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ІННОВАЦІЇ В СУДНОБУДУВАННІ ТА ОКЕАНОТЕХНІЦІ

МАТЕРІАЛИ XIII МІЖНАРОДНОЇ НАУКОВО-ТЕХНІЧНОЇ КОНФЕРЕНЦІЇ

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НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ КОРАБЛЕБУДУВАННЯ імені адмірала Макарова

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[4]. Kris Osborn. The Navy's Unmanned Surface Vessels Will Be Hungry for Energy. https://nationalinterest.org/blog/buzz/integrated-power-and-energy-systems-will-power-21st-century-weapons-199462

Formulation Of The Main Tasks Of Creating Unmanned Surface Vessels Based On A Systematic Approach

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The report is devoted to the formation of key tasks for the design of marine robotics, including unmanned transport systems. A variant of formalization of the key initial stage of the development of unmanned marine systems is proposed. This will contribute to the maximum compliance of the final product with the goals.

Key words: design, system analysis, unmanned surface ship.

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FLEXIBLE MEASUREMENT SYSTEM FOR ONLINE MONITORING AND CONTROL OF VARIOUS LIQUIDS

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Abstract. The concept and various options of a versatile multipurpose system for liquid measurement and custody transfer with corresponding web applications are presented. The main feature of the concept is an open and scalable system architecture that securely enables access to the measurement data for all interested users/services, enabling advanced flexibility and making the next step in business process automation, increasing safety and performance levels using the concept of data availability.

Keywords: inventory management system, custody transfer, measurement, web application.

The measurement and control of parameters of various liquids are one of the most frequent tasks in all kinds of production/processing/transportation processes [1-3]. All the measured parameters are conventionally grouped into two main sets: quantitative and qualitative. Both quantity and quality parameters of controllable liquids are important and used to calculate overall process efficiency or other specific process features. The *main goal* of this study is the synthesis of the concept of a modern custody transfer and inventory control system that brings together the ease of exploitation

of a complex system with full legislation compliance, scalability, and the feature of simple data sharing/usage for additional calculation algorithms or processing.

The data about the quantity and product quality parameters is important both on the production and the business levels (e.g. - to provide safety and assets utilization efficiency at the controllable facility; calculate the overall quantity of stored products; analyze and predict product flows estimate business opportunities and predict/optimize flows and revenues, especially in case of large and distributed holdings). It seems natural to make the most of data acquired in the “connected world” and digital era. To provide high efficiency and sustainable development it’s necessary to act fast and decisions must be based on the actual data. Thus, it’s important to measure all required parameters with the required time delays/frames, and make that data available for all interested subscribers, ensure required data quality in several aspects: accuracy and uncertainty, consistency for a task and the ability to use this data together with the data from other sources to produce new knowledge and value. In this case metering systems became the sources of valuable data about the business/production processes and assets involved: storage facilities and measurement & control equipment used, and personnel involved. Considering the modern measurement solutions, it's important to show the trends of redistribution of functions; equipment becoming smart and complex. Thus, sensors and systems become intelligent and flexible having a large computational power, and advanced communications options. The custody transfer systems (equipment, software and their interconnections) for liquids (e.g. hydrocarbons) are regulated by appropriate national legislation. Thus, the changes to the structure of the system or calculation algorithms face challenges because of the closed architecture of the measurement systems. The concept also requires paying attention to the security questions, because of the high significance of the data to the end-users. One of the *principal aims* of the concept is to maximize the economic benefit to the end-user of its measurement solution and resources utilization.

Another goal function is to make the system versatile in the meaning of applications: tanks storage terminals, refineries, fuel depots (aviation, marine), petrochemical industries, power plants, biofuel plants, vegetable oil depots. It must be applicable for reservoirs of any type and size. It should be mentioned that the system must be able to work with pressurized tanks, so advanced algorithms should be used for vapor calculation and overall systems accuracy improvement [4-5]. The system must meet the requirements of scalability: it must work both independently in a small reservoir park (e.g. fueling station with 1-3 reservoirs) and in a large holding with various distributed terminals and a number of tanks containing various liquids. It must be emphasized that the architecture of the system must be designed to work on stationary and moving objects (e.g. marine tankers, mobile warehouses or fuel carriers) enabling monitoring of fuel and cargo during transportation or other important domain-related applications [2, 6]. The listed features are the limitations for both equipment and software development. All aforementioned features can be illustrated on the basis of the “SADCO+” and “MIRA+” [7] tank gauging system under development.

The typical system installed on a localized reservoir includes a set of required sensors (levels 1, multipoint temperature 2, pressure 3), switchboards 4 to connect components of the system with the console 5 that collects all required data and runs the calculation subroutines – see Fig. 1.

The console also writes all the data into the local or remote database server, so the data is always available. The console can also run an internal web application providing measurement data and standardized reports for intranet clients.

From a legal point of view, all equipment and software must comply with the requirements of legal metrology (as per OIML and API standards) and/or comply with the requirements of other important directives, e.g. ATEX for safety requirements for equipment used in explosive atmospheres.

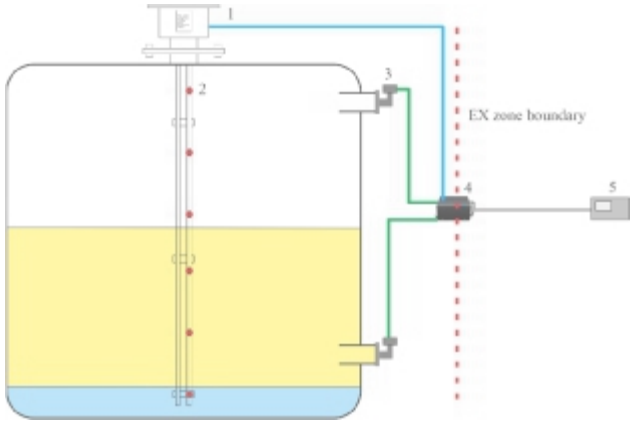

Fig. 1 Multipurpose tank gauging system for inventory management and custody transfer (one of the typical options for one tank)

To achieve the required level of flexibility it's assumed to use web-based architecture for large distributed systems. The systems in this case are able for data sharing of information using all available channels. Web applications (or their modules) can be used for data aggregation and report generation. They can be furtherly developed for user-specific needs such as calculations of derivative parameters using alternative techniques (not equal to the standards of equipment installation points), and other specific functionality that isn't performed locally. Thanks to the modular design and the use of web applications, a system can be easily expanded or upgraded – see the Fig.2 for the description of the optional structure.

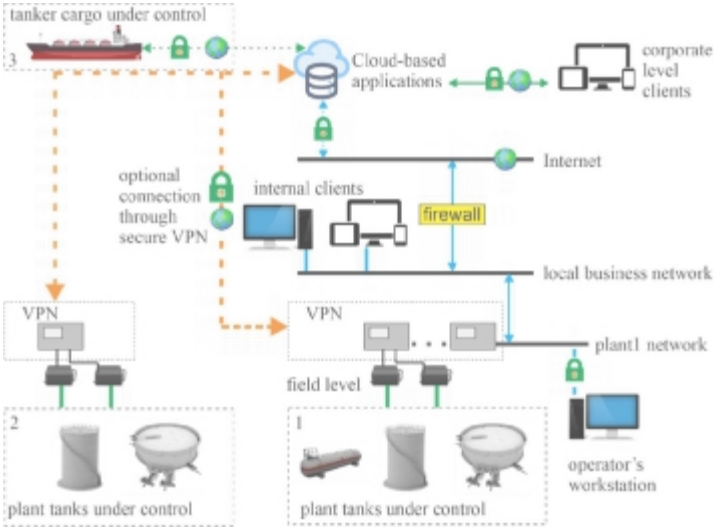

Fig. 2 – The architecture of the distributed system with dedicated data access and information flows through VPN or secure connection over internet

The typical system installed on a localized facility (e.g. 1,2,3) runs the internal web application to provide data for internal clients. Consoles can be networked using a VPN or local network to provide scalability and equipment placement flexibility. The software can use an internal or separate database server for security reasons. To enable data availability from all over the world cloud services can be used in a full replication mode or periodically updating the information for each controllable object.

Main requirements for the inventory management and custody transfer systems for liquids in reservoirs are given. The architecture of the flexible multipurpose tank gauging system for distributed objects which uses the advantages of modern web applications and cloud solutions is presented.

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ТРЕНАЖЕРНА ПІДГОТОВКА СУДНОВИХ ЕЛЕКТРОТЕХНІЧНИХ ОФІЦЕРІВ ЗА ОСВІТНЬО-ПРОФЕСІЙНОЮ ПРОГРАМОЮ „ЕКСПЛУАТАЦІЯ СУДНОВОГО ЕЛЕКТРООБЛАДНАННЯ І ЗАСОБІВ АВТОМАТИКИ”

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Анотація. Розглядаються питання тренажерної підготовки студентів з використаннямі навчально-тренажерного стенду суднової електростанції (НТССЕС). НТССЕС має у своєму складі дві ідентичні за своєю структурою та схемними рішеннями генераторні секції, які дозволяють виконувати різноманітні практичні та науково-експериментальні дослідження у галузі якості електроенергії, що виробляється, паралельної роботи генераторів, розподілу навантаження, захисту генераторних агрегатів та ін.

Ключові слова: тренажер, електроенергетична система судна, генераторна секція, управління, функціональні операції електромеханіка.

Основним керівним документом щодо підготовки командного складу морських суден, в тому числі електромеханіків суднових, є Міжнародна конвенція про підготовку і дипломування моряків та несення вахти (ПДНВ-78) з поправками 2010 р [3].

Згідно ПДНВ студент (курсант) – електромеханік морської спеціальності протягом навчання має не тільки засвоїти всі теоретичні відомості та розуміти принципи будови, роботи і базового обслуговування електротехнічних засобів, систем сигналізації і автоматики, комп’ютерної техніки і комп’ютерних мереж судна, які знаходяться в його компетенції, але й