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A NEW APPROACH TO THE RATIONAL CHOICE OF THERMAL UNITS SEALING SYSTEMS RESOURCE INCREASING SUBSTANTIATION

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To estimate reliability of thermal units sealing systems it is offered complex criteria in which parameters of the technical state of assemblies and also the functions reflecting a degree of effect operational, mechanical and temperature factors on process of a depressurization of the unit elements are integrated.

The major requirement to any projected heat engineering unit is technogenic safety. The problem of the sealing of coke-oven doors constantly attracts the attention of coke chemists all over the world in connection with ever increasing requirements for the ecological safety of coke production. The search and creation of more reliable door structures with various types of seals is carried on in many directions. Hundreds of various designs have been developed and tested in practice, in particular the designs of sealing mechanisms — rigid, flexible, soft, elastic, plastic, etc.

However, the problem has not been solved completely because of the insufficient level of the quality of all known designs of seals of coke-oven doors with respect to one or more characteristics: cost, durability, compensating capacity, strength, etc.

It is necessary to develop a methodology of definition of sealing systems efficiency that allows calculating the values of ecological compatibility emission assemblies' criteria during any period of the operation.

It's rather difficult to establish numerical values of tightness criteria for the facility applied in chemical, coking, metal industries because this process is under the influence of factors, which are difficult to consider, in particular stock load, gases, formed during the refining process, serving machines influence; temperature differences in the time of loading - unloading of a material and change of thermal streams of the heating system; aggressive environment influences at high temperatures, etc.

It's necessary to appoint the features of describing parameter of depressurization process to reflect the influence of operating factors. Medium leakage per unit perimeter per time unit Q is accepted as a parameter.

The choice of the concrete parameter narrows the results applicability area of research that contradicts the requirements defining the value of results. This contradiction can be weaken using the rational form of results representation on the basis of the generalized analysis methods, in particular, the theory of similarity and the analysis of dimensions. Methods are in replacement of multitude of individual factors by dimensionless complexes group, number of

which, as a rule, is less than the general number of initial dimensional factors. Ipso facto, the degree of a result generality rises without any information loss.

According to theorems of the theory of the dimensions, any physical parity between dimensional quantities can be formulated as a parity between infinitesimals. The criterion of emission assemblies of thermal devices tightness is developed with the use of similarity and the analysis of dimensions theory methods, in which all enumerated factors are merged.

$$Q_{ПДВ}\left(\frac{\mu}{\Delta pB}\right),$$

μ - dynamic viscosity gas-and-dust emissions. Δp - pressure difference between internal and external environment, **B** - the area of the gap in connection of the elements.

With account taken the depressurization process and ageing of elements during operation of the thermal unit emission-danger assemblies tightness is provided if:

$$Q_{ПДВ}\left(\frac{\mu}{\Delta pB}\right)\cdot\frac{1}{K_Q}\geq 1,$$

where K - criteria functions taking into account factors influence on the assembly tightness

Criteria functions are the regression equations in a general view. Regression equations factors are obtained by processing the experiment results of coke ovens connections tightness change during the operating process.

The considered problem is multi-parametric, that's why to obtain full factors influence on representation of depressurization process the great machine time consumptions are needed. The use of generalized analysis creates fundamental advantages in such conditions since the reduction of a problem arguments number at transition to dimensionless complexes on one or several units as much reduces the number of a required variable values.

Criteria functions definition for the basic units of the coke industry such as coke ovens and the tightness estimation under the offered criterion has shown, that the emission danger of the coke oven most responsible zones corresponds to a term of 160-250 cycles of the operation. (Fig. 1).

The door zone loses tightness in 320 – 420 cycles of the oven pushing after setting into operation for coke-batteries with ovens volume of 41,6 m^3, standpipe zone – in 160 cycles of oven-pushing due to maximum permissible emission on benz(a)piren transcending . It means, after the short period the unit loses tightness, and cancerogenic substances get regularly to atmosphere.

According to the theory of dimensionless tightness criterion dependence similarity from the dimensionless complex factors, obtained as a result of coke oven depressurization process researching, are fair not only for such designs, but also for all similar objects.

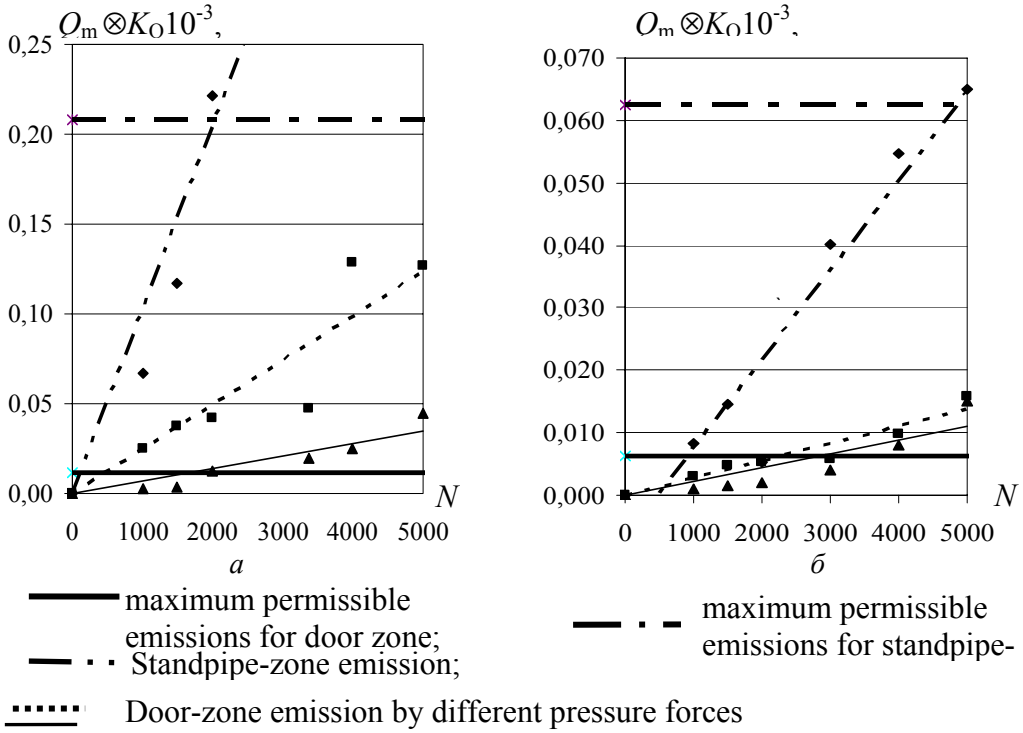

Fig. 1. Estimation of emission-danger assemblies on tightness criteria: a – on benz(a)piren, b – on benzol.

During the designing of new heat aggregates configurations knowledge of numerical values of the emission-danger assemblies tightness criteria will allow to establish the minimal gap between sealing surfaces, injurious substances emissions under which won't exceed the allowed ones.

НАНОТОКСИКОЛОГИЯ: СОВРЕМЕННОЕ СОСТОЯНИЕ И ПЕРСПЕКТИВЫ

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Последнее десятилетие отмечено интенсивным развитием нанотехнологий и широким использованием наноматериалов в различных сферах. Промышленное производство наноматериалов тесно связано с решением вопросов промышленной токсикологии и гигиены труда на предприятиях. Оценка потенциального риска профессиональных заболеваний среди работников предприятий и экологических последствий возможного загрязнения окружающей среды является важной составной частью организации производства наноматериалов. Основные принципы нанотоксикологии как «науки о воздействии инженерных наноустройств и наноструктур на живые организмы» были сформулированы G.Oberdorster и соавторами в 2005 г. [1]. За истекшие 4 года нанотоксикология превратилась в быстро развивающуюся отрасль