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Performance Analysis Of Rate Of Increasing Heat Transfer In A Composite Material On Micro Tubes Using CFD

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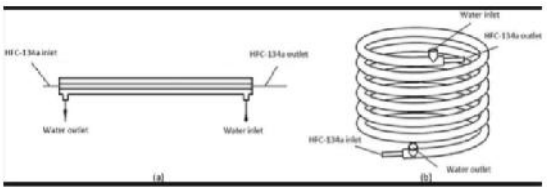
Abstract: **In the last two years, the calculations have been made for a tube whose measurement ranges from 50 to 500 µm. The normal match number in the outlet level of the gag current depends on the pipe width and reaches 1.16 to 1.25. The properties of the low-flow gas stream were detected in a straight pipe of a smaller scale. A smaller scale tube whose total sum of the air is pushed out so that electrons in motion do not push against any gas particle and can effectively move from one terminal to another. The cathodic bundle tubes, which include picture tubes and other video tubes, are the most commonly used miniaturized scale tubes. In this statement, the development of heat exchange research has been improved by the use of new types of heat exchange liquids called nanosubstance's that have nanoparticles. The limited convective laminar flow of various types of nano liquids (TIC and MGO), for example (TIC and MGO), with various volume sections of 0.4 and 0.5 using water as a liquid base, has been investigated through CFD research. The micro tube (meter) with a width of 0.01 cm and a length of 20 cm is used in this test. This test covers the Reynolds number in the range 90 to 800. Heat investigates to determine the temperature and movement of the heat with different materials. Materials currently used for copper tubes on a small scale, replace with compound materials.**

Keywords: **Heat Exchanger; Shell And Tube Type; CFD; Tube Cross-Section; Design; And Analysis;**

I. INTRODUCTION

1.1 MICRO CHANNEL: The flow characteristics of the little extended gas stream in a straight small-scale pipe are uncovered. A miniaturized scale tube, the sum of which air is evacuated, so that electrons in motion do not collapse in any gas particle and can move more effectively from one anode to the next. Cathode ray tubes, which include television picture tubes and other video tubes, are the most common small-scale tubes [1]. The limited convective laminar flow of different nanomaterials, for example, (Tic and MgO), with different sections of volume 0.4 and 0.5 that use water as base liquids, was investigated through CFD research. The micro tube (MT) of 0.01 cm wide and 20 cm long was used in this investigation. This research covers the Reynolds number in the range of 90 to 800.



1.1.1 Micro channel

1.2 COMPOSITE MATERIAL: A composite material (or organizational material called or shortened as a compound) is a material that is manufactured using at least two constituent materials with significant extraordinary physical or synthetic properties that, if considered, include a material with unique characteristics in relation to individual segments [2][3]. The individual segments remain strategically and unambiguously within the entire structure and separate the compounds from the mixtures and the strong arrangements.

1.3 COMMON DESIGNED COMPOSITE MATERIALS INCLUDE:

- Composite wood, for example, compressed wood
- Reinforced plastics, for example, fiber-strengthened polymer or fiberglass
- Ceramic framework composites (composite fired and metal lattices)
- Metal framework composites
- and other Advanced composite materials

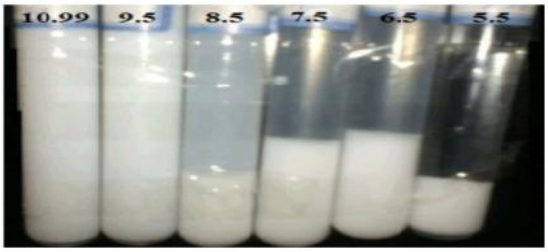
1.4 COPPER: Copper is a component of the substance with Cu image (Latin: Cuprum) and core number 29. It is a delicate, moldable and soft metal with high thermal and electrical conductivity [4]. A newly discovered surface of unsaturated copper has a red-orange hue.

1.4.1 Copper

1.5 CARBON EPOXY: The carbon fiber reinforced polymer, carbon fiber reinforced plastic or carbon fiber reinforced thermoplastic (CFRP, CRP, CFRTP or regular carbon fiber, composed of carbon or even carbon) is a largely solid plastic and lightweight reinforced with fiber containing carbon wires.

1.5.1 Carbon epoxy

1.6 NANO FLUID: Nano liquids weaken liquid suspensions of nanoparticles with something found in one of their primary measurements at less than 100 nm. Recent studies have found that the nano-liquid has improved thermophysical properties [5][6], such as thermal conductivity, thermal diffusion, thickness and heat exchange coefficients by convection, as opposed to basic liquids, oil or water. From the current audit, it is well understood that nanoparticles clearly show the improvement of hot conductivity, with the expansion of the volumetric distribution of nanoparticles.



1.6.1 nano fluid

1.7 Properties of Nano liquids

- Due to nano estimate particles, weight drop is least.
- Higher warm conductivity of nano particles will expand the warmth exchange rate.
- Successful work of nano liquid will prompt lighter and littler warmth exchanger.
- Drastic change in the properties of the base liquid, by suspending nano liquids
- Heat exchange rate increments because of vast surface region of the nano particles in the base liuid.
- Nano liquids are most reasonable for unic warming and cooling framework.

II. LITERATURE SURVEY

A . R. A. haled, etal [2010] "Late advances in warm exchange upgrades" The heat exchanger is a true component to the extent that warm exchange and conservation of vitality is a source of concern. A large number of heat exchangers are still available due to the wide range of conceivable plan results, basic meeting, low maintenance costs, cross-flow heat exchanger and counter current widely used in oil, petrochemicals, refrigeration, food storage and various companies. . The heat exchanger housing and tube are widely used in companies and cool for the exchange of heat from machine perfusion cool water to the ability to improve machine perfusion infusion. Change waste heat from molding machine by infusion to the cooling water dependent limit heat exchange of heat exchangers. Until the end of heat exchanger of the heat exchanger has improved, lice have distinguished between the best combination of heat exchangers parameters.

III. METHODOLOGY

The fundamental target of this taps, The Micro tube (MT) with 0.01 cm distance across and 20 cm length is utilizing in this examination.

1) This examination covers Reynolds number in the scope of 90 to 800.In this venture, warm investigation done at three unique materials (copper, carbon epoxy and e glass fiber) and warm examination is to decide the temperature circulation and warmth transition.

2) CFD examination to decide the warmth exchange coefficient, warm exchange rate, weight drop and mass stream rate at various NANO fluids(MgO and TiC) at various volume divisions 0.4 &0.5.

3) 3D demonstrating done in CREO and examination done in ANSYS.

4) Thermal examination to decide the temperature appropriation and warmth motion with various materials.

IV. RELEATED STUDY

4.1 INTRODUCTION TO CREO: PTC CREO, immediately asked as Pro / ENGINEER, is a software for three-dimensional modeling of group software that is made to bring in mechanical contact, cartoons, and CAD in the creation of

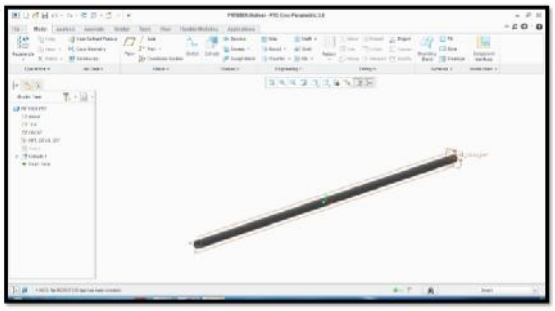
companies of workers. It is one of the main three-dimensional CAD modeling problems that contains a parametric device based on control. By using parameters, scope and capabilities to take the stance of your brand, you can improve the development, in addition to the point itself. Pro / ENGINEER Wildfire will include the offer prior to the presentation in CREO for 2010. It was exchanged for the devil using a credo developed by Parametric Technology Company (PTC), at any time to exchange the uninfected of its followers of geographical crops, establish the plan in one and the welding model. , 2D fresh orthographic for professional concept.

4.2 2D MODEL OF MICRO CHANNEL

4.3 PARAMETERS OF MICROCHANNEL

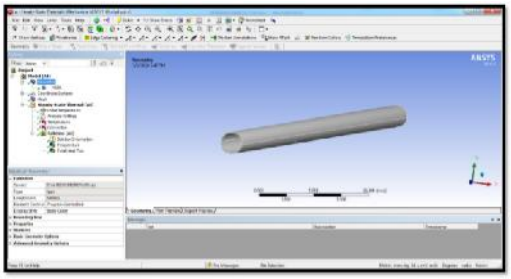
Parameter	Dimensions (mm)
Diameter	2
Thicness	0.08
Length	200

4.4 3D MODEL OF MICRO CHANNEL

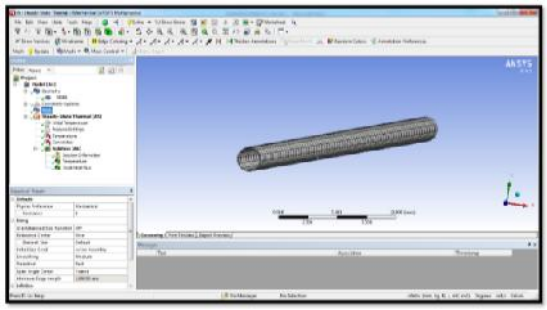


4.5 INTRODUCTION TO CFD: Computational liquid elements, typically shortened as CFD, are a part of liquid mechanics that utilizations numerical strategies and calculations to tae care of and investigate issues that include liquid streams. PCs are utilized to play out the estimations required to mimic the association of fluids and gases with surfaces characterized by limit conditions.

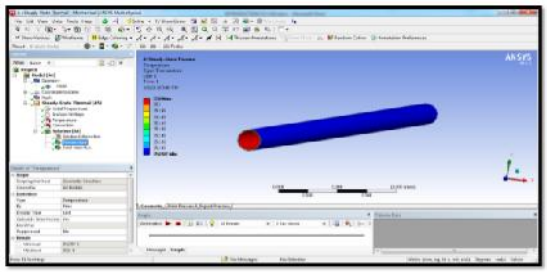
4.6 IMPORTED GEOMETRY



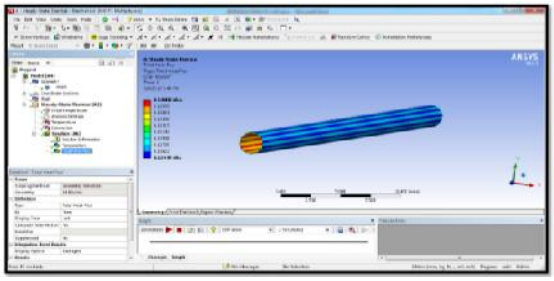
4.7 MESHING



4.8 TEMPERATURE



4.9 HEAT FLUX

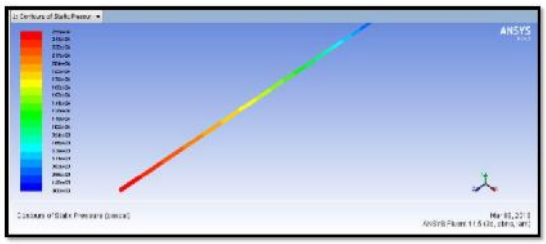


V. CFD ANALYSIS OF A MICRO TUBE

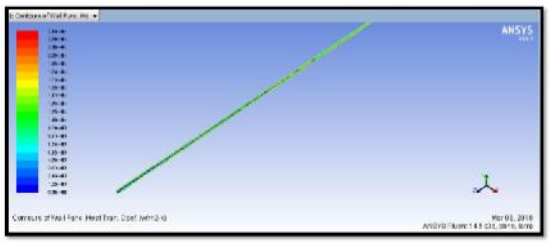
FLUID-TIC NANO FLIUD

At volume fraction-0.5%

5.1 PRESSURE



5.2 HEAT TRANSFER COEFFICIENT



5.3 MASS FLOW RATE

contact_region-src	0
contact_region-trg	0
inlet	0.020733861
interior-____msbr	0
interior-solid	-14.592369
outlet	-0.020720022
wall-12	0
wall-13	0
wall-7	0
wall-7-shadow	0
wall-____msbr	0
Net	1.3839453e-05

5.4 HEAT TRANSFER RATE

Total Heat Transfer Rate	(w)
contact_region-src	0
contact_region-trg	0
inlet	1649.4116
outlet	-1648.3602
wall-12	0
wall-13	0
wall-7	-0.0091088591
wall-7-shadow	0.01076318
wall-____msbr	0
Net	1.0530459

VI. COMPARISON RESULTS OF DIFFERENT MATERIALS AND NANO FLUIDS

6.1 THERMAL ANALYSIS RESULT

Material	Temperature (°C)		Heat flux (w/mm²)
	Max.	Min.	
Copper	353	352.97	0.14008
Carbon epoxy	353	352.98	0.14009
E-glass epoxy	353	352.96	0.1401

6.2 CFD ANALYSIS RESULT

Nano fluid	Volume fraction (Φ)	Reynolds number	Pressure (Pa)	Heat transfer coefficient (w/m2-)	Mass flow rate(g/s)	Heat transfer rate(W)
MgO	0.4	100	1.03e+04	1.72e+03	3.754e-06	0.09290
		500	2.23e+04	1.72e+03	1.7955e-06	0.04625
		800	3.95e+04	1.72e+03	2.074e-05	0.56198
	0.5	100	9.30e+03	1.89e+03	2.135e-05	0.591506
		500	2.46e+04	1.89e+03	2.644e-05	0.7025138
		800	4.62e+04	1.89e+03	2.19e-05	0.60643
TiC	0.4	100	8.5e+03	2.45e+04	1.6073e-05	1.3796
		500	2.55e+04	2.45e+04	1.3839e-05	1.0530459
		800	4.52e+04	2.45e+04	1.9599e-05	1.6916
	0.5	100	8.96e+03	3.84e+04	1.1020e-05	0.67324
		500	2.57e+04	3.84e+04	1.505e-05	0.8792
		800	4.56e+04	3.84e+04	2.11e-05	1.118334

VII. CONCLUSION

The micro tube (MT) measuring 0.01 cm and 20 cm long is used in this test. The Reynolds number extends between 90 and 800. The CFD test has determined the heat exchange coefficient, the hot exchange rate, weight loss and mass flow in various NANO fluids (MGO and TIC)) in different parts of volume 0.4 and 0.5. Warm research to determine the diffusion of temperature and the movement of heat with various materials. Material currently used for small-scale copper pipes, replaced with compound materials. By looking at the results of the CFD exam, the increases in the heat exchange coefficient are increased by volume. More heat exchange coefficient for titanium carbide in volume section 0.5. When the hot results of the investigation are observed, the transition of heat is estimated more for the epoxy E-Glass.

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