COMBINED ELECTRIC POWER INSTALLATION IN THE HEAT RECOVERY SYSTEMS OF EXHAUST GASES

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Object. Numerical study of thermodynamic efficiency of a combined-type recycling plant.

Results of work. Currently, in the face of natural gas shortage and its high cost, the problem of electricity generation in heat recovery systems becomes a relevant one. Industrial enterprises have significant volumes of thermal secondary gas energy-resources of various types of fuel-using aggregates. The temperature potential of the production gas emissions is 150-350℃. The usage of heat from waste gases is possible due to the use of closed steam-turbine ORC cycles in low boiling working mediums. In geothermal energy systems, steam and organic turbines are used.

In the heat recovery systems at the cement and glass plants, steam turbines and turbines with an organic working mediums are used. At metallurgical plants utilization units with steam turbines are used.

This paper presents a heat recovery unit containing a steam turbine and two turbines with an organic working fluid. Since, the application of an organic working fluid is limited by its temperature of thermal stability, then in this installation in the upper cycle water vapor is the working medium, and in the lower cycles organic working fluids are the working medium. The results of the numerical study of the electric power installation cycles showed that the total electric power produced was 326 kW/(kg/s), and the efficiency of the installation was 22%.

The effect of the steam temperature before entering the turbine on the characteristics of the electric power installation is shown. The application of ORC technology in heat recovery systems is limited by the temperature of vapor of a working medium (ORC), which is about 200-220℃. At higher temperatures it is possible to use butane, pentane and other organic fluids. Their main disadvantage is fire and explosion hazard.

Conclusion. The research is being carried out in the direction of creating an optimal technological scheme of heat recovery facilities for the purpose of using turbines developed by the industry, since the cost of organic turbines remains high.