

METHOD OF CALCULATION VENTILATION TANKS FROM THE REMANTS OF LIQUID PETROLIUM PRODUCTS

National Aviation University
 Prospect Komarova, 1, Kyiv, Ukraine, 03058
 E-mails: ¹s.puzik@email.ua; ²ostrovskiy166@mail.ru; ³dakcar01@ukr.net

The advantage compared to other fuel oil on the feasibility of their research. The calculations duration of ventilation and changes in the concentration of gasoline vapor remains in the gas space vertical tank with a capacity of 1000 m³ (TVS - 1000). We construct a nomogram for quantitative prediction residual presence of liquid gasoline A-95 and the time duration of ventilation TVS-1000 from the remnants of gasoline.

Keywords: ventilation, storage tank, liquid residues, A-95, TS-1 RT.

Statement of the problem

During the operation of reservoirs often have negative factors for the removal of which is necessary to perform cleaning and degassing tanks, using them fire repairs that usually vybuhopozhezho-threatening. Tech cleaning tanks of petroleum residues is one naysklad-nishyh, time-consuming and demanding.

Analysis of publications

Investigation of convective mass exchange showed that there is no method that could be used for prediction of fire danger ventilation process tanks of petroleum residues [2]. Therefore, it is necessary to conduct special experimental studies. When the valve-tion tanks with liquid residues ventilation process can be divided into three periods:

1. intense change in concentration of C₁ remains liquid petroleum gas space in the tank;
2. constant concentrations of C₂ remains liquid petroleum products to complete evaporation of the liquid;
3. decontamination process with the concentration of C₃ residue liquid oil to completely remove vapors from tanks.

The equation for determining the concentration of C for all periods of the process [1]:

$$C_1 = \frac{M_1}{L} + C_n - \left(\frac{M_1}{L} + C_n - C_0 \right) e^{-L/v\tau};$$

$$C_2 = \frac{M_2}{L} + C_n; \quad (1)$$

$$C_3 = C_0 + C_2 e^{-L/v\tau},$$

де V – volume of the tank, m³;

τ – time of ventilation, s;

M – evaporation, kg/s;

L – air flow, m/s;

0 – index, which indicates the initial conditions;

1,2,3 – indices that represent periods of ventilation;

n – index, which indicates the setting supply air.

Purpose - cleaning tanks forced ventilation owl in the way of complete evaporation nance liquid residue oil that is acceptable only under tanks with light oil.

The calculation process of forced ventilation TVS-1000

As during the evaporation of oil products is a continuous change of properties of it makes nestatsionarnist period 2. Therefore, for the calculation process of ventilation-vuariv reserves of petroleum residues equation (1) is not suitable.

Were used for experiments A-95 gasoline and jet fuel RT and TS-1.

1) It was found that gasoline has several advantages compared to other oil on the feasibility of the study:

2) the most effective use of valvetion as a means of preparing vessels to repair it is to this class of petroleum products as gasoline is the most volatile oil with a low content of tar;

3) gasoline characterized by low temperature and high pressure flash vapor, which causes a particular

explosion hazard process tank ventilation, so fires and explosions in preparation for repairs occur often in the tanks with gasoline;

4) use gasoline as a heterogeneous multi-agents allows for shorter-duration experiments you more accurately deter-restore the change in quantities that character-robe nestatsionarnist process konvektiv aqueous mass transfer, including vapor pressure, fractional composition, molecular weight, etc..

Thus, the time required to evaporate 1 ton of gasoline A-95 in the tank volume of 1000 m³ at ambient temperature 20 ° C and 10,000 m³ performance fans, is 12.4 hours, fuel RT 106 mph, fuel TS 115 h, and diesel fuel supply if the tank clean fresh air 773 hours. Concentrations of vapor diesel brand DT "L" is much lower than the maximum concentration, so there is reason to conclude that it is impossible in practice remains complete evaporation of liquid diesel fuel. Degas tanks from the di-diesel fuel is recommended only after careful removal of liquid residue.

The research allowed us to develop an engineering method for calculating the duration Ventmodulation and changes in the concentration of vapor remains light oil tanks in the gas space.

To determine the amount of product remaining oil in the reservoir must perform n-call of analysis of vapor that lyayetsya removal from the tank (Fig. 1). Samples for gas analysis can be selected in the camera by using a rubber hand pump or a gas pipette. Before purging the most appropriate set fixed sampling system consisting of a L-shaped tubes and manifolds. G-tube is installed in the exhaust crossing light hatch. One ki-nets of tubes must be directed upstream vapor being removed. The second end of the tube attached rubber or PVC (trunk) 5 tube diameter 10 mm, length 30-50 m This system allows sampling gas analysis on the ground directly from the tube without lifting a person into the tank.

Samples should be selected in different time intervals and the number of samples for gas analysis should be not less than three [2]. The time interval from the beginning in purging that are recommended for sampling in the tanks with gasoline, is given in the table.

The key to the nomogram (Fig. 1): from a certain point of time axis (x-axis) in the first quadrant is

held perpendicular to the intersection with the curve you change the costs of air L in time. From the resulting intersection points produced a line parallel to the x-axis (time axis) in the III quadrant of the intersection of terpene-dykulyarom conducted from the axis of the concentrations in the III quadrant from the point that corresponds to the concentration C. The resulting intersection point on the curve of concentration dynamics in III quadrant corresponds to the initial amount of liquid residue.

Intervals for sampling for gas analysis (in hours)

Productivity fan, m ³ /h	Fluid temperature, °C			
	-20	0	20	40
To 5000	6-10	5-10	4-10	4-10
5000-10000	5-8	4-8	4-7	3-7
10000-30000	3-5	3-5	2-5	2-5
30000-50000	2-3	1,5-3	1-3	1-3
50000	1-3	1-3	1-3	1-3

After determining the amount of residual liquid gasoline nomogram, shown in Fig. 1 is determined by time of ventilation nomogram given in Figure 2.

Nomogram for determining the time of ventilation consists of two quadrants, taking into account the influence of the length of the fan blowing performance and ambient temperature (I quadrant) and of liquid residues (II quadrant).

The key to the nomogram (Fig. 2): from the point on the horizontal axis corresponding to the performance of valve-tor L, is held perpendicular to the intersection with the curve dynamics in time for the temperature in the first quadrant. From the point of intersection has made direct parallel to the x-axis (the axis of productivity) to the intersection of the straight line that corresponds to the source of liquid residues G₀ in quadrant II. From this point of intersection falls perpendicular to the vertical axis (time axis).

That is to assess the flammability of the mixture and the duration of ventilation based on the proposed method of calculation, and made these nomograms.

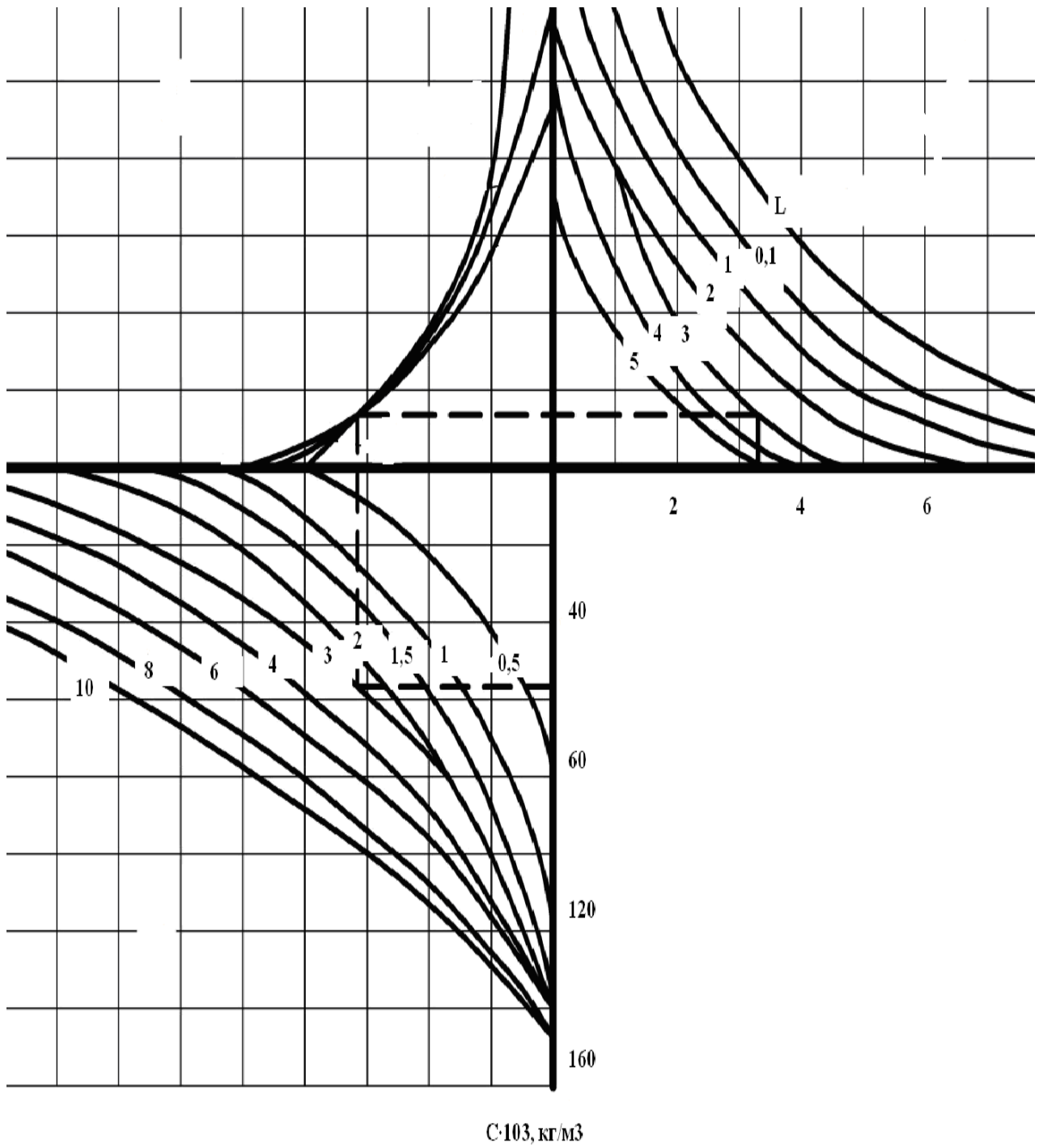


Figure 1. Nomogram for the prediction of residual liquid gasoline A-95 tanks in the TVS-1000

Using the nomograms can be calculated from the time of ventilation known and unknown amount of

liquid remains in the tank of gasoline TVS-3000 if the evaporation of oil from water "cushion".

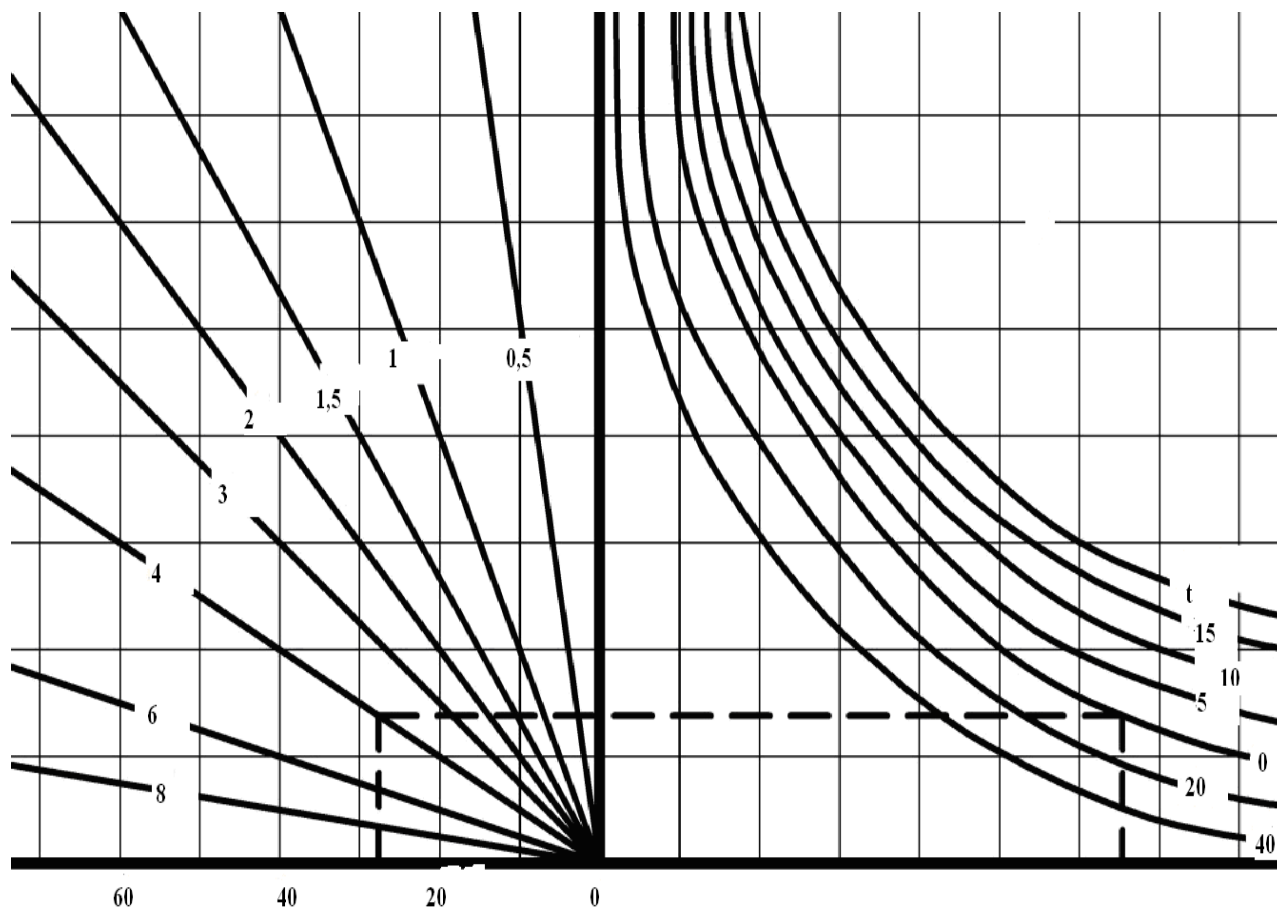


Figure. 2. Nomogram for predicting time ventilation vertical steel tanks TVS-1000

To predict the duration of ventilation vessel with an unknown number of liquid residues should be made in advance gas analysis. According to gas analysis in accordance with the nomogram shown in Fig. 1, determine the amount of liquid residues, and the nomogram, shown in Fig. 2, ventilation for time of known quantity of liquid residues gasoline.

Reducing srednoob'yemnoyi concentration in the gas space of the tank even 5% of the lower limit of the flash provides a further explosion safety process risk you-penetration fire exist until complete evaporation of petroleum products.

Assessing the flammability of the environment must take into account the uneven distribution of concentration tratsiy, including the presence of zones near the walls of the tank, where the concentration of the gas space 20-30% higher srednoob'yemnoyi.

Conclusions

A nomogram for the prediction of residual liquid gasoline A-95 and ventilation time TVS-1000 from the remnants of that gasoline. Shown that the more dangerous conditions arise during the preparation tanks to ventilation and in the initial period of ventilation. Duration of ventilation tanks TVS-1000 with remnants of gasoline A-95 in the amount of 0.5 tons at ambient temperature 20 ° C and fan performance 10,000 m³ is approximately 7 hours until the concentration in the gas space, equal to 10% of the lower limit of the flash.

The results can be taken as a basis for developing guidelines degassing tanks with the remnants of light oil products before firing repairs.

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С.О. Пузик¹, Б.О. Островський², Д.А. Комар³. Методика розрахунку процесу примусової вентиляції резервуарів від залишків рідких нафтопродуктів

Національний авіаційний університет, пр. Космонавта Комарова, 1, Київ, Україна, 03058

E-mails: ¹s.puzik@email.ua; ²ostrovskiy166@mail.ru; ³dakcar01@ukr.net

Установлено переваги бензину порівняно з іншими нафтопродуктами щодо доцільності їх дослідження. Виконано розрахунки тривалості вентиляції і зміни концентрації парів залишків бензину в газовому просторі вертикального резервуара місткістю 1000 м³ (РВЗ-1000). Побудовано номограми для кількісного прогнозу наявності рідких залишків бензину А-95 та часу тривалості вентиляції РВЗ-1000 із залишками цього бензину.

Ключові слова: вентиляція; резервуар; рідкі залишки; А-95; ТС-1; РТ.

S.O. Puzick¹, B.O. Ostrovskiy², D.A. Komar³. Method of calculation of tanks forced ventilation from the remnants of liquid products

National Aviation University, Kosmonavta Komarova avenue 1, Kyiv, Ukraine, 03680

E-mails: ¹s.puzik@email.ua; ²ostrovskiy166@mail.ru; ³dakcar01@ukr.net

The advantages of gasoline compared to other petroleum products in terms of feasibility of their research. Calculations of the duration of ventilation and changes in the concentration of vapors of gasoline remains in the gas space of the vertical tank with a capacity of 1000 m³ (RUS-1000). Nomogram constructed for the quantitative forecast available liquid balances petrol A-95 and the time duration ventylyaiyi RUS-1000 from the remnants of the petrol.

Keywords: liquid residues; ventilation; tank; A-95; TS-1; RT.

С.А. Пузик¹, Б.А. Островский², Д.А. Комар³. Методика расчета процесса принудительной вентиляции резервуаров от остатков жидких нефтепродуктов

Национальный авиационный университет, пр. Космонавта Комарова, 1, Киев, Украина, 03058

E-mails: ¹s.puzik@email.ua; ²ostrovskiy166@mail.ru; ³dakcar01@ukr.net

Установлены преимущества бензина по сравнению с другими нефтепродуктами относительно целесообразности их исследования. Проведены расчеты продолжительности вентиляции и изменения концентрации паров остатков бензина в газовом пространстве вертикального резервуара емкостью 1000 м³ (РВЖ-1000). Построены номограммы для количественного прогноза наличия жидких остатков бензина А-95 и времени продолжительности вентиляций РВЖ-1000 с остатками этого бензина.

Ключевые слова: вентиляция; жидкие остатки; резервуар; А-95; РТ; ТС-1.