

ANALYSIS OF THE REQUIREMENTS FOR MODERN HEAT EXCHANGERS AND METHODS OF PROCESS INTENSIFICATION

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Abstract. This article examines the issues of process intensification in shell tube heat exchangers used in industrial enterprises. Multi-stage systematic analysis of the impact on heat transfer processes based on the analysis of existing problems.

Keywords: gradirnya, scrubber, regenerative.

Аннотация. В данной статье рассматриваются вопросы интенсификации процессов в кожухотрубных теплообменниках, применяемых на промышленных предприятиях. Многоэтапный системный анализ влияния на процессы теплообмена на основе анализа существующих проблем.

Ключевые слова: градирня, скруббер, регенеративный.

Annotatsiya. Ushbu maqolada sanoat korxonalarida qo'llaniladigan qobiqli issiqlik almashtirgichlarda jarayonni kuchaytirish masalalari ko'rib chiqiladi. Mavjud muammolarni tahlil qilish asosida issiqlik uzatish jarayonlariga ta'sirini ko'p bosqichli tizimli tahlil qilish.

Kalit so'zlar: gradirnya, skrubber, regenerativ.

Modern heat exchangers must meet the following technical requirements;

- Intensify the process of heat exchange, ensuring the transfer of the required amount of heat from one medium to another by obtaining the final temperature;
- The working environment of the device must be efficient and reliable in the given thermodynamic parameters (pressure, temperature and volume) and in different aggregate conditions of the heat exchanger product;

- Pipes and work surfaces must be resistant to various chemicals used during cleaning;

- it is necessary to extend the service life of the working bodies of the device;

Currently, experts face challenges in the development of advanced heat exchangers, which can be grouped into three main groups:

The first group: Problems in this group are related to the service life of heat exchangers, which lead to contamination of heat exchanger surfaces, corrosion, as well as thermomechanical phenomena in the temporary operation of heat exchangers. All of these problems affect the properties of heat transfer (heat transfer number or heat transfer coefficient).

The second group: this group includes the contact details of heat exchangers and the problems of their compaction. In this case, it is important to create compact structures and ensure the intensity of the process.

The third group: these are the problems of raising the upper limit of the heat or cold agent.

To increase the efficiency and compactness of heat exchange devices, it is necessary to develop new schemes, mainly new promising methods and designs of heat transfer, including the intensification of vortex and circulating flow in the working pipes of the device.

Many studies are currently being conducted on these issues. In general, the profiling of heat exchanger pipe surfaces ensures the transition from laminar flow in pipes to turbulent flow. This, in turn, allows to intensify the thermal conductivity. This method results in rapid regeneration and turbulence of the flow boundary layer. Changes in the profile of the working pipe contribute to the increase in heat exchange surfaces. This, in turn, increases the heat transfer coefficient and causes an increase in hydraulic resistance in the device. In addition, the Reynolds number also increases, which increases the natural turbulence of the flow. It should be noted that

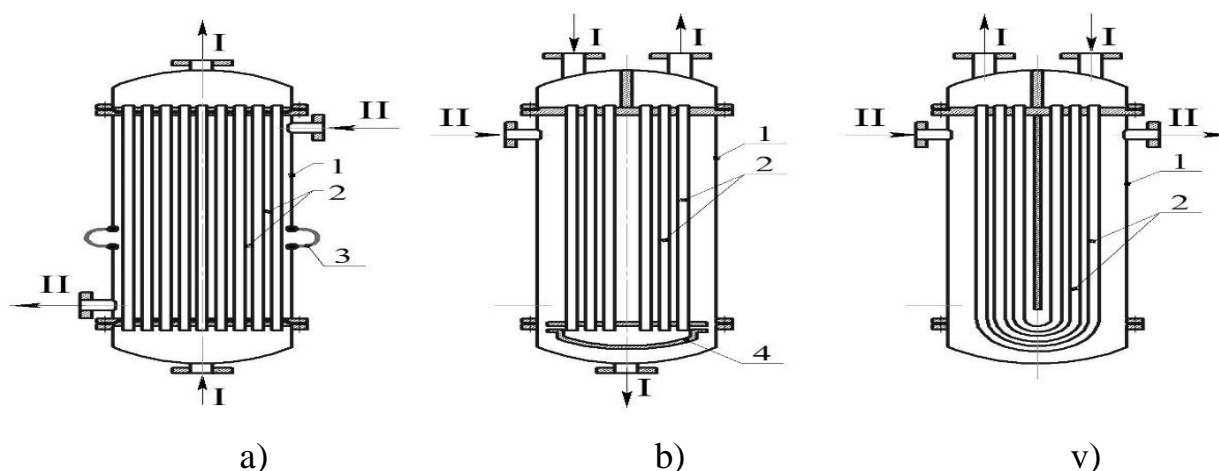
the use of structures that create vortices and circulating currents in the internal pipes of the heat exchanger reduces the pollution of the pipes.

The technical conditions of the process and the long-term performance of heat exchangers are considered in the development and application of intensive methods of heat exchange. In order to achieve a complete solution in ensuring the intensity, it is necessary to take into account the following:

1. Increasing the heat transfer capacity of the agent without changing the power of the pump that transmits the heat exchange agent or the hydraulic resistance of the device;
2. Reducing the temperature difference between heat exchangers without changing the design dimensions of the device and the number of zones;
3. Reducing its design parameters while maintaining the power of the heat exchange agent and the level of hydraulic resistance of the device;
4. Reducing the capacity of heat exchange surfaces while maintaining the specified capacity in the heat exchanger;
5. Creation of energy-efficient constructions of the listed pipelines.

1; Factors 2 and 4 serve to save energy consumed in the process. Factor 3 serves to save resources (reducing metal consumption and equipment cost). Factor 5 is general, in which each operating parameter of the heat exchanger must be evaluated. This factor is a convenient and simple way to intensify the heat exchange process. Most of the current research is aimed at intensifying the process and minimizing

energy consumption by changing the profile of the pipes.



a) compensatory lens; b) with a movable cap; c) U-shaped tube.

1 shell; 2 pipes; 3-lens compensator; 4 movable cap.

Figure 1.4. Shell heat exchangers with shell pipes that compensate for different elongation of shells and pipes.

The second product flow is fed into the interstitial space, the pipes are washed and removed. Most of these heat exchangers are one-way through the pipe space. To extend the flow of fluid between the pipes, it is installed cross-barriers with a thickness of 5 mm. The distance between the barriers is assumed to be from 0.2 m to 50 dt. These barriers also serve as a base for a set of pipes.

The movable head heater is detachable, and a set of pipes can be easily removed from the housing. This makes it easier to clean, inspect and repair the pipes.

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