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# "REVIEW PAPER ON HEAT TRANSFER ENHANCEMENT IN HEAT EXCHANGER WITH ROTATING TWISTED INSERTS"

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## ABSTRACT

***Fouling of heat exchangers in the dairy industry has been investigated extensively and a large number of studies are reported in literature. This review focuses on the mechanisms of milk fouling, detailing the role of protein denaturation and aggregation reactions as well as mass transfer. It has also been endeavoured to review the effect of a number of different factors on milk fouling. These factors have been divided into five major categories: milk composition, operating conditions, heat exchanger characteristics, presence of micro-organisms, and location of fouling.***

***Keyword:*** *Heat exchangers, dairy, of milk fouling, micro-organisms*

## I. INTRODUCTION

The heat exchangers have many applications in the industry. Its performance depends on its design, heat transfer rate, type of medium, pressure drop etc. Its heat transfer rate can be increased my changing the fluid stream inside the heat exchanger. It is done by placing the obstacle in the flow called as insert. Heat transfer rate can be enhanced by using different methods. Those are as follows: 1)Active Techniques: These techniques are more complicated for the design and use point of view. It requires external power source to enhance the heat transfer rate. It has limited application due to requirement of external power source. 3) Passive Techniques: These techniques use surface of geometrical modifications to the flow channel by incorporating inserts or additional devices. This technique does not require any external power; rather they use power form system itself. Ultimately leads into a rise in fluid pressure drop. This method gives higher heat transfer rate as compared with the extended surface. 4) Compound Techniques: It is a hybrid method where both active and passive techniques are combined to increase the heat transfer rate. As this method uses passive technique since it doesn't require any external power source. Due to this advantage it is widely used in the industries. 5)Extended Surface: They provide effective heat transfer enlargement. The new research led to modify the fin surface that also tends to improve the heat transfer coefficient. 6)Treated surface: These are the heat transfer surfaces which have thin alteration on their finish or coating.

The alteration could be continuous or discontinuous, where the roughness is much smaller than what affects the single phase heat transfer, and they are used for boiling and condensing. [3] 7) Displayed enhancement techniques: This technique includes the usage of inserts in the forced convection. These devices improve the energy transfer rate in the heat exchangers. Inserts are of different shapes and sizes are u 8)Swirl flow devices: They produce or superimpose the swirl flow or secondary recirculation on the axial flow in a channel. These devices include helical strip or cored screw type tube inserts, twisted tapes. [3] 8) Coiled.

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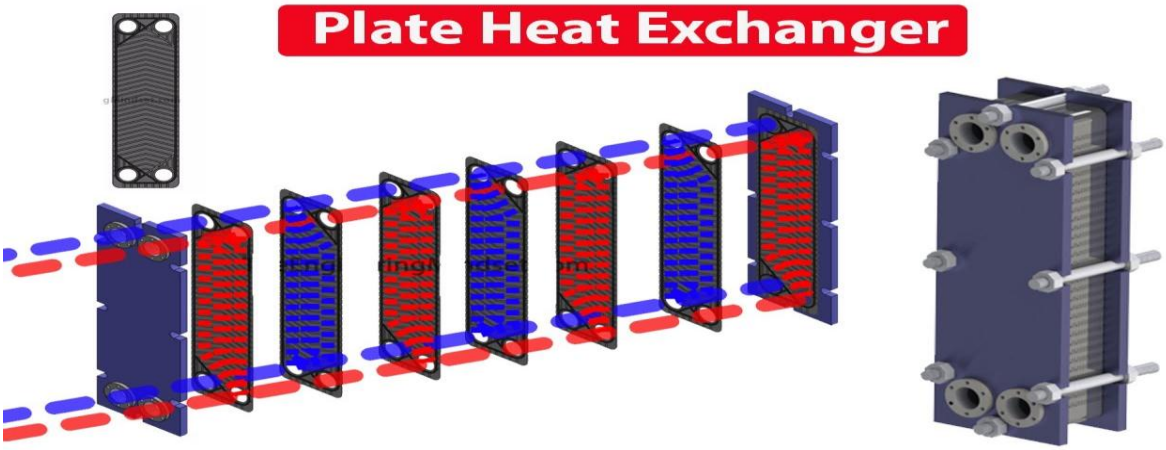


**Fig.1 Plate heat exchanger**

## II. LITERATURE SURVEY

The heat move from essential fluid to optional fluid is more than the without change framework. It allows the temperature of fluid increment for some helpful purposes in manufacturing process. Different tests were done around there to upgrade the rate of heat move to improve the efficiency of thesystem.

**TabishAlam et al [1]** The goal of this paper is to audit the various procedures, which have been utilized to upgrade the heat move rate in heat exchanger devices, for example, sun powered air heater, cooling cutting edges of turbine, etc using single stage heat move fluids. The consequences of ongoing distributed articles with the advancement of new advances, for example, Electro hydrodynamic (EHD) and Magneto hydro elements (MHD) are likewise included. Upgrade of heat move in heat exchanger can accomplished by methods for a few strategies. These strategies are gathered into the dynamic and passive strategy. In the dynamic strategies, framework need some outer power, nonetheless, passive technique use surface change either on heated surface or addition of twirl devices in the stream field. Dynamic techniques are exceptionally intricate due to outside power supply, in spite of the fact that these strategies have extraordinary potential and can control thermally. Passive techniques incorporate artificial harshness, broadened surface, winglets, inclusion of whirl devices in the stream which modifies the stream example causes to aggravate the thermal limit layer, and thusly high heat move. Passive techniques are prevailing over dynamic strategies since it can easily utilized in existing heat exchangers. In this paper, an exertion has been made to arrange the dynamic and passive strategies and audit the different heat move procedures connected in heat exchangers. Significant outcomes have been recorded for prepared reference. It has been reasoned that either dynamic or passive strategies have been utilized alone. In view of writing, a consolidated technique has likewise been prescribed which incorporate both dynamic and passive methods.

**ChiragMaradiya, JeetendraVadher et al [2]** Heat move devices have been utilized for conversion and recuperation of heat in numerous modern and household applications. More than five decades, there has been coordinated exertion to create design of heat exchanger that can result in decrease in vitality prerequisite just as material and other cost sparing.

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Heat move improvement systems by and large diminish the thermal resistance either by increasing the successful heat move surface region or by producing disturbance. Once in a while these progressions are joined by an expansion in the required siphoning power which results in greater expense. The viability of a heat move improvement system is assessed by the Thermal Performance Factor which is a proportion of the adjustment in the heat move rate to change in friction factor. Different kinds of supplements are utilized in many heat move upgrade devices. Geometrical parameters of the supplement to be specific the width, length, bend proportion, curve heading, and so on influence the heat move. For instance counter twofold turned tape addition has TPF of more than 2 and joined wound tape embed with wire loop can give a superior execution in both laminar and fierce stream contrasted with curved tape and wire curl alone. Much of the time, unpleasantness gives preferred execution over the turned tape as found if there should arise an occurrence of stream with huge Prandtl Number. The artificial harshness can be created by utilizing a ridged surface which improves the heat move qualities by breaking and destabilizing the thermal limit layer. This paper gives a comprehensive survey of passive heat move devices and their relative benefits for wide assortment of industrialapplications.

**Zhe Wang, Zan Wu et al [3]** As a novel coolant, the ethylene glycol-water (50 wt.%:50 wt.%) with diagram nano platelets nano fluids (GnPEGW) were set up at four weight focuses (0.01, 0.1 0.5 and 1.0 wt.%), and heat move and pressure drop attributes in a scaled down plate heat exchanger (MPHE) were explored. All nano fluid examples were arranged and weakened by ultrasonic vibration, and their thermal conductivity and dynamic viscosity were estimated by a transient plane source technique and a rotational rheometer, separately. Right off the bat, the convective heat move coefficient (HTC) and pressure drop connections were anticipated under the condition that water was utilized as working fluid in both the hot and cold sides of the MPHE. At that point, the impacts of GnP convergences of nanofluids on the thermal and pressure driven exhibitions have been resolved for the MPHE with the nanofluid in hot side and the water in virus side. Parametric assessment and execution examination of the MPHE using GnPEGW were broke down through different working conditions. Exploratory analysis demonstrated that: the proposed relationships from water can foresee the trial information of the base fluid and GnP-EGW nano fluids. In the best possible focus go from 0.01 to 0.1 wt. %, the GnP-EGW nanofluid has an adequate pressure drop punishment yet a higher heat move execution contrasted and the base fluid in the MPHE, which uncovers that it may be a potential coolingmedium.

**AtulBhattad et al [4]** In the present examination, numerical just as exploratory examinations have been done on the plate heat exchanger using cross breed nanofluid (Al2O3 +MWCNT/water) at various fixation to research its impact on heat move and pressure drop qualities. Discrete stage model has been utilized for the examination using CFD software and results have been contrasted and the exploratory outcome just as consequence of the homogenous model. Impacts of various working parameters (nanofluid delta temperature, stream rate and volume fixation) have been contemplated on coolant outlet temperature, heat move rate, convective and by and large heat move coefficients, Nusselt number, friction factor, pressure drop, siphoning force, viability and execution file. Velocity and temperature profiles have been additionally contemplated for base fluid, nanofluid and cross breed nanofluid. By using half and half nanofluid, heat move coefficient improves by 39.16% (merit) with irrelevant increment in siphoning intensity of 1.23% (negative mark). An improvement in heat move and pressure drop qualities; and subsequently on the viability of plate heat exchanger has been watched while using half breed nanofluids rather than basefluid.

**M.Thirumarimurugan et al [5]** A plate type heat exchanger consists of plates rather than cylinders to isolate the hot and cold fluids. Since every one of the plate has enormous surface zone, the plates furnish every one of the fluids with an incredibly huge heat move zone. Because of the high heat move efficiency of the plates, plate type heat exchanger is smaller when contrasted with a shell and cylinder heat exchanger with a similar heat move capacity. In this paper endeavors have been made to think about the presentation of Plate type heat exchanger with miscible and immiscible frameworks. The test concentrates engaged with the assurance of outlet temperature of both cold and hot fluid for different stream rates. The water-water framework, water-acidic acid framework, water ethylene glycol framework, ater-toluene framework and water-lamp oil framework at 9%, 10%, 20% and 25% composition were utilized to decide the exhibition of plate type heat exchanger for example generally speaking heat move coefficient(U), viability, cold side efficiency(c) and hot side efficiency(h).

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These trial information were utilized to create neural networks using general regression neural network (GRNN) Model. Further, these networks were tried with a lot of testing information and after that the simulated outcomes were contrasted and the genuine aftereffects of the testing information and found that the test information are near the simulateddata.

**AbhishekNandan et al [6]** Plate heat exchanger has discovered a wide scope of utilization in different ventures like nourishment enterprises, synthetic businesses, control plants and so on. It diminishes the wastage of vitality and improves the general efficiency of the framework. Consequently, it must be designed to acquire the greatest heat move possible. This paper is introduced so as to think about the different hypotheses and results given over the improvement of heat move execution in a plate heat exchanger. Be that as it may, there is as yet a need in information and summed up conditions for the count of various parameters in the heat exchanger. It requires more thoughtfulness regarding discover different possible connections and summed up answers for the exhibition improvement of plate heat exchanger.

**M. Faizal et al [7]** Experimental examinations were performed on a creased plate heat exchanger for little temperature distinction applications. Examinations were performed on a single groove design on 20 plates organized parallelly, with an absolute heat move territory of 1.16298 m2. The spacing, DX, between the plates was differed (DX = 6 mm, 9 mm, and 12 mm) to tentatively decide the arrangement that gives the ideal heat move. Water was utilized on both the hot and the virus channels with the stream being parallel and entering the heat exchanger from the base. The high temp water flowrates were changed. The virus side flowrate and the hot and cold water gulf temperatures were kept consistent. It is discovered that for a given DX, the normal heat move between the two fluids increments with increasing high temp water flowrates. The layerings on the plates upgrade disturbance at higher velocities, which improves the heat move. The ideal heat move between the two streams is acquired for the base spacing of DX = 6 mm. The pressure misfortunes are found to increment with increasing flowrates. The general heat move coefficients, U, the temperature distinction between the two stream at outlet, and the thermal length are additionally introduced for fluctuating boiling water flowrates and DX. The discoveries from this work would upgrade the present information in plate heat exchangers for little temperature distinction applications and furthermore help.

## III. CONCLUSION

The need to develop efficient heat exchangers has been partially fulfilled by using increased heat transfer rates. In the recent years, considerable emphasis has been placed on the development of various augmented heat transfer surfaces and devices. The heat exchanger industry has been striving for enhanced heat transfer coefficient and reduced pumping power in order to improve the thermo hydraulic efficiency of heat exchangers.
A good heat exchanger design should have an efficient thermodynamic performance, i.e. minimum Generation of entropy or minimum destruction of energy in a system incorporating a heat exchanger. The major challenge in designing a heat exchanger is to make the equipment compact and to achieve a high heat transfer rate using minimum pumping power.

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