

# USING A HIGH-TEMPERATURE FLUE GASES IN THE TECHNOLOGY OF COMBUSTION NEUTRALIZATION OF WASTEWATER

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**Abstract.** This paper provides an analysis of composition of typical polluting contaminants of industrial wastewater. The study suggest industry branches, wastewater of which contains the greatest amount of organic flammable substances (petroleum и oil). The present study was conducted to analyze an opportunity to replace fuel torch by the high-temperature flow of flue gases in the realization thermal treatment method (combustion neutralization).

## 1 Introduction

In today's world, water pollution problem of water objects by industrial and domestic wastewater is very actual [1, 2]. Uncontrolled discharges of the polluted water into natural reservoir have a significant and often irreparable damages to ecosystem of territory, which is close to industry. Chemical composition of polluted substances, which are discharges in reservoirs, vary and depend on specific of technology process in industry, which is made a discharge. During the choice of methods of treatment industry wastewater to concentration of harmful substances, which are not exceed maximum values, are guided by preliminary analysis of wastewater composition.

The aim of this paper is to analyse the composition of flammable substances of industrial wastewater, which are treated by combustion neutralization, and also assessment of using in the technology of high-temperature treatment of flue gases water.

## 2 Analysis of wastewater composition

The most toxiferous and dangerous compounds for organic reservoirs and ground, which could be in composition of industry wastewater are such organic substances, as: phenol, pitches, oil and etc. This substances are stable for biological decomposition [4], in case wastewater treatment is very important event for saving the ecologic balance.

The Analysis of composition of industrial wastewater shows us that the biggest concentration of toxic organic compounds is characteristic to discharged of pulp and

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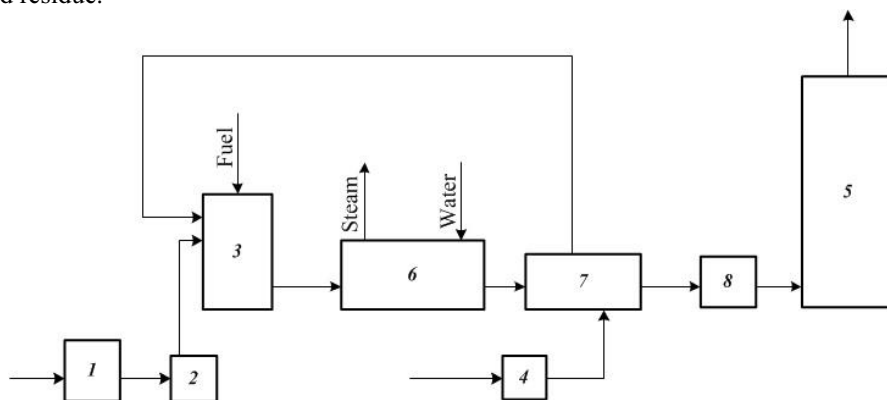
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paper, coal, oil, coke-chemical enterprises, enterprises of mechanical engineering [1–6]. The table below shows us the main types of organic substances in industry wastewater.

**Table 1.** A typical concentration of pollutants in industrial wastewaters.

|   |   |
|---|---|
| <b>Pulp and Paper Mill</b> (sulphate production) [3]<br>Suspended solids (100÷450 mg/l)<br>BOD <sub>5</sub> (130÷480 mg (O <sub>2</sub> ) /l)<br>Phenols C <sub>6</sub> H <sub>5</sub> OH (~0.06 mg/l)<br>Petroleum products (50÷60 mg/l) | <b>Petroleum Processing Plant</b> [4]<br>Suspended solids (100÷300 mg/l)<br>Solids (800÷1000 mg/l)<br>BOD <sub>5</sub> (90÷290 mg (O <sub>2</sub> ) /l)<br>Petroleum products (7000÷15000 mg/l) |
| <b>Machine Building Plant</b> [5, 6]<br>Solids (100÷200 mg/l)<br>Phenols C <sub>6</sub> H <sub>5</sub> OH (0.01÷1,0 mg/l)<br>Petroleum products (20÷100 mg/l)<br>Sulphates CaSO <sub>4</sub> , MgSO <sub>4</sub> (150÷250 mg/l)           | <b>Enterprises of Coal Industry</b> [5, 6]<br>Suspended solids (15000÷25000 mg/l)<br>Solids (5000÷1000 mg/l)<br>Sulphates CaSO <sub>4</sub> , MgSO <sub>4</sub> (100÷150 mg/l)                  |

The majority of the organic pollution presented in the tab. are flammable substances [7]. One of the ways to treat industry wastewater of flammable substances is combustion neutralization. [5, 6]. Industrial diagrams for realization of this method usually provides spraying wastewater for dispersible in the area of a flame into specialized combustion chamber (fig. 1). At the same time flammable substances of flow are burned and removed in the form of gas through the flue, unflammable contaminants dropped out in the form of solid residue.



**Fig. 1.** Scheme of a plant for wastewater combustion neutralization [8]: 1 – wastewater collector; 2 – pump; 3 – combustion chamber; 4 – blower; 5 – chimney; 6 – waste heat recovery boiler; 7 – air heater; 8 – exhauster.

Usually for realization of the combustion neutralization method used special furnace, in which is used fuel torch. At the same time for burning a contaminants fuel is spent and large amount of combustion gases is formed. As one of measures of increase the energy efficiency of thermal treatment could be utilization in diagrams of combustion neutralization of flue gases other industrial diagrams (for example, energy or technology coppers in case of selections of gases with temperature  $T > 600$  K). An interaction of a sprayed liquid flow (technological water with flammable contaminants) the high-temperature gas environment ( $T \approx 500-1000$  K) there will be an intensive evaporation of water which then can be taken away by a separator and come back to a production cycle. Burning out of combustible impurity will promote maintenance of temperature level of process for a treating process continuous. Such method of economy of fuel and utilization of secondary energy resources (combustion gases) can be implemented at the entities

operating boiler rooms and power plants of own needs, and also technological coppers of low and average power. However for projection and practical use of this technology of energy saving requires carrying out theoretical and experimental researches for determination of the main features and regularities of evaporation of water and burning out of impurity of technological wastewater at dispersion in the environment of high-temperature combustion gases. At that time there are published results of researches of major mechanisms and regularities of the movement of evaporation of drop streams of liquids at contact with hot gases and the heating surfaces [9, 10]. For development of technology of high-temperature wastewater treatment with using of hot combustion gases similar results of researches are necessary for drop streams of liquid with combustible contaminants.

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