NUMERICAL STADIES OF HEAT TRANSFER IN GAS HEATER INSTALLATION

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ЧИСЛЕННОЕ ИССЛЕДОВАНИЕ ТЕПЛООБМЕНА В ГАЗОПОДОГРЕВАЮЩЕЙ УСТАНОВКЕ

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Abstract. *Relevance of the work due to the need to research the effectiveness and reliability of the heat exchangers. Research of heat transfer with different velocity of gas and temperature of steam was conducted. Results of the numerical modeling of the processes of heat exchange was presented.*

1. Introduction

Gas is the most environmentally friendly fuel and the last years its role increases significantly. Drying and heating gas is an integral part of the prepare fuel before combustion [1]. For this purpose are using various heat exchangers.

2. Object of study

The object of investigation was take the fuel gas heater. Of ten it is located in refineries and on other facilities of industry. Steam is used as heating medium in heat exchanger. The heat exchanger with opposing steam flow. Gas heater (Fig.1) heats the purified fuel gas with an initial temperature of $30°C$ to the desired value before it is burned to the furnace.

Software package ANSYS Fluent was using for investigate the heat transfer in the installation. In order to speed up the calculation the model was simplified. From the set of pipes was taken one, then was built computational grid. Then calculates. Computational grid is shown in Figure 2.

In this work was carried out a study of heat transfer at various flow rates and temperatures of steam. Then was presented graphs change in temperature of the gas along the length of the heat exchanger.
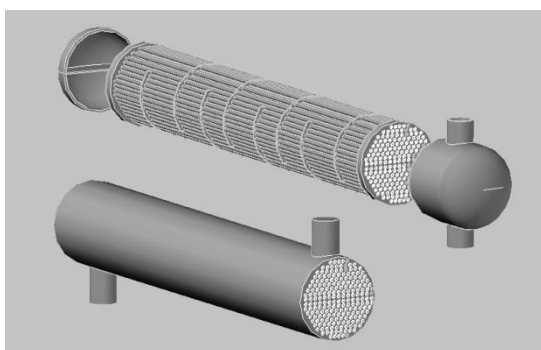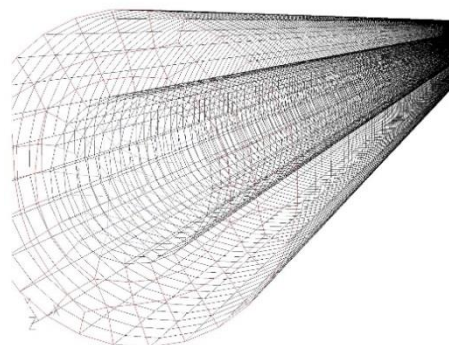

Figure 1.The fuel gas heater   *Figure 2.Computational grid*

3. Calculation results

Consider Figure 3, it shows the dependence of the gas temperature from the heating steam temperature.
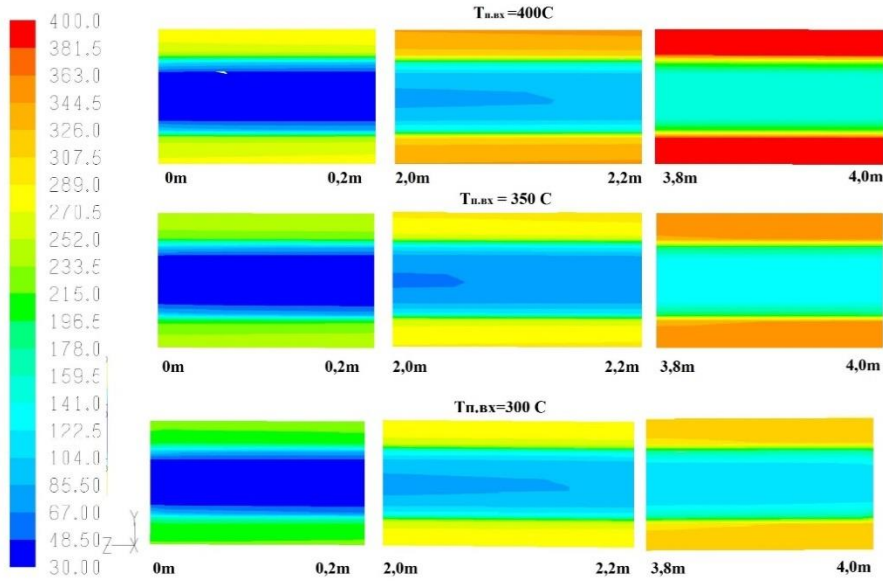
Figure 3. The dependence of the gas temperature from the heating steam temperature

The calculation results shows that by increasing the temperature of steam increases the temperature of the gas. This is because with increasing steam temperature the temperature drop increases, and, consequently, the heat transfer coefficient. In consequence, the heat transfer rate increases. Consider the graph of the distribution of the gas temperature along the length of the heat exchanger depending on the temperature of the steam (figure 4).
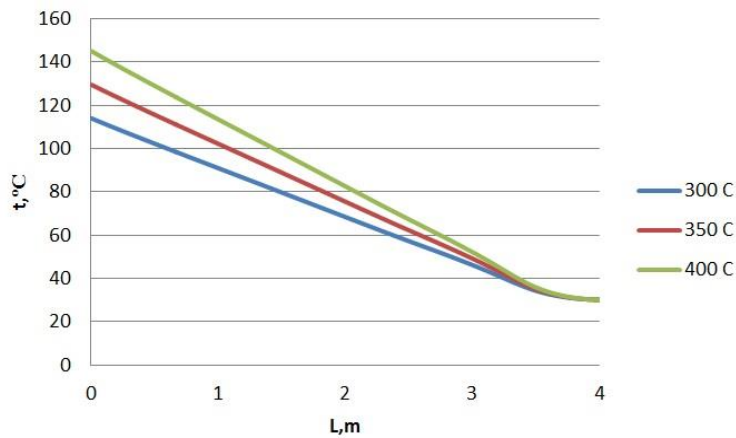

Figure 4.The distribution of the gas temperature along the length of the heat exchanger

In order to estimate the influence of gas velocity on temperature in the calculation were taken three values of gas velocity 4, 7 and 17 m/s. The results are presented on figure 5.
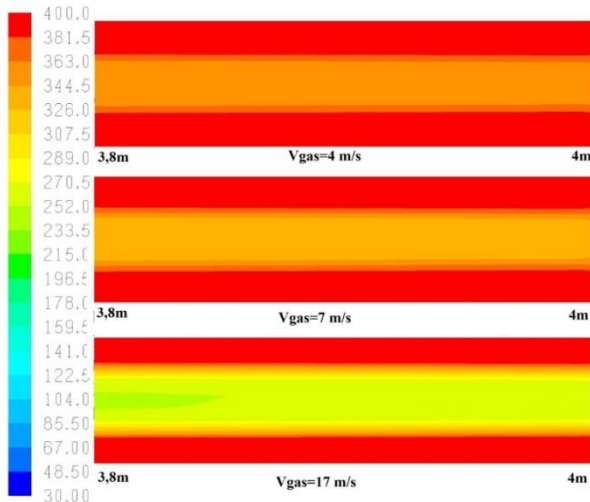
Figure 5.The dependence of the gas temperature from its velocity

Figure 5 shows that decreasing the speed of the gas, its temperature increases. This is because when a counter flow scheme of movement of the gas it moves constantly in the zone of higher temperature and with decreasing speed the time of its stay in the heat exchanger increases, hence, he manages to heat up more than at higher speed. Figure 6 shows a graph of the distribution of the gas temperature along the length of the heat exchanger.
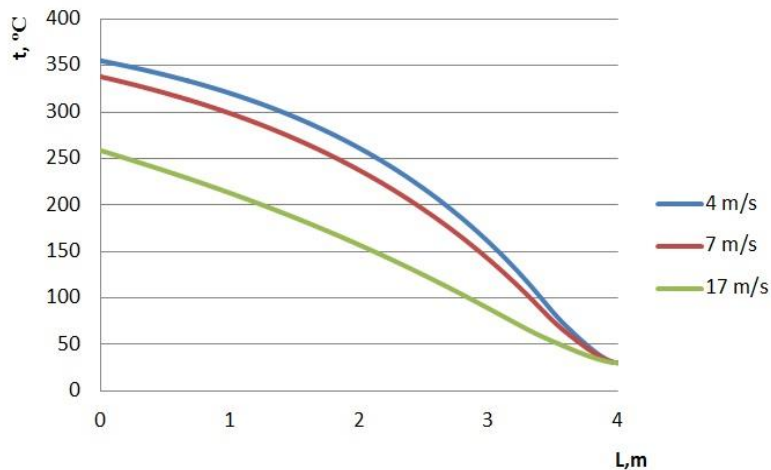

Figure 6.The distribution of the gas temperature along the length of the heat exchanger

4. Conclusion

In this work were carried out for investigation of heat transfer in gas heater. Namely, was evaluated the influence of steam temperature and gas velocity on its temperature. According to the obtained results, it is evident that to increase the gas temperature (the heat transfer enhancement) it is necessary to increase the temperature of heating media, in our case a pair of, or reduce the velocity of the gas.

References

1. Gil' A.V., Gil' A.Y. Research of integral parameters for furnaces of a circulating fluidized bed. EPJ Web of Conferences, 2015, 82, 01044.