiments of the invention, an integrated configuration, flow and execution systems (ICFES) may be used to specify, control and record a history of processing of both ***semiconductor*** device experimental lots and ***production*** lots of wafers. Moreover, the system allows combining of one or more partial flows of pre-existing flow blocks, and special processing into another processing flow block. A lot plan can be created that includes the flow block, and the lot plan can be updated to include partial flows and special processing before or during processing of the lot plan.

United States Patent Application **20060064188**
Kind Code **A1**
Ushiku; Yukihiro; et al. **March 23, 2006**

Process-state management system, management server and control server adapted for the system, method for managing process-states, method for manufacturing a product, and computer program product for the management server

Abstract

A process-state management system encompasses: a plurality of ***production*** machines; a control server configured to collectively control at least part of the ***production*** machines; a management server including a data-linking module configured to link operation-management data of the ***production*** machines with corresponding management information transmitted from the control server, respectively, the management server analyze the operation-management data linked with the management information with a common analysis application; and a management database configured to store the operation-management data linked with the management information.

United States Patent Application **20170004985**
Kind Code **A1**
NISHI; Shinichi; et al. **January 5, 2017**

PRODUCTION SYSTEM FOR PRINTING ELECTRONIC DEVICES

Abstract

An object of the present invention is to provide a printing ***production line*** system for an electronic device, the printing ***production line*** system that can achieve prevention of defective products caused by dust generated by a printing method and increase electronic device productivity, and a transport chamber provided with a robot transport ***line*** 100 in which a self-traveling robot 111, 112 that transports a base material 15 in a sheet-fed manner in a free state travels is provided, a plurality of processing chambers 6 for forming an electronic device on the base material 15 by printing are provided on at least one side of the transport chamber, a base material transfer area 601 that performs loading of the base material 15 to the processing chamber 6 from the self-traveling robot 111, 112 and unloading of the base material to the self-traveling robot 111, 112 from the processing chamber 6 is provided between the transport chamber and each processing chamber 6, the transport chamber and the base material transfer area 601 communicate with each other through an opening 602 in which a one-way air flow moving to the side where the processing chamber 6 is located from the side where the transport chamber is located is formed, and the one-way air flow in the opening 602 is formed by making an adjustment such that the air pressure in the transport chamber becomes higher than the air pressure in the base material transfer area 601.

United States Patent Application **20180133677**
Kind Code **A1**
KIM; Ju Hee **May 17, 2018**

APPARATUS FOR A MASS PRODUCTION OF MONODISPERSE BIODEGRADEABLE POLYMER-BASED MICROSPHERES AND A MULTI-CHANNEL FORMING DEVICE INCORPORATABLE THEREIN

Abstract

Provided is an apparatus for a mass ***production*** of microspheres and a multichannel forming device incorporatable therein. The apparatus comprises a multi-channel microsphere forming unit, a first source material reservoir containing the first source material and in fluid communication with the plurality of first microchannels, a second source material reservoir containing the second source material and in fluid communication with the plurality of second microchannels, a flow control unit configured to supply a first gas to the first source material reservoir at a first source material flow rate and to supply a second gas to a second source material reservoir at a second source material flow rate and a product reservoir for accommodating the microspheres formed from the multi-channel forming unit.