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UDC 004.054

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INDUSTRIAL GAS STOCK MANAGEMENT PROBLEM

This article outlines the problem of inventory management of industrial gases in the warehouses of enterprises that are engaged in their production as one of the key problems in economic activities of any enterprise of this kind. The analysis of modern approaches to address inventory management problems of industrial gases in the warehouses of the enterprise. The analysis of the formation of stocks of industrial gases, and the need to manage them in order to obtain the highest profit. Based on this analysis

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formed the subject area and the task is formulated for efficient inventory management of industrial gases, also put forward our own proposals, which should be considered to reduce the costs of the enterprise in the formation of stocks of industrial gases.

Key words: industrial gas; stocks; efficiency; demand; volume of stocks.

Піднято проблему управління запасами промислових газів на товарних складах підприємств, які їх виготовляють, як одну з ключових проблем у господарській діяльності будь-якого підприємства цього виду. Проаналізовано сучасні підходи щодо проблем управління запасами промислових газів на товарних складах підприємства. Проаналізовано формування запасів промислових газів та потребу управляти ними для того, щоб отримати найвищий дохід. На основі цього аналізу сформовано предметну область і завдання для ефективного управління запасами промислових газів, наведено наші власні пропозиції, на які слід зважати, щоб скоротити витрати підприємства під час формування запасів промислових газів.

Ключові слова: промисловий газ; запаси; ефективність; обсяг запасів.

Problem formulation. Industrial gases [1] are substances and their compounds of chemical origin in liquid or gaseous state, which are artificially produced by the atmospheric air separation, recovery from the crude hydrocarbons or chemical methods, and are stored pressurized in the special vessels, and used for a variety of ends.

Specific properties of industrial gases [2] are used for providing the enhanced efficiency, safety and cost effectiveness in many processes and activities.

Each entity engaged in manufacture of industrial gases faces the challenging issues related to industrial gases stock forming, transportation, storage and sales.

Industrial gases stock management problem [3] is particularly acute and topical.

Analysis of recent researches and publications. Currently, many plants, factories and enterprises use industrial gases for production of commodities and rendering of services. Such gases stock forming is essential consideration in every enterprise activity.

Greatest challenge is possible degradation of industrial gas quantitative (volume) and qualitative (stated properties) characteristics over time.

It is implicit in [3] that the industrial gas stock management problem should be understood to mean time-determined relationship between such gases characteristics variation and their stock held in enterprise storage facilities.

Purpose of the article. Provision of a rationale for a need for industrial gas stock management and problem of business costs of enterprise engaged in industrial gas production.

Main material. Work [4] presents the need for industrial gas stock management. Since surplus stock of industrial gases may result in the losses of enterprise engaged in their production due to the possible degradation of gas volume and stated properties, while understocking may result in the possibly missed profit, then problem of industrial gases stock accumulation, taking into account requirements of the market (demand, supply, competitors' prices), is the topical issue.

It should be noted that degradation of gas quantitative and qualitative characteristics depends on specific gas, and it means that some industrial gases can be

stored for a longer time than other ones, and potential profit from marketing of such gases would be higher.

Let us consider the industrial gas stock management problem presented in [4], taking into account that degradation of industrial gas characteristics depends on specific gas.

We identify basic data for the industrial gas stock management problem in view of the foregoing.

1. Different types of industrial gases may be held at the same storage facility; therefore, we consider industrial gases stock as multiproduct one.

2. The industrial gases stock should be understood to mean products manufactured by enterprise, but yet not sold. We designate total volume of “quick” gases as V_s and volume of “slow” gases as V_{SL} with $V_s < V_{SL}$.

3. Demand for the industrial gas should be understood to mean volume of gases, which are purchased by consumers from enterprise on a regular basis for the certain period, and we designate it as V_D .

4. We take into account that “seasonal” gas may be held in storage, for which demand is high in the certain periods of year, and we designate it as V_{SEAS} .

5. Industrial gases stock replenishment would take place at their stock reduction, taking into account the prospective demand and requirements of the market.

Therefore, optimum industrial gases stock model is given by the following formula:

$$V_T = V_s + V_{SL} + V_{SEAS}, \quad (1)$$

where V_T is total volume of industrial gases held in storage facilities, V_{SEAS} is volume of gases with high demand in the certain periods of year only, V_s is volume of gases retaining their characteristics for a not longer time than other ones, and V_{SL} is volume of slow gases.

Thus, ideally, V_T should tend to V_D .

$$V_T \approx V_D, \quad (2)$$

where V_T is total volume of industrial gases held in storage facilities, and V_D is volume of all gases, which are sold by enterprise.

We designate a gas volume unit price as R . In this case, we consider a price to be fixed for different gases. Thus, prospective profit from the sale of total gas volume held in storage facilities of enterprise is calculated according to formula:

$$T_{\text{pi}\ddot{o}} = V_{\text{T}} * R, \quad (3)$$

where V_{T} is total potential profit from the sale of total stock, V_{D} is total volume of industrial gases stock, and R is gas volume unit price.

However, the real profit from the sale of gas stock makes:

$$T_{\text{REAL}} = V_{\text{D}} * R, \quad (4)$$

where T_{REAL} is total real profit from the sale of total stock, V_{D} is total volume of industrial gases stock purchased from enterprise, and R is gas volume unit price.

In view of the foregoing, business costs are calculated according to formula:

$$Z = T_{\text{pi}\ddot{o}} - T_{\text{R}\ddot{A}\ddot{A}\text{L}}, \quad (5)$$

where Z is total business costs, $T_{\text{pi}\ddot{o}}$ is total potential profit from the sale of total industrial gases stock, and $T_{\text{R}\ddot{A}\ddot{A}\text{L}}$ is total real profit from the sale of total gases stock.

Thus, it may be assumed that total business costs related to industrial gases accumulation, sales and possible storage losses are criterion of effectiveness of industrial gases stock.

Conclusions and further researches directions. From our point of view, for the solution of the industrial gas stock management problem and development of efficient stock management models, following problems should be considered.

1. Industrial gas consumer market research with the purpose of development of models for planning of demand for the industrial gases. This would allow increasing the industrial gases stock offering most potential profit and thus business costs reduction.

2. Obvious is the problem of minimization of parameters involved in calculation of efficient industrial gas stock management. In such a case, industrial gases stock accumulation requirement could be predicted with high probability.

Further research perspectives are related to:

1) evaluation of parameters required for development of industrial gas stock management models;

2) development of methods for business costs reduction at industrial gases storage and sale.

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УДК 004:336.71

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**МОДЕЛЮВАННЯ ІНФОРМАЦІЙНОЇ СИСТЕМИ
З НАДАННЯ БАНКІВСЬКИХ ПОСЛУГ**

Розглянуто моделювання інформаційної банківської системи на основі досвіду створення цих систем. Проаналізовано ознаки, особливості та наявний стан розвитку інформаційних програмних засобів роботи з клієнтами, надання їм актуальних банківських послуг. Запропоновано покращання методу розробки інформаційної системи шляхом використання принципу модульності під час роботи з інформацією та банківськими продуктами. Наведено приклад власної інформаційної системи, а також діаграми, що наочно відображають цей процес.

Ключові слова: *інформаційна банківська система; принцип модульності; взаємодія користувача із системою; банківські продукти; оптимізація роботи.*

This article focuses on the modeling of the information system of banking service which was based on the experience of creating such systems. Information banking system

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