Pioneer: Journal of Advanced Research and Scientific Progress (JARSP)
Volume: 02 Issue: 11 | 2023 ISSN: 2751-7551
http://innosci.org

Problems of Increasing the Efficiency of Regenerative Heat Devices

Usmonov Mavlonbek Alimatjon ugli, Tillaboyeva Farangiz Shavkatjon qizi
Fergana Polytechnic Institute, doctorate

Abstract: Today, one of the main methods of increasing the economy of energy equipment is the use of effective heat exchange acceleration methods in the improvement of heat exchange equipment. By accelerating the heat exchange, the amount of heat transferred from the unit of the heat exchange surface increases and, accordingly, the mass and size indicators decrease. As a result, the general characteristics of the equipment are improved.

Keywords: heat exchange, heat exchange equipment, structural steel, pipes, heat transfer, channels, diffuser, confusor, heat carriers, power plants.

Introduction

Acceleration of heat exchange used in industry is carried out at the expense of transverse ridges, spiral ridges, grooves and special inserts in the channels. It is possible to change the operating mode of the equipment by using the method of accelerating heat exchange . For example, it is possible to reduce the temperature pressure or increase the temperature of the heat carrier at the maximum allowable temperature of the wall.

The technical level of the heat exchange equipment is determined by the improvement of the general characteristics of the heat energy equipment as a result of increasing the heat exchange.

Currently, due to the use of modern structural steel brands, it became possible to increase the thermal efficiency of industrial heating devices.

Acceleration of heat exchange increases the efficiency of not only the heat energy device, but also the energy complex. However, when accelerating the heat transfer processes, the hydraulic resistance of the heat exchange equipment increases, and additional energy is consumed during the acceleration of heat exchange. For example, in the pulsation of the pressure in the flow, in the organization of the mechanical vibration of the heat exchange surface.

Various acceleration methods are used in the development of heat exchange equipment.

Of these:

- ✓ application of turbulent flow of heat carriers ;
- ✓ reduce the diameter of the channels;
- ✓ dense spikes of pipes;
- ✓ increase the speed of flow of m uxits;
- ✓ smoothing of heat exchange surfaces;
- ✓ turbulization of flows of heat carriers;
- ✓ use of uneven heat exchange surfaces;
- ✓ i turning the flow of heat carriers;
- ✓ high channels and discontinuous heat exchange surfaces ;

- ✓ application of the slope of the pipes when the steam is condensed in the pipes;
- ✓ organization of the film flow of the environment on the heat exchange surface;
- ✓ use of curved channels.

accelerate the heat exchange in the pipe, the method of twisting the flow of the heat carrier along the longitudinal axis of the pipe can be used. Among them: a turbine wheel in the form of an auger or a smoothly wound belt, or a shovel compactor in the form of a multi-bladed propeller. Tangential fluid transfer can be used to divert the flow. If the pipe is installed only at the entrance of the pipe, the twisting of the flow quickly disappears when the liquid moves through the channel under the influence of viscous forces. The characteristics of the twisting flow for screw augers are determined by the twisting step of the auger S, that is, by the twisting angle of the blades.

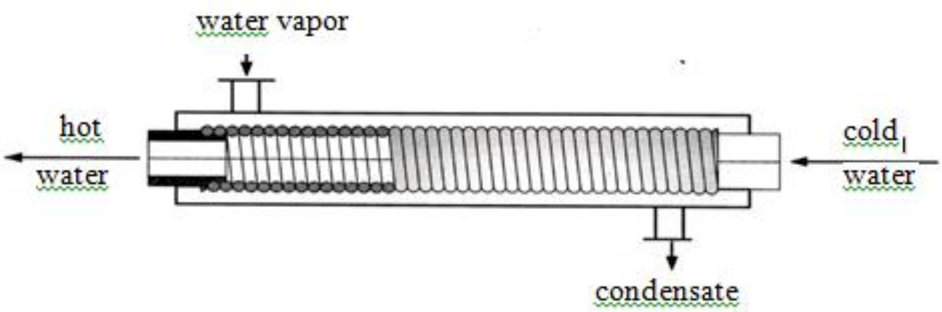

Fig. 1. Scheme of a "pipe-in-pipe" type heat exchanger with a heat exchange element in the form of a spring-screw channel

Acceleration of heat transfer in a twisted flow is achieved by increasing the speed of the flow in front of the wall and secondary flows under the influence of centrifugal forces and the boundary layer on the wall of the channel and the core of the flow .

Due to heat conduction, the heat transfer pipe gives heat (or takes away heat) to the wall of the pipe.

In the laminar and transition modes, at a low cost of energy consumption for driving the heat carriers, belt stackers make it possible to increase the heat output several times. Aggregators are especially effective in the field of such flow regimes

In the turbulent mode, the heat transfer increases by 1.5-2 times when using agglomerating belts. The decrease in the efficiency of agglomerators with an increase in the Reynolds number is characterized by the fact that the heat transfer accelerators affect the full flow and not the pre-wall area.

Disadvantage of the screw installed along the continuous flow is that it increases the hydraulic resistance. To reduce this hydraulic resistance while maintaining a high level of heat exchange, it is possible to achieve a series installation of separate screws in the pipe. The heat transfer in such a channel depends on the geometry of the coils and the distance between them.

To accelerate the heat exchange, the flow twist is installed not only in the pipe, but also in the space between the pipes of the heat exchange equipment.

In the development of high-efficiency heat exchange devices, channels of the diffuser-confuser type (channels with wavy walls) occupy a worthy place.

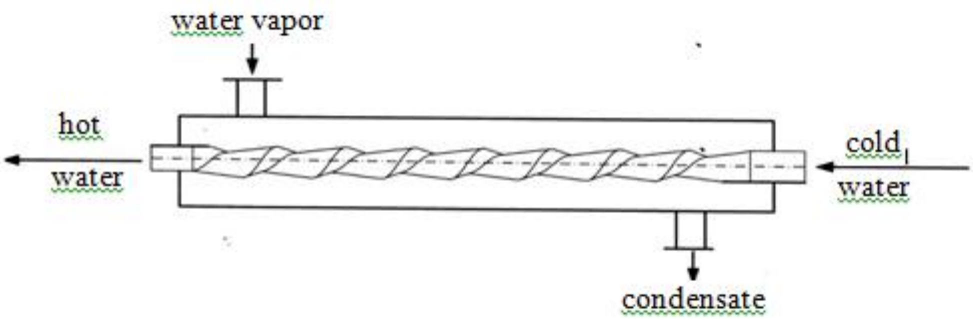

Fig. 2. Scheme of heat exchange equipment of the type "Pipe-in-pipe" with a heat exchange element of the type "diffuser-confuser" with a screw heat exchange surface

In such heat exchange equipment, the channels are arranged in series in the form of a diffuser-confuser. Acceleration of heat exchange in such a channel depends on the hydrodynamic properties of the flow.

The gas flow in the diffuser breaks away from the wall and has the characteristics of increasing turbulence, mixing transversely, which leads to the acceleration of heat exchange.

As the current flows through the baffle, its acceleration causes sorting. Due to this, the turbulence property in the confusor decreases and the heat exchange process slows down, but if the flow passes to the confusor after the diffuser, the diffuser generates turbulent flows, and its edge separates from the confusor in the break zone.

As a result, the process of heat exchange in the condenser is ensured at a high level. In general, the diffuser teraconfusor system is characterized by high thermal efficiency, in which hydraulic resistance decreases.

The heat transfer and hydraulic resistance of the channel will depend on the connection between the diffuser and confusor lengths. In particular, the dimensions of the inlet and outlet sections of the diffuser and the shape of the connecting edge of the flow are important.

The process of heat exchange in a wavy smooth channel is equal to 40-50% of their hydraulic resistance compared to a flat channel. The "diffuser and confusor" elements present on the heat exchange surfaces in the form of convex pipes provide a two-way acceleration process of heat transfer and increase the area of the heat exchange surface by 1.5-1.7 times on average compared to flat pipes.

Channels with discrete turbulence in the turbulent flow of the heat carrier.

It can be created by cutting, stamping, gluing, wire wrapping and other methods to create artificial ripples. Bumpiness can be integral or discrete. Acceleration of the heat exchange process with the help of turbulence can be due to the early transition from laminar flow to turbulent flow.

In this case, the pre-wall layer of the liquid is turbulized in relation to the flat wall. Turbulent movement of the flow is achieved due to turbulence, and at the same time heat exchange increases and hydraulic resistance increases. The main factors affecting heat transfer and hydraulic resistance are:

- ✓ gadir - the height of the bump and the thickness of the mucous layer;
- ✓ the shape of the bulges and, accordingly, the thickness - a number of characteristics of swelling.

These factors show their influence in the process of giving heat.

causes the following characteristics to appear.

- point density - is the concentration of the number of elements of the particles , which is taken according to the unit area of the surface;
- is the coefficient of increasing the surface , in which it is determined by the ratio of 1 pagon meter of the pipe to the surface area. Also, the internal diameter is determined by the ratio of the diameter of the tube, which is the diameter of the tube.
- gadir - bumpiness dramatically increases the heat exchange surface and ensures that it has a 2 times larger area compared to a flat surface.
- gadir - turbidity has the ability to slow down the growth of hydraulic resistance by speeding up the heat exchange process three times or more.

Usually, gadir - budir is used in order to accelerate heat exchange in channels, pipe cavity and external washing of bodies. The increase in heat transfer and hydraulic resistance is proportional to the heat exchange surface area.

Therefore, it is necessary to use roughness surfaces with a high coefficient of gain. The evaluation of the efficiency of rough surfaces with point bumps is done on the basis of the energy coefficient, and it shows that the use of conical round bump surfaces gives higher efficiency.

With discrete roughness, in the form of individual point bumps (distributed along the wall) or continuous bumps, viewed along the perimeter of the channel cross-section (or its part) relative to the flow ndalang may be placed. Also, the shape of the bumps can be made in different ways.

Discrete bulges is carried out at the expense of turbulation and disruption of the pre-wall zone of the turbulent boundary flow.

In this case, the increase in heat exchange and a relatively small increase in hydraulic resistance depends on the ratio of the height H of the bulge, more precisely, to the thicknesses of its boundary layer and viscous layer N. The distance between bumps t or the relative step tLh depends on the shape of the bumps and their mutual location.

Channels with transverse annular bulges .

When heat exchange is accelerated in pipes, the use of annular transverse ridges is very effective, which is usually obtained by simple welding. Turbulence of flow at relatively small field Reynolds numbers and relatively large pitch bulges leads to increased heat transfer.

As a result of the experiments, it was proved that the increase in heat exchange due to the turbulization of the flow is possible due to the increase in the hydraulic resistance. But as the Reynolds number of the flow increases, the effect of accelerating the heat exchange process decreases.

In order to accelerate the heat exchange in the pipes, small transverse ring bulges will have the following advantages:

- the grooves formed on the outer surface of the pipe by means of a groove accelerate the heat exchange in the flow of the heat carrier moving between the pipes;
- nesting technology is simple to perform, and its mechanization works are easily performed;
- the technology of assembly of mask-tube heat exchangers available today is used only for coiled tubes;
- it accelerates the heat release in the head of dense pipes, whose bulges are made by grooving, and it is used when it is not possible to rib the outer surface of the pipes.

Spherical dimples on the heat exchange surface.

Appear in spherical troughs washed by the ambient flow and are observed in both laminar and turbulent flow regimes. Such a phenomenon has the characteristic of absorbing the environment.

As a result of a number of experimental studies, it was found that the increase in heat transfer for spherical cavities was not in the standard form of the increase in hydraulic resistance, for example, such a situation is clearly manifested in slotted channels.

In short, surfaces with spherical depressions cause a 1.5-4.5 times increase in heat exchange compared to a flat surface, and the increase in hydraulic resistance is relatively small. It should be noted that the technology of forming spherical grooves on flat surfaces is easy and does not have a significant impact on the overall cost of the heat exchanger.

The thermal-hydraulic characteristics of surfaces formed by spherical depressions depend on the following:

- ✓ according to the shape of the pits (pointed, edged or smooth-edged)
- ✓ the density of placement of pits on the heat exchange surface;
- ✓ the relative depth and longitudinal and transverse step of the grooves in relation to the height of the channel;

In addition, in combination with the above- mentioned parameters, the heat exchange and hydraulic resistance are significantly affected by the pits located on the adjacent surfaces of the channel.

Has the same effect on the reduction of thermal efficiency. According to the experience of YM Brodov, the acceleration effect decreases as the Reynolds number of the flow increases.

The efficiency of the heat exchange process increases by about 10% in the case of transverse washing of the spikes of the spiral coiled pipes. Water vapor condensation increases heat transfer by 10-70% compared to flat pipes.

From the point of view of thermal efficiency (in the process of heat exchange in the channel), internal spiral ribbed tubes with a small height are considered to be the preferred option, but in practice spiral ribbed tubes are still common. Because ribbed pipes have high metal capacity. This causes its price to increase sharply.

Spiral bulges can be arranged by installing wire-to-barrel spring inserts in the pipes.

If the steps of the wire spiral are small, the thermal contact of the bulge with the surface of the pipe is broken. Therefore, the increase in the heat exchange surface due to the bulges is sharply reduced compared to the spirally grooved bulges. This disadvantage reduces the thermal efficiency of small-pitch spring coils, and a coiled spiral coil is preferable in this case.

Conclusion

In order to increase the working process of boiler rooms of thermal power plants from an economic point of view, it is desirable to utilize the heat of flue gases. As a result of the use of regenerative heat exchange devices in order to utilize the heat of flue gases, it will be possible to save the fuel and energy resources used for the initial heating of the atmospheric air . The use of the Yungstrem type regenerative heat exchange device in order to save fuel and energy resources allows the quality of waste heat provides disposal. In order to increase the efficiency of using regenerative heat exchangers of the Jungstrom type, it is desirable to simplify the construction of the channels and reduce the heat transfer surface.

References

1. Umurzakova, M. A., Usmanov, M. A., & Rakhimov, M. N. (2021). ANALOGY REYNOLDS PRI TECHENIYAX AND DIFFUZORNO-CONFUZORNYX KANALAX. *Economics and society* , (3-2 (82)), 479-486.
2. Abbasov, Y., & Usmanov, M. (2022). CALCULATION OF THEIR POWER AND HEATING SURFACE IN IMPROVING THE EFFICIENCY OF AIR HEATING SYSTEMS. *Science and innovation* , *1* (A7), 738-743.
3. Abbasov, YS, Abdukarimov, BA, & Ugli Usmanov, MA (2022). Optimization of Working Parameters of Colorifiers used in Heat Supply Systems. *Central Asian Journal of Theoretical and Applied Science* , *3* (6), 399-406.
4. Maksudov, RI, Dehkanov, SS, & Usmanov, MA (2023). THERMAL INSULATION MATERIALS AND DETERMINATION OF THEIR OPTIMAL THICKNESS. *Economics and society* , (4-1 (107)), 151-157.
5. Abbasov , Y. _ S. , & ugli Usmanov , M. _ A. _ (2022). Design of an Effective Heating System for Residential and Public Buildings. *Central Asian Journal of Theoretical and Applied Science* , *3* (5), 341-346 .
6. Madaliyev , E. , Makhsitalayev , B. , & Rustamova , K. (2022). IMPROVEMENT OF SEWAGE FLATS. *Science and innovation* , *1* (A7), 796-801.
7. Madaliyev, E., & Maksitaliyev , B. (2022). A NEW WAY OF GETTING ELECTRICITY. *Science oath innovation* , *1* (A7), 790-795.
8. Mo'minov, O. A., Abdukarimov, B. A., & O'tbosarov, S. R. (2021). Improving support for the process of the thermal convection process by installing reflective panels in existing radiators in places and theoretical analysis. In *Наука и инновации в строительстве* (pp. 47-50).
9. Абдукаримов, Б. А., Муминов, О. А., & Утбосаров, Ш. Р. (2020). Оптимизация рабочих параметров плоского солнечного воздушного обогревателя. In *Приоритетные направления инновационной деятельности в промышленности* (pp. 8-11).
10. Mo’minov, O. A., & O’tbosarov Sh, R. Type of heating radiators, principles of operation and theoretical analysis of their technical and economic characteristics. *JournalNX*, *7*(05), 299-303.
11. Muminov, O., & Maksudov, R. (2022). HIDROTECHNICS PREVENT VIBRATIONS THAT OCCUR IN CONSTRUCTIONS. *Science and innovation*, *1*(A7), 762-766.
12. Muminov, O. (2022). TYPES OF CAVITATION, CAUSING VIBRATION IN ENGINEERING AND WATER SUPPLY SYSTEMS. *Science and innovation*, *1*(A7), 732-737.
13. Abdullayev, B. X., & Rahmankulov, S. A. (2021). Modeling Aeration in High Pressure Hydraulic Circulation. *Central Asian Journal of Theoretical and Applied Science*, *2*(12), 127-136.
14. Madaliev, M. E. U., Rakhmankulov, S. A., & Tursunaliev, M. M. U. (2021). Comparison of Finite-Difference Schemes for the Burgers Problem. *Middle European Scientific Bulletin*, *18*, 76-83.
15. Abdullayev, B. X., & Rahmankulov, S. A. (2021). Movement of Variable Flow Flux Along the Path in a Closed Inclined Pipeline. *Central Asian Journal of Theoretical and Applied Science*, *2*(12), 120-126..

16. Rakhmankulov, A. (2022). ГИДРАВЛИЧЕСКИЕ ПАРАМЕТРЫ ПОТОКА ВОДЫ В БОРОДЕ С НЕСТАЦИОНАРНЫМ ДНОМ. *Science and innovation*, *1*(A7), 820-826.
17. Rakhmankulov, A. (2022). ГИДРАВЛИЧЕСКИЕ ПАРАМЕТРЫ ПОТОКА ВОДЫ В БОРОДЕ С НЕСТАЦИОНАРНЫМ ДНОМ. *Science and innovation*, *1*(A7), 820-826.
18. Solijonov, MV (2022). QUYOSH ENERGİYAsidan FOYDALANGAN YANGI QOYISH HAVO ISITISH PARAMETRLARINI ISHLAB CHIQISH PARAMETRLARINI OPTİMLAYTIRISh. *MATEMATİK NAZARIYA VA INFORMATYA FANLARI MARKAZIY ASIAN JURNALI* , *3* (12), 190-197.
19. Abdukarimov, BA, Solijonov, MV, & Abdumalikov, RR (2023). AN'VANSIY VA QAYTA OLiladigan ENERGIYA MANBALARI ASOSIDA ISHLAB CHIQISH ISILIK TA'MINLANISH TIZIMLARINI TADQIQOT. *OLTIN MIYA* , *1* (1), 253-255.
20. Abdukarimov, A., Solijonov, M., & Abduxamidov, A. (2022). QUYOSH ENERGIYASIDAN FOYDALANISHDA YANGI SOLAR HAVO ISITISHLARNING ISHLATILISH PARAMETRLARINI OPTİMLAYTIRISh. *Fan va innovatsiyalar* , *1* (A8), 815-823.
21. Abdujalilova, S. S., & Zukhridinovna, R. S. (2023). MEASURING WATER CONSUMPTION IN FITTINGS. *CENTRAL ASIAN JOURNAL OF MATHEMATICAL THEORY AND COMPUTER SCIENCES*, *4*(5), 29-33.
22. Ибрагимова, З. К. К., Хамдамова, Н. С. К., Умуркулов, Ш. Х. У., & Сабиров, Д. Р. У. (2022). Подготовка питьевой воды из маломощных поверхностных водоисточников. Central Asian Research Journal for Interdisciplinary Studies (CARJIS), 2(Special Issue 4), 77-83.
23. OBIDOV J., UMURQULOV S. O ‘ZBEKISTON YASHIL IQTISODIYOT SOHASIDA ISLOHOTLARNI AMALGA OSHIRISHDA MUQOBIL ENERGIYA MANBALARINING O ‘RNI VA AHAMIYATI //Bulletin of Contemporary Studies. – 2023. – Т. 1. – №. 3. – С. 15-18.
24. Bekzod, A. (2020). Relevance of use of solar energy and optimization of operating parameters of new solar heaters for effective use of solar energy. *IJAR*, *6*(6), 16-20.
25. Mo'minov, O. A., Abdukarimov, B. A., & O'tbosarov, S. R. (2021). Improving support for the process of the thermal convection process by installing reflective panels in existing radiators in places and theoretical analysis. In *Наука и инновации в строительстве* (pp. 47-50).
26. Abdukarimov, B., O'tbosarov, S., & Abdurazakov, A. (2021). Investigation of the use of new solar air heaters for drying agricultural products. In *E3S Web of Conferences* (Vol. 264). EDP Sciences.
27. Abdukarimov, B. A., O’tbosarov, S. R., & Tursunaliyev, M. M. (2014). Increasing Performance Efficiency by Investigating the Surface of the Solar Air Heater Collector. *NM Safarov and A. Alinazarov. Use of environmentally friendly energy sources*.
28. Худайкулов, С. И., Жовлиев, У. Т., Сайлиев, О. И., & Утбосаров, Ш. Р. (2022). МОДЕЛИРОВАНИЯ ЗАДАЧИ ТУРБУЛЕНТНОГО ТЕЧЕНИЯ СМЕСИ ВЯЗКИХ ЖИДКОСТЕЙ. *BARQARORLIK VA YETAKCHI TADQIQOTLAR ONLAYN ILMIY JURNALI*, *2*(1), 405-410.
29. Эгамбердиев, О. Ш., Хамдамов, А., Ўзбеков, Ж., Рахмонкулова, С., & Халилов, Н. (2022). НАСОС СТАНЦИЯСИНИНГ ИШЛАШ ЖАРАЁНИНИ ОПТИМАЛ БОШҚАРИШ АЛГОРИТМИ. *Евразийский журнал академических исследований*, *2*(11), 94-99.

30. Nurmuhammad, X. (2022). HYDRAULIC IMPACT IN HYDRO SYSTEMS AND ITS CAUSES. *CENTRAL ASIAN JOURNAL OF MATHEMATICAL THEORY AND COMPUTER SCIENCES*, *3*(12), 159-164.

31. Ishankulovich, K. S., & Akramovna, U. N. (2021). Simulation of the Lift of Two Sequential Gate Valves of the Karkidon Reservoir. *Middle European Scientific Bulletin*, *18*, 148-156.

32. Ishankulovich, K. S. (2022). Modeling The Rotation Of A Turbulent Flow With A Variable Radius. *International Journal of Progressive Sciences and Technologies*, *31*(2), 388-395.

33. O‘tbosarov, S. H., & Xusanov, N. (2022). ASSEMBLY OF STRUCTURES AND WATER DIVIDERS. *Science and innovation*, *1*(A7), 780-784.

34. Mo’minov, O. A., & O’tbosarov Sh, R. Type of heating radiators, principles of operation and theoretical analysis of their technical and economic characteristics. *JournalNX*, *7*(05), 299-303.

35. Abdukarimov, B.A., Tillaboyeva F. Sh, va A.T.A’zamjonov. «QUYOSH SUV ISITISH KOLLEKTOR ISILIK QUVURLARIDAGI GIDRAVLIK JARAYONLARNI HISOBLASH». *Ekonomi va sotsium* 4-1 (107) (2023): 4-10.

36. qizi Tillaboyeva, F. S. (2023). QUYOSHLI SUV ISITGICH KOLLEKTORLARINING ISSIQLIK ALMASHINUVI HISOBI. GOLDEN BRAIN, 1(31), 156-162.

37. qizi Tillaboyeva, F. S. (2022). QUYOSH KOLLEKTORLARI. QUYOSH KOLLEKTORLARINING TURLARI VA KOMPONENTLARI. *INTERNATIONAL CONFERENCE ON LEARNING AND TEACHING*, *1*(6), 255-258.

38. Abdulkhaev, Z., Abdujalilova, S., & Abumalikov, R. (2023). CONTROL OF HEAT TRANSFER ABILITY OF RADIATORS USING THERMOVALVE. *Journal of Construction and Engineering Technology*, *1*(1).

39. Erkinjonovich, A. Z., Abdujalilova, S. S., Aminjonovna, A. I., Abdulazizovna, M. N., & Botyrjonovna, Y. A. (2023). Fire Prevention Using an Automatic Shut-of Valve. *CENTRAL ASIAN JOURNAL OF MATHEMATICAL THEORY AND COMPUTER SCIENCES*, *4*(8), 91-94.