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15. Sekine, Y. Coking Technology Using Heavy Oil Residue and Hyper Coal / Sekine Y., Sumomozawa F., Shishido T. // ISIJ INTERNATIONAL. – 2014. –№11 – Pp. 2446-2453.
16. ГОСТ 22989-78. Связующее для производства активных углей. Технические условия.
17. Allaby, M. (2013). Bituminous coal. In A dictionary of geology and earth sciences (4th ed.). Oxford: Oxford University Press. ISBN 9780199653065.
18. Kentucky Geological Survey: Earth Resources -- Our Common Wealth. (n.d.). Coal to make coke and steel. University of Kentucky. Retrieved November 28, 2020. (Link: Coal to make coke and steel)
19. Trippi, M. H., Ruppert, L. F., Eble, C. F., & Hower, J. C. (2021). Coking Coal of the United States—Modern and Historical Coking Coal Mining Locations and Chemical, Rheological, Petrographic, and Other Data from Modern Samples (Open-File Report No. 2020–1113, p. 2). U.S. Geological Survey. doi:10.3133/ofr20201113.
20. Arigoni, A., Newman, A., Turner, C., & Kaptur, C. (2017). Optimizing global thermal coal shipments. Omega, 72, 118-127. doi: 10.1016/j.omega.2016.12.001.

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ANALYSIS OF OIL DUST RELEASED DURING PROCESSING OF METAL SURFACES UNDER LABORATORY CONDITIONS

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Abstract:

Objective. In this article, in the process of metal surface treatment, in order to cover the metal surface, in laboratory conditions, the process of processing metal heated to a high temperature using motor oils is studied.

Methods. A laboratory device was used to study this process. Oil-containing gases obtained in laboratory conditions have been studied.

Results. The results obtained were compared with the allowable concentration of gases. Absorption cleaning is recommended to retain gases in excess of the permitted rate. The results obtained with the proposed new device were analyzed.

Keywords: metal, oil dust, absorption, metallurgy, gas concentration, concentration, absorber, mass transfer coefficient.

Introduction. The activation of technological processes in ferrous and non-ferrous metallurgy, chemistry, mechanical engineering and other industries in practice serves to increase production volumes, improve quality and reduce costs [1]. These processes mainly use compressed gases, especially air, oil products [2,3,4]. The purification of oil-containing gases emitted into the atmosphere as a result of oiling the metal surface by the absorption method is considered effective. Separation mass transfer processes are widely used in industry and are carried out mainly in column-type apparatuses. Gas mixtures separate For swallowing process wide used [5]. Absorption - gases or couples choose to swallow process gas phase liquid absorbers. Liquid cleaning tool dust swallow what is called. Gas mixtures was swallowed up component absorbent what is called [6]. Physical and chemical processes underlie the technology of oil refining. Calculation, design and control of such processes require knowledge of the physical and chemical properties of oil, gas condensate and their mixtures [7] . In this case, waste gases are formed that are released during the production process. And the resulting gas is purified by the absorption method. Harmful and toxic gases emitted by an enterprise may vary depending on the type of production and the substances used by it. Depending on the characteristics and physico-chemical properties of each off-gas emitted, different types of treatment equipment must be used. For example, off-gases, separated from oil-containing gases, are cleaned by the absorption method, and dry dust is separated by cyclones.

Methods. Experimental equipment was created to study the process of capturing oil dust emitted into the atmosphere and its absorption into the environment in metallurgical and metalworking enterprises. The schematic diagram of the equipment is shown in Figure - 1.

The experimental setup (Fig-1) includes a smoke blower *1*, an oil evaporation oven *2*, a thermometer for measuring the temperature of the attached liquid *3*, a heater for evaporating the evaporated liquid *4*, evaporating liquid *5*, thermometer for measuring the temperature of the generated flue gases *6*, chimney *7*, glass monometer for measuring hydraulic resistance *8*, valve *9*, rotameter for measuring gas volume flow *10*, for atomizing the gas that has passed through the rotametric nozzle *11, absorber 12* for purification of generated smoke, absorber *13* , nozzle for increasing the gas surface *14*, gas analyzer for measuring the concentration of SA in the purified gas *15*, valve for draining waste liquids *16*, branch pipe for the outlet of purified gas *17*, temperature controller of the absorber consists of a rheostat 18 for adjusting the temperature of the spiral, coils 19 for heating the absorber, regenerator 20 for regenerating the spent absorber.

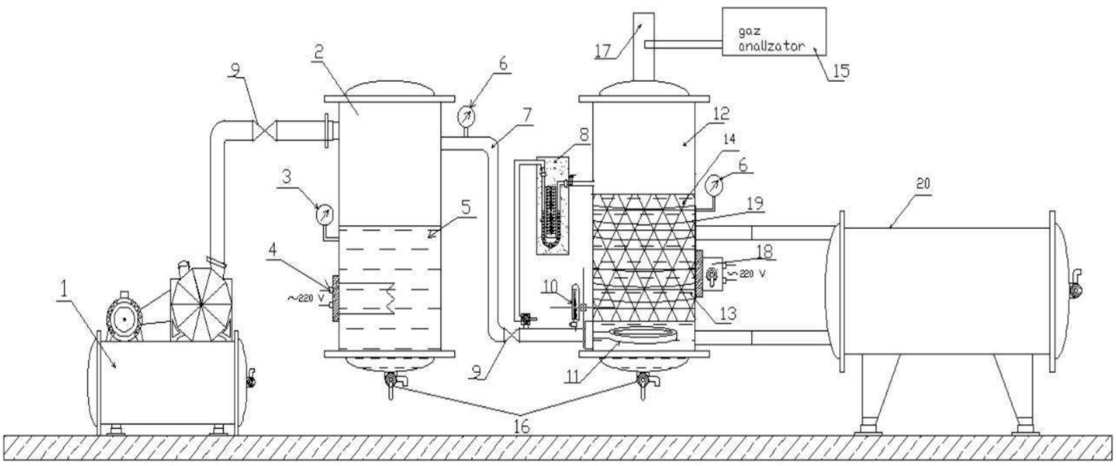

Figure 1. _ Scheme of the experimental setup for studying the absorption process

1-compressor; *2*-evaporator; *3.6*-thermometer (LATR); *4*-electric skin; *5*-oil; *7*-pipe; *8*-pressure gauge; *9*-valve; *10*-rotameter; *11*-nozzle; *12*-shock absorber; *13*-absorbent; *14*-nozzle; *15*-gas analyzer; *16*-valves; *17*-pipe; *18*-rheostat; *19*-spiral; *20*-regenerator

The experimental setup works in the following order. 5 *evaporating* liquids (T-750, I-20, OE-26) are poured into 2 containers with a volume of 8 liters. The liquid is heated to a temperature of 300-600 ℃ after *4* tens. The temperature of the resulting smoke is measured by three thermometers. 1 compressor is connected to the steam transmitter to supply smoke to 12 absorbers at the required speed and pressure. To control the parameters of the smoke supplied to the absorber, the chimneys 9 are equipped with valves. The resulting smoke is sent to 12 absorbers through 11 barbarians. The smoke bubbler passes through the absorber 13. The purified gas that has passed through the absorbent is discharged through pipe 17. Gas analyzer 15 (GX-3R Pro) was used to measure the concentration of purified smoke. 20 are sent to the regenerator to clean the absorber. The temperature of the absorber is controlled by an 18-wire coil.

To place the nozzle on the device, a nozzle tower is made from it and placed on the device.

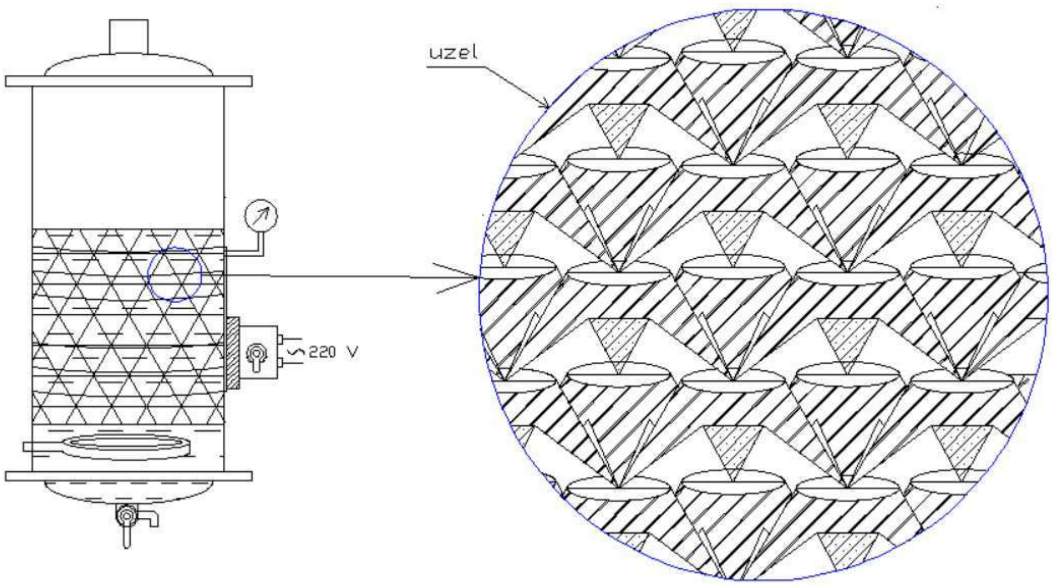

Figure 2. Packed tower to absorber placed appearance

Nozzle tower from the absorber passable gas effect surface increase to work out, to the nozzle to be sent gas effect surface increase to work designed. Before the start of the experiment, the mass of the substances used was measured on an electronic balance model CAS WM' 3000. After the experiment, the used substances are removed from the device. The content and weight of used oil and absorbent are continuously measured. The measurement also takes into account the operating time of the absorbent.

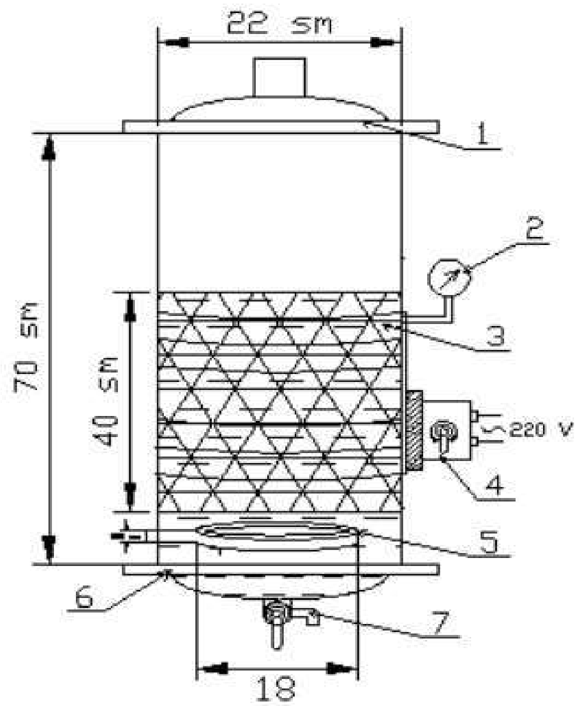

Figure 3. 1.6-cap, 2-thermometer, 3-nozzle, 4-electric tank, 5-bubbler, 7-faucet

The experiment in fig. 2 The absorber is assembled for the main geometrical dimensions of the absorption device as follows: device diameter D=22 cm, height H=70 cm, nozzle height (changes) h=20...50 cm, barbater Diameter d_1 = 18 cm, d_2=10 cm. The device is designed for the absorption process. A cylindrical metal case and additional devices necessary for the process are connected to it. The body of the absorber 1 consists of a gas holder 3, a monometer 2 connected to it, an electric heater for temperature control 4, a bubbler 5 for passing gas, a cover 6 and a valve for draining liquid 7.

The device works as follows. The gas passed through the bubbler 5 interacts with the absorbent through the nozzle 3 and is ejected after mass transfer. The device temperature is controlled by 4 electric heaters. The pressure in the device is measured by two manometers. The absorber dimensions are calculated depending on the gas volume flow. The nozzle mounted on the absorber is specially designed for gas distribution, and through this device the gas passing through the barbattery is evenly distributed throughout the volume.

The laboratory device was tested for volume flow (Q=0,08 m^3/s) · Optimization is done to change the consumption and adjust to the normal operation of the device.

There are different types of gas distribution nozzles, and each nozzle is selected depending on the working environment and operating conditions of the device. Suggested nozzle lined up in one row.

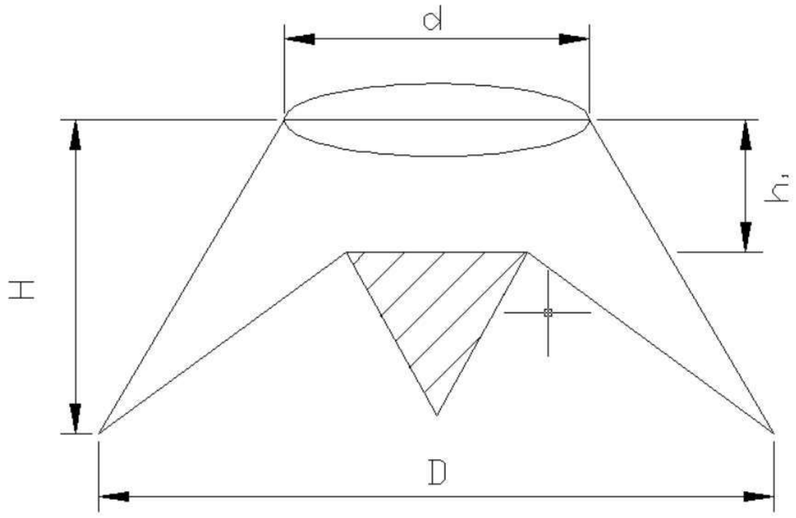

Figure 4. Overview of the nozzle and placed on the device. Figure - 4 shows the proposed nozzle. The nozzle size is the optimal size based on experience

The calculation of the proposed packing is mathematical and is determined experimentally . Taking into account the fact that the nozzle has a conical shape and is made by separating the conical parts, the calculation of the nozzle is based on the calculation of the cone. First, the total volume and the equivalent nozzle diameter were determined. Used from it except the nozzle free size and get wet coefficient experience way with determined. The results will have the following meaning. A three-base nozzle with a size of 66*66*40 has a comparative surface δ=65 m ^{2}/m^3, free volume v=0,07 m^3/m^3, equivalent diameter d_e=0,0043 m.

Obtained results based on nozzle mass transfer coefficient when determined. Offer made nozzle efficiency to compare for, 50*50*5 people and conical nozzle mass transfer coefficient knocked down.

This for each one nozzle constant pressure and geometrical dimensions one another in the absorber test was carried out. Nozzle height is also equal in the case received one absorber mass transfer coefficient was determined. The mass imparting coefficient is the main one of the parameters considered. it is the process of urine and gas phase between being a physicist chemical processes represents. Physics processes for important was phases little by little effect showing the main value is considered. This for the following consider works to take went [8]. According to the following formula, the nozzle mass to give the coefficient is determined:

$$Kxf = \frac{1}{\frac{1}{\beta xf} + \frac{1}{m\beta xf}} \qquad (1)$$

Here K_{xf}- mass transfer coefficient, b_{xf} -gas in phase mass transfer coefficient, m - degree indicator, *0.05-4.6* h equals. [9,10,11].

Results. The massing according to the obtained results is shown in Figure 5.

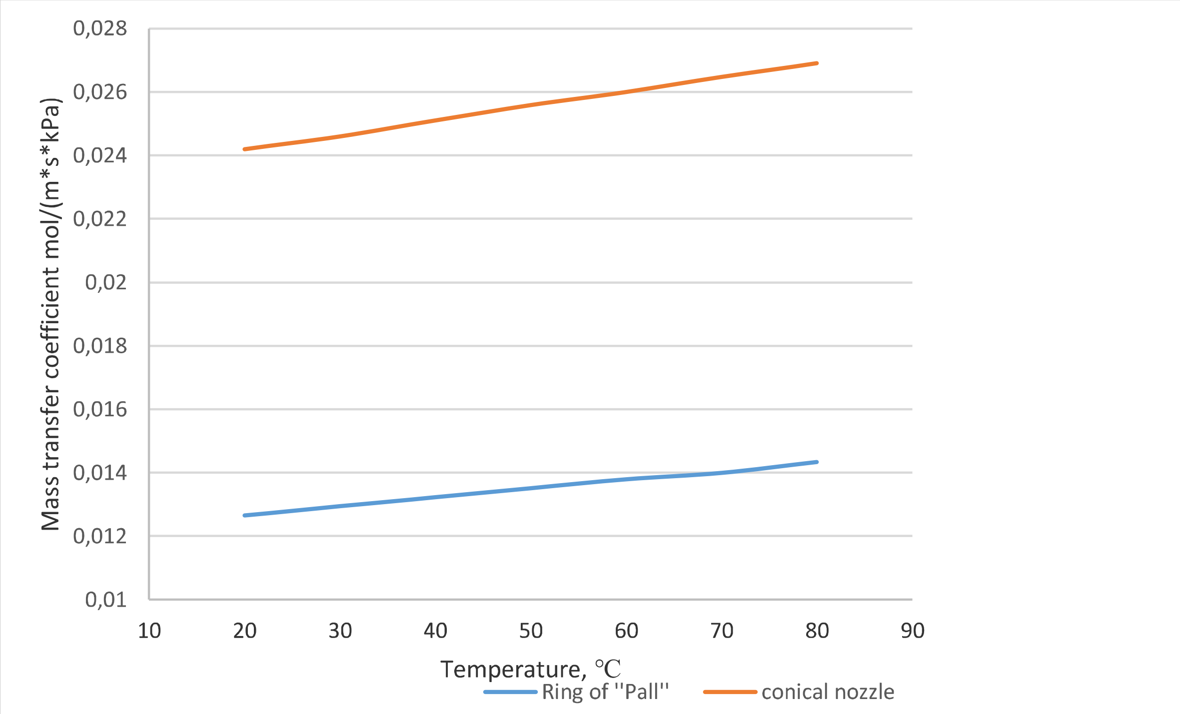

Figure 5. The conical nozzle and the scheme of your rings give a coefficient to the temperature depending on without gas

Conducting mass ratio of each single nozzle shape, type, nozzle made substance characteristics depend experience 20 ℃ in the working ring when you go mass transfer coefficient 0,01266 $\frac{mol}{m*s*kPa}$ to equal the point that has been determined. At the same temperature, the mass transfer coefficient in the proposed conical nozzle is 0.0242 $\frac{mol}{m*s*kPa}$ equal to the fact that it was determined. Obtained results based on the mass to give a coefficient based on the effectiveness of the indicator definition can be this for the following from the formula was used

$$K_{kf} = \frac{N1-N2}{N1} \quad (2)$$

Here K_{kf} - efficiency coefficient, N_1 - conical nozzle mass give a coefficient of 0.0242, N_2 -Pall ring mass give a coefficient.

At 20 ℃ mass transfer coefficient I do not know at 47.68% under development high brotherhood has been determined. Set the temperature to 60℃ while increasing the mass transfer Pall coefficient is 0.013 $\frac{mol}{m*s*kPa}$ equals it happened Tapered in the nozzle until this figure is 0.026 $\frac{mol}{m*s*kPa}$ equals the fact that was determined.

Discussion and analysis. The experience has been transferred, that's all, it shows that the high viscosity in liquids will have a conical nozzle that will have a large efficiency. From this, in addition to the conical nozzle, the washable gases contained mechanic additives are also effective separate can. To this reason, the conical in the nozzle of the mechanic of the addition catches to remain flat on the surfaces of his absence. neat placed confusion in the nozzle of the mechanic adding the device to the bottom drowned without a separate is taken. The experience of high viscosity was transferred to have in industrial oil OE-26 went to take. Process physicist absorption method to do the process is considered.

Conclusion. Summary when doing so to say, now the high-temperature operating devices of the heavy machine industry, asphalt work to produce factories, food cooking in their branches to heat up as a result of other oil and organic supplements separate out. It is organic oily powders at low temperatures condensation as a result of the surroundings to the environment and the industry of the enterprise that's all determined from the norms of applause goes. These oil cleaning for absorption process is considered to be effective. Above in the article in the industry separable greasy dust laboratory method of harvest, made and environmental standards based cleaning for an efficient device, the proposal is made. Oils are an efficient cleaning to ensure that the absorption from the process has been used. Absorbers work performance to increase for the conical nozzle was created. Its effectiveness has been compared with. Comparison as a result of the new nozzle work performance of 47.68% (mass. give coefficient on) to the same thing that was determined. The suggestion made by the device greasy dust absorption in the process of an effective device is that the above from experience own confirmation found.

References

1. Okonsky I.C., Process I apparatus oxygen I cryogenic production [Text] / I.S. Okonsky.- M., Mashinostroenie, 1985. - 256 p.
2. Kalinin, N.V. Air supply systems for industrial enterprises [Text] / N.V. Kalinin, I.A. Kabanova, V.A. Galkovsky , V.M. Kostyuchenko. - Smolensk, Smolensk branch of MPEI (TU): 2005y.- 122 p.
3. Stark , S.B. Blowers and vacuum plants in ferrous metallurgy [Text] / S.B. Stark, L.N. Belyanchikov. - M., Metallurgy: 1971. - 264 p.
4. A.N. Planovsky, P.I. Nikolaev. Technologies of Processes and Apparatuses of Chemical and Petroleum Engineering.-M.: Publishing House of Chemistry, 2007. 493 p.
5. Massachusetts Adlivankina, M.N. Greyhounds. Calculation of absorption plants. Three. settlement, GOUVPO "MGUS". - M, 2006, 65 p.
6. Glagoleva O.F., Kapustin V.M., Gulmisaryan T.G. I am a Doctor of Oil Refining Technology. In 2 parts. Part one. Primary oil processing / Ed. FROM. Glagoleva and V.M. Kapustin. - M.: Chemistry, Kolos, 2006. - 400 p.
7. Nurmukhamedov H, S., Temirov O. Sh., Turobzhonov S.M., Yusopbekov N.R., Zakirov S.G., Tadzhikhodzhaev Z.A., Gases again work technology, process and devices- T: "Science And technologies", 2016, 856 p.
8. Pavlov K. F., Ramankov P. G., Noskov N. N., Examples and tasks in the course of processes and apparatuses of chemical technology. - Lel in the city: "Chemistry", 1987, 577 p.
9. Yusopbekov N.R., Nurmukhamedov Ch,S., Zakirov S.G ., chem. technologies basic process And devices . Science and technologies ", 2015, 451 p .
10. Dytnersky Y.I. Chemical technology of processes and apparatuses, vol. 1-2. - M.: Chemistry, 1995, -768 p.
11. Ramm V.M. absorption gas. - M.: Chemistry, 1976. 656 p.

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